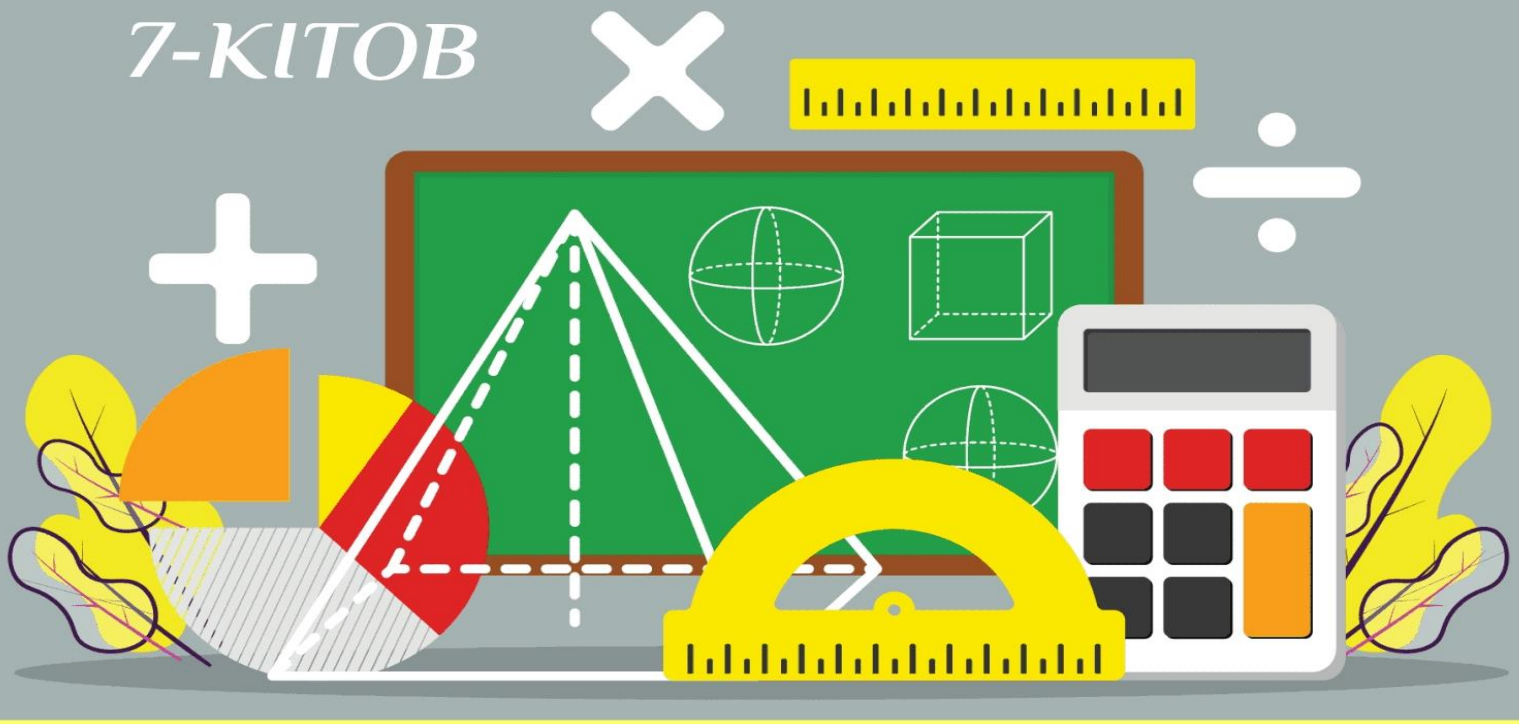
Pirnazar DAVRONOV, Maxbuba RAXIMQULOVA

MATEMATIKADAN
MISOL VA MASALALAR YECHISH

7-KITOB



O‘ZBEKISTON RESPUBLIKASI XALQ TA’LIMI VAZIRLAGI

SAMARQAND VILOYATI XALQ TA’LIMI XODIMLARINI
QAYTA TAYYORLASH VA ULARNING MALAKASINI
OSHIRISH HUDUDIY MARKAZI

Pirnazar DAVRONOV, Maxbuba RAXIMQULOVA

MATEMATIKADAN
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“QAMAR MEDIA” NASHRIYOTI
TOSHKENT – 2021

UDK 51(076.1)
KBK 22.1я7
P 46

P. Davronov, M. Raximqulova. Matematikadan misol va masalalar yechish. Metodik qo‘llanma. – “Qamar media” nashriyoti. Toshkent – 2021, 315-bet

Taqrizchilar:

E.Sattorov – SamDU matematika fakul’teti, “Matematika, fizika va funksional analiz” kafedrasi dotsenti

B.Usmanov – Samarqand viloyati XTXQTMOHM, “Aniq va tabiiy fanlar” kafedrasi dotsenti

Mazkur metodik qo‘llanmani yozishdan maqsadi, insonlarning ma’naviy ehtiyojlarini qondirishga ko‘maklashish asosida jamiyat, mamlakat taraqqiyotiga hissa qo‘shishdan iborat. Shu ma’noda maktab matematikasini o‘qib-o‘rganuvchi o‘qituvchilar, ayniqsa repetitorlik qiluvchi hamkasblar, maktabdan keyingi ta’limga tayyorgarlik ko‘ruvchi o‘quvchilar davlat test markazi tomonidan nashr etilgan axborotnomalardagi misol va masalalarini yechishda biror qiyinchlikka duch kelishsa, biz yozgan kitoblardan foydalanishlari qulay bo‘ladi.

ISBN 978-9943-7049-3-0

S O‘ Z B O S H I

Assalomu alaykum muhtaram kitobxon. Sizni muhtaram, - deb atadim. Boisi, Olloh insonni muhtaram va mukarram qilib yaratgan. Bunga barchamiz birdek musharraf bo‘lishimiz uchun shahdu shijoat ko‘rsatmog‘imiz darkor. Men, 1973 - 2018 yillar davomida oily o‘quv yurtlarida faoliyat ko‘rsatdim va doimo talabalarimdan ma’lum qismining yaxshi o‘qimasligidan tashvishlanib yashadim. Sababi, yoshlarimizdan har biri, jonajon Vatanimizning porloq kelajagini yaratishga, uzining hissasini qo‘shadigan insonlar hisoblanadi.

2018-yilning sentabr oyidan boshlab “Samarqand viloyat xalq ta’limi xodimlarini qayta tayyorlash va ularning malakasini oshirish hududiy markazi”da faoliyat ko‘rsatayapman. Shu joyga ishga kelib, talabalarimning yaxshi o‘qimasligi sabablarini bildim.

Markaz rahbarining topshirig‘iga asosan, malaka oshirishga kelgan tinglovchi maktab o‘qituvchilarining o‘zi o‘qitadigan fani bo‘yicha bilimlari bir o‘quv yili davomida o‘rganildi. Afsuski, maktablarning biror o‘quv fani bo‘yicha o‘qituvchilarning o‘zlashtirishlari 50% dan oshmadi. Jahonda o‘qitilishiga eng asosiy e’tibor qaratiladigan matematika fani bo‘yicha, bizning o‘qituvchilardan o‘rtach 57 foizi qoniqarsiz natija ko‘rsatishdi. Mamlakat, bu darajadagi o‘qituvchilarning o‘quvchilaridan nimani kutishi mumkin?

Bu salbiy oqibatning bosh sababi, aksariyat o‘qituvchilarning davlatimiz tomonidan chiqarilgan ta’lim

to‘g‘risida qabul qilinayotgan qonunlar, farmonlar, qarorlar va boshqa me’yoriy hujjatlardan behabarligi, o‘qitadigan fani, uni o‘qitish metodikasi, pedagogika, psixologiya fanlari yutuqlarini o‘zlashtirib, ularni kasbiy-shaxsiy faoliyatiga qo‘llash bo‘yicha, o‘z ustida, talab darajasida ishlamasligidan iborat.

Malaka oshirishga kelgan o‘qituvchilarining e’tirof etishlaricha, 50% dan ortiq o‘quvchilar o‘zlarining o‘quv imkoniyatlaridan past darajada o‘qigan holda maktablarni bitirishmoqda.

Men, bunday ma’lumotni bergan o‘qituvchilardan biriga “Aytaylik, sinfingizda 25 nafar o‘quvchi bor, ulardan biri sizning farzahdingiz. 24 nafar o‘quvchi yaxshi o‘qiyapdi, bitta sizning farzandingiz yomon o‘qishiga rozimisiz?”- degan savol bilan murojaat qilishni odat qilganman. Ular keskin ravishda “yuq” deb javob berishadi. Shunday ekan, 50% dan ortiq o‘quvchilarni savodsiz qoldirishni qanday baholaysizlar? O‘sha bilimi past bolaning ota-onasi qariganda, o‘zini eplay olmaydigan bu inson ularga qanday ko‘maklashadi? Bu insonning zimmasiga tushadigan mamlakat yukini kim ko‘taradi? kabi savollarimiz, o‘qituvchilarga o‘zining ta’sirini ko‘rsatmoqda, o‘ylantirib qo‘ymoqda. Ularning aksariyat qismi, o‘z ustimizda ishlab, o‘quvchilarni yaxshi o‘qitmasak bo‘lmas ekan,- degan fikrlarga kelishmoqda.

Xalqimizda “Erni er qiladigan ham, qora yer qiladigan ham …”-degan naql bor. Shunga o‘xshash, mamlakatni yuqori darajada rivojlantiradigan ham, taraqqiyotini susaytiradigan ham o‘qituvchilar hisoblanadi. Chunki, mamlakat taraqqiyoti, undagi yetuk kadrlariga bog‘liq. Bunday kadrlarni esa o‘qituvchilar tayyorlab beradi. Demak, Ona Vatanimizning kelajakdagi

taraqqiyoti, bevosita uning oqituvchilari va murabbiy mutaxassislari kasbiy-shaxsiy faoliyatlarining natijadorligiga bog‘liq.

2018-yil setntabrdan boshlab, ozim dars o‘tadigan, kamida 50 nafar matematika va 25 nafar fizika fani o‘qituvchilariga, har oyida eksperiment tariqasida, 8-sinf o‘quv dasturi doirasidagi tengsizlikni isbotlashlarini taklif etib kelaman. Hozirga qadar mingdan ortiq o‘qituvchilardan faqat ikki nafari tengsizlikni isbotlay olishdi. Bu muvaffaqiyatining sababi, ular o‘quvchilar repetitorligi bilan shug‘ullanishadi.

Men, maktablarimizda fidokorona mehnat qilayotgan hamkasblarimning faxrli va zahmatli faoliyatlarini kamsitmagan holda, repetitorlikni ta’limning eng natijador usuli deb bilaman. Har bir o‘quvchi bilan yakka tartibda ishlashga yunaltirilgan repetitorlik eng yuqori natija beradi.

Repetitorlik qiluvchi o‘qituvchi mustaqil izlanadi, mustaqil o‘rganadi, o‘z ustida tinimsiz ishlaydi. Barcha o‘qituvchilarning oz ustida tizimli ishlashga erishmasdan, Vatan taraqqiyotiga erishib bo‘lmaydi.

Hazrat Shayx Muhammad Sodiq Muhammad Yusuf o‘gitlarida aytilishicha, muallimlik eng yuksak farz, ya’ni majburiy kasb amali bo‘lib, ustozlar haqqiga avvalo Olloh, farishtalar, barcha osmon va er egalari, hatto uyasidagi chumoli, suv ostidagi baliqlar ham salovat aytib turishar ekan. Har qanday kasb egasining, ayniqsa o‘qituvchining o‘z kasbiy-shaxsiy faoliyatiga mas’uliyatsizlik bilan yondashishi Olloh oldida katta gunoh, Vatanga xiyonat hisoblanar ekan. Bundan ko‘rinadiki, Ikki dunyo saodatini o‘ylaydigan har bir inson kasbiga sodiq bo‘lmog‘i darkor.

Shayx Muhammad Sodiq Muhammad Yusuf Ibn Sinoning ilm o‘rganishi tartibi misolida, qadimgi o‘qib-o‘rganishning 7 bosqichini quyidagicha bayon qilgan: 1) 10 yoshgach madrasada Qur’oni karimni yod olgan; 2) qonun, ya’ni shariat ilmi; 3) matematika; 4) falsafa; 5) mantiq; 6) tib; 7) tabbiiy fanlarni o‘rgangan. Ibn Sino matematika ilmini, ko‘mir sotib tirikchiligini o‘tkazadigan olimdan olgan.

Jahonda “Singapur mujizasi” iborasi ko‘p ishlatiladi. Singapur davlati asoschisi Li Kuan Yuga, siz “Singapur mo‘jizasi” ga qanday erishdingiz, - degan savol ko‘p berilar ekan. Li Kuan Yuning javobi: “Men Singapurda mo‘jiza yaratmadim. Men faqat Vatanim oldidagi burchimni bajardim, xolos. Davlat byudjetini ta’limga yunaltirdim. Muallimni eng quyi tabaqadan Singapurdagi eng yuqori martabaga ko‘tardim. Davlatdagi “mo‘jiza”larni qilgan insonlar muallimlardir. Ular ilm, axloq, mehnat va haqiqatni sevadigan kamtar avlodni etishtirib chiqardilar. Buning uchun ulardan minnatdormiz”.

Bizning Prizidentimiz Shavkat Mirziyoyv ham davlat boshiga kelgan kundan boshlab, asosiy e’tiborini ta’lim tizimini tubdan isloh qilishga qaratmoqda. Ta’lim to‘g‘risidagi chiqargan barcha farmonlari, qarorlari, Oliy Majlisga murojaatnomalari, xalq ta’limi xodimlari bilan muloqatlari mazmun mohiyati maktabgacha ta’limni, maktab ta’limini rivojlantirishga, o‘qituvchi va murabbiylarni kasbidan tashqari ishlardan, ortiqcha qog‘ozbozliklardan ozod qilishga, ularning ijtimoiy, iqtisodiy mavqeni oshirishga qaratilgan. Jumladan, O‘zbekiston Republikasi Prezidenti Shavkat Mirziyoyv huzurida 2019-yil 23-avgust kuni “Yoshlarni vatanparvarlik ruxida tarbiyalash va jamiyatda o‘qituvchi mavqeini oshirish” masalalariga bag‘ishlab

o‘tkazilgan videoselektr majlisi Bayonida “O‘zbekiston Republikasi Prezidenti Administratsiyasi, Hukumati, barcha darajadagi davlat va xo‘jalik boshqaruv organlari, mahalliy hokimliklar rahbarlarining e’tibori maktab ta’limini rivojlantirish buyuk umummilliy maqsadga, umumxalq harakatlga aylanishi, ustozlarga yuksak hurmat-ehtirom ko‘rsatish – jamiyatimizda oliy qadriyat darajasiga ko‘tarilishi zarur ekanligi ko‘rsatilsin”.

Joylarda barcha rahbarlar va mutasaddilar “Butut kuchni xalq ichidan olaylik, quchoq ochib maktablarga boraylik” shiori ostida maktab ta’limini rivojlantirishga yunaltirilgan buyuk umummilliy maqsadga, umumxalq harakatlga ytakchilik qilishi ko‘rsatib o‘tilsin” kabi qator, juda muhim qarorlar o‘z aksini topgan.

O‘qituvchilarning maoshlari 2017-2019 yillarning o‘zida 2,5 barobar oshirildi, olis tumanlardagi maktablarda ishlayotgan pedagog kadrlar mehnatini rag‘batlantirish uchun ularga 50 foizgacha qo‘shimcha oylik ustamalar o‘rnatildi.

Muqaddas kitobimiz Qur’oni Karim “Iqro”, ya’ni o‘qi deb boshlangan bo‘lsa, Payg‘ambarimiz (s.a.v): “Beshikdan qabrgacha ilm izlang” deb marhamat qilgan bo‘lsalar, Imom Buxoriy (r.a): “Dunyoda ilmdan boshqa najot yuq va bo‘lmagay”,-deb aytgan bo‘lsa, Republikamiz Prezidenti Shavkat Mirziyoyev “O‘qituvchi va murabbiylar biz uchun ibrat namunasi, barcha insoniy fazilatlar timsolidir”, - deb bizlarni ulug‘laydi.

Muallim va murabbiylar kitoblarda va davlatimiz rahbari tomonidan shunchalik ulug‘lanar ekanmiz, Ona Vatanimizning porloq kelajagi va avlodlarimizning bizdan rozi bo‘lishlari,

faxrlanishlari, ikki dunyomizning saodatli bo‘lishi uchun kasbimizga sodiqlik bilan mehnat qilishimiz zarur.

Men, Davlat test markazi tomonidan 1996-2003 yillarda chop etilgan 89 ta “Axborotnoma” ning 77 tasida matematika fanidan berilgan 5773 ta misol va masalalarni, 2003 yildan so‘ng “Matematika” va “Abiturient” ruknlarida e’lon qilingan misol va masalalarni yechib chiqqanman. Tabiiy-ki, malakalarini oshirishga kelgan maktablar o‘qituvchilarda “70 yoshdan oshgan bobo shuncha ish qilayotgan ekan, men nima qilayapman”,-degan fikirni uyg‘otish, ularni o‘z ustida ishlashga va repetitorlik qilishga yunaltirish maqsadida, yechilgan misol va masalalarimni matematika va fizika yunalishlari tinglovchilariga ko‘rsataman. Ishlarni ko‘rgan, mutaxassisligi qaysi fandan bo‘lishiga qaramasdan, ularni kitob qilib chiqarishimni taklif etishadi, hamma uchun foydali bo‘lishini ta’kidlashadi. Hatto ko‘pchiligi, qo‘lyozmalarimdan nushalar olishmoqdalar.

Fikrimizcha, umumiy orta ta’lim maktablari o‘qituvchilarni o‘z ustida ishlatish mexanizmlaridan biri, ularning repetitorligini soliqsiz qilib qo‘yishdan iborat. Bunday holda, mamlakat ko‘proq foyda ko‘radi. Davlat tomonidan soliqsiz rag‘batlantiruvch iqtisodiy yordam ko‘rsatish mexanizmi, hozirgi davrda juda dolzarb bo‘lib turgan, muallimlarni o‘z ustida ishlashga, kasbiga sodiqlik bilan o‘quvchilarini yaxshi o‘qitishga yunaltiradi.

Axborotnomalarda e’lon qilingan misol-masalalardan 5000 tasi, mavzulashtirilgan holda, juda katta zahmatli mehnatlar evaziga, M.M.Muxitdinov, Sh.B.Ahmedov, N.O.Xusanovlar hammuallifligida, uchta kitob shaklida “Matematika 5000

misollar yechimlari va javoblari” nomi bilan 2019 yil, Toshkent shahridagi “Zamin nashr” da chop etilgan.

Mualliflar istihola qilishgan shekilli, matematika va aniq fanlar mutaxassislari, hatto umumiy o‘rta ta’lim maktablarini bitirgan, o‘z ustida ishlaydigan har qanday inson uchun zarur bo‘lgan kitobni, o‘qishga kiruvchi yoshlar uchun mo‘ljallangan deb yozishibdi. To‘g‘ri emas. Chunki, umumjahon maktab ta’limida to‘rtta fan, ya’ni mamlakat tili, tarixi, matematika va 2000 yildan ingliz tili fanlarini o‘qitilish majburiy qilib qo‘yilgan. Shu ma’noda ham bu kitoblar mamlakatimizning har bir kutubxonasida, maktablarida, oliy o‘quv yurtlarida, oilalarda bo‘lishi kerak. Fikrim to‘g‘riligining yana bir isbotini keltiraman. Ko‘p yillar “Oliy matematika” kafedrasiga mudirlik qilgan, “Oliy matematika”, “Matematik statistika”, “Ehtimollar nazariyasi” fanlaridan kitoblari nashr etilgan, yaxshi mutaxassis, 1996 yilda bitta axborotnomadagi 60 ta misol-masalalardan 27 tasi xato berilgan, bir ko‘ringda deb kelgandi. U, o‘g‘lini oliy o‘quv yurtiga kirishga tayyorlamoqchi bo‘lgan. Ushbu holat, o‘sha hamkasbimizning elementar matematika bilan shug‘ullanmay qo‘yganligini bildirardi. Chunki, elementar mamematika ko‘pchlik masalalarini yechishning o‘zgarmas qolipi yo‘q. Chunki, bitta misol yoki masalani yechishning juda ko‘p yo‘llari, usullari mavjud. Matematikaning boshqa sohalari muayyan qolipda turadi. Masalan, aniq integralga doir masalalar integral yig‘indi, differensial tenglamalar esa integrallashga keltirib hal etiladi va h.k.z.

Elementar mamematika, matematikaning boshqa sohalariga nisbatan, insondan ko‘proq devergent va konvergent fikrlashni

talab etadi. Ushbu jarayon, o‘quvchida abstrakt tafakkur qilishni kuchli rivojlantiradi va shakllantiradi.

Devergent fikrlash, bitta masalani ko‘p usullarda yechishni nazarda tutsa, konvergent fikrlash, o‘sha yechimlar ichidan eng yaxshi variantini, ya’ni qisqa, oson va tushunarli usulni tanlay olishni bildiradi.

Hamkasblarimning takliflariga asosan, o‘zim yechgan misol va masalalarimni qo‘llanma shakliga keltirish ustida ishlar ekanman, ism-shariflari yuqorida keltirilgan mualliflarning kitoblaridan, o‘zim ikkilangan misol va masalalarning javoblarini taqqoslab foydalandim. Ular mening ishlarimdan ham foydalanishadi degan umiddaman. Masalan, ular 5000 misol va masalalarni yechishgan bo‘lsa, men 5773 ta yechim taklif etaman. Shuningdek, 1-kitobning 148-betida yechimi keltirilmagan 24-savolga o‘xshash masalalarni yechish usullarini ham keltiraman.

Kitoblar mualliflari, ozlari taklif etgan misol va masalalarni yechishning tugal sharhlarini berishgah, biz sharhni kamaytirib, kitobxonni ko‘proq mustaqil izlanishga, mustaqil ishlashga yunaltirishni maqsad qilib qo‘ydik, ya’ni o‘quvchi foydalanilgan formulalarni izlab topsin, masala yechilishining oson joylari, o‘quvchining qo‘liga qog‘oz, ruchka olib oxiriga yetkazishi uchun qoldirilgan.

Kitob yozishning bosh maqsadi, insonlarning ma’naviy ehtiyojlarini qondirishga ko‘maklashish asosida jamiyat, mamlakat taraqqiyotiga hissa qo‘shishdan iborat. Shu ma’noda o‘qib-o‘rganuvchi, biror mavzu bo‘yich qandaydir misol-masalani yechishda qiyinchlikka uchrasa hamkasblarimiz kitoblaridan, axborotnomalar bilan ishlayotgan o‘quvchi,

o‘qituvchi, ayniqsa repetitorlarning biz yozgan kitoblardan foydalanishlari qulay bo‘ladi.

1996-1997-yillar axborotnomalarida berilgan misol va masalalarning yechimlarini mavzulashtirilgan tarzda, qolgan yillarnikini esa axborotnomalarda keltirilgan tartibda berdik.

Biz taklif etayotgan tizimda, o‘quvchi dastlab mavzulashtirilgan bir xil tipdagi misol va masalalarni yechishsa, keyingi axborotnoma bilan ishlash bosqichida, oldin o‘rgangan bilimlarini, o‘zgaruvchan sharoitlarda ham qo‘llay olish ko‘nikmalarini egallashadi.

Olloh bo‘l degan narsa yoki hodisa o‘sha damda zohir bo‘ladi. Biroq, Olloh Qur’oni Karimda olamni olti kunda hisob kitob bilan yaratganligini aytgan. Hisob kitob esa matematika. Demak, matematika Ollohning insoniyatga bergan ne’matlaridan biri. Shuning uchun ham, matematika fani muallimlari mutaxassisliklari bilan faxrlanishlari barobarida, Ollohdan qo‘rqib, uning farz qilib bergan kasbiga sodiqlik bilan ishlashlari joiz.

Matematika bu hayot. Matematikasi to‘kis joyda ofat ham bo‘lmaydi, hech bir ishlab chiqrish bankrotga ham uchramaydi. 2020-yilning 1-may kuni Sirdaryo viloyatining “Sardoba” suv omborida talofat ro‘y berdi. Minglab yurdoshlarimiz aziyat chekishdi, mamlakat g‘aznasiga katta ziyon keltirdi. Bu talofatning asosiy sababi, “Sardoba” suv omdori qurilishi matematikasining buzilishida, matematikasiga xiyonat qilinishida deb bilaman.

Men, umrimning ko‘p qismini matematika olami ichida o‘tkazganim bilan faxrlanaman. Uni o‘rganishni, misol va masalalarini yechishi hush ko‘raman. Ayrim masalalarni

haftalab, oylab yecha olmay yuraman. Ba’zan o‘sha masalani, uxlab yotgan paytimda, tushimda yechaman. Aslida u masalani yechish oson bo‘ladi. Lekin kerakli almashtirish esga kelmayotgan bo‘ladi. Masalani bersang yecha olmaydigan, yechmini bersang osonku deydiganlar ko‘p bo‘lishadi. Men uchun o‘zim yechmagan har qanday masala qiyin, yechganim esa oson. Professor V.R.Smishlyaev matematika eng qiyin, eng oson fan deganda haq edi. Hayotda yashash ham, matematika olamida turish ham shunday. Masalani uzoq muddat ishlay olmay yurib, uning yechimini daqiqalar ichida topilgandagi quvonchni, lazzatni, o‘z-o‘zingdan g‘ururlanishni barchamizga nasib etsin.

Ko‘pchiligimizga masalani bunday yechibsiz, u boshqacha ishlanmaydimi,-deyilsa, shoshilib qolamiz. Bu borada, matematikadan 13 tomdan iborat “Negizlar” asarini yozgan Evkliddan o‘rnak olish kerak. Evklidni podshoh huzuriga chorlab, hayotda “Negizlar” siz yashab bo‘lmaydimi, - degan savolni berdi. Shunda, Evklid qat’iy ishonch bilan, shohmi-gadomi hayotda “Negizlar”dan foydalanishga majbur, - deb javob bergan edi. Chunki, har kim uzining qobiliyati darajasida, paydo bo‘lgan muammoni devergentmi, konvergentmi har xil usulda yechishi mumkin. Uning mehnatini hurmat qilishimiz kerak. Chunki hamkasbimiz olgan o‘sha yechim, bizni yangi marralarga, konvergent yechim olishga undaydi. Ajdodlarimiz yasagan tosh qurollar, bugungi rivojlangan texnika, texnologiyalarning debochsi hisoblanadi. Ushbu ijtimoiy uzluksiz jarayonda paydo bo‘layotgan muommolar yechimlarining oson yo‘llari topilib boradi, insoniyatning emushlari engillashib, hayot go‘zallashb boradi.

Xulosa qilib aytganda, barchamiz Vatanimiz, elimiz manfaati yulida umr bo‘yi o‘quvchi bo‘lib qolaylik, eng muhimi mustaqil izlanib, mustaqil o‘rganib, yangidan yangi g‘oyalarni o‘zlashtiraylik, ularni hayotga tatbiq etishda haqiqiy pragmatik bo‘lib, millatimizning koriga yaraydigan azmu shijoatli, g‘ayratu jasoratli, aqlu zakovatli kadrlar tayyorlab beraylik.

Ushbu qo‘llanmani tayyorlash va nashr qilishda, katta xizmat ko‘rsatgan shogirdim, Samarqand viloyat xalq ta’limi xodimlarini qayta tayyorlash va ularning malakasini oshirish hududiy markazi “Maktabgach, boshlang‘ich va maxsus ta’lim metodikalari” kafedrasi mudiri, dotsent, kitobning hammuallifi Maxbuba Raximqulovaga o‘z minnatdorchiligimni bildiraman.

Professor P.Z.Davronov

1-axborotnoma

1. $\sqrt{\left(\frac{\pi}{2}-\sqrt{3}\right)^2}+\sqrt{\left(\frac{\pi}{3}-\sqrt{2}\right)^2}-\sqrt{5+2\sqrt{6}}$ ni soddalashtiring.

A) $\frac{5\pi}{6}-2(\sqrt{2}+\sqrt{3})$ B) $\sqrt{3}+\sqrt{2}$ C) $\frac{5\pi}{6}$

D) $-2\sqrt{3}-2\sqrt{2}$ E) $-\frac{5\pi}{6}$

Yechilishi: $\sqrt{\left(\frac{\pi}{2}-\sqrt{3}\right)^2}+\sqrt{\left(\frac{\pi}{3}-\sqrt{2}\right)^2}-\sqrt{5+2\sqrt{6}}=$

$=\left|\begin{array}{c}\frac{\pi}{2}-\sqrt{3}<0;\\ \frac{\pi}{3}-\sqrt{2}<0;\\ Murakkab\ radikal\\ formulasiga\ asosan:\\ \sqrt{5+2\sqrt{6}}=\sqrt{3}+\sqrt{2}.\end{array}\right|=-\frac{\pi}{2}-\frac{\pi}{3}+\sqrt{3}+\sqrt{2}-$

$-\left(\sqrt{3}+\sqrt{2}\right)=-\frac{5\pi}{6}$. Javobi: E.

2. $\sqrt{x^2}-\sqrt[3]{x^3}+\sqrt[4]{x^4}-\sqrt[5]{x^5}=7$ tenglamani yeching.

A) *yechimga ega emas* B) 1,75

C) 1,25 D) -1,25 E) -1,75

Yechilishi: $\sqrt{x^2}-\sqrt[3]{x^3}+\sqrt[4]{x^4}-\sqrt[5]{x^5}=7 \Rightarrow$

$\Rightarrow |x|-x+|x|-x=7 \Rightarrow 2|x|-2x=7 \Rightarrow$

$\Rightarrow \left|\begin{array}{c}x\geq 0 \Rightarrow \emptyset;\\ x<0.\end{array}\right| \Rightarrow -2x-2x=7 \Rightarrow x=-1{,}75.$

Javobi: E.

3. $ax^2 + bx + c = 0$ tenglamaning koeffitsentlari $b = a + c$ tenglikni qanoatlantiradi. Agar x_1 va x_2 berilgan kvadrat tenglamaning ildizlari bo‘lsa, $\frac{x_2}{x_1} + \frac{x_1}{x_2}$ ning qiymatini toping.

A) $\frac{a^2-c^2}{ac}$ B) $\frac{a}{c} + \frac{c}{a}$ C) $\frac{1}{a} + \frac{1}{c}$ D) $\frac{1}{a} - \frac{1}{c}$ E) $\frac{2(a+c)}{ac}$

Yechilishi: $ax^2 + bx + c = 0;\ \ b = a + c;\ \ \frac{x_2}{x_1} + \frac{x_1}{x_2};$

$x_{1,2} = \frac{-(a+c) \pm \sqrt{(a+c)^2 - 4ac}}{2a} => x_1 = -1;\ \ x_2 = -\frac{c}{a}; =>$

$=> \frac{x_2}{x_1} + \frac{x_1}{x_2} = \frac{-\frac{c}{a}}{-1} + \frac{-1}{-\frac{c}{a}} = \frac{a}{c} + \frac{c}{a}.$ Javobi: B.

4. $y = x^2 + bx + 4$ parabola b ning nechta butun qiymatida absissalar o‘qiga urinadi?

A) 0 B) 1 C) 2 D) 3 E) 4

Yechilishi: $\begin{cases} y = x^2 + bx + 4 \\ y = 0 \end{cases} => x^2 + bx + 4 = 0 =>$

$=> \begin{cases} D = 0; \\ b^2 - 4ac = 0 \\ a = 1 > 0; \end{cases} => b^2 - 4 \cdot 1 \cdot 4 = 0 => b = \pm 4.$

Javobi: E.

5. Agar x_1 va x_2 $x^2 + 3x - 3 = 0$ tengalamaning ildizlari bo‘lsa, $x_1^4 + x_2^4$ ning qiymatini toping.

A) 207 B) 192 C) 243 D) 168 E) 252

Yechilishi: $Viyet\ teoremasiga\ asosan$:

$x^2 + 3x - 3 = 0 => x_1^4 + x_2^4 =$

$= p^4 - 4 \cdot p^2 \cdot q + 2 \cdot q^2 = 207.$ Javobi: A.

6. $(x^2 + 3x)^2 < 16$ tengsizlikni yeching.

A) (-1; 4) B) (-4;1) C) (-2;3)

D) (-3;2) E) $(-2; 1) \cup (2; 3)$

Yechilishi: $(x^2 + 3x)^2 < 16 => |x^2 + 3x| < 4 =>$

$\Rightarrow\ -4 < x^2 + 3x < 4\ \Rightarrow \begin{cases} x^2 + 3x + 4 > 0 \\ x^2 + 3x - 4 < 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x_1 = -4; \\ x_2 = 1. \end{cases}$ Javobi: B.

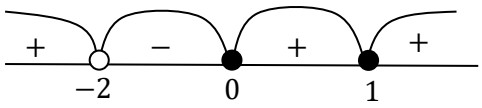
7. $\frac{x(x-1)^2}{(x+2)^3} \leq 0$ tengsizlikni yeching.

A) (-1;0] B) (-2;1] C) (-2;0]

D) $(-2; 0] \cup \{1\}$ E) $(-2; 1) \cup \{0\}$

Yechilishi: $\frac{x(x-1)^2}{(x+2)^3} \leq 0 \Rightarrow \begin{cases} x = 0 \\ (x-1)^2 = 0 \\ (x+2)^3 \neq 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x = 0 \\ x = 1 \\ x \neq -2 \end{cases} \Rightarrow$

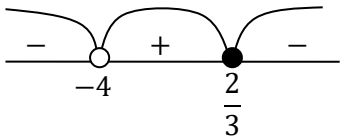


$\Rightarrow (-2; 0] \cup \{1\}$. Javobi: D.

8. $\sqrt{\frac{2-3x}{x+4}} > -2$ tengsizlikning eng kichik butun yechimini toping.

A) 0 B) -1 C) -2 D) -3 E) -5

Yechilishi: $\sqrt{\frac{2-3x}{x+4}} > -2 \Rightarrow \frac{2-3x}{x+4} \geq 0 \Rightarrow \begin{cases} x = \frac{2}{3} \\ x \neq -4 \end{cases} \Rightarrow$



$\Rightarrow x = -3$. Javobi: D.

9. $\frac{1}{8} + \frac{1}{24} + \frac{1}{48} + \frac{1}{80}$ yig'indini hisoblang.

A) 0,1 B) 0,2 C) 0,4 D) 0,6 E) 0,8

Yechilishi: $\frac{1}{8} + \frac{1}{24} + \frac{1}{48} + \frac{1}{80} = \frac{1}{8}\left(1 + \frac{1}{10}\right) + \frac{1}{24}\left(1 + \frac{1}{2}\right) =$

$= \frac{1{,}1}{8} + \frac{1{,}5}{24} = \frac{3{,}3+1{,}5}{24} = \frac{48}{240} = \frac{1}{5} = 0{,}2.$ Javobi: B.

10. $y = \left(\text{tg}\frac{\pi}{6}\right)^{x^2-4x+2}$ funksiyaning qiymatlar sohasini toping.

A) $\left[\frac{1}{\sqrt{3}};\ \sqrt{3}\right]$ B) $\left(0;\sqrt{3}\ \right]$ C) (0;3]

D) $(-\infty; 3]$ E) $\left[-\ \frac{1}{\sqrt{3}};\ \sqrt{3}\right]$

Yechilishi: $y = \left(\text{tg}\frac{\pi}{6}\right)^{x^2-4x+2} = \left(\frac{1}{\sqrt{3}}\right)^{x^2-4x+2} =>$

$=> y' = \left(\frac{1}{\sqrt{3}}\right)^{x^2-4x+2} \cdot \ln\left(\frac{1}{\sqrt{3}}\right) \cdot (2x-4) =>$

$$=> \begin{cases} y' = 0 \\ \left(\frac{1}{\sqrt{3}}\right)^{x^2-4x+2} \neq 0 \\ \ln\left(\frac{1}{\sqrt{3}}\right) \neq 0 \end{cases} => 2x - 4 = 0 => x = 2;$$

$y(2) = \left(\frac{1}{\sqrt{3}}\right)^{-2} = 3 => (0; 3]$. Javobi: C.

11. $\log_x(5x-4) = 2$ tenglamaning ildizlari yig'indisini toping.

A) 5 B) 4 C) 3 D) 2 E) 4,5

Yechilishi: $\log_x(5x-4) = 2$;

Aniqlanish sohasini toping:

$x > 0,\ x \neq 1,\ 5x - 4 > 0 => x > 0{,}8.$

$5x - 4 = x^2 => x^2 - 5x + 4 = 0 => \begin{cases} x_1 = 1 \\ x_2 = 4 \end{cases} =>$

$=> x = 4.$ Javobi: B.

12. Nechta butun son $3^{\sqrt{5-x}} \leq (x-4) \cdot \ln(x-4)$ tengsizlikni qanoatlantiradi?

A) $\emptyset$ B) 1 C) 2 D) 3 E) 4

Yechilishi: $3^{\sqrt{5-x}} \leq (x-4) \cdot \ln(x-4) =>$

$$=> \begin{cases} 5-x \geq 0 \\ x-4>0 \end{cases} => \begin{cases} x \leq 5 \\ x>4 \end{cases} => (4;5]; Biroq \ln 1 = 0.$$

$Demak, \emptyset.$ Javobi: A.

13. $\sqrt{5^x} + \sqrt{12^x} = \sqrt{13^x}$ tenglama nechta ildizga ega?

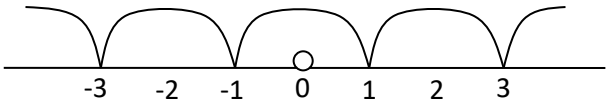
A) $\emptyset$ B) 1 C) 2 D) 3 E) 4

Yechilishi: $x^2 + y^2 = z^2$ *tenglamani qanoatlantiruv – chi* 3 *ta butun musbat sonlarga Pifagor sonlari deyiladi*. 5, 12 *va* 13 *Pifagor sonlari bo′lganligi uchun* $x = 4$. Javobi: B.

14. $x^4 - 10x^2 + 9 \leq 0$ tengsizlikning butun yechimlari nechta?

A) 2 B) 3 C) 4 D) 5 E) 6

Yechilishi: $x^4 - 10x^2 + 9 \leq 0 => \begin{cases} x_1 = -3, & x_3 = 1 \\ x_2 = -1, & x_4 = 3 \end{cases}$



$=> x = -3, -2, -1, 1, 2, 3.$

Javobi: E.

15. Agar $f(x) = \begin{cases} |x+1|, & x > -2 \\ 3 - 4|x|, & x \leq -2 \end{cases}$ bo‘lsa, $f(-1) - f(-3)$ ni hisoblang.

A) 0 B) 3 C) 6 D) 4 E) 9

Yechilishi: $f(x) = \begin{cases} |x+1|, & x > -2 \\ 3 - 4|x|, & x \leq -2 \end{cases}$ bo′lsa,

$f(-1) = |-1+1| = 0; \quad f(-3) = 3 - 4|-3| = -9;$

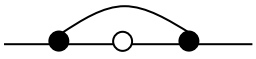
$f(-1) - f(-3) = 0 - (-9) = 9.$ Javobi: E.

16. $f(x) = \frac{3\sqrt{x} + 4\sqrt{2-x}}{\sin(\pi x)}$ funksiyaning aniqlanish sohasini toping.

A) [0;2] B) [0;1] C) (0;1) ∪ (1;2)

D) $[0;\frac{\pi}{2}) \cup (\frac{\pi}{2};2]$ E) $[0;\frac{1}{2}) \cup (\frac{1}{2};2]$

Yechilishi: $f(x) = \frac{3\sqrt{x}+4\sqrt{2-x}}{sin(\pi x)} => \begin{cases} x \geq 0 \\ 2-x \geq 0 \\ sin\,\pi x \neq 0 \end{cases} =>$

$=> \begin{cases} x \geq 0; \\ x \leq 2; \\ x \neq k, \quad k \in Z. \end{cases}$ 

$=> (0;1) \cup (1;2).$

Javobi: C.

17. $y = 2 + 3\cos(8x - 7)$ funksiyaning eng kichik musbat davrini toping.

A) 2π B) $\frac{\pi}{2}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{4}$ E) π

Yechilishi: $E.k.d = \frac{2\pi}{8} = \frac{\pi}{4}$. Javobi: D.

18. $\sin x < 1 + \frac{x^2}{4}$ tengsizlikni yeching.

A) $\emptyset$ B) $\left(-\frac{\pi}{2} + 2\pi n; \frac{\pi}{2} + 2\pi n\right),\ n \in Z$ C) $[-\pi;\pi]$

D) $\left[-\frac{\pi}{6} + 2\pi n; \frac{\pi}{6} + 2\pi n\right],\ n \in Z$ E) $(-\infty;\infty)$

Yechilishi: $\sin x < 1 + \frac{x^2}{4} => 1 + \frac{x^2}{4} \geq 1 => (-\infty;+\infty).$

Javobi: E.

19. Uchburchak tomonlarining uzunliklari $\sin 30^\circ$; $\sin 40^\circ$ va $\sin 60^\circ$ ga teng. Shu uchburchakning turini aniqlang.

A) O‘tkir burchakli

B) O‘tmas burchakli

C) To‘g’ri burchakli

D) Aniqlab bo‘lmaydi

C) Bunday uchburchak mavjud emas

Yechilishi: $a = \sin 30° => a^2 = \frac{1}{4};$

$b = \sin 40° < \sin 45° => b^2 < \frac{1}{2};$

$c = \sin 60° \Rightarrow\ c^2 = \frac{3}{4}. U\ holda\ c^2 > a^2 + b^2.$

Javobi:B.

20. Agar $x = \log_5 2 + \log_{11} 3$ bo‘lsa, quyidagi sonlarning qaysi biri eng katta bo‘ladi?

A) x B) x^2 C) x^3 D) $\sqrt{x}$ E) $\sqrt[3]{x}$

Yechilishi: $\log_5 2 < 0{,}5;\ \log_{11} 3 < 0{,}5 \Rightarrow x < 1\ yoki$

$$x = \log_5 2 + \log_{11} 3 = \frac{\lg 2}{\lg\frac{10}{2}} + \frac{\lg 3}{\lg 11} = \frac{0{,}3010}{1-0.3010} + \frac{0{,}4771}{1{,}0414} =$$

$$= \frac{0{,}3010}{0{,}699} + \frac{0{,}4771}{1{,}0414} = 0{,}4306 + 0{,}4581 = 0{,}8887.$$

Javobi: E.

21. $|x| = x^2 - 6$ tenglamaning ildizlari ko‘paytmasini toping.

A) -6 B) -1 C) 3 D) -9 E) 6

Yechilishi: $|x| = x^2 - 6 \Rightarrow \begin{cases} x^2 + x - 6 = 0 \\ x^2 - x - 6 = 0 \end{cases} \Rightarrow$

$$\Rightarrow \begin{cases} x_1 = -3; & x_3 = -2\ chet\ ildiz; \\ x_2 = 2\ chet\ ildiz; & x_4 = 3. \end{cases} \quad x_1 \cdot x_4 = -9.$$

Javobi: D.

22. $2^{3-\frac{x}{2}} = 3$ tenglamani yeching.

A) $\log_2 \sqrt{3}$ B) $\log_3 (2\frac{2}{3})$ C) $\log_2 (3\frac{3}{5})$

D) $\log_2 (2\frac{2}{3})$ E) $\log_2 (7\frac{1}{9})$

Yechilishi: $2^{3-\frac{x}{2}} = 3 \Rightarrow \frac{8}{2^{\frac{x}{2}}} = 3 \Rightarrow 2^{\frac{x}{2}} = \frac{8}{3} \Rightarrow$

$$\Rightarrow \frac{x}{2}\log_2 2 = \log_2 \frac{8}{3} \Rightarrow x = \log_2 \frac{64}{9} = \log_2 7\frac{1}{9}.$$

Javobi: E.

23. $|x^2 + 3x + 2| = |x^2 + 2x + 5| + |x - 3|$ tenglamani yeching.

A) 3;5 B) 4;6 C) [3;∞) D) [0;3] E) [3;10]

Yechilishi: $|x^2+3x+2|=|x^2+2x+5|+|x-3|$;

1) $x^2+3x+2\geq 0 \Rightarrow x^2+3x+2=x^2+2x+5+$
$+|x-3| \Rightarrow x-3=|x-3|$;

2) $x^2+3x+2<0 \Rightarrow -x^2-3x-2=x^2+2x+5+$
$+|x-3| \Rightarrow 2x^2+5x+7=-|x-3|$.

1) va 2) dan $\begin{cases} x-3=|x-3|; \\ 2x^2+5x+7=-|x-3|. \end{cases}$

3) $x-3\geq 0 \Rightarrow \begin{cases} x-3=x-3 \ \ ayniyat; \\ 2x^2+5x+7=-x+3. \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} ayniyat \\ 2x^2+6x+4=0 \end{cases} \Rightarrow \begin{cases} ayniyat \\ x^2+3x+2=0 \end{cases} \Rightarrow$

$\begin{cases} ayniyat \\ x_1=-2;\ x_2=-1; \end{cases}$

4) $x-3<0 \Rightarrow \begin{cases} x-3=-x+3 \\ 2x^2+5x+7=x-3 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 2x-6=0 \\ 2x^2+6x+10=0 \end{cases} \Rightarrow \begin{cases} x=3; \\ x^2+3x+5=0. \end{cases}$

3) va 4) dan $[3;\ \infty)$. Javobi: C.

24. Agar $|\cos x|=2+\cos x$ bo‘lsa, $2^{\cos x}+3^{\sin x}$ ning qiymatini toping.

A) 1 B) 0,5 C) 0,75 D) 1,25 E) 1,5

Yechilishi: $|\cos x|=2+\cos x \Rightarrow$

$\Rightarrow \begin{cases} \cos x \neq 2+\cos x \\ -\cos x=2+\cos x \end{cases} \Rightarrow \cos x=-1 \Rightarrow$

$x=\pi+2\pi k \Rightarrow 2^{\cos x}+3^{\sin x}=2^{-1}+3^0=$

$=\frac{1}{2}+1=1{,}5$. Javobi: E.

25. $\begin{cases} \sin x\cdot\cos y=-\frac{1}{3} \\ \cos x\cdot\sin y=\frac{2}{3} \end{cases}$ $ctg\,(x-y)=?$

A) 0 B) 1 C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) $-\frac{\sqrt{3}}{3}$

Yechilishi: $\begin{cases}\sin x \cdot \cos y = -\frac{1}{3} \\ \cos x \cdot \sin y = \frac{2}{3}\end{cases} =>$

$=> \begin{cases}\sin(x-y) = -\frac{1}{3} - \frac{2}{3} = -1 \\ x - y = -arc\sin 1 = -\frac{\pi}{2}\end{cases} =>$

$=> \begin{cases}\sin(x-y) = -1 \\ \cos(x-y) = \cos\left[-\frac{\pi}{2}\right] = 0\end{cases} => \operatorname{ctg}(x-y) =$

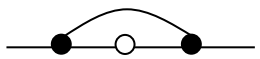
$= \frac{\cos(x-y)}{\sin(x-y)} = \frac{0}{-1} = 0.$ Javobi: A.

26. $y = \sin\left(\frac{x}{\sqrt{x-1}-\sqrt{3-x}}\right)$ funksiyaning aniqlanish sohasini toping.

A) [1;3] B) [1;2) C) (2;3]

D) [1;2) ∪ (2;3] E) [0;3]

Yechilishi: $y = \sin\left(\frac{x}{\sqrt{x-1}-\sqrt{3-x}}\right);$ $\begin{cases} x-1 \geq 0 \\ 3-x \geq 0 \\ \sqrt{x-1} \neq \sqrt{3-x} \\ -1 \leq \sin x \leq 1 \end{cases} =>$

$\begin{cases} x \geq 1 \\ x \leq 3 \\ x \neq 2 \end{cases}$ 

$[1;2) \cup (2;3].$ Javobi: D.

27. $a = \sin 1; b = \sin 2; c = \sin 3;$ $d = \sin 4$ va $e = \sin 5$ sonlarni kamayish tartibida joylashtiring.

A) $a > b > c > d > e$

B) $e > d > b > c > a$

C) $b > c > a > d > e$

D) $c > b > a > d > e$

E) $b > a > c > d > e$

Yechilishi: $a = \sin 1 \approx \sin 57^0$

$b = \sin 2 \approx \sin 114^\circ = \sin(\pi - 66^\circ) = \sin 66^\circ$

$c = \sin 3 \approx \sin 171^\circ = \sin(\pi - 9^\circ) = \sin 9^\circ$

$e = \sin 5 \approx \sin 285^\circ = \sin(2\pi - 75^\circ) = -\sin 75^\circ$ $d = \sin 4 \approx \sin 228^\circ = \sin(\pi + 48^\circ) = -\sin 48^\circ$ $b > a > c > d > e$. Javobi: E.

28. $|\sin 3x| = \frac{1}{2}$ tenglamani yeching.

A) $\pm\frac{\pi}{6} + \frac{\pi n}{2}, n \in Z$

B) $\frac{\pi}{3} + 2\pi n, n \in Z$

C) $\pm\frac{\pi}{9} + \frac{\pi n}{3}, n \in Z$

D) $\pm\frac{\pi}{18} + \frac{\pi n}{3}, n \in Z$

E) $\pm\frac{\pi}{12} + \pi n, n \in Z$

Yechilishi: $|\sin 3x| = \frac{1}{2} \Rightarrow \begin{cases} \sin 3x = -\frac{1}{2} \\ \sin 3x = \frac{1}{2} \end{cases} \Rightarrow$

$$\Rightarrow \begin{cases} 3x = (-1)^{k+1}\frac{\pi}{6} + \pi k \\ 3x = (-1)^k \frac{\pi}{6} + \pi k \end{cases} \quad 3x = \pm\frac{\pi}{6} + \pi k \Rightarrow$$

$\Rightarrow x = \pm\frac{\pi}{18} + \frac{\pi k}{3}, \quad k \in Z.$ Javobi: D.

29. $\log_x 3 < 2$ tengsizlikni yeching.

A) $(\sqrt{3}; \infty)$ B) $(3; \infty)$ C) $(0; 1) \cup (\sqrt{3}; \infty)$

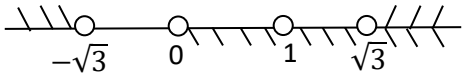
D) $(0;1)$ E) $(0; 1) \cup (3; \infty)$

Yechilishi: $\log_x 3 < 2; \quad x > 0, \quad x \neq 1$

1) $0 < x < 1 \Rightarrow x^2 < 3 \Rightarrow |x| < \sqrt{3} \Rightarrow$

$\Rightarrow -\sqrt{3} < x < \sqrt{3};$

2) $x > 1 \Rightarrow x^2 > 3 \Rightarrow |x| > \sqrt{3} \Rightarrow \begin{cases} x > \sqrt{3}; \\ x < -\sqrt{3}. \end{cases}$



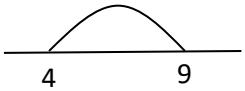
$(0;1) \cup (\sqrt{3}; +\infty)$.

Javob: C.

30. $\sqrt{x} \geq x - 6$ tengsizlikni qanoatlantiruvchi butun sonlarning yig'indisini toping.

A) 6 B)15 C) 28 D) 35 E) 45

Yechilishi: $\sqrt{x} \geq x - 6 \Rightarrow x^2 - 13x + 36 \leq 0$

$\Rightarrow \begin{cases} x \geq 0; \\ x^2 - 13x + 36 \leq 0. \end{cases} \Rightarrow$  $\Rightarrow$

$\Rightarrow \begin{matrix} x = 4,5,6,7,8,9 \\ x = 0,1,2,3 \end{matrix} \Rightarrow 45.$ Javobi: E.

31. $x(x+1)(x+2)(x+3) \leq 24$ tengsizlikning yechimlari orasida nechta butun son bor?

A) 2 B) 3 C) 4 D) 5 E) 6

Yechilishi: $x(x+1)(x+2)(x+3) \leq 24;$

$(x^2 + 3x)(x^2 + 3x + 2) \leq 24; \quad x^2 + 3x = t;$

$t \cdot (t+2) \leq 24; \quad t^2 + 2t - 24 \leq 0 \Rightarrow t \in [-6; 4].$

$U\ holda \begin{cases} x^2 + 3x \geq -6; \\ x^2 + 3x \leq 4. \end{cases} \Rightarrow \begin{cases} x^2 + 3x + 6 \geq 0 \\ x^2 + 3x - 4 \leq 0 \end{cases} \Rightarrow$

$(x+4)(x-1) \leq 0 \Rightarrow x = -4, -3, -2, -1, 0, 1.$

Javobi: E.

32. Agar $tgx = 0{,}5$ bo'lsa, $\cos^8 x - \sin^8 x$ ning qiymatini toping.

A) 0,25 B) 0,408 C)0,392 D) 0,416 E) 0,625

Yechilishi: $\operatorname{tg} x = 0{,}5; \quad x = arc\operatorname{tg}\frac{1}{2};$

$$\cos^8 x - \sin^8 x = \left(\cos arc\,\mathrm{tg}\frac{1}{2}\right)^8 - \left(\sin arc\,\mathrm{tg}\frac{1}{2}\right)^8 =$$

$$= \left(\frac{1}{\sqrt{1+(\frac{1}{2})^2}}\right)^8 - \left(\frac{\frac{1}{2}}{\sqrt{1+\left(\frac{1}{2}\right)^2}}\right)^8 = \frac{4^4}{5^4}\left(1 - \frac{1}{(2^2)^4}\right) =$$

$= \frac{4^4}{625} \cdot \frac{2^8-1}{4^4} = \frac{255}{625} = 0{,}408.$ Javobi: B.

33. $1 - \sin^6 22{,}5^0 + \cos^6 22{,}5^0$ ni hisoblang.

A) $\frac{\sqrt{3}-1}{2}$ B) $\frac{\sqrt{6}+5}{4}$ C) $\frac{10+3\sqrt{2}}{8}$ D) $\frac{16+7\sqrt{2}}{16}$ E) $\frac{10+2\sqrt{3}}{5}$

Yechilishi: $1 - \sin^6 22{,}5^0 + \cos^6 22{,}5^0 =$

$= \sin^2 22{,}5 - \sin^6 22{,}5 + \cos^2 22{,}5 + \cos^6 22{,}5 =$

$= \sin^2 22{,}5\,(1 - (\sin^2 22{,}5)^2) + \cos^2 22{,}5 \cdot$

$\cdot (1 + (\cos^2 22{,}5)^2) = \frac{1}{2}(1 - \cos 45) \cdot$

$\cdot \left\{1 - \left[\frac{1}{2}(1 - \cos 45°)\right]^2\right\} + \frac{1}{2}(1 + \cos 45°) \cdot$

$\cdot \left\{1 + \left[\frac{1}{2}(1 + \cos 45°)\right]^2\right\} = \cdots = \frac{12-2\sqrt{2}}{64} + \frac{52+30\sqrt{2}}{64} =$

$= \frac{64+28\sqrt{2}}{64} = \frac{16+7\sqrt{2}}{16}.$ Javobi: D.

34. $\left(\cos x + \frac{\pi}{2}\right)\left(\sin x - \frac{\pi}{3}\right) \cdot \left(\mathrm{tg}^2 x - \frac{1}{3}\right) \geq 0$ tengsizlikni yeching.

A) $\left[-\frac{\pi}{3} + \pi n;\ \frac{\pi}{2} + \pi n\right], n \in Z$

B) $\left[-\frac{\pi}{3} + \pi n;\ \frac{\pi}{3} + \pi n\right], n \in Z$

C) $\left[-\frac{\pi}{3} + \pi n;\ \frac{\pi}{6} + \pi n\right], n \in Z$

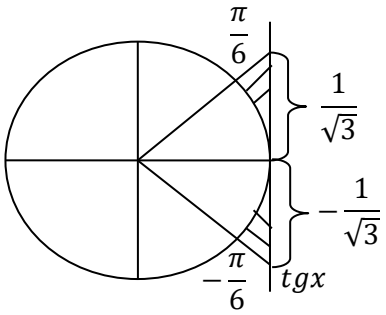
D) $\left[-\frac{\pi}{6} + \pi n;\ \frac{\pi}{3} + \pi n\right], n \in Z$

E) $\left[-\frac{\pi}{6}+\pi n;\ \frac{\pi}{6}+\pi n\right], n \in Z$

Yechilishi: $\left(\cos x+\frac{\pi}{2}\right)\left(\sin x-\frac{\pi}{3}\right)\cdot\left(\mathrm{tg}^2\, x-\frac{1}{3}\right)\geq 0;$

$\cos x+\frac{\pi}{2}>0;\ \sin x-\frac{\pi}{3}<0 \Rightarrow \mathrm{tg}^2\, x-\frac{1}{3}\leq 0 \Rightarrow$

$\Rightarrow |\mathrm{tg}\, x|\leq\frac{1}{\sqrt{3}} \Rightarrow \begin{cases}\mathrm{tg}\, x\geq -\frac{1}{\sqrt{3}}\\ \mathrm{tg}\, x\leq\frac{1}{\sqrt{3}}\end{cases}$



$\left[-\frac{\pi}{6}+\pi n;\ \frac{\pi}{6}+\pi n\right], n \in Z.$

Javobi: E.

35. $y=(\sqrt{3}\cos 3x+\sin 3x)^7$ funksiyaning eng kichik qiymatini toping.

A) -14 B) -21 C) -64 D) -128 E) -3^7

Yechilishi: $-\sqrt{a^2+b^2}\leq y\leq\sqrt{a^2+b^2}$ *formulaga asosan* $a=\sqrt{3};\ b=1 \Rightarrow \sqrt{a^2+b^2}=2.$

$-2^7\leq(\sqrt{3}\cos 3x+\sin 3x)^7\leq 2^7;$

$-128\leq(\sqrt{3}\cos 3x+\sin 3x)^7\leq 128;$

$y_{min}=-128.$ Javobi: D.

36. $\frac{5^{x^2}-5}{3\sin x+4\cos x-2\pi}\geq 0$ tengsizlikni yeching.

A) [-1;1] B) $[1;\frac{\pi}{2}]$ C) $[-1;\pi]$ D) $[0;\pi]$ E) $[1;\pi]$

Yechilishi: $\frac{5^{x^2}-5}{3\sin x+4\cos x-2\pi}\geq 0$ *Kasr maxrajining ishorasini aniqlaymiz*:

$-\sqrt{a^2+b^2}\leq a\cos x+b\sin x\leq\sqrt{a^2+b^2}$ *formulaga asosan*: $-2\pi-5\leq 3\sin x+4\cos x\leq 5-2\pi.$

Demak, kasr maxraji doimo manfiy. U holda, kasr−ning surati $5^{x^2}-5\leq 0 \Rightarrow x^2\leq 1 \Rightarrow |x|\leq 1 \Rightarrow$

$\Rightarrow -1 \le x \le 1 \Rightarrow [-1;1]$. Javobi: A.

37. $\cos\alpha \cos\frac{\alpha}{2}\cos\frac{\alpha}{4}\cos\frac{\alpha}{8}\dots\cos\frac{\alpha}{128}$ ni soddalashtiring.

A) $\frac{1}{128}\ \frac{\sin\alpha}{\sin\frac{\alpha}{128}}$ B) $\frac{1}{256}\ \frac{\sin 2\alpha}{\sin\frac{\alpha}{128}}$ C) $\frac{1}{128}\ \frac{\sin 2\alpha}{\sin\frac{\alpha}{256}}$

D) $\frac{1}{256}\ \frac{\sin\alpha}{\sin\frac{\alpha}{128}}$ E) $\frac{1}{64}\ \frac{\sin\alpha}{\sin\frac{\alpha}{64}}$

Yechilishi: $\cos\alpha \cos\frac{\alpha}{2}\cos\frac{\alpha}{4}\cos\frac{\alpha}{8}\dots\cos\frac{\alpha}{128} =$

$= \cdots \cos\frac{\alpha}{64}\cdot\frac{2\sin\frac{\alpha}{128}\cdot\cos\frac{\alpha}{128}}{2\sin\frac{\alpha}{128}} = \cdots \cos\frac{\alpha}{64}\cdot\frac{\sin\frac{\alpha}{64}}{2\sin\frac{\alpha}{128}} =$

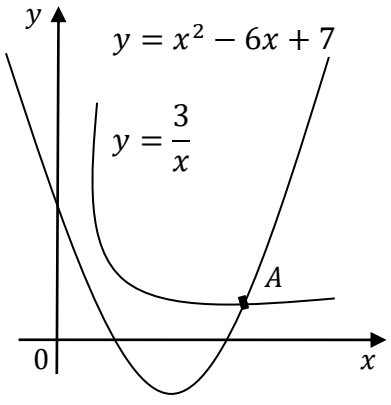
$= \cdots \cos\frac{\alpha}{32}\cdot\frac{2\sin\frac{\alpha}{64}\cdot\cos\frac{\alpha}{64}}{4\sin\frac{\alpha}{128}} = \cdots = \frac{1}{256}\cdot\frac{\sin 2\alpha}{\sin\frac{\alpha}{128}}$. Javobi: B.

38. $\frac{3}{x} = x^2 - 6x + 7$ tenglamaning nechta ildizi bor?

A) 0 B) 1 C) 2 D) 3 E) 4

Yechilishi: 1) $y = x^2 - 6x + 7;\ \ x = -\frac{b}{2a} = -\frac{-6}{2} = 3;$

$y = -\frac{36-4\cdot 7}{4} = -2. Parabola\ uchi\ (3;\ -2).$

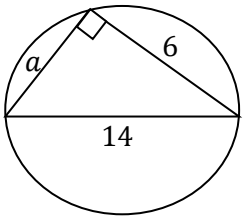


2) $y = \frac{3}{x}$. Javobi:B.

39. To‘g’ri burchakli uchburchakka tashqi chizilgan doira yuzi 49π ga teng, ichki chizilgan doiraning yuzi 9π ga teng. Shu uchburchakning yuzini toping.

A) 49 B) 52 C) 43 D) 51 E)57

Yechilishi: $\pi R^2 = 49\pi \Rightarrow R = 7;$



$\pi r^2 = 9\pi => r = 3;\ \ c = 14;$

$a + b = 2(R + r) => a + b = 20 =>$

$=> b = 20 - a;\ c^2 = a^2 + b^2 =>$

$=> 14^2 = a^2 + (20 - a)^2 => 196$

$= a^2 + 400 - 40a +$

$+a^2 => 2a^2 - 40a + 204 = 0 =>$

$a^2 - 20a + 102 = 0 => a = 10 \pm \sqrt{100 - 102};$

$(a + b)^2 = 20^2 =>\ a^2 + b^2 + 2ab = 400 =>$

$=> ab = \frac{400-196}{2} = 102 => S = \frac{1}{2}ab = 51.$

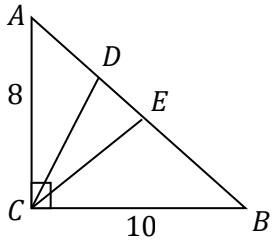
2-usul: $S_{\triangle} = (2R + r)r => S_{\triangle} = (2 \cdot 7 + 3) \cdot 3 = 51.$

Javobi: D.

40. To‘g’ri burchakli ACB uchburchakning katetlari 8 ga va 10 ga teng. Shu uchburchakning C to‘g’ri burchagi uchidan CE mediana va CD bissektrisa o‘tkazildi. CDE uchburchakning yuzini toping.

A) $2\frac{2}{9}$ B) $2\frac{2}{7}$ C) $2\frac{3}{8}$ D) $3\frac{2}{5}$ E) $3\frac{2}{3}$

Yechilishi: $AB^2 = 10^2 + 8^2 => AB = 2\sqrt{41};$



$AE = BE = CE = \sqrt{41};$

$Bissektrisaning\ xossasiga$

$asosan\ \ \frac{10}{BD} = \frac{8}{AD} =>$

$=> \frac{10}{BE+DE} = \frac{8}{\sqrt{41}-DE} => DE = \frac{\sqrt{41}}{9};$

$CD = \frac{\sqrt{AC \cdot BC \cdot (AB+AC+BC)(AC+BC-AB)}}{AC+BC} =$

$= \frac{\sqrt{80 \cdot (18+2\sqrt{41})(18-2\sqrt{41})}}{18} = \frac{\sqrt{80(18^2-4 \cdot 41}}{18} = \frac{\sqrt{80 \cdot 80 \cdot 2}}{18} =$

$= \frac{80\sqrt{2}}{18} = \frac{40\sqrt{2}}{9};\quad P = \frac{5\sqrt{41}+20\sqrt{2}}{9};$

$S = \sqrt{P(P-CE)(P-DE)(P-CD)} = 2\frac{2}{9}$. Javobi: A.

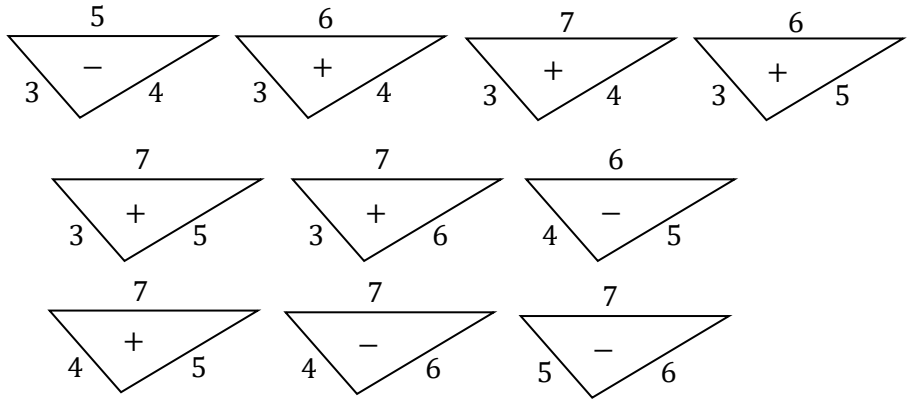
41. Uzunliklari 3, 4, 5, 6 va 7 bo‘lgan kesmalardan nechta teng yonli bo‘lmagan o‘tmas burchakli uchburchaklar yasash mumkin?

A) $Birorta\ ham\ uchburchak\ yasash\ mumkin\ emas$

B)2 C) 3 D)5 E) 10

Yechilishi: $3, 4, 5, 6, 7.$ $C_5^3 = \frac{5!}{3!(5-3)!} = 10;$

$c^2 > a^2 + b^2\ formulaga\ asosan$:



Javobi: 6 ta.

42. Qavariq ko‘pburchakning n ta ichki burchagi 30° dan kichik. n ning eng katta qiymati nechaga teng bo‘lishi mumkin?

A) 2 B) 3 C) 4 D) 5 E) $aniqlab\ bo'lmaydi$

Yechilishi: $\frac{180°(n-2)}{n} < 30° => 180°n - 360° < 30°n =>$

$\frac{180°(n-2)}{n} < 30° => 180°n - 360° < 30°n =>$

$150°n < 360° => n < \frac{12}{5} => n = 2.$ Javobi: A.

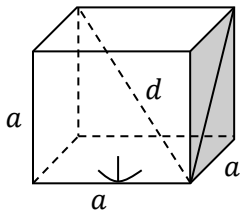
43. Qirrasi 28 ta bo‘lgan piramidaning yon yoqlari nechta?

A) 12 B)14 C) 15 D) 18 E) 16

Yechilishi: $14\ ta.$ Javobi: B.

44. Kubga ichki chizilgan silindrning hajmi 2π ga teng. Shu kubga tashqi chizilgan sferaning yuzini toping.

A) 12π B) 18π C) 20π D) 24π
E) 27π



Yechilishi: $\pi R^2 H = 2\pi \Rightarrow R^2 H = 2;$

$R = \frac{a}{2};\ H = a;\ (\frac{a}{2})^2 a = 2 \Rightarrow a = 2;$

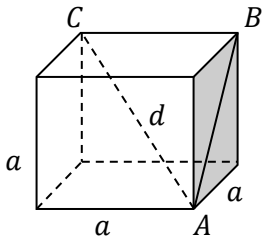
$d^2 = 3a^2 = 3 \cdot 3^2 \Rightarrow d = \sqrt{27};$

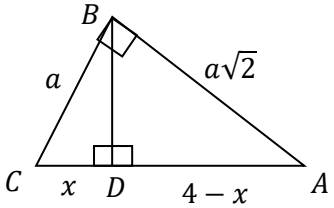
$S = 4\pi R^2 = 4\pi \left(\frac{\sqrt{27}}{2}\right)^2 = 27\pi.$ Javobi: E.

45. Kubga tashqi chizilgan sharning hajmi $10\frac{2}{3}\pi$ ga teng. Kubning diagonaliga tegishli bo‘lmagan uchlaridan diagonaligacha bo‘lgan masofani toping.

A) $\frac{4\sqrt{2}}{3}$ B) $\frac{3\sqrt{2}}{4}$ C) $\frac{4\sqrt{2}}{9}$ D) $\frac{4\sqrt{2}}{3}$ E) $\frac{3\sqrt{3}}{8}$

Yechilishi: $10\frac{2}{3}\pi = \frac{4}{3}\pi R^3 \Rightarrow R = 2;$





$d^2 = 3a^2 \Rightarrow 4^2 = 3a^2 \Rightarrow a = \frac{4}{\sqrt{3}};$

$$\Rightarrow \begin{cases} BD^2 = a^2 - x^2 \\ BD^2 = (a\sqrt{2})^2 - (4-x)^2 \end{cases} \Rightarrow$$

$\Rightarrow a^2 - x^2 = 2a^2 - 16 + 8x - x^2 \Rightarrow x = \frac{4}{3};$

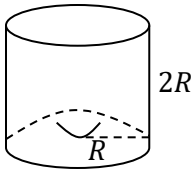
$\triangle ABC\ dan\ BD^2 = a^2 - x^2 = \frac{16}{3} - \frac{16}{9} = \frac{16*2}{9} \Rightarrow$

$\Rightarrow BD = \frac{4\sqrt{2}}{3}.$ Javobi: A.

46. Teng tomonli silindr shaklidagi g’o‘ladan eng katta hajmdagi shar yo‘nib olindi. G’o‘laning qancha foizi chiqindiga ketgan?

A) 25 B) 30 C) $33\frac{1}{3}$ D) $37\frac{2}{5}$ E) $32\frac{2}{3}$

Yechilishi: $V_s = \pi R^2 H = 2\pi R^3$; $V_{sh} = \frac{4}{3}\pi R^3$;



$V_s - V_{sh} = \frac{2\pi R^3}{3}$; $\begin{matrix} 2\pi R^3 - 100\% \\ \frac{2\pi R^3}{3} - x\% \end{matrix}$ $=>$

$=>\ x = 33\frac{1}{3}$. Javobi: C.

47. Qavariq n burchakning diagonallari soni 25 tadan kam emas va 30 tadan ko‘p emas. n nechaga teng bo‘lishi mumkin?

A) 7 B) 8 C) 9 D) 10 E)11

Yechilishi: $25 \le \frac{n(n-3)}{2} \le 30 => \begin{cases} n = 8.5 \\ n = 9.8 \end{cases} => n = 9.$

Javobi: C.

48. $tg555^\circ$ ni hisoblang.

A) $\frac{\sqrt{3}}{6}$ B) $\sqrt{3} - 1$ C) $2 - \sqrt{3}$

D) $2 + \sqrt{3}$ E) $1 - \frac{\sqrt{3}}{2}$

Yechilishi: $\text{tg}\,555^\circ = tg\left(3\pi + 15^\circ\right) = tg\,15^\circ =$

$= \sqrt{\frac{1-\cos 30^\circ}{1+\cos 30^\circ}} = \sqrt{\left(1 - \frac{\sqrt{3}}{2}\right) : \left(1 + \frac{\sqrt{3}}{2}\right)} = \sqrt{\frac{2-\sqrt{3}}{2}\ \frac{2}{2+\sqrt{3}}} =$

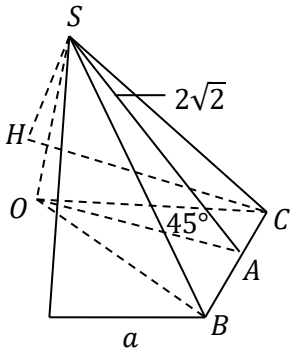
$= \sqrt{\frac{(2-\sqrt{3})^2}{4-3}} = 2 - \sqrt{3}$. Javobi: C.

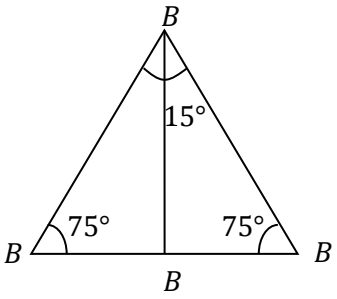
49. Muntazam o‘n ikkiburchakli piramidaning apofemasi $2\sqrt{2}$ ga teng, barcha yon yoqlari asos tekisligiga 45° burchak ostida og’ishgan. Uning hajmini toping.

A) $56 - 30\sqrt{2}$ B) $64 - 32\sqrt{3}$ C) $68 - 48\sqrt{2}$

D) $64 - 32\sqrt{2}$ E) $48 - 24\sqrt{3}$

Yechilishi: $SA = 2\sqrt{2}$; $\angle OAS = 45°$.





$\frac{H}{2\sqrt{2}} = \sin 45^\circ \Rightarrow H = 2;\ \ 12\alpha = 180(12-2) \Rightarrow$

$\Rightarrow \alpha = 150^\circ;\ \frac{OA}{2\sqrt{2}} = \cos 45^\circ \Rightarrow OA = 2\ ;$

$\frac{AC}{AO} = tg15^\circ = 2-\sqrt{3}\ \Rightarrow AC = AO\left(2-\sqrt{3}\right) \Rightarrow$

$\Rightarrow BC = 2AC = 4\left(2-\sqrt{3}\right) = 8-4\sqrt{3}.$

$S_\Delta = \frac{1}{2}\cdot BC\cdot OA = \frac{1}{2}\left(8-4\sqrt{3}\right)2 = 8-4\sqrt{3};$

$S_{\text{asos}} = 12S_\Delta = 12\left(8-4\sqrt{3}\right);$

$V = \frac{1}{3}\cdot 12\left(8-4\sqrt{3}\right)2 = 64-32\sqrt{3}.$ Javobi: B.

50. $y = \sin^4 2x.\quad y' = ?$

A) $2\sin^2 2x \sin 4x$ B) $4\sin^2 4x \sin 2x$

C) $4\sin 2x \sin^2 4x$ D) $4\sin^2 2x \sin 4x$

E) $2\sin 2x \sin^2 4x$

Yechilishi: $y = \sin^4 2x \Rightarrow\ \ y' = 4\sin^3 2x\, 2\cos 2x =$

$= 4\sin^2 2x\,(2\sin 2x\cos 2x) = 4\sin^2 2x \sin 4x.$

Javobi: D.

51. $\cos x\ \geq (-\frac{\pi}{2}x)'$ tengsizlikni yeching.

A) yechimga ega emas

B) $[-\pi + 2\pi;\ \pi + 2\pi n], n \in Z$

C) $\left[-\frac{\pi}{2} + 2\pi n;\ \frac{\pi}{2} + 2\pi n\right], n \in Z$

D) $\left[-\frac{\pi}{2} + \pi n;\ \frac{\pi}{2} + \pi n\right], n \in Z$

E) $(-\infty;\infty)$

Yechilishi: $\cos x \geq (-\frac{\pi}{2}x)' => \ \cos x \geq -1{,}57.$

Javobi: A.

52. $\int_1^2 \frac{x}{x+1}dx$ ni hisoblang.

A) $2+\ln\frac{1}{2}$ B) $1+\ln\frac{2}{3}$ C) $3-\ln\frac{2}{3}$

D) $1-\ln\frac{2}{3}$ E) $2-\ln\frac{2}{3}$

Yechilishi: $\int_1^2 \frac{x}{x+1}dx = x+1=t => \ x=t-1;$

$dx = d(t-1) => dx = (t-1)'dt => \ dx = dt.$

$x=1 => \ t=2; \quad x=2 => \ t=3.$

$\int_2^3 \frac{t-1}{t}dt = \int_2^3 \left(1-\frac{1}{t}\right)dt = \int_2^3 dt - \int_2^3 \frac{dt}{t} =$

$= t|_2^3 - lnt|_2^3 = 3-2-[ln3-ln2] = 1+ln\frac{2}{3}.$

Javobi: B.

53. $\int_3^4 \frac{dx}{x^2-1}$ ni hisoblang.

A) $\ln\sqrt{\frac{2}{3}}$ B) $\ln\sqrt{\frac{3}{4}}$ C) $\ln\sqrt{\frac{5}{6}}$ D) $\ln\sqrt{\frac{7}{8}}$ E) $\ln\sqrt{\frac{6}{5}}$

Yechilishi: $\int_3^4 \frac{dx}{x^2-1} = \frac{1}{2}\int_3^4 [\frac{1}{x-1}-\frac{1}{x+1}]dx = \frac{1}{2}\left[\int_3^4 \frac{d(x-1)}{x-1} - \right.$

$\left. - \int_3^4 \frac{d(x+1)}{x+1}\right] = \frac{1}{2}[\ln|x-1|\,|_3^4 - \ln|x+1|\,|_3^4] =$

$= \frac{1}{2}[ln3-ln2-ln5+ln4] = \frac{1}{2}[ln12-ln10] =$

$= \frac{1}{2}ln\frac{6}{5} = ln\sqrt{\frac{6}{5}}.$ Javobi: E.

54. $y=\sin x; \quad y=\cos x$ va $x=0$ $(x\in\left[0;\frac{\pi}{4}\right])$ chiziqlar bilan chegaralangan shaklning yuzini hisoblang.

A) $3-\sqrt{2}$ B) $2-\sqrt{2}$ C) $2-\sqrt{3}$

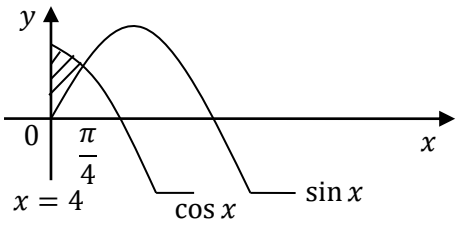
D) $\sqrt{3}-1$ E) $\sqrt{2}-1$

Yechilishi: $y=\sin x$; $y=\cos x$; $x=0$; $x\in\left[0;\frac{\pi}{4}\right]$;

$S=\int_0^{\pi/4}(\cos x-\sin x)dx=\int_0^{\pi/4}\cos x\,dx-$

$-\int_0^{\pi/4}\sin x\,dx=\sin x\left|_0^{\frac{\pi}{4}}+\cos x\right|_0^{\frac{\pi}{4}}=\sin\frac{\pi}{4}-\sin 0+$

$+\cos\frac{\pi}{4}-\cos 0=\frac{\sqrt{2}}{2}-0+\frac{\sqrt{2}}{2}-1=\sqrt{2}-1.$



Javobi: E.

55. $y=3\cos^2 3x-3\sqrt{3}\cos 3x-\sin^2 3x-\sin^2 3x+4$ funksiyaning eng kichik qiymatini toping.

A) 1,545 B) 1,2325 C) 2,1413

D) 1,3125 E) 2,125

Yechilishi: $y=3\cos^2 3x-3\sqrt{3}\cos 3x-\sin^2 3x+4$;

$y'=6\cos 3x\,(-\sin 3x)\cdot 3-3\sqrt{3}(-\sin 3x)\cdot 3-$

$-2\sin 3x\cos 3x\cdot 3=-24\sin 3x\cos 3x+9\sqrt{3}\sin 3x=$

$=\sin 3x\left(9\sqrt{3}-24\cos 3x\right).$

$y'=0 \Rightarrow \begin{cases}\sin 3x=0\\ \cos 3x=\frac{3\sqrt{3}}{8}\end{cases}\Rightarrow$

$\Rightarrow\begin{cases}3x=\pi n\\ 3x=arc\cos\frac{3\sqrt{3}}{8}+2\pi n\end{cases}\Rightarrow$

$\Rightarrow\begin{cases}x=\frac{\pi}{3}\cdot n;\\ x=\frac{1}{3}\arccos\frac{3\sqrt{3}}{8}+\frac{2\pi}{3}\cdot n.\end{cases}$

$$n = 0 => \begin{cases} x = 0; \\ x = \frac{1}{3}\arccos\frac{3\sqrt{3}}{8}. \end{cases}$$

$$y(0) = 3 - 3\sqrt{3} + 4 = 7 - 5{,}1961 = 1{,}8039;$$

$$y\left(\frac{1}{3}\arccos\frac{3\sqrt{3}}{8}\right) = 3 \cdot \left(\cos\arccos\frac{3\sqrt{3}}{8}\right)^2 -$$

$$-3\sqrt{3}\cos\arccos\frac{3\sqrt{3}}{8} - \left(\sin\arccos\frac{3\sqrt{3}}{8}\right)^2 + 4 =$$

$$= 3 \cdot \left(\frac{3\sqrt{3}}{8}\right)^2 - 3\sqrt{3} \cdot \frac{3\sqrt{3}}{8} - \sqrt{1 - \left(\frac{3\sqrt{3}}{8}\right)^2} + 4 =$$

$$= \frac{81}{64} - \frac{27}{8} - \sqrt{\frac{37}{64}} + 4 = 1{,}2656 + 3{,}375 - 0{,}7603 + 4 =$$

$$= 5{,}2656 - 4{,}1353 = 1{,}1303.$$ Javobi: D.

56. 0,8 ga teskari bo‘lgan songa qarama-qarshi sonni toping.

A) -0,8 B) 1,25 C) -1,25 D) -1,2 E) 1,2

Yechilishi: $0{,}8 = \frac{8}{10} = \frac{4}{5} => \frac{5}{4} = 1{,}25 => -1{,}25.$

Javobi: C.

57. Qaysi sonni o‘zining kvadrati bilan yig’indisi eng kichik bo‘ladi?

A) -1 B) -0,4 C) -0,8 D) -0,5 E) -0,6

Yechilishi: $(-0{,}5)^2 - 0{,}5 = 0{,}25 - 0{,}5 = -0{,}25.$

Javobi: D.

58. $9x^2 + kx = 2x - k + 6$ tenglamaning ildizlari bir-biriga teng bo‘ladigan k ning barcha qiymatlari ko‘paytmasini toping.

A) 100 B) -120 C) 220 D) -196 E)160

Yechilishi: $9x^2 + kx = 2x - k + 6 =>$

$=> 9x^2 + (k-2)x + k - 6 = 0 => (k-2)^2 - 4 \cdot 9 \cdot$

$\cdot (k-6) = 0 => k^2 - 4k + 4 - 36k + 216 = 0 =>$

$=> k^2 - 40k + 220 = 0. Viyet\ teoremasiga\ asosan$
$x_1 \cdot x_2 = q\ bo'ladi.\ Demak, k_1 \cdot k_2 = 220.$ Javobi: C.

59. $\frac{2a^{-1/3}}{a^{2/3}-3a^{-1/3}} - \frac{a^{2/3}}{a^{5/3}-a^{2/3}} - \frac{a+1}{a^2-4a+3}$ ni soddalashtiring.

A) 0 B) 1 C) -1 D) $\frac{a-1}{a+1}$ E) $\frac{a}{a-3}$

Yechilishi: $\frac{2a^{-1/3}}{a^{2/3}-3a^{-1/3}} - \frac{a^{2/3}}{a^{5/3}-a^{2/3}} - \frac{a+1}{a^2-4a+3} =$

$= \frac{\frac{2}{\sqrt[3]{a}}}{\sqrt[3]{a^2}-\frac{3}{\sqrt[3]{a}}} - \frac{\sqrt[3]{a^2}}{\sqrt[3]{a^5}-\sqrt[3]{a^2}} - \frac{a+1}{(a-1)(a-3)} = \frac{2}{\sqrt[3]{a}} \cdot \frac{\sqrt[3]{a}}{a-3} -$

$- \frac{\sqrt[3]{a^2}}{\sqrt[3]{a^2}(a-1)} - \frac{a+1}{(a-1)(a-3)} = \frac{2}{a-3} - \frac{1}{a-1} - \frac{a+1}{(a-1)(a-3)} =$

$= \frac{2a-2-a+3-a-1}{(a-1)(a-3)} = 0.$ Javobi: A.

60. Futbol chempionatidagi komandalarning barchasi bir-biri bilan bir martadan o‘ynagandan keyin, hammasi bo‘lib 120 match o‘tkazildi. Chempionatda nechta komanda ishtirok etgan?

A) 12 B) 14 C) 15 D) 16 E) 20

Yechilishi: $C_n^2 = 120 => \frac{n!}{2!(n-2)!} = 120 =>$

$=> \frac{(n-2)!(n-1)\cdot n}{1\cdot 2(n-2)!} = 120 => n^2 - n - 240 = 0 =>$

$=> n - 16.$ Javobi: D.

61. Egizaklar yoshining yig’indisi 10 yilda 2 marta ortdi. Yana 10 yildan keyin ulardan har birining yoshi nechaga teng bo‘ladi?

A) 20 B) 30 C) 40 D) 25 E) 35

Yechilishi: $x + 10 + y + 10 = 2(x + y) =>$

$=> x + y = 20 => \begin{cases} x = y \\ 2x = 20 \end{cases} => x = 10.$ Javobi: B.

62. Rustam, Qodir, Azim pul yig’ishib, 2625 so‘mga koptok sotib olishdi. Agar ulardan har biri qolgan ikkitasi qo‘shgan

pulning yarmidan ko‘p bo‘lmagan pul qo‘shgan bo‘lsa, Rustam qancha pul qo‘shgan?

A)$Aniqlab\ bo'lmaydi$ B) 950

C) 825 D) 875 E) 975

Yechilishi: $R + Q + A = 2625;\ \ R \le \frac{Q+A}{2};$

$\frac{Q+A}{2} + Q + A = 2625 => 3Q + 3A = 2625 \cdot 2 =>$

$=> Q + A = \frac{5250}{3} = 1750 => R = 2625 - 1750 = 875.$

Javobi: D.

63. Raqamlarining yig’indisiga bo‘lganda bo‘linmasi 4 ga va qoldig’i nolga teng bo‘ladigan ikki xonali sonlar nechta?

A) 2 B) 3 C) 4 D) 5 E) 6

Yechilishi: $xy \left| \frac{x+y}{4} => xy = 4(x+y) => \right.$

$=> 10x + y = 4x + 4y => 6x = 3y => y = 2x =>$

$=> \begin{cases} x = 1,\ 2,\ 3,\ 4 \\ y = 2,\ 4,\ 6,\ 8 \end{cases} => 12; 24; 36; 48.$ Javobi: C.

64. Kilosi 600 so‘mdan baliq sotib olindi. Tozalangandan keyin baliqning og’irligi dastlabki og’irligining 80% ini tashkil etdi. 1 kg tozlangan baliq necha so‘mga tushgan?

A) 480 B) 500 C) 640 D) 720 E) 750

Yechilishi: $600 \cdot 0{,}2 = 120 \ => \ 600 + 120 = 720.$

Javobi: D.

65. Agar $\begin{cases} x^2y + xy^2 = 120 \\ x^2y - xy^2 = 30 \end{cases}$ bo‘lsa, $x^2 - y^2$ ning qiymatini hisoblang.

A) 16 B) 20 C) 25 D) 34 E) 42

Yechilishi: $\begin{cases} x^2y + xy^2 = 120 \\ x^2y - xy^2 = 30 \end{cases} => \begin{cases} 2xy^2 = 90 \\ 2x^2y = 150 \end{cases} =>$

$$=> \begin{cases} xy^2 = 45 \\ x^2y = 75 \end{cases} => \begin{cases} x = \frac{45}{y^2} \\ \frac{45^2}{y^4} \cdot y = 75 \end{cases} => \begin{cases} x = \frac{45}{y^2} \\ y^3 = 27 \end{cases} =>$$

$$=> \begin{cases} x = 5 \\ y = 3 \end{cases} => x^2 - y^2 = 25 - 9 = 16.$$ Javobi: A.

66. $\frac{2}{x^2-9} < \frac{3}{x^2-16}$ tengsizlikni yeching.

A) $(-\infty; +\infty)$ B) $(-4; -3) \cup (3; 4)$

C) $(-\infty; -4) \cup (-3; 3) \cup (4; \infty)$ D)$-\infty; -4) \cup (4; \infty)$

E) $(-\infty; -4) \cup (3; 4) \cup (6; \infty)$

Yechilishi: $\frac{2}{x^2-9} < \frac{3}{x^2-16} => \frac{2}{x^2-9} - \frac{3}{x^2-16} < 0 =>$

$$\frac{x^2+5}{(x^2-9)(x^2-16)} > 0 => \begin{cases} x^2 + 5 > 0; \\ x \neq -3; \\ x \neq 3; \\ x \neq -4 \\ x \neq 4. \end{cases} =>$$

$(-\infty; -4) \cup (-3; 3) \cup (4; \infty)$. Javobi: C.

67. $x\,(x^2 + 4x + 4)\sqrt{25 - x^2} \geq 0$ tengsizlikning butun sonlardan iborat yechimlari yig'indisini toping.

A) 15 B) 10 C) 8 D) 12 E) 0

Yechilishi: $x(x^2 + 4x + 4)\sqrt{25 - x^2} \geq 0 =>$

$$=> x\,(x + 2)^2\sqrt{25 - x^2} \geq 0 => \begin{cases} x \geq 0; \\ x + 2 \geq 0; \\ 25 - x^2 \geq 0. \end{cases} =>$$

$$=> \begin{cases} x \geq 0; \\ x \geq -2; \\ -5 < x \leq 5. \end{cases} \quad x = -5 + (-2) + 0 + 1 + 2 + 3 +$$

$+4 + 5 = 10.$ Javobi: B.

68. $|17 - 3x^2| = 3x + 2$ tenglama nechta ildizga ega?

A) 1 B) 2 C) 3 D) 4 E) $ildizi\ yo'q$

Yechilishi: $|17-3x^2|=3x+2 \Rightarrow$

$\Rightarrow \pm(17-3x^2)=3x+2 \Rightarrow$

$\Rightarrow \begin{cases} -17+3x^2-3x-2=0 \\ 17-3x^2=3x+2 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 3x^2-3x-19=0; \\ 3x^2+3x-15=0. \end{cases}$

$x_{1,2}=\frac{3\pm\sqrt{9+4\cdot3\cdot19}}{2\cdot3} \Rightarrow \begin{cases} x_1=\frac{3-\sqrt{237}}{6}; \\ x_2=\frac{3+\sqrt{237}}{6}; \end{cases}$

$x_{3,4}=\frac{-3\pm\sqrt{9+4\cdot3\cdot15}}{2\cdot3} \Rightarrow \begin{cases} x_3=\frac{-3-\sqrt{189}}{6}; \\ x_4=\frac{-3+\sqrt{189}}{6}. \end{cases}$

Tekshirish orqali ildiz 2 ta ekanligi topiladi.

Javobi: B.

69. $(x^2+x+1)(x^2+x+2)=12$ tenglamaning haqiqiy ildizlari ko‘paytmasini toping.

A) -12 B) 6 C) -2 D) 8 E) 2

Yechilishi: $(x^2+x+1)(x^2+x+2)=12;$

$x^2+x=y;\ (y+1)(y+2)=12 \Rightarrow$

$\Rightarrow y^2-3y-10=0 \Rightarrow \begin{cases} y_1=-5; \\ y_2=2. \end{cases}$ *U holda*

$\begin{cases} x^2+x=-5 \\ x^2+x=2 \end{cases} \Rightarrow \begin{cases} x^2+x+5=0 \\ x^2+x-2=0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} D<0; \\ x_1=-2;\ x_2=1. \end{cases}$ Javobi: C.

70. Dastlabki mingta natural sonlarning o‘rta arifmetikasini toping.

A) 500 B) 501 C) 501,5 D) 500,5 E) 502,5

Yechilishi: $\frac{S_{1000}}{1000}=\frac{1}{1000}\cdot\frac{1+1000}{2}\cdot1000=500{,}5.$ Javobi: D.

2-axborotnoma

1.a ning qanday haqiqiy qiymatlarida $x^4 + a = x^2 + a^2$ tenglama uchta turli haqiqiy ildizlarga ega bo'ladi?

A) (0;4) B) 2 C) 0va 1 D) [0;1] E) 0

Yechilishi: $x^4 + a = x^2 + a^2;\ x^4 - x^2 + a - a^2 = 0;$

$x^2 = y \geq 0; \quad y^2 - y + a - a^2 = 0$

$y_{1,2} = \frac{1 \pm \sqrt{1-4a+4a^2}}{2} = \frac{1 \pm (1-2a)}{2} => \begin{cases} y_1 = 1 - a; \\ y_2 = a. \end{cases}$

$y \geq 0\ ni\ tekshiramiz$:

1) $\begin{cases} 1 - a = 0 \\ a = 0 \end{cases} => \begin{cases} a = 1; \\ a = 0. \end{cases}$ $Bunda\ berilgan\ teng - lama 3\ ta\ haqiqiy\ ildizlarga\ ega.$

2) $\begin{cases} 1 - a > 0 \\ a > 0 \end{cases} => \begin{cases} a < 1 \\ a > 0 \end{cases} => (0; 1).$ Javobi: C.

2.Agar $m^2 + n^2 = p^2 + q^2 = 1$ va $mp + nq = 0$ bo'lsa, $mn + pq$ ning qiymatini toping.

A) 1 B) 0 C) 2 D) 4 E) 0,5

Yechilishi: $m^2 + n^2 = p^2 + q^2 = 1;$

$\begin{cases} m^2 + n^2 = 1 \\ p^2 + q^2 = 1 \end{cases} => mn + pq =?\ mp + nq = 0 =>$

$=> mp = -nq => \begin{cases} m = -\frac{nq}{p} \\ p^2 = 1 - q^2 \end{cases} => (-\frac{nq}{p})^2 +$

$+n^2 = 1 =>\ \frac{n^2q^2}{1-q^2} + n^2 = 1 =>\ n^2 = 1 - q^2;$

$\begin{cases} p^2 = 1 - q^2 \\ n^2 = 1 - q^2 \end{cases} => p^2 = n^2 => p = n.\ U\ holda$

$mp + nq = 0 => mn + pq = 0.$ Javobi: B.

3.(a_n) ketma-ketlikning dastlabki n ta hadining yig'indisi $S_n = 11 - 4n^2$ formula bo'yicha hisoblanadi. $a_5 + a_6$ ning qiymatini toping.

A) 60 B) 80 C) -80 D) -60 E) -208

Yechilishi: $a_{n+1} = S_{n+1} - S_n formuladan\ foydala - niladi$: $a_5 = S_5 - S_4 = -89 + 53 = -36;$

$a_6 = S_6 - S_5 = -133 + 89 = -44;\ a_5 + a_6 = -80.$

Javobi: C.

4.$\lg a, \lg b$ va 3 sonlar ko'rsatilgan tartibda arifmetik progressiyani tashkil etadi. Agar $a^4 = b^2$ bo'lsa, $a + b$ ning qiymatini toping.

A) 1000 B) 300 C) 101 D)110 E)10,1

Yechilishi: $\frac{\lg a+3}{2} = \lg b => \lg a + 3 = 2\lg b;$

$a^4 = b^2 => 4\lg a = 2\lg b => \lg a + 3 = 4\lg a =>$

$\lg a = 1 =>\ a = 10 =>\ 2\lg b = 1 + 3 =>$

$\lg b = 2 =>\ b = 100 =>\ a + b = 110.$ Javobi: D.

5.b_n geometrik progressiyada $b_2 + b_3 = 24$ va $b_2 + b_3 = 6$ bo'lsa, b_1 ning qiymatini toping.

A) 0,4 B) 1 C) $1\frac{1}{5}$ D) 2,2 E) $\frac{1}{5}$

Yechilishi: $\begin{cases} b_4 - b_2 = 24 \\ b_2 + b_3 = 6 \end{cases} => \begin{cases} b_1q^3 - b_1q = 24 \\ b_1q^2 + b_1q = 6 \end{cases} =>$

$=> \frac{b_1q(q^2-1)}{b_1q(q+1)} = \frac{24}{6} => q - 1 = 4 => q = 5 =>$

$=> b_1 = \frac{1}{5}.$ Javobi: E.

6.$y = f(x)$ funksiyaning aniqlanish sohasi [-1;2] dan iborat. $y = f(1 + x)$ funksiyaning aniqlanish sohasini toping.

A) [-2;-1] B) [-2;1] C) [-4;2] D)[-1;0] E) [0;3]

Yechilishi: $y = f(x) => x \in [-1; 2] =>$

$=>$ (x + 1) $\in [-1; 2]$; $U\ holda - 1 \le 1 + x \le 2 =>$

$=> -2 \le x \le 1.$ $Demak, (1 + x) \in [-2; 1]$. Javobi: B.

7.$y = \sqrt{x^2 + 2x + 4}$ funksiyasining qiymatlar sohasini ko'rsating.

A) $[0; +\infty)$ B) $[2; \infty)$ C) $(0; \infty)$

D) $[\sqrt{2}; \infty)$ E) $[\sqrt{3}; \infty)$

Yechilishi: $y = \sqrt{x^2 + 2x + 4} => \begin{cases} a = 1 > 0 \\ b = 2 \\ c = 4 \end{cases} =>$

$=> y = -\frac{b^2 - 4ac}{4a} = -\frac{4 - 4 \cdot 1 \cdot 4}{4 \cdot 1} = -\frac{4 - 16}{4} = -\frac{-12}{4} = 3.$

$E(y) = \left[\sqrt{3}; +\infty\right)$. Javobi: E.

8.Qaysi to'g'ri chiziq $y = 4 - x^2$ funksiya grafigiga $x_0 = 2$ nuqtada o'tkazilgan urinmaga parallel bo'ladi?

A) $y = 4 - 4x$ B)$y = 2x + 8$ C) $y = x + 8$

D) $y = 4x + 8$ E) $y = -8 + 4x$

Yechilishi: $y - y_0 = f'(x_0)(x - x_0)\ formulaga\ aso - san$: $\begin{cases} y = 4 - x^2 \\ x_0 = 2 \end{cases} => \begin{cases} y_0 = 4 - x_0 \\ y' = -2x \end{cases} => \begin{cases} y_0 = 0; \\ y' = -4 \end{cases} =>$

$=> y = -4(x - 2) => y = -4x + 8 =>$

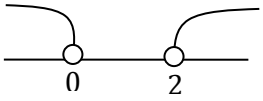
$y = -4x + 4$. Javobi: A.

9.Agar $f(x) = x^3 + x + \sqrt{2}$ va $g(x) = 3x^2 + x + \sqrt{2}$ bo'lsa, $f'(x) > g(x)$ tengsizlikning eng kichik natural yechimini toping.

A) 3 B) 2 C) 6 D) 5 E)1

Yechilishi: $f'(x) = 3x^2 + 1;$ $g'(x) = 6x + 1 =>$

$=> 3x^2 + 1 > 6x + 1 => x^2 - 2x > 0 => \begin{cases} x = 0; \\ x = 2. \end{cases}$



$\Rightarrow x = 3.$ Javobi: A.

10.Agar $f(x) = e^{1-x} \cdot sin\frac{\pi x}{2}$ bo'lsa, $f'(1)$ ning qiymatini toping.

A) 1 B) 2 C) $-\sqrt{2}$ D) 2 E) -1

Yechilishi: $f'(x) = \left(e^{1-x} \cdot \sin\frac{\pi}{2}x\right)' = -e^{1-x} \cdot \sin\frac{\pi}{2}x +$

$+\frac{\pi}{2} \cdot e^{1-x}\cos\frac{\pi}{2}x \Rightarrow f'(1) = -1.$ Javobi: E.

11.$y = \cos^2 x - \frac{\sqrt{3}}{2}\sin 2x$ funksiyaning eng katta va eng kichik qiymatlari yig'indisini toping.

A) 1,5 B) 0,5 C) 1 D) 2 E) $-\frac{\sqrt{3}}{2}$

Yechilishi: $y = \cos^2 x - \frac{\sqrt{3}}{2}\sin 2\,x = \frac{1}{2} + \frac{1}{2}\cos 2x -$

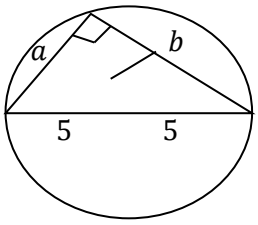
$-\frac{\sqrt{3}}{2}\sin 2x = \frac{1}{2} + \cos\frac{\pi}{3}\cos 2x - \sin\frac{\pi}{3}\sin 2x =$

$= \frac{1}{2} + \cos\left(\frac{\pi}{3} + 2x\right).\ -1 \le \cos\left(\frac{\pi}{3} + 2x\right) \le 1.\ U\ holda$

$y_{min} = \frac{1}{2} - 1 = -\frac{1}{2};\ y_{max} = \frac{1}{2} + 1 = \frac{3}{2}.$

$y_{max} + y_{min} = 1.$ Javobi: C.

12.Radiusi 5ga teng bo'lgan doiraga to'g'ri burchakli uchburchak ichki chizilgan. Shu uchburchakka ichki chizilgan doiraning radiusi 1ga teng. Uchburchakning yuzini toping.



A) 12 B) $8\sqrt{2}$ C) 11 D) 22 E) $6\sqrt{2}$

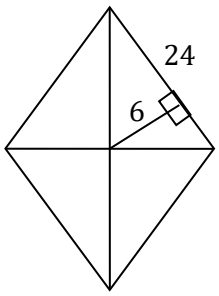
Yechilishi: $S_\Delta = (2R + r) \cdot r =$

$= (2 \cdot 5 + 1) \cdot 1 = 11.$

Javobi: C.

13.Rombga ichki chizilgan aylananing radiusi 6 ga teng. Agar rombning perimetri 96 ga teng bo'lsa, uning o'tmas burchagini toping.

A) 150° B) 120° C) 135° D) 110° E) 130°



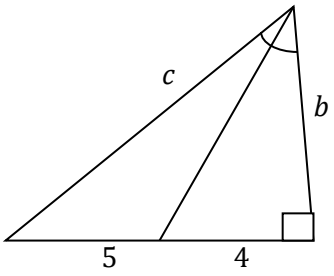
Yechilishi: $a = \frac{4r}{\sin\alpha} => 24 = \frac{2\cdot 6}{\sin\alpha} =>$

$=> \alpha = 30^\circ => \beta = 150^\circ.$

Javobi: A.

14.To'g'ri burchakli uchburchak o'tkir burchagining bissektrisasi (qarama-qarshi) katetni uzunliklari 4 va 5 ga teng bo'lgan qismlarga ajratadi. Shu uchburchakning perimetrini toping.

A) 32 B) 40 C) 36 D) 45 E)42



Yechilishi: $\frac{c}{5} = \frac{b}{4} => c = \frac{5b}{4};$

$c^2 = 9^2 + b^2 =>$

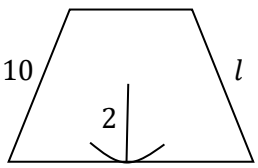
$=> \frac{25b^2}{16} = 81 + b^2 =>$

$=> b = 12 => c = 15 => p = 36.$

Javobi: C.

15. Yon tomoni 10 ga teng bo'gan teng yonli trapetsiyaga radiusi 2ga teng bo'lgan doira ichki chizilgan. Trapetsiya yuzining doira yuziga nisbatini toping.

A) $\frac{4}{\pi}$ B) $\frac{20}{\pi}$ C) $\frac{5}{\pi}$ D) $\frac{10}{\pi}$ E) $\frac{16}{\pi}$



Yechilishi: $\begin{cases} l = MN \\ h = 4 \end{cases} =>$

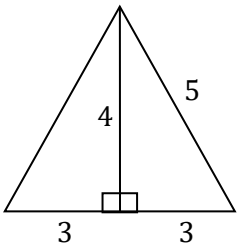
$=> S_t = 10 \cdot 4 = 40;$

$S_d = \pi \cdot 2^2 = 4\pi; \ \frac{S_t}{S_d} = \frac{40}{4\pi} = \frac{10}{\pi}.$

Javobi: D.

16.Konus asosining yuzi 9π ga, yon sirtining yuzi 15π ga teng. Shu konusga ichki chizilgan sferaning radiusini toping.

A) 1,5 B) 1,8 C) 2 D) 2,4 E) 2,5



Yechilishi: $\pi R^2 = 9\pi => R = 3;$

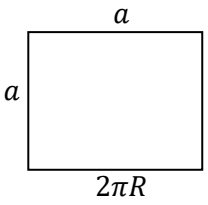
$\pi Rl = 15\pi => l = 5.\ S = \frac{1}{2} \cdot 6 \cdot 4 = 12;$

$r = \frac{2 \cdot S}{a+b+c} = \frac{24}{16} = \frac{3}{2} = 1{,}5$. Javobi: A.

17.Silindr yon sirtining yoyilmasi kvadratdan iborat bo'lib, uning yuzi $\frac{8}{9}$ ga teng. Silindrning hajmini toping.

A) $\frac{4\pi\sqrt{2}}{27}$ B) $\frac{4}{27\pi^2}$ C) $\frac{4\sqrt{2}}{27\pi}$ D) $\frac{16\pi}{9}$ E) $\frac{64\pi}{81}$

Yechilishi: $a^2 = \frac{8}{9} => a = \frac{2\sqrt{2}}{3};$



$2\pi R = \frac{2\sqrt{2}}{3} => R = \frac{\sqrt{2}}{3\pi};$

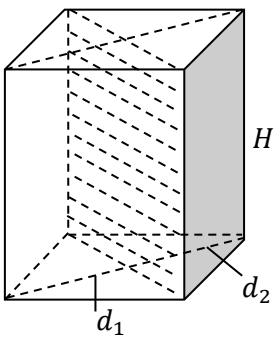
$V = \pi R^2 H = \pi(\frac{\sqrt{2}}{3\pi})^2 \cdot \frac{2\sqrt{2}}{3} = \frac{4\sqrt{2}}{27\pi}.$

Javobi: C.

18.To'g'ri prizmaning asosi rombdan iborat. Diagonal kesimlarining yuzlari esa 9 va 12 ga teng. Shu prizma yon sirtining yuzini toping.

A)15 B) 30 C)7,5 D) $6\sqrt{7}$ E) 36

Yechilishi: $\begin{cases} d_1 H = 9 \\ d_2 H = 12 \end{cases} => \frac{d_1}{d_2} = \frac{3}{4} =>$



$=>\ d_1 = \frac{3}{4} \cdot d_2.$

$\frac{3d_2}{4} \cdot H = 9\ => H = \frac{12}{d_2};$

$d_1^2 + d_2^2 = 4a^2\ =>$

$=>\ \frac{9d_2^2}{16} + d_2^2 = 4a^2\ => a = \frac{5d_2}{8};$

$S_{yon} = 4a \cdot H = 4 \cdot \frac{5d_2}{8} \cdot \frac{12}{d_2} = 30.$

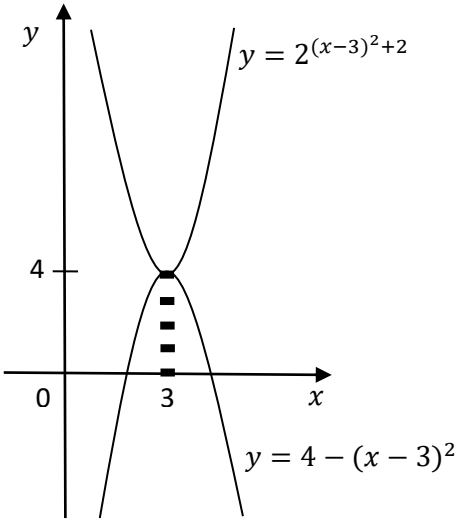
Javobi: B.

19.$6x - x^2 - 5 = 2^{x^2-6x+11}$ tenglamaning idizlari yig'indisini toping.

A) -5 B) -3 C) 6 D) 4 E) 3

Yechilishi: $6x - x^2 - 5 = 2^{x^2-6x+11}$

$\begin{cases} y = 6x - x^2 - 5 \\ y = 2^{x^2-6x+11} \end{cases} => \begin{cases} y = 4 - (x-3)^2; \\ y = 2^{(x-3)^2+2}. \end{cases}$



$x = 3.$ Javobi: E.

20.$\frac{1+2\log_3 2}{(1+\log_3 2)^2} + \log^2{}_6\, 2$ ni hisoblang.

A) 2 B) 0,5 C) 1 D)$\frac{1}{4}$ E) $\log_3 2$

Yechilishi: $\frac{1+2\log_3 2}{(1+\log_3 2)^2} + \left(\frac{\log_3 2}{\log_3 6}\right)^2 = \frac{1+2\log_3 2}{(1+\log_3 2)^2} +$

$+ \frac{\log^2{}_3\, 2}{(1+\log_3 2)^2} = \frac{(1+\log_3 2)^2}{(1+\log_3 2)^2} = 1.$ Javobi: C.

21.$\left(\sqrt{2-\sqrt{3}}\right)^x + \left(\sqrt{2+\sqrt{3}}\right)^x = 4$ tenglamaning ildizlari yig'indisini toping.

A) -1 B) 1 C) 4 D) -4 E) 2\

Yechilishi: $\sqrt{2-\sqrt{3}}\ va\ \sqrt{2+\sqrt{3}}\ sonlar\ ko'paytmasi$

$1\ ga\ teng\ bo'lganligi\ uchun\ ular\ teskari\ sonlar.$

$Demak, \left(\sqrt{2+\sqrt{3}}\right)^x = t\ bo'lsa, \left(\sqrt{2-\sqrt{3}}\right)^x = \frac{1}{t}$

$bo'ladi.\ \ U\ holda$

$t + \frac{1}{t} - 4 = 0 => t^2 - 4t + 1 = 0 =>\ t_1 = 2+\sqrt{3};$

$t_2 = 2-\sqrt{3}.$

$1)\left(\sqrt{2+\sqrt{3}}\right)^x = 2+\sqrt{3} => (2+\sqrt{3})^{\frac{x}{2}} = 2+\sqrt{3} =>$

$=> \frac{x}{2} = 1 => x_1 = 2.$

$2)\left(\sqrt{2-\sqrt{3}}\right)^x = \frac{1}{2-\sqrt{3}} => \left(2-\sqrt{3}\right)^{\frac{x}{2}} =$

$= \left(2-\sqrt{3}\right)^{-1} => \frac{x}{2} = -1 => x_2 = -2.$

$x_1 \cdot x_2 = -4.$ Javobi: D.

22. $\log_4(2-\sqrt{x+3}) < 2\cos\frac{5\pi}{3}$ tengsizlikning butun sonlardan iborat nechta yechimi bor?

A) 6 B) 4 C) 5 D) 3 E) 1

Yechilishi: $\log_4(2-\sqrt{x+3}) < 2\cos\frac{5\pi}{3}$

$2-\sqrt{x+3} > 0\ => \sqrt{x+3} < 2 => x+3 < 4 =>$

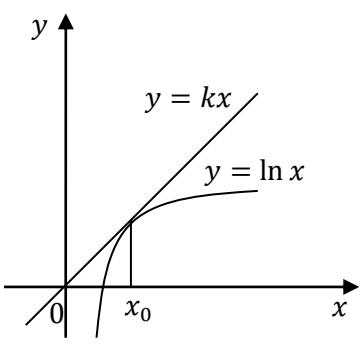
$=> x < 1;\ \ x+3 \geq 0 =>\ \ x \geq -3.\ \ [-3;+1).$

$\log_4(2-\sqrt{x+3}) < 1 =>\ 2-\sqrt{x+3} < 4 =>$

$\sqrt{x+3} > 2 =>\ x \geq -3.$

$x = -3; -2; -1; 0.$ Javobi: B.

23. $y = \ln x$ funksiya grafigiga o'tkazilgan urinma koordinata boshidan o'tadi. Shu urinmaning tenglamasini yozing.



A) $y = x$ B) $y = 2x$ C) $y = ex$

D) $y = \frac{x}{e}$ E) $y = 3x$

Yechilishi: 1) $y = \ln x \Rightarrow$

$y' = \frac{1}{x} \Rightarrow k = \frac{1}{x_0} \Rightarrow x_0 = \frac{1}{k};$

2) $\begin{cases} y = \ln x \\ y = kx \end{cases} \Rightarrow \ln x = kx \Rightarrow$

$\Rightarrow \ln x_0 = kx_0 \Rightarrow$

$\Rightarrow \ln \frac{1}{k} = k\frac{1}{k} \Rightarrow \frac{1}{k} = e \Rightarrow$

$\Rightarrow k = \frac{1}{e} \Rightarrow y = kx \Rightarrow y = \frac{1}{e} \cdot x.$ Javobi: D.

24.Agar $f(x) = e^{ax^2+bx+1}$ funksiya uchun $f(1) = f(0) = f'(0)$ bo'lsa, ab ning qiymatini toping.

A) 1 B) 2 C)-4 D) 0 E) -1

Yechilishi: $f(x) = e^{ax^2+bx+1}; f(1) = e^{a+b+1};$

$f(0) = e;\ f'(x) = (2ax + b) \cdot e^{ax^2+bx+1} \Rightarrow$

$\Rightarrow f'(0) = b \cdot e \Rightarrow f(0) = f'(0) \Rightarrow b = 1;$

$f(0) = f(1) \Rightarrow e = e^{a+1+1} \Rightarrow a = -1.\ a \cdot b = -1.$

Javobi: E.

25.Agar $p = \frac{1}{lg\pi} + \frac{1}{\log_5 \pi} + \frac{1}{\log_2 \pi}$ bo'lsa, quyidagi munosabatlarning qaysi biri to'g'ri?

A) $p < 3$ B) $p = 3$ C) $p < 4$

D) $p = 4$ E) $p > 4$

Yechilishi: $p = \frac{1}{lg\pi} + \frac{1}{\log_5 \pi} + \frac{1}{\log_2 \pi} = \frac{1}{lg\pi} + \frac{1}{\frac{lg\pi}{lg5}} + \frac{1}{\frac{lg\pi}{lg2}} =$

$= \frac{1}{lg\pi} + \frac{lg\frac{10}{2}}{lg\pi} + \frac{lg2}{lg\pi} = \frac{1+1-lg2+lg2}{lg\pi} = \frac{2}{lg\pi} = \frac{lg100}{lg\pi} =$

$= \log_\pi 100 \Rightarrow \log_\pi 100 = p \Rightarrow 100 = \pi^p \Rightarrow$

$\Rightarrow p > 4.$ Javobi: E.

26.Agar $\operatorname{ctg}\alpha = \sqrt{2} - 1$ bo'lsa, $\cos 2\alpha$ ning qiymatini toping.

A) $\sqrt{2}$ B) $\frac{\sqrt{2}+1}{2}$ C) $-\frac{1}{\sqrt{2}}$ D) $-\frac{1}{2}$ E) $\frac{1}{2}$

Yechilishi: $\operatorname{ctg}\alpha = \sqrt{2} - 1 \Rightarrow \operatorname{tg}\alpha = \frac{1}{\sqrt{2}-1} = \sqrt{2} + 1$

$\cos 2\alpha = \frac{1-\operatorname{tg}^2\alpha}{1+\operatorname{tg}^2\alpha} = \frac{1^2-(\sqrt{2}+1)^2}{1+(\sqrt{2}+1)^2} = \frac{-\sqrt{2}(1+\sqrt{2})}{2\sqrt{2}(1+\sqrt{2})} = -\frac{1}{2}$.

Javobi: D.

27.$\sin^4\frac{\pi}{8} + \cos^4\frac{3\pi}{8}\sin^4\frac{5\pi}{8} + \cos^4\frac{7\pi}{8}$ ni hisoblang.

A) 2 B) $\frac{5}{2}$ C) 4 D) $\frac{3}{2}$ E) $\frac{5}{4}$

Yechilishi: $\sin^4\frac{\pi}{8} + \cos^4\frac{3\pi}{8} + \sin^4\frac{5\pi}{8} + \cos^4\frac{7\pi}{8} =$

$= \sin^4\frac{\pi}{8} + \cos^4\left(\pi - \frac{\pi}{8}\right) + \sin^4\left(\pi - \frac{3\pi}{8}\right) + \cos^4\frac{3\pi}{8} =$

$= \sin^4\frac{\pi}{8} + \cos^4\frac{\pi}{8} + \sin^4\frac{3\pi}{8} + \cos^4\frac{3\pi}{8} = \left|\sin^4 x + \right.$

$\left. +\cos^4 x = 1 - \frac{1}{2}\cos^2 2x\right| = 1 - \frac{1}{2}\sin^2 2\cdot\frac{\pi}{8} + 1 -$

$-\frac{1}{2}\sin^2 2\cdot\frac{3\pi}{8} = \frac{3}{2}$. Javobi: E.

28.$\sin 2x + \sqrt{\sin 2x - \operatorname{tg}\left(x - \frac{\pi}{4}\right)\cdot\operatorname{tg}\left(x + \frac{\pi}{4}\right)} = 0$ tenglama $[-\pi; 4\pi]$ oraliqda nechta ildizga ega?

A) 9 B) 7 C) 10 D) 8 E) 5

Yechilishi: $\cos 2x + \sqrt{\sin 2x - \operatorname{tg}\left(x - \frac{\pi}{4}\right)\cdot\operatorname{tg}\left(x + \frac{\pi}{4}\right)} = 0$

$[-\pi; 4\pi] = [-180°; 720°]$.

1. *Aniqlanish sohasi topiladi*:

$$\begin{cases}\cos\left(x - \frac{\pi}{4}\right) \neq 0 \\ \cos\left(x + \frac{\pi}{4}\right) \neq 0\end{cases} \Rightarrow \begin{matrix} x \neq -\frac{\pi}{4} + \pi k; \\ x \neq \frac{3\pi}{4} + \pi k.\end{matrix} \quad k \in Z.$$

2. $tg\left(x-\frac{\pi}{4}\right)\cdot tg\left(x+\frac{\pi}{4}\right)=\frac{tgx-1}{tgx+1}\cdot\frac{tgx+1}{1-tgx}=-1.$

3. $\cos 2x+\sqrt{\sin 2x+1}=0;\sqrt{\sin 2x+1}=$

$=-\cos 2x=>\begin{cases}\sqrt{\sin 2x+1}\geq 0\\ -\cos 2x\geq 0\end{cases}=>$

$=>\begin{cases}\sin 2x+1=\cos^2 2x\\ \cos 2x\leq 0\end{cases}=>$

$=>\begin{cases}\sin 2x+1=1-\sin^2 2x\\ \cos 2x\leq 0\end{cases}=>$

$\begin{cases}\sin 2x\,(\sin 2x+1)=0\\ \cos 2x\leq 0\end{cases}=>1)\begin{cases}\sin 2x=0\\ \cos 2x\leq 0\end{cases}=>$

$=>\begin{cases}x=\frac{\pi}{2}k\\ \cos 2x\leq 0\end{cases}=>x=\frac{\pi}{2}+\pi k,k\in Z.$

$2)\begin{cases}\sin 2x=-1\\ \cos 2x\leq 0\end{cases}=>\begin{cases}x=-\frac{\pi}{4}+\pi k,k\in Z\\ \cos 2x\leq 0\end{cases}$

$Bulardan\ x=\frac{\pi}{2}+\pi k,k\in Z.[-\pi;4\pi]\ oraliqdagi$

$yechimlarni\ \ topish\ uchun\ k\ ga\ qiymat\ beriladi$:

$k=2;\ -1;0;1;2;3.\ Yechim\ 5\ ta.$ Javobi: E.

29.$y=(1+\mathrm{tg}^2\,x)\cdot\cos^2 x-\frac{\sin 2x}{2\cos x}$ funksiyaning qiymatlar sohasini toping.

A) [0;2] B) (0;2) C) [-1;1] D) (-2;0) E) [-2;0]

Yechilishi: 1. $Aniqlanish\ soha\ topiladi$:

$\cos x\neq 0=>x\neq\frac{\pi}{2}+\pi k,\ k\in Z$

2. $Almashtirishlar\ olinadi$: $y=(1+\mathrm{tg}^2\,x)\cdot\cos^2 x-$

$-\frac{\sin 2x}{2\cos x}=\frac{1}{\cos^2 x}\cdot\cos^2 x-\frac{2\sin x\cos x}{2\cos x}=1-\sin x=>$

$=>[0;2].$ Javobi: A.

30.$3^{\cos x}\cdot 3^{\cos^2 x}\cdot 3^{\cos^3 x}\ldots=3$ tenglamani yeching.

A) $\pm\frac{\pi}{3}+2\pi k,\ k\in Z$

B) $\frac{\pi}{3}+\pi k,\ \ k\in Z$

C) $\frac{2\pi}{3}+\pi k, k\in Z$

D) $\pm\frac{\pi}{6}+2\pi k,\ \ k\in Z$

E) $(-1)^k\frac{\pi}{3}+\pi k,\ \ k\in Z$

Yechilishi: $3^{\cos x}\cdot 3^{\cos^2 x}\cdot 3^{\cos^3 x}\ldots=3 \Rightarrow$

$\Rightarrow \cos x+\cos^2 x+\cos^3 x+\cdots=1 \Rightarrow$

$\Rightarrow S=1; b_1=\cos x;\ q=\cos x;$

$1=\frac{\cos x}{1-\cos x}\Rightarrow\begin{cases}\cos x\neq 1\\ \cos x=\frac{1}{2}\end{cases}\Rightarrow\begin{cases}x\neq 2\pi k;\\ x=\pm\frac{\pi}{3}+2k\pi, k\in Z.\end{cases}$

Javobi: A.

31.$\cos(\pi\sin x)>0$ tengsizlikni yeching.

A) $\left(\pi k;\ \frac{\pi}{3}+\pi k\right), k\in Z$

B) $\left(-\frac{\pi}{6}+\pi k;\ \frac{\pi}{6}+\pi k\right), k\in Z$

C) $\left(-\frac{\pi}{3}+2\pi k;\ \frac{\pi}{3}+2\pi k\right), k\in Z$

D) $\left(\pi k;\ \frac{\pi}{6}+\pi k\right), k\in Z$

E) $\left(-\frac{\pi}{6}+2\pi k;\ -\frac{\pi}{6}+2\pi k\right), k\in Z$

Yechilishi: $\cos(\pi\sin x)>0 \Rightarrow$

$\Rightarrow\ -\frac{\pi}{2}+2k\pi<\pi\sin x\ <\frac{\pi}{2}+2k\pi \Rightarrow$

$\Rightarrow -\frac{1}{2}+2k<\sin x<\frac{1}{2}+2k\Rightarrow\begin{cases}\sin x>-\frac{1}{2}\\ \sin x<\frac{1}{2}\end{cases}$

$\left(-\frac{\pi}{6}+\pi k;\ \frac{\pi}{6}+\pi k\right)$. Javobi: B.

32.1; 3; 7; 15; 31…; 2^n-1; ... ketma-ketlikning dastlabki n ta hadining yig'indisini toping.

A) 4^n+3n

B) $2(2^n-1)-n$

C) 2^n+n+1

D) $2^{2n}-4n$

E) aniqlab bo'lmaydi.

Yechilishi: 1; 3; 7; 15; 31…; 2^n-1; ...

$2^1-1+2^2-1+2^3-1+\cdots+2^n-1=$

$=2+2^2+2^3+\cdots+2^n-n=\frac{2(2^n-1)}{2-1}-n=$

$=2(2^n-1)-n.$ Javobi: B.

33.$\left(1-\frac{1}{4}\right)\left(1-\frac{1}{9}\right)\left(1-\frac{1}{16}\right)\ldots\left(1-\frac{1}{2000^2}\right)$ ko'paytmaning qiymatini hisoblang.

A) $\frac{1999}{2000}$ B) $\frac{19}{1999}$ C) $\frac{2001}{2000}$ D) $\frac{1999}{4000}$ E) $\frac{2001}{4000}$

Yechilishi: $\left(1-\frac{1}{4}\right)\left(1-\frac{1}{9}\right)\left(1-\frac{1}{16}\right)\ldots\left(1-\frac{1}{2000^2}\right)=$

$=\left(1-\frac{1}{2}\right)\left(1+\frac{1}{2}\right)\cdot\left(1-\frac{1}{3}\right)\left(1+\frac{1}{3}\right)\cdot\left(1-\frac{1}{4}\right)\left(1+\frac{1}{4}\right)$

$\ldots\left(1-\frac{1}{2000^2}\right)=\frac{1}{2}\cdot\frac{1}{3}\cdot\frac{2}{3}\cdot\frac{4}{3}\cdot\frac{3}{4}\cdot\frac{5}{4}\ldots\left(1-\frac{1}{2000}\right)\cdot$

$\cdot\left(1+\frac{1}{2000}\right)=\frac{1}{2}\cdot\frac{2001}{2000}=\frac{2001}{4000}.$ Javobi: E.

34.$y=1-8\sin^2 x\cos^2 x$ funksiyaning eng kichik musbat davrini toping.

A) 2π B) π C) $\frac{\pi}{2}$ D) $\frac{\pi}{4}$ E) funksiya davriy emas.

Yechilishi: $y=1-8\sin^2 x\cdot\cos^2 x=$

$=1-2(2\sin x\cos x)^2=1-2\sin^2 2x=$

$=|\cos 2x=1-\sin^2 x|=\cos 4x=>E.k.d=\frac{2\pi}{4}=\frac{\pi}{2}.$

Javobi: C.

35.k ning qanday qiymatlarida $2x + y = 9$ va $kx + 5y = 18$ to'g'ri chiziqlarning kesishgan nuqtasi to'rtinchi koordinat burchagining bissektrisasiga tegishli?

A) 3 B) 7 C) 4 D) 5 E) 9

Yechilishi: $\begin{cases} 2x + y = 9 \\ kx + 5y = 18 \end{cases} =>$

$=> \begin{cases} y = 9 - 2x \\ kx + 5(9 - 2x) = 18 \end{cases} => kx - 10x = -27 =>$

$=> (k - 10)x = -27 => x = \frac{27}{10-k};\ y = 9 - \frac{54}{10-k} =$

$= \frac{90-9k-54}{10-k} = \frac{36-9k}{10-k};\quad y = -x => \frac{36-9k}{10-k} = \frac{-27}{10-k} =>$

$=> k = 7.$ Javobi: B.

36.12% ga arzonlashtirilgandan keyin mahsulotning bahosi 1100 so'm bo'di. Mahsulotning dastlabki bahosini aniqlang.

A) 1200 B) 1240 C)1280 D) 1250 E) 1260

Yechilishi: $\begin{matrix} x - 100\% \\ 1100 - 88\% \end{matrix} => x = 1250.$ Javobi: D.

37.x y ning 30% ini tashkil etadi, y esa z dan 300% ga ko'p. x z dan necha foiz ko'p?

A) 100 B) 80 C) 200 D) 250 E) 150

Yechilishi: $x = 0{,}5y;\ y = 3z =>\ x = 0{,}5 \cdot 3z =>$

$=> x = 1{,}5z.$ Javobi: E.

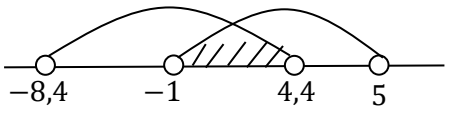
38.$(\sqrt{4-x})^2 \le \frac{21-x^2}{4}$ tengsizlikning butun sonlardan iborat yechimlaridan eng katta va eng kichigining yig'indisini toping.

A) 5 B) 4 C) 3 D) 2 E) 1

Yechilishi: $\left(\sqrt{4-x}\right)^2 \le \frac{21-x^2}{4} =>$

$=> |4 - 4x| \le \frac{21-x^2}{4} => \begin{cases} -4 + x \le \frac{21-x^2}{4} \\ 4 - x \le \frac{21-x^2}{4} \end{cases} =>$

$$=> \begin{cases} x^2 - 4x - 5 \le 0 \\ x^2 + 4x - 37 \le 0 \end{cases} => \begin{cases} x_1 = -1;\ x_2 = 5; \\ x_3 = -2 - \sqrt{41} = -8{,}4; \\ x_3 = -2 + \sqrt{41} = 4{,}4. \end{cases}$$



$x = 0,1,2,3,4 => 0 + 4 = 4.$

Javobi: B.

39.Arifmetik progressiyaning hadlari 60 ta. Uning juft o'rinda turgan hadlari yig'indisi toq o'rinda turgan hadlari yig'indisidan 15 ga ko'p. Progressiyaning to'rtinchi hadi 4,5 ga teng. Progressiyaning hadlari yig'indisini toping.

A) 900 B) 1200 C) 1050 D) 1065 E) 1125

Yechilishi: $a_1, a_{3,} \dots, a_{59} => S_{30} = \frac{a_1 + a_{59}}{2} \cdot 30 =$

$= 15\ (a_1 + a_{59}).$

$a_2, a_4, \dots, a_{60} = S_{30} = \frac{a_2 + a_{60}}{2} \cdot 30 = 15\ (a_2 + a_{60}).$

$15\ (a_1 + a_{59}) + 15 = 15\ (a_2 + a_{60});$

$a_1 + a_{59} + 1 = a_2 + a_{60};$

$a_1 + a_1 + 58d + 1 = a_1 + d + a_1 + 59d => d = \frac{1}{2};$

$a_1 + 3d = 4{,}5 =>\ a_1 = 3;\ a_{60} = a_1 + 59d = 32{,}5;$

$S_{60} = \frac{a_1 + a_{60}}{2} \cdot 60 = \frac{35{,}5}{2} \cdot 60 = 1065.$ Javobi: D.

40.$\cos 92^\circ \cos 73^\circ - \sin 92^\circ \sin 73^\circ$ ni hisoblang.

A) $\frac{\sqrt{2+\sqrt{2}}}{2}$ B) $-\frac{\sqrt{2+\sqrt{2}}}{2}$ C) $-\frac{\sqrt{2+\sqrt{3}}}{2}$

D) $-\frac{\sqrt{2-\sqrt{3}}}{2}$ E) $\frac{\sqrt{2-\sqrt{2}}}{2}$

Yechilishi: $\cos 92^\circ \cos 73^\circ - \sin 92^\circ \sin 73^\circ =$

$= \cos(92^\circ + 73^\circ) = \cos 165^\circ = \cos(\pi - 15^\circ) =$

$= -\cos 15^\circ = -\sqrt{\frac{1}{2}(1+\cos 30^\circ)} = -\sqrt{\frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right)} =$

$= -\frac{\sqrt{2+\sqrt{3}}}{2}$. Javobi: C.

41. $\operatorname{tg} 1395^\circ$ ni hisoblang.

A) $\sqrt{3}$ B) $-\frac{1}{\sqrt{3}}$ C) -1 D) 1 E) $\frac{\sqrt{3}}{3}$

Yechilishi: $\operatorname{tg} 1395^\circ = \operatorname{tg}(8\pi - 45) = -\operatorname{tg} 45 = -1.$

Javobi: C.

42. $\cos^2 x = 1$ tenglamaning nechta ildizi $x^2 \le 10$ shartni qanoatlantiradi?

A) 1 B) 2 C) 3 D) 4 E) 5

Yechilishi: $\cos^2 x = 1 \Rightarrow \begin{cases} \cos x = -1 \\ \cos x = 1 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x = \pi + 2\pi k,\ k \in Z \\ x = 2\pi k,\ k \in Z \end{cases} \Rightarrow x = \pi + \pi k, k \in Z.$

$x^2 \le 10 \Rightarrow |x| \le \sqrt{10} \Rightarrow -\sqrt{10} \le x \le \sqrt{10}.$

$k = -2 \Rightarrow x = -\pi;\ k = -1 \Rightarrow x = 0;$

$k = 0 \Rightarrow x = \pi.$ Javob: C.

43. $ctg37°ctg38°ctg39° \ldots ctg52°ctg53°$ ni hisoblang.

A) 0 B) 1 C) -1 D) $-\sqrt{3}$

Yechilishi: $\operatorname{ctg} 37^\circ \operatorname{ctg} 38^\circ \operatorname{ctg} 39^\circ \ldots \operatorname{ctg} 52^\circ \operatorname{ctg} 53^\circ =$

$= \operatorname{ctg} 37^\circ \operatorname{ctg} 38^\circ \ldots \operatorname{ctg} 45^\circ \ldots \frac{1}{\operatorname{ctg} 38^\circ} \cdot \frac{1}{\operatorname{ctg} 37^\circ} = 1.$

Javobi: B.

44. Quyidagi sonlardan qaysi uchtasi o'tkir burchakli uchburchakning tomonlarini ifodalaydi?

A) 2;3;4 B) 4;5;7 C) 5;6;7 D) 8;15;17 E) 5;7;13

Yechilishi: 5; 6; 7. $c^2 < a^2 + b^2 \Rightarrow 7^2 < 5^2 + 6^2 \Rightarrow$

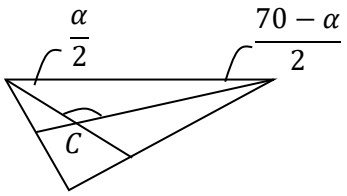
$\Rightarrow 49 < 61.$ Javobi: C.

45.Uchburchakning ikkita burchagi yig'indisi 70%. Shu burchakning bissektrisalari kesishishidan hosil bo'lgan burchaklardan hosil bo'lgan burchaklardan kichigi necha gradusga teng?

A) 50° B) 45° C) 40° D) 35° E) 25°

Yechilishi: $\angle C = 180^\circ - \left(\frac{\alpha}{2} + \frac{70-\alpha}{2}\right) = 180^\circ - \frac{70}{2} =$

$= 145^\circ.$



Bundan kichik burchak 35°.

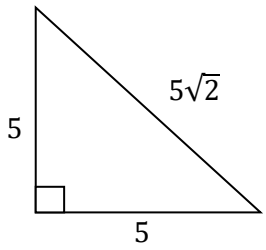
Javobi: D.

46.To'g'ri burchakli uchburchakning diagonali $5\sqrt{2}$ ga teng. Bu uchburchak eng ko'pi bilan qanday yuzaga ega bo'lishi mumkin?

A) 25 B) 20 C) 16,5 D) 15,4 E) 12,5

Yechilishi: $S_{\square} = a^2 = 25 \Rightarrow$

$\Rightarrow S_{\triangle} = 12{,}5.$



Hosila olib ishlash mumkin:

$1.\ c^2 = a^2 + b^2 \Rightarrow b^2 = c^2 - a^2 \Rightarrow$

$\Rightarrow b = \sqrt{c^2 - a^2};$

$2.\ S_a = \frac{1}{2}ab = \frac{1}{2}a\sqrt{c^2 - a^2};$

$3.\ S'_a = \frac{1}{2}\left[a\sqrt{50 - a^2}\right]' = \frac{1}{2}\left[\sqrt{50 - a^2} + a \cdot \frac{-2a}{2\sqrt{50-a^2}}\right] =$

$= \frac{1}{2}\left(\sqrt{50 - a^2} - -\frac{a^2}{\sqrt{50-a^2}}\right) = \frac{25-a^2}{\sqrt{50-a^2}}.$

$S' = 0 \Rightarrow \frac{25-a^2}{\sqrt{50-a^2}} = 0 \Rightarrow a^2 = 25 \Rightarrow a = 5. \Rightarrow$

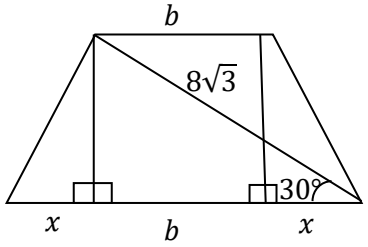
$b = \sqrt{50 - 25} = 5.\ U\ holda\ S_{\triangle} = \frac{1}{2} \cdot 5 \cdot 5 = 12{,}5.$

Javobi: E

47.Teng yonli trapetsiyaning diagonali $8\sqrt{3}$ ga teng va u asosi bilan 30° li burchak tashkil etadi. Trapetsiyaning o'rta chizig'i nimaga teng?

A)16 B)12 C)10 D)20 E) aniqlab bo'lmaydi

Yechilishi: $MN = \frac{a+b}{2}$;



$a = b + 2x.\ \frac{b+x}{8\sqrt{3}} = \cos 30°;$

$b + x = 8 \cdot \sqrt{3} \cdot \frac{\sqrt{3}}{2} = 12.$

$MN = \frac{x+b+x+b}{2} = b + x = 12.$

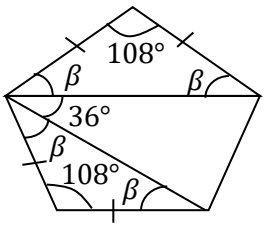
Javobi: B.

48.Muntazam beshburchakning bir uchidan o'tkazilgan ikki diagonali orasidagi burchakni toping.

A) 30° B) 40° C) 36° D) 42° E) 48°

Yechilishi: $5\alpha = 180° \cdot 3 = 540° =>$

$=> \alpha = 108°.$



$108° + 2\beta = 180° =>\ \beta = 36°.$

Javobi: C.

49.Teng yonli trapetsiyaga ichki chizilgan aylananing markazidan uning kichik asosidagi uchigacha bo'lgan masofa 15 ga, katta asosidagi uchigacha bo'lgan masofa 20 ga teng. Shu trapetsiyaning yuzini hisoblang.

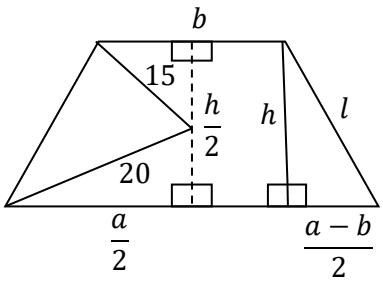
A) 300 B) 360 C)540 D) 480 E) 600

Yechilishi: $h = \sqrt{a \cdot b};\ +\begin{matrix}\left(\frac{h}{2}\right)^2 + \left(\frac{a}{2}\right)^2 = 400 \\ \left(\frac{h}{2}\right)^2 + (\frac{b}{2})^2 = 225\end{matrix} =>$

$=> 2 \cdot \frac{h^2}{4} + \left(\frac{a}{2}\right)^2 + (\frac{b}{2})^2 = 625\ => \left(\frac{a}{2}\right)^2 + 2 \cdot \frac{a}{2} \cdot \frac{b}{2} +$

$+\left(\frac{b}{2}\right)^2 = 625 => \left(\frac{a}{2}+\frac{b}{2}\right)^2 = 625 => l = \frac{a+b}{2} = 25.$

2) $-\begin{matrix}\left(\frac{h}{2}\right)^2 + (\frac{a}{2})^2 = 400 \\ \left(\frac{h}{2}\right)^2 + (\frac{b}{2})^2 = 225\end{matrix} =>$



$=> (\frac{a}{2})^2 - (\frac{b}{2})^2 = 175 =>$

$=> \frac{a-b}{2} \cdot \frac{a+b}{2} = 175 =>$

$=> \frac{a-b}{2} = 175:25 => \frac{a-b}{2} = 7.$

3) $h^2 = \left(\frac{a+b}{2}\right)^2 - \left(\frac{a-b}{2}\right)^2 = 25^2 + 7^2 =$

$= 625 - 49 = 576 => h = 24;$

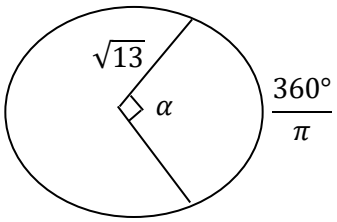
$S_t = l \cdot h = 25 \cdot 24 = 600.$ Javobi: E.

50.Radiusi $\sqrt{13}$ ga, yoyining radian o'lchovi 2 ga teng bo'lgan sektorning yuzini hisoblang.

A) 13 B) 26 C) 39 D)52 E) 18

Yechilishi:

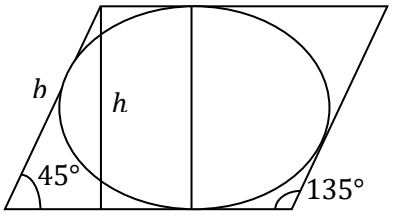
$\alpha = \frac{360^\circ}{\pi};$



$S = \frac{\pi R^2 \alpha}{360^\circ} = \frac{\pi(\sqrt{13})^2}{360^\circ} \cdot \frac{360^\circ}{\pi} = 13.$

Javobi: A.

51.O'tmas burchagi 135° bo'lgan parallelogrammga ichki chizilgan doiraning yuzi 9π ga teng. Parallegrammning perimetrini toping.



A) 24 B) $18\sqrt{8}$ C) 32

D) $24\sqrt{2}$ E) berilganlar yetarli emas

Yechilishi: $\pi R^2 = 9\pi =>$

$\Rightarrow R = 3 \Rightarrow h = 6;$

$\frac{h}{b} = \sin 45^\circ \Rightarrow b = 6\sqrt{2};$

$p = 24\sqrt{2}.$

Javobi: D.

52.$x^2 + y^2 = 10$ aylana va $x + y = 2$ to'g'ri chiziqning kesishishidan hosil bo'lgan vatarning uzunligini toping.

A) 6 B) $4\sqrt{2}$ C) $5\sqrt{2}$ D) $4\sqrt{3}$ E) $3\sqrt{6}$

Yechilishi: $\begin{cases} x^2 + y^2 = 10 \\ x + y = 2 \Rightarrow x = 2 - y; \end{cases}$

$x^2 + y^2 = 10 \Rightarrow (2 - y)^2 + y^2 = 10 \Rightarrow$

$\Rightarrow 4 - 4y + y^2 + y^2 = 10 \Rightarrow$

$\Rightarrow 2y^2 - 4y - 6 = 0 \Rightarrow$

$\Rightarrow y^2 - 2y - 3 = 0 \Rightarrow$

$\Rightarrow \begin{cases} y_1 = -1 \\ y_2 = 3 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x_1 = 3 \\ x_2 = -1 \end{cases} \Rightarrow \begin{matrix} A(3;-1); \\ B(-1;3). \end{matrix}$

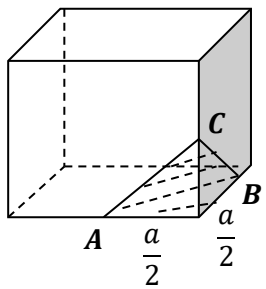
$\overrightarrow{AB} = \{-1 - 3; 3 - (-1)\} = \{-4; 4\} \Rightarrow \left|\overrightarrow{AB}\right| = 4\sqrt{2}.$

Javobi: B.

53.Kubining bir uchidan chiqqan uchta qirralarining o'rtalari orqali o'tkazilgan kesimning yuzi $16\sqrt{3}$ ga teng. Shu kubga ichki chizilgan shar sirtining yuzini hisoblang.

A) 96π B) 256π C) 144π D) 192π E) 128π

Yechilishi: $AB = AC = BC;$



$S_\Delta = 16\sqrt{3} \Rightarrow$

$\Rightarrow 16\sqrt{3} = \frac{AB^2\sqrt{3}}{4} \Rightarrow AB = 8.$

$AB = \frac{a}{2}\sqrt{2} \Rightarrow 8 = \frac{a}{2}\sqrt{2} \Rightarrow a = 8\sqrt{2};$

$S = 4\pi R^2 = 4 \cdot \pi(4\sqrt{2})^2 = 128\pi.$

Javobi: E.

54.Agar silindrning yon sirti 2 marta orttirilsa, uning hajmi necha marta ortadi?

A) 2 B) 4 C) 8 D) $2\sqrt{2}$ E) aniqlab bo'lmaydi.

Yechilishi: $S = 2\pi RH;\quad V = \pi R^2 H.$

$H\ yoki\ R\ dan\ qaysi\ birining\ ortishi\ aytilmagan.$

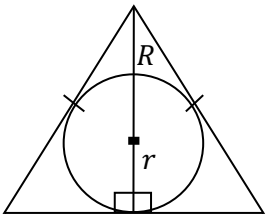
Javobi: E.

55.Teng tomonli konusga ichki va tashqi shar chizilgan. Ichki chizilgan shar hajmi tashqi chizilgan shar hajmining necha foizini tashkil etadi?

A) 10 B)12,5 C) 20 D) 25 E) 22,5

Yechilishi: $V = \frac{4}{3}\pi R^3;\quad R = \frac{2}{3}h;\quad r = \frac{1}{3}h;$

$V_1 = \frac{4}{3}\pi(\frac{2h}{3})^3 = \frac{32\pi h^3}{81};$



$V_2 = \frac{4}{3}\pi(\frac{h}{3})^3 = \frac{4\pi h^3}{81};$

$V_1 - 100\%$
$V_2 - x\ \% \Rightarrow x = \frac{100V_2}{V_1} =$

$= \frac{4 \cdot 100 \cdot \pi h^3}{81} \cdot \frac{81}{32\pi h^3} = 12{,}5.$ Javobi: B.

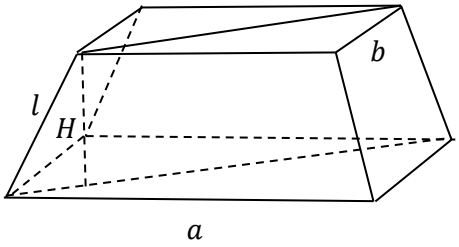
56.Muntazam to'rtburchakli kesik piramida kichik asosining yuzi 50 ga, katta asosining yuzi 200 ga teng. Shu piramidaga ichki chizilgan sfera sirtining yuzini toping.

A) 96π B) 125π C) 120π D) 100π E) 144π

Yechilishi: $a^2 = 200 \Rightarrow a = 10\sqrt{2};$
$b^2 = 50 \Rightarrow b = 5\sqrt{2};$

$l = \frac{a+b}{2} = 7{,}5\sqrt{2}.$

$H^2 = \left(7{,}5\sqrt{2}\right)^2 - \left(2{,}5\sqrt{2}\right)^2 =$



$= 112{,}5 - 12{,}5 = 100 =>$

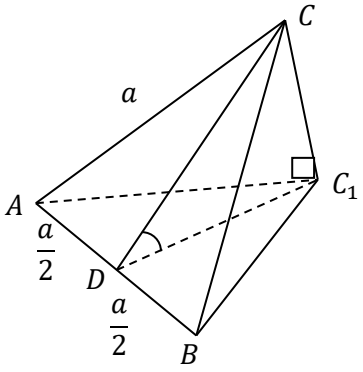
$=> h = 10 \ => \ R = 5 =>$

$=> S = 100\pi.$ Javobi: D.

57.Muntazam ABC uchburchak to'g'ri burchakli ABC_1 uchburchakka proeksiyalandi. Shu uchburchaklarning tekisliklari orasidagi burchakni toping.

A) 30° B) 45° C) 60°

D) $\arccos\frac{\sqrt{3}}{4}$ E) $\arccos\frac{\sqrt{3}}{3}$



Yechilishi: $CD^2 = a^2 - \frac{a^2}{4} =>$

$=> CD = \frac{\sqrt{3}a}{2};$

$C_1D^2 = \frac{a}{2} \cdot \frac{a}{2} => \ C_1D = \frac{a}{2};$

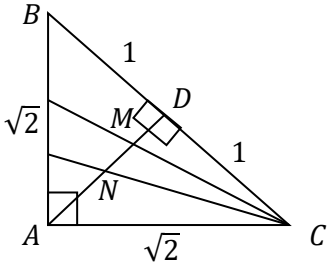
$\cos\angle D = \frac{C_1D}{CD} =$

$= \frac{a}{2} \cdot \frac{2}{\sqrt{3}a} = \frac{\sqrt{3}}{3}; \ \angle D = arc\cos\frac{\sqrt{3}}{3}.$ Javobi: E.

58.Teng yonli to'g'ri burchakli uchburchakning kateti $\sqrt{2}$ ga teng. Shu uchburchakning medianalari kesishgan nuqtadan bissektrisalari kesishgan nuqtagacha bo'lgan masofani aniqlang.

A) $\frac{\sqrt{2}-1}{2}$ B)$\frac{2-\sqrt{3}}{3}$ C) $\frac{2\sqrt{3}-3}{6}$ D) $\frac{3\sqrt{2}-4}{3}$ E) $\frac{2\sqrt{3}-3}{2}$

Yechilishi: $AD = 1; \ AM = \frac{2}{3};$



$DM = \frac{1}{3}; \ AN{:}ND = \frac{\sqrt{2}-\sqrt{2}}{1+1} =>$

$AN = \sqrt{2} \cdot ND \ ; AN + ND = 1 =>$

$=> \sqrt{2}ND + ND = 1 \ =>$

$=> ND = \frac{1}{\sqrt{2}+1} = \frac{\sqrt{2}-1}{2-1} = \sqrt{2} - 1; \ MN = ND - DM =$

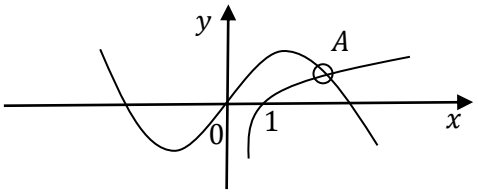
$= \sqrt{2} - 1 - \frac{1}{3} = \frac{3\sqrt{2}-3-1}{3} = \frac{3\sqrt{2}-4}{3}.$ Javobi: D.

59.$\sin x = \log_2 x$ tenglamaning nechta ildizi bor?

A) Ildizi yo'q B) 1 C) 2 D) 4 E) cheksiz ko'p

Yechilishi: $\sin x = \log_2 x \Rightarrow$

$\Rightarrow \begin{cases} y = \sin x; \\ y = \log_2 x. \end{cases}$



Javobi: B.

60.$y = \log_{\frac{1}{3}}(x^2 + x - 2)$ funksiyaning [3;6] kesmadagi eng katta va eng kichik qiymatlari ayirmasini toping.

A) $\log_{\frac{1}{3}} 6$ B) $\log_{\frac{1}{3}} 4$ C) $\log_3 6$ D) $\log_3 4$ E) $\log_{\frac{1}{3}} 2$

Yechilishi: $y = \log_{\frac{1}{3}}(x^2 + x - 2); [3; 6];$

$Aniqlanish\ sohasi\ topiladi$: $x^2 + x - 2 > 0 \Rightarrow$

$\Rightarrow (-\infty; -2) \cup (1; +\infty)$

$Kritik\ nuqta\ topiladi$:

$y' = \frac{1}{(x^2+x-2)\ln\frac{1}{3}} \cdot (x^2 + x - 2)' = \frac{2x+1}{(x^2+x-2)\ln\frac{1}{3}} \Rightarrow$

$\Rightarrow 2x + 1 = 0 \Rightarrow x = -\frac{1}{2} \notin [3; 6].$

$Bunday\ holda$: $y(3) = \log_{\frac{1}{3}} 10 - \log_{\frac{1}{3}} 10 =$

$= -\log_3 10;$

$y(6) = \log_{\frac{1}{3}} 40 = \log_{\frac{1}{3}} 10 + \log_{\frac{1}{3}} 4 = -\log_3 10 -$

$-\log_3 4;$

$-\log_3 10 - (-\log_3 10 - \log_3 4) = \log_3 4.$ Javobi: D.

61.$f(x) = (x-1)x^3 + e^{3x} - \frac{1}{3x}$ funksiyaning boshlang'ich funksiyasini toping.

A) $\frac{1}{5}x^5 - \frac{1}{4}x^4 + \frac{1}{3}e^{3x} - \frac{1}{3}\ln|x| + C$

B) $\frac{1}{4}x^4 - \frac{1}{5}x^5 - \frac{1}{3}e^{3x} + \frac{1}{3}\ln|x| + C$

C) $\frac{1}{5}x^5 - \frac{1}{4}x^4 - \frac{1}{3}e^{3x} + \frac{1}{3}\ln|x| + C$

D) $\frac{x^4-x^3}{3} + 3e^{3x} + \frac{1}{3}\ln|x| + C$

E) $\frac{e^{3x}-x^2}{3} - \frac{x^4-x^3}{2} + C$

Yechilishi: $f(x) = (x-1)x^3 + e^{3x} - \frac{1}{3x} =$

$= x^4 - x^3 + e^{3x} - \frac{1}{3}\cdot\frac{1}{x};$

$F(x) = \int x^4 dx - \int x^3\, dx + \int e^{3x}\, dx - \frac{1}{3}\int \frac{dx}{x} =$

$= \frac{1}{5}x^5 - \frac{1}{4}x^4 + \frac{1}{3}e^{3x} - \frac{1}{3}ln|x| + C.$ Javobi: A.

62. $y = x;\ y = \frac{1}{x}; y = 0$ va $x = e$ chiziqlar bilan chegaralangan figuraning yuzini toping.

A) 1 B) 1,5 C) 2 D) 2,5 E) 3

Yechilishi: $y = x;\ y = \frac{1}{x};$

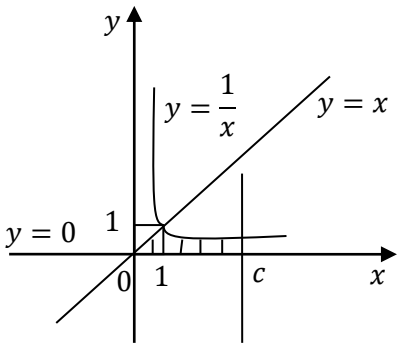
$y = 0;\ x = e.$

$S_\Delta = \frac{1}{2}\cdot 1 \cdot 1 = \frac{1}{2};$

$S_1 = \int_1^e \frac{dx}{x} = \ln x\,|_1^e =$

$= \ln e - \ln 1 = 1 - 0 = 1;$

$S = S_\Delta + S_1 = \frac{1}{2} + 1 = 1{,}5.$



Javobi: B.

63. $a > 0; b < 0;\ |a| \neq |b|.$ Quyidagi ifodalardan qaysi birining qiymati musbat bo'lmasligi mumkin?

A) $a - b$ B) $|a + b|$ C) a^3b^2 D) $|a - b|$

E) $|a| - |b|$

Yechilishi: $a > 0;\quad b < 0;\quad |a| \neq |b|.$

$Faraz\ qilamiz$: $a = 1 > 0\ ,\ b = -2 < 0 =>$

$=>\ |1| \neq |-2|;\ |1| - |-2| = 1 - 2 < 0.$

Javobi: E.

64.Toshbaqa 1 minutda 50 sm yo'l bosadi. U 0,1 km masofani qancha soatda o'tadi?

A) $2\frac{2}{3}$ B) $2\frac{1}{3}$ C) $3\frac{1}{3}$ D) $3\frac{1}{2}$ E) $3\frac{2}{3}$

Yechilishi: $0{,}1km = 0{,}1 \cdot 1000m = 100m =$

$= 100 \cdot 100sm = 10000sm;$

$\frac{10000}{50} = 200 => 200 \cdot 1min = 200 \cdot \frac{1}{60} soat = 3\frac{1}{3}S.$

Javobi: C.

65.Yil boshida o'g'il bolalar sinfdagi o'quvchilarning 30% ini, qizlar esa 21 nafarni tashkil etardi. Yilning o'rtasida sinfga 6 ta yangi o'g'il bola keldi va 6 ta qiz boshqa sinfga o'tdi. Shundan so'ng o'g'il bolalar sinfdagi o'quvchilarning necha foizini tashkil etadi?

A) 45 B) 50 C) 55 D) 60 E) 75

Yechilishi: $x - jami\ o'quvchilar.\ U\ holda$

$0{,}3x + 21 = x => 0{,}7x = 21 => x = 30;$

$\begin{cases} o' = 9 \\ q = 21 \end{cases} => \begin{cases} o' = y + 6 = 15; \\ q = 21 - 6 = 15. \end{cases}$

$Demak, 50\%.$ Javobi: B.

66.Bog'dagi daraxtlarning 60% i teraklar. Qolgan daraxtlarning 30% I chinorlar bo'lsa, boshqalari-tollar. Bog'dagi daraxtlarning necha foizini tollar tashkil qiladi?

A) 12 B)18 C) 28 D) 24 E) 32

Yechilishi: $x - jami\ \ daraxtlar\ soni;$

$60\% - teraklar;\ \ 40 \cdot \frac{100}{30} = 12\% - chinorlar;$

$100 - 60 - 12 = 28\% - tollar.$ Javobi: C.

67.Kinoteatrning birinchi qatorida 21 ta o'rin bor. Har bir keyingi qatorda o'rinlar soni oldingi qatordagidan 2 tadan ko'p. 40- qatorda nechta o'rin bor?

A) 42 B) 80 C) 99 D) 100 E) 101

Yechilishi: $21, 23, 25, \dots, a_{40};\ n = 40.$

$a_{40} = 21 + 2(40 - 1) = 21 + 80 - 2 = 99.$

Javobi: C.

68.Natural sonlardan iborat ketma-ketlikning ikkinchi hadi birinchi hadidan katta, uchinchi hadidan boshlab har bir hadi, o'zidan oldingi ikkita handing ko'paytmasiga teng. Agar shu ketma-ketlikning to'rtinchi hadi 18 ga teng bo'lsa, uning ikkinchi va birinchi hadi ayirmasini toping.

A) 1 B) 5 C) 17 D) 1 yoki 17 E) 7

Yechilishi: $a_1;\ a_2;\ a_1 \cdot a_2;\ a_1 \cdot a_2^2 = 18;$

$Ketma - ketlik\ hadlari\ 18\ ning\ karralilaridan\ tashkil\ topadi$: 18: 2; 3; 6. $a_2 - a_1 = 1.$

Javobi: A

69.Agar $m \in N$ bo'lsa, quyidagi keltirilgandan qaysi biri doimo juft bo'ladi?

A) $m(m + 6)$ B) $m^2 + 18m$ C) $\frac{m^2-16}{m+4}$

D) $m^5 + 13m$ E) $m^4 + 8$

Yechilishi: $m^5 + 13m = m(m^4 + 13).$ Javobi: D.

3-axborotnoma

1. Ikki sonning yig'indisi 6 ga, kvadratlarining ayirmasi esa 48 ga teng. Shu sonlarning ko'paytmasini toping.

A) 8 B) -8 C) 7 D) -7 E) 12

Yechilishi: $\begin{cases} x+y=6 \\ x^2-y^2=48 \end{cases} => \begin{cases} x+y=6 \\ (x-y)(x+y)=48 \end{cases} =>$

$=> \begin{cases} x+y=6 \\ x-y=8 \end{cases} => \begin{cases} x=7 \\ y=-1 \end{cases} => x \cdot y = -7.$ Javobi: D.

2. $100^2 - 97^2 + 96^2 - 93^2 + 92^2 - 89^2 + \cdots + 4^2 - 1$ ni hisoblang.

A) 1575 B) 5055 C) 6675 D) 6775 E) 7475

Yechilishi: $100^2 - 97^2 + 96^2 - 93^2 + 92^2 - 89^2 + \cdots +$

$+4^2 - 1 = (100-97)(100+97) + (96-93) \cdot$

$\cdot (96+93) + \cdots + (4-1)(4+1) = 3 \cdot 197 + 3 \cdot 189 +$

$+3 \cdot 181 + \cdots + 3 \cdot 5 = 3(5 + \cdots + 181 + 189 + 197);$

$197 = 5 + 8(n-1) => n = 25;$

$3S_{25} = 3 \cdot \frac{5+197}{2} \cdot 25 = 7575.$ Javobi: A.

3. $\frac{13}{225}$ ni cheksiz davriy o'nli kasr shaklida yozing.

A) 0,05(2) B) 0,5(2) C) 0,2(5) D) 0,02(5) E) 0,05(7)

Yechilishi: $\frac{13}{225} = 0{,}05(7).$ Javobi: E.

4. $\frac{12\frac{4}{5} \cdot 3{,}75 - 4\frac{4}{11} \cdot 4.125}{2\frac{2}{7} : \frac{4}{35}}$ ni hisoblang.

A) 0,5 B) 1,5 C) 0,6 D) 0,3 E) 0,2

Yechilishi: $\left(\frac{64}{5} \cdot \frac{375}{100} - \frac{48}{11} \cdot \frac{4125}{1000}\right) : \frac{16}{7} \cdot \frac{35}{4} = 30 : 20 = 1{,}5.$

Javobi: B.

5. $\frac{4(0{,}8^2-0{,}8\cdot1{,}7+1{,}7^2)}{1{,}6^3+3{,}4^3}$ ni hisoblang.

A) 1,2 B) 0,2 C) 1,5 D) 0,5 E) 0,4

Yechilishi: $\frac{4(0{,}8^2-0{,}8\cdot1{,}7+1{,}7^2)}{1{,}6^3+3{,}4^3}=\frac{4(0{,}8^2-0{,}8\cdot1{,}7+1{,}7^2)}{2^3(0{,}8^3+1{,}7^3)}=$

$=\left|a^2-ab+b^2=\frac{a^3+b^3}{a+b}\right|=\frac{4}{8(0{,}8+1{,}7)}=\frac{1}{5}=0{,}2.$

Javobi: B.

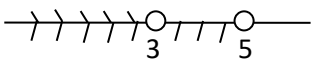
6. k ning qanday qiymatlarida $\frac{3x+1}{x+1}=k-2$ tenglama manfiy ildizga ega?

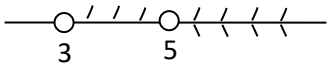
A) (3;5) B) (-∞;3) ∪ (5;∞) C) (2;4)

D) (1;3) E) (-∞;1)∪(3;∞)

Yechilishi: $\frac{3x+1}{x+1}=k-2 \Rightarrow \begin{matrix} x\neq -1 \\ 3x+1=kx-2x+k-2; \end{matrix}$

$5x-kx=k-3;\ \ x(5-k)=k-3;\ \ x=\frac{k-3}{5-k}<0;$

1) $\begin{cases}k-3<0\\5-k>0\end{cases}\Rightarrow$  $\begin{cases}k<3\\k<5\end{cases}=>(-\infty;3)$

2) $\begin{cases}k-3>0\\5-k<0\end{cases}=>$  $\begin{cases}k>3\\k>5\end{cases}=>(5;+\infty)$

$Demak, (-\infty;3)\cup(5;+\infty).$

Javobi: B.

7. $\frac{x}{3}-\frac{x+8}{6}=\frac{3x+2}{9}-\frac{x+11}{6}$ tenglamani yeching.

A) -5 B) 5 C) ∅ D) -4

E) *cheksiz ko′p ildizga ega*

Yechilishi: $\frac{x}{3}-\frac{x+8}{6}=\frac{3x+2}{9}-\frac{x+11}{6}.$ Javobi: C.

8. $\left(\frac{\sqrt{y}-\sqrt{x}}{y-\sqrt{xy}+x}+\frac{x}{x\sqrt{x}+y\sqrt{y}}\right)\cdot\frac{x\sqrt{x}+y\sqrt{y}}{y^3}$ ni soddalashtiring.

A) $\sqrt{x}+\sqrt{y}$ B) $\sqrt{x}-\sqrt{y}$ C) $\sqrt{x}$ D) $\sqrt{y}$ E)$\frac{1}{y^2}$

Yechilishi: $\left(\frac{\sqrt{y}-\sqrt{x}}{y-\sqrt{xy}+x}+\frac{x}{x\sqrt{x}+y\sqrt{y}}\right)\cdot\frac{x\sqrt{x}+y\sqrt{y}}{y^3}=$

$=\left(\frac{\sqrt{y}-\sqrt{x}}{(\sqrt{y})^2-\sqrt{x\sqrt{y}}+(\sqrt{x})^2}+\frac{x}{(\sqrt{x})^3+(\sqrt{y})^3}\right)\cdot\frac{(\sqrt{x})^3+(\sqrt{y})^3}{y^3}=$

$=\frac{(\sqrt{y}-\sqrt{x})(\sqrt{y}+\sqrt{x})+x}{(\sqrt{x})^3+(\sqrt{y})^3}\cdot\frac{(\sqrt{x})^3+(\sqrt{y})^3}{y^3}=\frac{1}{y^2}.$ Javobi: E.

9. $\begin{cases}12x^2-(2x-3)(6x+1)>x\\(5x-1)(5x+1)-25x^2\geq x-6\end{cases}$ tengsizliklar sistemasining butun sonlardan iborat yechimlari yig'indisini toping.

A) 6 B) 7 C) 9 D)12 E) 15

Yechilishi: $\begin{cases}12x^2-(2x-3)(6x+1)>x\\(5x-1)(5x+1)-25x^2\geq x-6\end{cases}=>$

$=>\begin{cases}12x^2-(12x^2+2x-18x-3)-x>0\\25x^2-1-25x^2\geq x-6\end{cases}=>$

$=>\begin{cases}12x^2-12x^2+15x+3>0\\x\leq 5\end{cases}=>\begin{cases}x>-\frac{1}{5};\\x\leq 5.\end{cases}$

$\left(-\frac{1}{5};5\right]$. $1+2+3+4+5=15.$ Javobi: E.

10. Paroxod daryo oqimi bo'ylab 48 km va oqimga qarshi shuncha masofani 5 soatda bosib o'tdi. Agar daryo oqimining tezligi soatiga 4 km bo'lsa, paroxodning turg'un suvdagi tezligini toping.

A) 12 B) 16 C) 20 D) 24 E) 18

Yechilishi: $\begin{matrix}(v_T+4)\cdot t_1=48\\(v_T-4)\cdot t_2=48\end{matrix}=>\begin{cases}t_1=\frac{48}{v_T+4}\\t_2=\frac{48}{v_T-4}\end{cases}=>$

$=>\ t_1+t_2=\frac{48}{v_T+4}+\frac{48}{v_T-4}=>5=\frac{48}{v_T+4}+\frac{48}{v_T-4}=>$

$=> v_T = 20.$ Javobi: C.

11. Agar $x^2 - 3x + m = 0$ tenglamaning x_1 va x_2 ildizlari uchun $3x_1 - 2x_2 = 14$ munosabat o'rinli bo'lsa, *m* ning qiymatini toping.

A) -4 B) 4 C) 6 D) -6 E) 3

Yechilishi: $x^2 - 3x + m = 0 \Rightarrow \begin{cases} x_1 + x_2 = 3 \\ x_1 x_2 = m \end{cases} =>$

$=> x_1 = 3 - x_2;$

$3(3 - x_2) - 2x_2 = 14 => x_2 = -1 => x_1 = 4 =>$

$=> m = -4.$ Javobi: A.

12. p ning qanday qiymatida $x^2 - px + 5 = 0$ tengalamaning ildizlaridan biri boshqasidan 4 ga katta?

A) 6 B) 4 C) -4 D) ±6 E) ±4

Yechilishi: $\begin{matrix} x^2 - px + 5 = 0 \\ x_1 = x_2 + 4 \end{matrix} => \begin{cases} x_1 + x_2 = p \\ x_1 x_2 = 5 \end{cases} =>$

$=> (x_2 + 4)x_2 = 5 => x_2^2 + 4x_2 - 5 = 0 =>$

$=> \begin{cases} x_{2_1} = -5 \\ x_{2_2} = -1 \end{cases} => \begin{cases} x_{1_1} = -1 \\ x_{1_2} = 5 \end{cases} => \begin{cases} p = -6 \\ p = 6 \end{cases} => p = \pm 6.$

Javobi: D.

13. $\sqrt{x^4 + x^2 + 8x} - x = 4$ tenglamani yeching.

A) ±4 B) 4 C) ±2 D) 2 E) -2

Yechilishi: $\sqrt{x^4 + x^2 + 8x} - x = 4 => x^4 + x^2 + 8x =$

$= x^2 + 8x + 16 => x^4 = 2^4 => x = \pm 2.$ Javobi: C.

14. m ning qanday qiymatlarida $(m - 1)x^2 + 2mx + 3m - 2$ kvadrat uchhadni to'la kvadrat shaklida tasvirlash mumkin?

A) 2; $\frac{1}{2}$ B) -2 C) 2 D) $\frac{1}{2}$ E) $-\frac{1}{2}$

Yechilishi: $(m - 1)x^2 + 2mx + 3m - 2;$

$a > 0,\ D = 0\ bo'lishi\ kerak: a = m - 1;\ b = 2m;$

$c = 3m - 2.\ m - 1 > 0 => m > 1.$

$(2m)^2 - 4(m-1)(3m-2) = 0 =>$

$2m^2 - 5m + 2 = 0 => \begin{cases} m_1 = \frac{1}{2} \\ m_2 = 2 \end{cases} => m = 2.$ Javobi: C.

15. k ning qanday qiymatlarida $kx^2 - (k-7)x + 9 = 0$ tenglama ikkita teng manfiy ildizga ega?

A) 49; 1 B)1 C) -49; -1 D) 49 E)-1

Yechilishi: $kx^2 - (k-7)x + 9 = 0 \ => \ 1) \begin{cases} b > 0 \\ c > 0 \\ D = 0 \end{cases} =>$

$=> \begin{cases} -k + 7 > 0 \\ 9 > 0 \end{cases} => \ k < 7.$

2) $b^2 - 4ac = 0 \ => \ (k-7)^2 - 4 \cdot k \cdot 9 = 0 \ =>$

$=> k^2 - 14k + 49 - 36k = 0 =>$

$=> k^2 - 50k + 49 = 0 => \begin{cases} k_1 = 1 \\ k_2 = 49 \end{cases} => \ k_1 = 1 < 7.$

Javobi: B.

16. $x|x| + 2x + 1 = 0$ tenglamani yeching.

A) 1 B) -1 C)$1 - \sqrt{2}$ D) $1 + \sqrt{2}$

E) -1; $1 - \sqrt{2}$; $1 + \sqrt{2}$

Yechilishi: $x|x| + 2x + 1 = 0 => \begin{cases} -x^2 + 2x + 1 = 0 \\ x^2 + 2x + 1 = 0 \end{cases} =>$

$=> \begin{cases} x_1 = 1 - \sqrt{2}; \\ x_2 = 1 + \sqrt{2}; \\ x_3 = -1. \end{cases}$ Javobi: C.

17. Agar x_1 va x_2 $2x^2 + 3x - 4 = 0$ tenglamaning ildizlari bo'lsa, $\frac{x_1^3 - x_2^3}{x_1 - x_2}$ ning qiymatini toping.

A) 0,25 B) -0,25 C) 4,25 D) -4,25 E) 3,25

Yechilishi: $2x^2+3x-4=0 \Rightarrow x_1=-\frac{3+\sqrt{41}}{4}$;

$x_2=-\frac{3-\sqrt{41}}{4}$; $\frac{x_1^3-x_2^3}{x_1-x_2}=x_1^2+x_1x_2+x_2^2=4{,}25.$

Javobi: C.

18. $|(x-6)^3+28|=36$ tenglamaning ildizlari yig'indisini toping.

A) -2 B) 6 C) -6 D) 10 E)-10

Yechilishi: $|(x-6)^3+28|=36 \Rightarrow$

$\Rightarrow \begin{cases}(x-6)^3+28=36\\-(x-6)^3-28=36\end{cases} \Rightarrow \begin{cases}(x-6)^3=2^3\\(x-6)^3=-4^3\end{cases} \Rightarrow$

$\Rightarrow \begin{cases}x_2=8\\x_1=2\end{cases} \Rightarrow x_1+x_2=10.$ Javobi: D.

19. $\frac{x^2-12x+23}{(x+1)(x-4)} \le -\frac{2}{x-4}$ tengsizlikning butun sonlardan iborat yechimlari nechta?

A) 2 B) 3 C) 4 D) 4 E) 7

Yechilishi: $\frac{x^2-12x+23}{(x+1)(x-4)} \le -\frac{2}{x-4} \Rightarrow$

$\frac{x^2-12x+23}{(x+1)(x-4)}+\frac{2}{x-4} \le 0 \Rightarrow \frac{(x-5)^2}{(x+1)(x-4)} \le 0 \Rightarrow (-1;4) \Rightarrow$

$\Rightarrow 0;1;2;3.$ Javobi: C.

20. $\sqrt{x-4}-\sqrt{x-7} \ge 1$ tengsizlikning butun sonlardan iborat yechimlari nechta?

A) 0 B) 1 C) 2 D) 4 E) *cheksiz ko'p*

Yechilishi: $\sqrt{x-4}-\sqrt{x-7} \ge 1 \Rightarrow$

$\Rightarrow \begin{vmatrix}x-4\ge 0 \Rightarrow x\ge 4;\\x-7\ge 0 \Rightarrow x\ge 7.\end{vmatrix} \Rightarrow \sqrt{x-4} \ge 1+\sqrt{x-7} \Rightarrow$

$\Rightarrow x-4 \ge 1+2\sqrt{x-7}+x-7 \Rightarrow 2\sqrt{x-7} \le 2 \Rightarrow$

$\Rightarrow \sqrt{x-7} \le 1 \Rightarrow x-7 \le 1 \Rightarrow x \le 8. \Rightarrow x=8.$

Javobi: B.

21. $x^3 - 5x^2 - 2x + 10 = 0$ tenglama ildizlarining ko'paytmasini toping.

A)10 B) -10 C) 20 D) 5 E) -5

Yechilishi: $x^3 - 5x^2 - 2x + 10 = 0 =>$

$=> x^2(x-5) - 2(x-5) = 0 =>$

$(x-5)(x^2-2) = 0 => \begin{cases} x_1 = \sqrt{2}; \\ x_2 = -\sqrt{2}; \\ x_3 = 5. \end{cases} =>$

$=> x_1 x_2 x_3 = -10.$ Javobi: B.

22. $x^3 - 13x + 12 = 0$ tenglama haqiqiy ildizlarining o'rta arifmetigini toping.

A) $2\frac{2}{3}$ B) $1\frac{1}{3}$ C) 0 D) $-\frac{1}{2}$ E) $-1\frac{1}{3}$

Yechilishi: $x^3 - 13x + 12 = 0;$ $x^3 - 13x + 12$ *ning ozod hadi* 12 *ning bo'luvchilaridan biri* 1 *ni olib, Bezu teoremasiga asosan, ko'phadni* $x - 1$ *ga bo'lamiz. Agar qoldiq nol chiqsa,* $x = 1$ *ko'phadning ildizi bo'ladi.*

$(x^3 - 13x + 12) : (x-1) = x^2 + x - 12 =>$

$x^3 - 13x + 12 = (x-1)(x^2 + x - 12) =>$

$=> \begin{cases} x - 1 = 0 \\ x^2 + x - 12 = 0 \end{cases} => \begin{cases} x_1 = 1 \\ x_2 = 3 \\ x_3 = -4 \end{cases} => \frac{x_1 + x_2 + x_3}{3} = 0.$

Javobi: C.

23. $(4 - x^2)\sqrt{-1 - 3x} = 0$ tenglama ildizlarining o'rta arifmetigini toping.

A) $-\frac{1}{3}$ B) $\frac{1}{3}$ C) $-\frac{7}{3}$ D) $\frac{7}{3}$ E) $\frac{5}{3}$

Yechilishi: $(4-x^2)\sqrt{-1-3x}=0 \Rightarrow \begin{cases} 4-x^2=0 \\ -1-3x\geq 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x^2=4 \\ 3x\leq -1 \end{cases} \Rightarrow \begin{cases} x_1=-2 \\ x_2\leq -\frac{1}{3} \\ x_3=2-chet\ ildiz \end{cases} \Rightarrow$

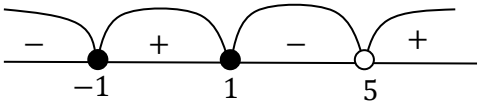
$\Rightarrow x_1+x_2=-\frac{7}{3}$. Javobi: C.

24. $\frac{(x-1)^2+2x-2}{(x-5)^3}\geq 0$ tengsizlikning [-3; 8] kesmadagi butun sonlardan iborat yechimlari sonini toping.

A) 3 B) 4 C) 5 D) 6 E) 7

Yechilishi: $\frac{(x-1)^2+2x-2}{(x-5)^3}\geq 0 \Rightarrow \frac{x^2-2x+1+2x-2}{(x-5)^3}\geq 0 \Rightarrow$

$\Rightarrow \frac{x^2-1}{(x-5)^3}\geq 0 \Rightarrow \begin{cases} x^2-1=0 \\ x-5\neq 0 \end{cases} \Rightarrow \begin{cases} x=1 \\ x\neq 5 \end{cases}$



$[-3;8] \Rightarrow \quad x=-1;0;1;6;7;8.$

Javobi: D.

25. a sonining qanday qiymatlarida $x+4=\frac{a}{x}$ tenglama ikkita turli haqiqiy ildizga ega?

A) (-4; ∞) B) (-4; 0) ∪ (0; ∞) C) [-4; ∞)

D) [-4; 0) ∪ (0; ∞) E) (-4; 4)

Yechilishi: $x+4=\frac{a}{x} \Rightarrow x^2+4x-a=0 \Rightarrow$

$\Rightarrow \begin{cases} b=4>0 \\ c=-a\leqslant 0 \end{cases} \quad D=b^2-4ac\neq 0 \Rightarrow$

$\Rightarrow 16-4\cdot 1\cdot(-a)\neq 0 \Rightarrow a\neq -4.$

$(-4;0)\cup(0;+\infty)$. Javobi: B.

26. $f(x)=(x^3+2x^2-1)^2-3x^2$ ko'phadning juft darajali hadlari koeffisientlarining yig'indisini toping.

A) -6 B) -2 C) 3 D) -3 E) -1

Yechilishi: $f(x) = (x^3 + 2x^2 - 1)^2 - 3x^2 =$

$= (x^3)^2 + (2x^2)^2 + (-1)^2 + 2 \cdot x^3 \cdot 2x^2 + 2 \cdot x^3(-1) +$

$+2 \cdot (2x^2) \cdot (-1) - 3x^2 = x^6 + 4x^4 + 1 + 4x^5 - 2x^3 -$

$-4x^2 - 3x^2 = x^6 + 4x^4 - 7x^2 + 4x^5 - 2x^3 + 1;$

$1 + 4 - 7 + 1 = -1.$ Javobi: E.

27. $3 \cdot \sqrt{\frac{x}{x-1}} - 2{,}5 = 3 \cdot \sqrt{1 - \frac{1}{x}}$ tenglamani yeching.

A) $\frac{2}{5}$ B) $-\frac{2}{5}$ C) 3 D) $\frac{9}{5}$ E) 2

Yechilishi: $3 \cdot \sqrt{\frac{x}{x-1}} - 2{,}5 = 3 \cdot \sqrt{1 - \frac{1}{x}}$;

$3\left[\frac{\sqrt{x}}{\sqrt{x-1}} - \frac{\sqrt{x-1}}{\sqrt{x}}\right] = \frac{5}{2} => \frac{x-x+1}{\sqrt{x^2-x}} = \frac{5}{6} => 6 = 5\sqrt{x^2 - x} =>$

$=> 25x^2 - 25x - 36 = 0 =>$ $\begin{cases} x_1 = -\frac{4}{5} - chet\ ildiz; \\ x_2 = \frac{9}{5}. \end{cases}$

Javobi: D.

28. $\frac{3x^2+8x-3}{x+3} = x^2 - x + 2$ tenglama ildizlarining ko'paytmasini toping.

A) 2 B) -2 C) 6 D) -6 E) 3

Yechilishi: $\frac{3x^2+8x-3}{x+3} = x^2 - x + 2;$

$\frac{3(x+3)\left(x-\frac{1}{3}\right)}{x+3} = x^2 - x + 2 => x^2 - 4x + 3 = 0 =>$

$=> \begin{cases} x_1 = 1 \\ x_2 = 3 \end{cases} => \ x_1 \cdot x_2 = 3.$ Javobi: E.

29. Agar $\sqrt{x + 3 + \sqrt{x + 14}} + \sqrt{x + 3 - \sqrt{x + 14}} = 4$ bo'lsa, $x(x + 1)^{-1}$ ifodaning qiymatini toping.

A) $\frac{3}{2}$ B) $-\frac{3}{2}$ C) 3 D) $\frac{2}{3}$ E) $-\frac{2}{3}$

Yechilishi: $(\sqrt{x+3+\sqrt{x+14}}+\sqrt{x+3-\sqrt{x+14}})^2 =$

$= 4^2 => x+3+\sqrt{x+14}+x+3-\sqrt{x+14}+$

$+2\sqrt{(x+3)^2-(x+14)} = 16 =>$

$=> 2(x+3)+2\sqrt{x^2+6x+9-x-14} = 16 =>$

$=> \sqrt{x^2+5x-5} = 5-x => x^2+5x-5 = 25-$

$-10x+x^2 => 15x = 30 => x = 2 => 2\cdot 3^{-1} = \frac{2}{3}$.

Javobi: D.

30. $\sqrt{5-|2x-1|} < 2$ tengsizlikning butun sonlardan iborat yechimlari sonini toping.

A) 2 B) 3 C) 4 D) 6 E) $cheksiz\ ko'p$

Yechilishi: $\sqrt{5-|2x-1|} < 2$.

1) $5-|2x-1| \geq 0 => |2x-1| \leq 5 => -2 \leq x \leq 3$;

2) $5-|2x-1| < 4 => |2x-1| < 1 =>$

$-1 < 2x-1 < 1 => 0 < 2x < 2 => 0 < x < 1$;

3) $x = -2; -1; 2; 3$. Javobi: C.

31. $(\frac{\sqrt{5}}{3})^{2x^2-5x} = 1{,}8$ tenglamaning ildizlari yig'indisini toping.

A) 5 B) -5 C) 2,5 D) -2,5 E) 1,25

Yechilishi: $(\frac{\sqrt{5}}{3})^{2x^2-5x} = \frac{9}{5} => (\frac{\sqrt{5}}{3})^{2x^2-5x} = (\frac{3}{\sqrt{5}})^2 =>$

$=> 2x^2-5x+2 = 0 => \begin{cases} x_1 = \frac{1}{2} \\ x_2 = 2 \end{cases} => x_1+x_2 = 2{,}5.$

Javobi: C.

32. $x^2 \cdot 3^x - 3^{x+1} \le 0$ tengsizlikning butun sonlardan iborat yechimlari nechta?

A) $\emptyset$ B) 1 C) 2 D) 3 E) $cheksiz\ ko'p$

Yechilishi: $x^2 \cdot 3^x - 3^x \cdot 3 \le 0 \Rightarrow\ 3^x(x^2-3) \le 0 \Rightarrow$

$\Rightarrow \begin{cases} 3^x > 0 \\ x^2 - 3 \le 0 \end{cases} \Rightarrow |x| \le \sqrt{3} \Rightarrow\ -\sqrt{3} \le x \le \sqrt{3} \Rightarrow$

$\Rightarrow -1{,}73 \le x \le 1{,}73 \Rightarrow x = -1; 0;\ 1.$ Javobi: D.

33. $\log_8 5^{2\log_{25} 32}$ ni hisoblang.

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{5}{3}$ D) 2 E) $\frac{7}{3}$

Yechilishi: $\log_8 5^{2\log_{25} 32} = \log_{25} 32 \log_8 25 =$

$= \log_{25} 2^5 \log_{2^3} 25 = 5 \cdot \frac{1}{3} \log_{25} 2 \cdot \log_2 25 = \frac{5}{3}.$

Javobi:C.

34. $log^2_{0,2} \frac{x}{25} + log^2_{0,2} \frac{x}{5} = 1$ tenglamaning ildizlari ko'paytmasini toping.

A) $\frac{1}{125}$ B) 125 C) 25 D) $\frac{1}{25}$ E) 5

Yechilishi: $log^2_{0,2} \frac{x}{25} + log^2_{0,2} \frac{x}{5} = 1;\ \ x > 0.$

$\left(log^2_{5^{-1}} \frac{x}{25}\right)^2 + \left(log^2_{5^{-1}} \frac{x}{5}\right)^2 = 1;$

$\left(log^2_5 \frac{x}{25}\right)^2 + \left(log^2_5 \frac{x}{5}\right)^2 = 1;$

$(\log_5 x - 2)^2 + (\log_5 x - 1)^2 = 1;$

$log^2_5 x - 4\log_5 x + 4 + log^2_5 x - 2\log_5 x + 1 = 1;$

$2log^2_5 x - 6\log_5 x + 4 = 0;\ \ \log_5 x = y;$

$2y^2 - 6y + 4 = 0 \Rightarrow y^2 - 3y + 2 = 0 \Rightarrow \begin{cases} y_1 = 1 \\ y_2 = 2 \end{cases} \Rightarrow$

$\begin{cases} \log_5 x_1 = 1 \\ \log_5 x_2 = 2 \end{cases} \Rightarrow \begin{cases} x_1 = 5 \\ x_2 = 25 \end{cases} \Rightarrow x_1 \cdot x_2 = 125.$ Javobi: B.

35. $(\frac{1}{2})^{\log_{0,2}\log_2\frac{9x+6}{9x^2+2}} > 1$ tengsizlikni yeching.

A) $\left(0;\frac{2}{3}\right)$ B) $\left(0;\frac{1}{6}\right)\cup\left(\frac{2}{3};\infty\right)$ C) $\left(0;\frac{1}{6}\right)\cup\left(\frac{2}{3};\infty\right)$

D) $\left(-\frac{1}{6};\frac{2}{3}\right)$ E) $\left(\frac{2}{3};\infty\right)$

Yechilishi: $\left(\frac{1}{2}\right)^{\log_{0,2}\log_2\frac{9x+6}{9x^2+2}} > \left(\frac{1}{2}\right)^0$; $\frac{9x+6}{9x^2+2} > 0 \Rightarrow$

$\Rightarrow \begin{cases} 9x+6>0 \\ 9x^2+2>0 \end{cases} \Rightarrow x > -\frac{2}{3};\ 0 < \frac{1}{2} < 1 \Rightarrow$

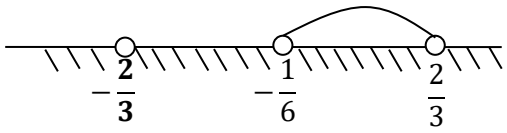
$\Rightarrow \log_{0,2}\log_2\frac{9x+6}{9x^2+2} < 0 \Rightarrow \begin{cases} 0<0{,}2<1 \\ \log < 0 \end{cases} \Rightarrow$

$\Rightarrow \log_2\frac{9x+6}{9x^2+2} > 1 \Rightarrow \frac{9x+6}{9x^2+2} > 2 \Rightarrow$

$\Rightarrow \frac{9x+6-18x^2-4}{9x^2+2} > 0 \Rightarrow \frac{-18x^2+9x+2}{9x^2+2} > 0 \Rightarrow$

$\Rightarrow \frac{18x^2-9x-2}{9x^2+2} < 0 \Rightarrow \begin{cases} 9x^2+2>0 \\ 18x^2-9x-2<0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x_1 = -\frac{1}{6} \\ x_2 = \frac{2}{3} \end{cases} \left(-\frac{1}{6};\frac{2}{3}\right).$



Javobi: D.

36. Agar arifmetik progressiyada $a_2 + a_5 - a_3 = 10$ va $a_1 + a_6 = 17$ bo'lsa, uning o'ninchi hadini toping.

A) 24 B) 26 C) 28 D) 29 E) 30

Yechilishi: $\begin{cases} a_2 + a_5 - a_3 = 10 \\ a_1 + a_6 = 17 \end{cases} \Rightarrow \begin{cases} a_1 = 1 \\ d = 3 \end{cases} \Rightarrow$

$\Rightarrow a_{10} = a_1 + 9d = 28.$ Javobi: C.

37. Agar geometrik progressiyada $b_1 = 2;\ b_n = \frac{1}{8}$ va $S_n = 3\frac{7}{8}$ bo'lsa, uning nechta hadi bor?

A) 12 B) 10 C) 8 D) 6 E) 5

Yechilishi: $b_1 = 2;\quad b_n = \frac{1}{8};\quad S_n = 3\frac{7}{8}.$

$b_n = b_1 q^{n-1} => \frac{1}{8} = 2q^{n-1} => q^n = \frac{q}{16};$

$S_n = \frac{b_1(q^n-1)}{q-1} => 3\frac{7}{8} = \frac{2(q^n-1)}{q-1} => \frac{31}{16} = \frac{q^n-1}{q-1} =>$

$=> 31(q-1) = 16\left(\frac{q}{16} - 1\right) => 31q - 31 =$

$= 16\left(\frac{q}{16} - 1\right) => q = \frac{1}{2} => (\frac{1}{2})^n = \frac{1}{16} \cdot \frac{1}{2} =>$

$=> 2^{-n} = 2^{-5} => n = 5.$ Javobi: E.

38. Hadlarning yig'indisi 2,25 ga, ikkinchi hadi 0,5 ga teng bo'lgan cheksiz kamayuvchi geometrik progressiyaning maxrajini toping.

A) $\frac{1}{3};\frac{1}{6}$ B) $\frac{1}{4}$ C) $\frac{2}{3};\frac{1}{4}$ D) $\frac{1}{6}$ E) $\frac{1}{3};\frac{2}{3}$

Yechilishi: $\frac{225}{100} = \frac{\frac{1}{2}:q}{1-q} => \frac{9}{4} = \frac{\frac{1}{2q}}{1-q} =>$

$9q^2 - 9q + 2 = 0 =>\quad q = \frac{1}{3};\quad q = \frac{2}{3}.$ Javobi: E.

39. $ctg35° - tg35° - 2tg20°$ ni hisoblang.

A) $\frac{1}{2}$ B) 0 C) 1 D) $\frac{\sqrt{3}}{2}$ E) $\sqrt{3}$

Yechilishi: $ctg35° - tg35° - 2tg20° = \frac{\cos 35}{\sin 35} - \frac{\sin 35}{\cos 35} -$

$-2tg20 = \frac{\cos^2 35 - \sin^2 35}{\frac{1}{2}\cdot 2\sin 35\cos 35} - 2tg20 = 2 \cdot \frac{cos70}{sin70} - 2tg20 =$

$= 2\left(\frac{\cos(90-20)}{\sin(90-20)} - tg20\right) = 2\left(\frac{\sin 20}{\cos 20} - tg20\right) = 2 \cdot 0 = 0.$

Javobi: B

40. $2\sin 32° \cos 2° + 2\sin^2 28° + \frac{1}{2}$ ni hisoblang.

A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2 E) 3

Yechilishi: $2\sin 32° \cos 2° + 2\sin^2 28° + \frac{1}{2} =$

$= 2 \cdot \frac{1}{2}[\sin 34° + \sin 30°] + 2 \cdot \frac{1}{2}(1 - \cos 56°) + \frac{1}{2} =$

$= \sin 34° - \cos 56° + 2 = \sin 34° - \cos(90° - 34°) +$

$+2 = 2.$ Javobi: D.

41. $\frac{\sin(\pi+\alpha)}{\sin(\frac{3\pi}{2}+\alpha)} + \frac{\cos(\pi-\alpha)}{\cos(\frac{\pi}{2}+\alpha)-1}$ ni soddalashtiring.

A) $\frac{1}{\cos\alpha}$ B) $\frac{1}{\sin\alpha}$ C) $\sin\alpha$ D) $\cos\alpha$ E) 1

Yechilishi: $\frac{\sin(\pi+\alpha)}{\sin(\frac{3\pi}{2}+\alpha)} + \frac{\cos(\pi-\alpha)}{\cos(\frac{\pi}{2}+\alpha)-1} = \frac{-\sin\alpha}{-\cos\alpha} + \frac{-\cos\alpha}{-\sin\alpha-1} =$

$= \frac{\sin\alpha}{\cos\alpha} + \frac{\cos\alpha}{\sin\alpha+1} = \frac{\sin^2\alpha+\cos^2\alpha+\sin\alpha}{(\sin\alpha+1)\cdot\cos\alpha} = \frac{1}{\cos\alpha}.$ Javobi: A.

42. Agar $\sin(\alpha - \frac{\pi}{2}) = \frac{2\sqrt{6}}{5}$ va $\alpha \in \left(\frac{\pi}{2};\ \pi\right)$ bo'lsa, $tg2\alpha$ ning qiymatini toping.

A) $\frac{\sqrt{6}}{46}$ B) $\frac{\sqrt{6}}{23}$ C) $-\frac{4\sqrt{6}}{23}$ D) $\frac{2\sqrt{6}}{23}$ E) $\frac{4\sqrt{6}}{23}$

Yechilishi: $\sin(\alpha - \frac{\pi}{2}) = \frac{2\sqrt{6}}{5};\quad \alpha \in \left(\frac{\pi}{2};\ \pi\right).\ tg2\alpha = ?$

$-\sin\left(\frac{\pi}{2} - \alpha\right) = -\cos\alpha => \cos\alpha = -\frac{2\sqrt{6}}{5};$

$\alpha = arccos\left(-\frac{2\sqrt{6}}{5}\right) = \pi - arccos\frac{2\sqrt{6}}{5};$

$tg2\alpha = \frac{\sin 2\alpha}{\cos 2\alpha} = \frac{2\sin\alpha\cos\alpha}{\cos^2\alpha - \sin^2\alpha} =$

$= \frac{2\sin\left(\pi - arccos\frac{2\sqrt{6}}{5}\right)\cos(\pi - arccos\frac{2\sqrt{6}}{5})}{[\cos(\pi - arccos\frac{2\sqrt{6}}{5})]^2 - [\sin\left(\pi - arccos\frac{2\sqrt{6}}{5}\right)]^2} =$

$= \frac{-2\sin arccos\frac{2\sqrt{6}}{5}\cdot\cos arccos\frac{2\sqrt{6}}{5}}{[\cos arccos\frac{2\sqrt{6}}{5}]^2 - [\sin arccos\frac{2\sqrt{6}}{5}]^2} = \frac{-\frac{4\sqrt{6}}{25}}{\frac{48-25}{25}} = -\frac{4\sqrt{6}}{23}.$

Javobi: C.

43. $\cos^2 x + \sin x \cos x = 1$ tenglamaning $[-320^\circ; 50^\circ)$ oraliqqa tegishli ildizlari yig'indisini toping.

A) -535° B) -270° C) -315°

D) -240° E) -585°

Yechilishi: $\cos^2 x + \sin x \cos x = 1; \quad [-320^\circ; 50^\circ)$

$\cos^2 x + \sin x \cos x - \sin^2 x - \cos^2 x = 0 =>$

$=> \sin x(\cos x - \sin x) = 0 => \begin{cases} \sin x = 0 \\ tgx = 1 \end{cases} =>$

$=> \begin{cases} x = \pi n \\ x = \frac{\pi}{4} + \pi n \end{cases} n \in Z. n = -2 => x = -315°;$

$n = 1 => \begin{cases} x = -180°; \\ x = -135°. \end{cases} n = 0 => x = 45°. => -585°.$

Javobi: E.

44. $\sin(arc\,tg\left(-\frac{2}{3}\right))$ ni hisoblang.

A) $-\frac{2\sqrt{13}}{13}$ B) $-\frac{2\sqrt{17}}{17}$ C) $-\frac{2\sqrt{21}}{21}$

D) $-\frac{2\sqrt{15}}{15}$ E) $-\frac{2\sqrt{19}}{19}$

Yechilishi: $\sin arc\,tg\left(-\frac{2}{3}\right) = -\sin arc\,tg\frac{2}{3} =$

$= -\frac{2}{3} : \sqrt{1 + (\frac{2}{3})^2} = -\frac{2\sqrt{13}}{13}.$ Javobi: A.

45. $\vec{m}\,(-1;\ -1\,),\ \vec{n}\,(-1; 1), \vec{p}\,(-5; 3)$ va $\vec{q}\,(-5; 2)$ vektorlarning qaysilari $\vec{a}(-3; 2)$ va $\vec{b}(2; -1)$ vektorlardan yasalgan parallelogrammning diagonallari bo'ladi?

A) $\vec{m}; \vec{n}$ B) $\vec{m}; \vec{p}$ C) $\vec{m};\ \vec{q}$ D) $\vec{n};\ \vec{p}$ E) $\vec{p};\ \vec{q}$

Yechilishi: $\vec{a} + \vec{b} = \{-3 + 2;\ 2 + (-1)\} = \{-1; 1\} = \vec{n};$

$\vec{a} - \vec{b} = \{-3 - 2;\ 2 - (-1)\} = \{-5; 3\} = \vec{p}.$

Javobi: D.

46. Agar $|\vec{a}| = \sqrt{137},\ |\vec{a}+\vec{b}| = 20$ va $|\vec{a}-\vec{b}| = 18$ bo'lsa, $\vec{b}$ ni toping.

A) $7\sqrt{2}$ B) $7\sqrt{3}$ C) $8\sqrt{2}$ D) 12 E) 15

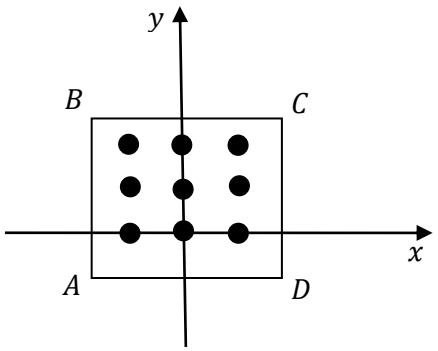
Yechilishi: $|\vec{a}| = \sqrt{137};\ |\vec{a}+\vec{b}| = 20;\ |\vec{a}-\vec{b}| = 18$

$$|\vec{a}|^2 + 2\vec{a}\vec{b} + |\vec{b}|^2 = 400$$

$$+\frac{|\vec{a}|^2 - 2\vec{a}\vec{b} + |\vec{b}|^2 = 324}{2(|\vec{a}|^2 + |\vec{b}|^2) = 724} \Rightarrow |\vec{b}|^2 = 362 - 137 \Rightarrow |\vec{b}| = 15.$$

Javobi: E.

47. Koordinatalari butun sonlardan iborat nechta nuqta uchlari A (-1,5; -0,5), B(-1,5; 2,5) C) (1,5; 2,5) va D (1,5; -0,5) nuqtalarda bo'lgan to'g'ri to'rtburchakning ichida yotadi?



A) 9 B) 3 C) 4 D) 6 E) 8

Yechilishi: 9 ta.

Javobi: A.

48. Agar $f(x) = \frac{2x+1}{3x-1}$ bo'lsa, $f\left(\frac{1}{x}\right) + f\left(\frac{x}{9}\right)$ funksiyani aniqlang.

A) $\frac{1}{3}$ B) $\frac{x}{3}$ C) $-\frac{x}{3}$ D) $-\frac{1}{3}$ E) $\frac{1}{3x-1}$

Yechilishi: $f(x) = \frac{2x+1}{3x-1} \Rightarrow f\left(\frac{1}{x}\right) = \frac{\frac{2}{x}+1}{\frac{3}{x}-1} = \frac{2+x}{3-x};$

$$f\left(\frac{x}{9}\right) = \frac{\frac{2x}{9}+1}{\frac{3x}{9}-1} = \frac{2x+9}{9}\cdot\frac{3}{x-3} = \frac{2x+9}{3(x-3)};$$

$f\left(\frac{1}{x}\right) + f\left(\frac{x}{9}\right) = -\frac{2+x}{x-3} + \frac{2x+9}{3(x-3)} = -\frac{1}{3}.$ Javobi: D.

49. Nechta tub son $f(x) = 2arc\sin\frac{x-3}{3} - 4\log_2(5-x)$ funksiyaning aniqlanish sohasiga tegishli?

A) 1 B) 2 C) 3 D) 4 E) $cheksiz\ ko'p$

Yechilishi: $f(x) = 2arc\sin\frac{x-3}{3} - 4\log_2(5-x)$.

1) $-1 \le \frac{x-3}{3} \le 1 \Rightarrow -3 \le x-3 \le 1 \Rightarrow -6 \le x \le 6$;

2) $5-x > 0 \Rightarrow x < 5$. $U\ holda\ [-6;5) \Rightarrow x = 2;3$.

Javobi: B.

50. Agar $f(x) = \frac{1}{3^{2x}\ln 3} - \ln 4$ bo'lsa, $f'(\log_3 5)$ ni hisoblang.

A) $\frac{29}{50}$ B) $\frac{2}{25\ \ln^2 3}$ C) $\frac{2}{25}$ D) $-\frac{2}{25}$ E) $-\frac{121}{250}$

Yechilishi: $f(x) = \frac{1}{3^{2x}\ln 3} - \ln 4$;

$f'(x) = \frac{-1\cdot(3^{2x}\ln 3)'}{(3^{2x}\ln 3)^2} - 0 = \frac{-2\cdot 3^{2x} ln^2 3}{(3^{2x})^2 ln^2 3} = -\frac{2}{3^{2x}} \Rightarrow$

$\Rightarrow\ f'(\log_3 5) = -\frac{2}{3^{2\log_3 5}} = -\frac{2}{25}$. Javobi: D.

51. $y = \sin\frac{x}{2}$ $(x \in (0;\pi))$ funksiyaning grafigiga (x_0, y_0) nuqtada o'tkazilgan urinmaning burchak koeffitsienti $\frac{\sqrt{3}}{4}$ ga teng. $x_0 \cdot y_0$ ni hisoblang.

A) $\frac{2}{3}$ B) $\frac{1}{6}$ C) $\frac{2\pi}{3}$ D) $-\frac{2\pi}{3}$ E) $\frac{\pi}{6}$

Yechilishi: $y = \sin\frac{x}{2}$; $x \in (0;\pi)$. $y'(x_0) = k = \frac{\sqrt{3}}{4}$;

$y_0 = \sin\frac{x_0}{2}$; $y' = \frac{1}{2}\cos\frac{x}{2} \Rightarrow y'(x_0) = \frac{1}{2}\cos\frac{x_0}{2} \Rightarrow$

$\Rightarrow\ \frac{\sqrt{3}}{4} = \frac{1}{2}\cos\frac{x_0}{2} \Rightarrow\ \cos\frac{x_0}{2} = \frac{\sqrt{3}}{2} \Rightarrow\ x_0 = \frac{\pi}{3} \Rightarrow$

$\Rightarrow y_0 = \sin\frac{1}{2}\cdot\frac{\pi}{3} = \frac{1}{2} \Rightarrow\ x_0 \cdot y_0 = \frac{\pi}{6}$. Javobi: E.

52. Agar m va M $y = x + \frac{1}{x}$ funksiyaning mos ravishda minimum va maksimum nuqtalaridagi qiymatlari bo'lsa, $m - 2M$ ning qiymatini toping.

A) -6 B) 6 C) -4 D) 4 E) 3

Yechilishi: $y = x + \frac{1}{x}$; $D(y) = (-\infty; 0) \cup (0; +\infty)$;

$y' = 1 - \frac{1}{x^2} => y' = 0 => x = \pm 1.$

$D(y) = (-\infty; -1) \cup (-1; 0) \cup (0; 1) \cup (1; +\infty)$;

$y(-1) = -1 - 1 = -2$; $y(1) = 1 + 1 = 2.$

$m - 2M = -2 - 2 \cdot 2 = -6.$ Javobi: A.

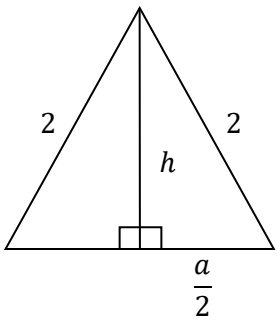
53. Teng yonli uchburchakning yon tomoni 2 ga teng. Shu uchburchakning yuzi eng katta bo'lishi uchun, asosi nimaga teng bo'lishi kerak?

A) $2\sqrt{2}$ B)$\sqrt{2}$ C) $2\sqrt{3}$ D) $\sqrt{3}$ E) 1,5

Yechilishi: $h^2 = 4 - \frac{a^2}{4} => h = \sqrt{\frac{16-a^2}{4}}$;

$S_{\triangle} = \frac{1}{2} a \cdot \sqrt{\frac{16-a^2}{4}} = \sqrt{\frac{16a^2-a^4}{16}} =$

$= \frac{1}{4}\sqrt{16a^2 - a^4}.$



$S'_{\triangle} = \frac{1}{4} \cdot \frac{32a-4a^3}{2\sqrt{16a^2-a^4}} =>$

$=> 32a - 4a^3 = 0 =>$

$=> 4a(8 - a^3) = 0 => \begin{cases} 4a \neq 0; \\ a = 2\sqrt{2}. \end{cases}$ Javobi: C.

54. $f(x) = \frac{1}{\sin^2 2x \cos^2 2x}$ funksiyaning boshlang'ich nuqtasini toping.

A) $tg2x - ctg2x + C$

B) $tg2x + ctg2x + C$

C) $\frac{1}{2}tg2x - \frac{1}{2}ctg2x + C$

D) $\frac{1}{2}tg2x + \frac{1}{2}ctg2x + C$

E) $tgx - ctgx + C$

Yechilishi: $f(x) = \frac{1}{\sin^2 2x \cos^2 2x} = \frac{4}{(2\sin 2x \cos 2x)^2} = \frac{4}{\sin^2 4x}$;

$$F(x) = \int \frac{4}{\sin^2 4x} dx = -4 \cdot \frac{1}{4} ctg\ 4x + C =$$

$$= -ctg\ 4x + C = -ctg\ 2 \cdot 2x + c = -\frac{\text{ctg}^2\ 2x - 1}{2ctg2x} =$$

$$= -\frac{1}{2} ctg\ 2x + \frac{1}{2} \cdot \frac{1}{ctg2x} + C = \frac{1}{2} tg\ 2x - \frac{1}{2} ctg\ 2x + C.$$

Javobi: C.

55. $\int_4^9 \left(\frac{2x}{5} - \frac{1}{2\sqrt{x}}\right) dx$ni hisoblang.

A) 7 B) 8 C) 10 D) 12 E)15

Yechilishi: $\int_4^9 \frac{2}{5} x dx - \int_4^9 \frac{1}{2} x^{-\frac{1}{2}} dx = \frac{2}{5} \cdot \frac{x^2}{2} |_4^9 - \frac{1}{2} \cdot \frac{x^{\frac{1}{2}}}{\frac{1}{2}} |_4^9 =$

$= \frac{1}{5}[9^2 - 4^2] - [\sqrt{9} - \sqrt{4} = 13 - 1 = 12.$ Javobi: D.

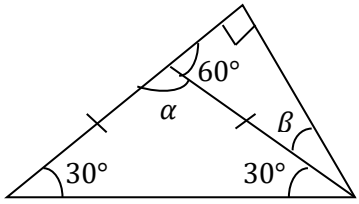
56. Teng yonli uchburchakning asosidagi burchagi 30° ga teng. Shu uchburchakning yon tomonlaridan biri va ikkinchi yon tomonga tushurilgan balandligi orasidagi burchakni toping.

A) 150° B) 120° C) 60° D) 45° E) 67°

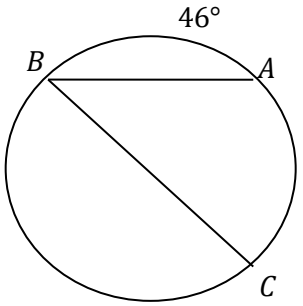
Yechilishi: $30° + 30° + \alpha = 180°;$

$\alpha = 120°.$

$\beta = 90° - 60° = 30°.$ Javobi: E.



57. Aylanadagi nuqtadan BA vatar va BC diametr o'tkailadi. BA vatar 46° li yoyga tiralgan. O'tkazilgan vatar va diametr orasidagi burchakni toping.



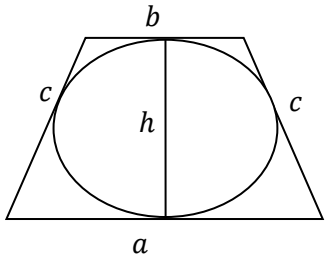
A) 23° B) 30° C) 134°
D) 60° E) 67°

Yechilishi: $\overset{\frown}{ABC} = 180° - 46° = 134°$. $\angle ABC = 67°$.

Javobi: E.

58. Teng yonli trapetsiyaning perimetri 40 ga, unga ichki chizilgan aylananing radisusi 3 ga teng. Shu trapetsiyaning yuzini toping.

A) 40 B) 50 C) 60 D) 80 E) 100



Yechilishi: $a + b + 2c = 40;$

$Aylana\ ichki\ chizilgan$:

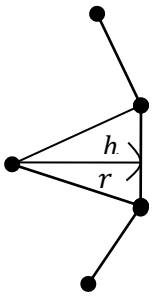
$h = 2r = 6;\ \ c = \frac{a+b}{2}.$

$a + b = 2c;\ \ 4c = 40 => c = 10.$

$S = c \cdot h = 60.$ Javobi: C.

59. Muntazam yigirmaburchakning yuzi 16 ga, unga ichki chizilgan aylananing yuzi 4π ga teng. Yigirmaburchakning perimetrini toping.

A) 12 B) 16 C) 18 D) 20 E) 24



Yechilishi: $r_d = h_\triangle.\ \ S_d = 4\pi =>$

$=>\ \pi r^2 = 4\pi => r = h = 2;$

$S_k = 16 =>\ S_k = 20 \cdot S_\triangle.$

$S_\triangle = \frac{1}{20};\ S_k = \frac{1}{20} \cdot 16 = \frac{4}{S};\ \frac{4}{5} = \frac{1}{2} \cdot a \cdot 2 =>$

$=> a = \frac{4}{5};$

$p = 20 \cdot a = 20 \cdot \frac{4}{5} = 16.$ Javobi: B.

60. Rombning yuzi 12 ga, diagonallarining nisbati 1:2 ga teng. Romb tomonining uzunligini toping.

A) 4 B) $\sqrt{7}$ C) $\sqrt{15}$ D) 6 E) 2

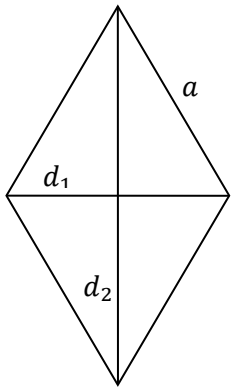
Yechilishi: $\frac{d_1}{d_2} = \frac{1}{2} => d_2 = 2d_1;\ S = 4S_{\measuredangle} = 3;$

$\frac{1}{2} \cdot \frac{d_1}{2} \cdot \frac{2d_1}{2} = 3 => d_1^2 = 12 => d_1 = 2\sqrt{3};\ d_2 = 4\sqrt{3};$

$a^2 = \left(\frac{d_1}{2}\right)^2 + \left(\frac{2d_2}{2}\right)^2 =$

$= \left(\sqrt{3}\right)^2 + \left(2\sqrt{3}\right)^2 = 15 =>$

$=> a = \sqrt{15}.$ Javobi: C.



4-axborotnoma

1. $\frac{2\frac{2}{7}\cdot(-2,6)\cdot 3,5}{4}=\frac{\frac{4}{13}\cdot(-3,9)\cdot 3,25}{x}$ proporsiyaning noma'lum hadini toping.

A) 0,65 B) 0,7 C) 0,75 D) 0,78 E) 0,74

Yechilishi: $-\frac{16}{7}\cdot\frac{26}{10}\cdot\frac{35}{10}\cdot x=-\frac{4}{13}\cdot\frac{39}{10}\cdot\frac{325}{100}\cdot 4 \Rightarrow$

$\Rightarrow \frac{1}{5}\cdot 8\cdot 13x=\frac{1}{5}\cdot 2\cdot 3\cdot 13 \Rightarrow x=\frac{3}{4}=0,75.$

Javobi: C.

2. Mahsulotning narxi ketma-ket ikki marta 10% ga oshirilgandan so'ng 484 so'm bo'ldi. Birinchi ko'tarilgandan so'ng mahsulotning narxi necha so'm bo'lgan?

A) 420 B) 430 C) 450 D) 440 E) 410

Yechilishi: $1,1(1,1x)=484 \Rightarrow 1,21x=484 \Rightarrow$

$\Rightarrow x=400 \Rightarrow 1,1x=440.$ Javobi: D.

3. [4; 8] kesmada nechta o'zaro tub sonlar jufti bor?

A) 5 B) 6 C) 4 D)7 E) 8

Yechilishi: $[4;8]$ $4;5;6;7;8$ $C_5^2=\frac{5!}{2!3!}=10;$

$(4;5),(4;7),(5;6),(5;6),(5;7),(5;8),(6;7),(7;8).$

Javobi: E.

4. 4 va 64 sonlarining o'rta arifmetigi ularning o'rta geometrigidan necha marta katta?

A) $2\frac{1}{4}$ B) $2\frac{3}{4}$ C) 2,2 D) $2\frac{3}{8}$ E) $2\frac{1}{8}$

Yechilishi: $\frac{4+64}{2}=34;$ $\sqrt{4\cdot 64}=2\cdot 8=16;$

$\frac{34}{16} = \frac{17}{8} = 2\frac{1}{8}$. Javobi: E.

5. Nechta ikki xonali son 15 ga qoldiqsiz bo'linadi?

A) 4 B) 5 C) 7 D) 6 E) 8

Yechilishi: $15, 30, \dots, 90 => 90 = 15 + 15(n-1) =>$

$=> n = 6$. Javobi: D.

6. Uchta sonning nisbati 1: 2: 6 ga, ularning yig'indisi esa 429 ga teng. Shu sonlardan eng kattasining va eng kichigining ayirmasini toping.

A) 245 B) 255 C) 235 D) 275 E) 265

Yechilishi:

$\begin{cases} x:y:z = 1:2:6; \\ x+y+z = 459. \end{cases}$ $Nisbatdan\ x = t, y = 2t,\ z = 6t$

$deb\ olsak: 9t = 459 => t = 51.\ Demak,\ x = 51,$

$y = 102, z = 306\ bo'ladi.\ U\ holda$

$z - x = 306 - 51 = 255$. Javobi: B.

7. Agar $m - n$ ratsional son, mn, m va n lar esa irratsional sonlar bo'lsa, quyidagilardan qaysi biri ratsional son bo'ladi?

A) $m - 2n$ B) $m^2n - mn^2$

C) $m^3 - n^3 - 3mn(m-n)$ D) $2m - n$ E) $3m - 5n$

Yechilishi: $m^3 - n^3 - 3mn(m-n) = m^3 - 3m^2n +$

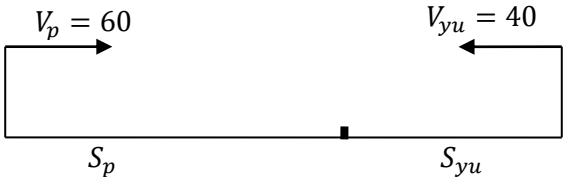
$+3mn^2 - n^3 = (m-n)^3$. Javobi: C.

8. Bir vaqtda A va B shaharlardan bir-biriga qarab passajer va yuk poyezdi yo'lga tushdi. Passajer poyezdining tezligi 60 km/soatga, yuk poyezdiniki esa 40 km/soatga teng. Poyezdlar 3 soatdan keyin uchrashdi. Uchrashgandan qancha vaqt o'tganidan keyin yuk poyezdi A shaharga yetib keladi?

A) 4 $soat$ 10 m B) 4$soat$ 15m C) 4 $soat$ 20 m

D) 4 $soat$ 25m E) 4 $soat$ 30m

Yechilishi:



$S_p = 60 \cdot 3 = 180km;$

$180 = 40 \cdot t => t = 4{,}5.$

Javobi: E.

9. Agar $x = 256$ bo'lsa, $\frac{x-1}{x^{\frac{3}{4}}+x^{\frac{1}{2}}} \cdot \frac{x^{\frac{1}{2}}+x^{\frac{1}{4}}}{x^{\frac{1}{2}}+1} \cdot x^{\frac{1}{4}} + 1$ ning qiymatini hisoblang.

A) 14 B) 15 C) 16 D) 13 E) 12

$$\frac{x-1}{x^{\frac{3}{4}}+x^{\frac{1}{2}}} \cdot \frac{x^{\frac{1}{2}}+x^{\frac{1}{4}}}{x^{\frac{1}{2}}+1} \cdot x^{\frac{1}{4}} + 1 = \frac{(\sqrt{x}-1)(\sqrt{x}+1)}{\sqrt[4]{x^3}+\sqrt{x}} \cdot \frac{\sqrt{x}+\sqrt[4]{x}}{\sqrt{x}+1} \cdot \sqrt[4]{x} + 1 =$$

$$= \frac{(\sqrt{x}-1)\left(\sqrt[4]{x^3}+\sqrt{x}\right)}{\sqrt[4]{x^3}+\sqrt{x}} + 1 = \sqrt{x} - 1 + 1 = \sqrt{x} =>$$

$=> \sqrt{256} = 16.$ Javobi: C.

10. $\left(\frac{a+x}{a} - \frac{x-y}{x}\right) \cdot \frac{a^2}{x^2+ay} : \frac{a}{8x}$ ni soddalashtiring.

A) 10 B) 6 C) 7 D)8 E) 9

$$\left(\frac{a+x}{a} - \frac{x-y}{x}\right) \cdot \frac{a^2}{x^2+ay} \cdot \frac{8x}{a} = \frac{ax+x^2-ax+ay}{ax} \cdot \frac{8ax}{x^2+ay} = 8.$$

Javobi: D.

11. $\sqrt{2+\sqrt{3}} - \sqrt{2-\sqrt{3}}$ ni soddalashtiring.

A) $\sqrt{3}$ B) $2\sqrt{3}$ C) $2\sqrt{2}$ D) $\sqrt{2}$ E) $\sqrt{6}$

Yechilishi: $\sqrt{2+\sqrt{3}} = \sqrt{\frac{2+\sqrt{4-3}}{2}} + \sqrt{\frac{2-1}{2}} = \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}};$

$$\sqrt{2+\sqrt{3}} - \sqrt{2-\sqrt{3}} = \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \sqrt{2}.$$

Javobi: D.

12. a ning qanday qiymatlarida $x^2 + 3x + a + 0{,}75 = 0$ tenglamaning ikkala ildizi ham manfiy bo'ladi?

A) $0{,}5 < a < 2$ B) $-0{,}75 < a < 1{,}5$

C) $0{,}6 < a < 1{,}8$ D) $0{,}8 < a < 1{,}2$

E) $0{,}9 < a < 1{,}4$

Yechilishi: $x^2 + 3x + a + 0{,}75 = 0$;

1) $D \neq 0 \Rightarrow 3^2 - 4 \cdot 1 \cdot (a + 0{,}75) \neq 0 \Rightarrow a \neq 1{,}5$;

2) $b > 0; c > 0 \Rightarrow 3 > 0;\ a + 0{,}75 > 0 \Rightarrow$

$\Rightarrow a > -0{,}75$. 1) va 2) dan $-0{,}75 < a < 1{,}5$.

Javobi: B.

13. $2 - 3|x - 5| = -4$ tenglamaning ildizlari yig'indisini toping.

A) 8 B) 7 C) 9 D) 6 E) 10

Yechilishi: $2 - 3|x - 5| = -4 \Rightarrow 3|x - 5| = 6 \Rightarrow$

$\Rightarrow |x - 5| = 2 \Rightarrow \begin{cases} x - 5 = 2 \\ -x + 5 = 2 \end{cases} \Rightarrow \begin{cases} x_2 = 7 \\ x_1 = 3 \end{cases} \Rightarrow$

$\Rightarrow x_1 + x_2 = 10$. Javobi: E.

14. $\frac{x^2 - 13x + 36}{x^4 + 25} \leq 0$ tengsizlikning eng katta va eng kichik yechimlari ayirmasini toping.

A) 6 B) 4 C) 5 D) 7 E) 8

Yechilishi: $\frac{x^2 - 13x + 36}{x^4 + 25} \leq 0 \Rightarrow x^2 - 13x + 36 \leq 0 \Rightarrow$

$\Rightarrow (x - 4)(x - 9) \leq 0 \Rightarrow [4; 9] \Rightarrow 9 - 4 = 5$.

Javobi: C.

15. Agar $x - \sqrt{x + 3} - 17 = 0$ bo'lsa, $\sqrt{x + 3}$ ning qiymatini hisoblang.

A) 3 B) 4 C) 6 D) 7 E) 5

Yechilishi: $x - \sqrt{x + 3} - 17 = 0 \Rightarrow (x - 17)^2 =$

$= (\sqrt{x + 3})^2 \Rightarrow x^2 - 35x + 286 = 0 \Rightarrow$

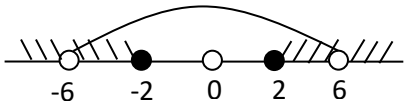
$=> \begin{cases} x = 13 \\ x = 22 \end{cases} => \sqrt{x+3} = 5.$ Javobi: E.

16. $\sqrt{|x|-2} < \frac{2|x|}{x}$ tengsizlikning butun sonlardan iborat nechta yechimi bor?

A) 6 B) 5 C) 3 D) 4 E) 7

Yechilishi: $\sqrt{|x|-2} < \frac{2|x|}{x} => 1) \begin{cases} |x|-2 \geq 0 \\ x \neq 0 \end{cases} =>$

$=> \begin{cases} |x| \geq 2 \\ x \neq 0 \end{cases} => \begin{cases} x \geq 2; \\ x \leq -2; \\ x \neq 0. \end{cases}$



$2)\ |x|-2 < \frac{4x^2}{x^2} =>$

$=> |x|-2 < 4 => -6 < x < 6;$

$x = 2; 3; 4; 5.$ Javobi: D.

17. $\sqrt{x+2\sqrt{x-1}} + \sqrt{x-2\sqrt{x-1}}$ $(1 \leq x \leq 2)$ ni soddalashtiring.

A) $2\sqrt{x-1}$ B) 2 C) -2 D) $-2\sqrt{x-1}$ E) 4

Yechilishi: $\sqrt{x+2\sqrt{x-1}} + \sqrt{x-2\sqrt{x-1}} = y;$

$(1 \leq x \leq 2) => y^2 = x+2\sqrt{x-1} + x-2\sqrt{x-1} +$

$+2\sqrt{x^2-4(x-1)} = 2x + 2\sqrt{x^2-4x+4} =$

$= 2x + 2(x-2) = 2x + 2x - 4 = 4x - 4 =$

$= 4(x-1) => y = 2\sqrt{x-1}.$ Javobi: A.

18. $\sqrt[3]{16+16\sqrt{2}} \cdot \sqrt[6]{48-32\sqrt{2}}$ni hisoblang.

A) 2 B) 6 C) 4 D) 8 E) 5

Yechilishi: $\sqrt[3]{16+16\sqrt{2}} \cdot \sqrt[6]{48-32\sqrt{2}} =$

$= \sqrt[6]{[16(1+\sqrt{2})]^2 \cdot 16(3-2\sqrt{2})} =$

$= \sqrt[6]{16^3(3+2\sqrt{2})(3-2\sqrt{2})} = \sqrt[6]{4^6(9-8)} = 4.$

Javobi: C.

19. 15 ta haddan iborat arifmetik progressiyaning sakkizinchi hadi 18 ga teng. Shu progressiyaning hadlari yig'indisini toping.

A) 280 B) 270 C) 250 D) 300 E) 260

Yechilishi: $\underbrace{a_1, a_2, \dots, a_7, 18, a_9, \dots, a_{14}, a_{15}}_{36} =>$

$=> \frac{a_1+a_{15}}{2} = a_8 => S_{15} = \frac{36}{2} \cdot 15 = 270.$ Javobi: B.

20. Geometrik progressiyaning oltinchi va birinchi hadi ayirmasi 1210 ga, maxraji 3ga teng. Shu progressiyaning dastlabki beshta hadi yig'indisini toping.

A) 610 B) 615 C) 600 D) 605 E) 608

Yechilishi: $\begin{cases} b_6 - b_1 = 1210 \\ q = 3. \end{cases} => b_1 q^5 - b_1 = 1210 =>$

$=> b_1(3^5 - 1) = 1210 => b_1 = \frac{1210}{242} = 5;$

$S_5 = \frac{5\cdot(3^5-1)}{3-1} = \frac{5\cdot 242}{2} = 605.$ Javobi: D.

21. Cheksiz kamayuvchi geometrik progressiyaning birinchi hadi 2 ga, hadlarining yig'indisi esa 5 ga teng. Shu progressiyaning hadlari kvadratlaridan tuzilgan progressiyaning hadlari yig'indisini toping.

A) 6,25 B) 6,5 C) 5,75 D) 6,75 E) 5,85

Yechilishi: $b_1 = 2;\ S = 5 => 5 = \frac{2}{1-q} =>$

$=> 5 - 5q = 2 => 5q = 3 => q = \frac{3}{5};$

$2^2;\ (\frac{6}{5})^2;\ (\frac{18}{25})^2;\ \dots => q = \frac{9}{25}.\ S = \frac{4}{1-\frac{9}{25}} = \frac{100}{16} =$

$= \frac{25}{4} = 6\frac{1}{4} = 6{,}25.$ Javobi: A.

22. $tg\ 240^{\circ}, \sin 120^{\circ}, \cos 150^{\circ}$ va $ctg\ 225^{\circ}$ sonlardan eng kattasining eng kichigiga ko'paytmasini toping.

A) -1.4 B) -1,5 C) $-\frac{\sqrt{6}}{2}$ D) 1,5 E) $\frac{\sqrt{6}}{2}$

Yechilishi: $tg240° = tg(180 + 60) = tg60° = \sqrt{3};$

$\sin 120° = \sin(90 + 30) = \cos 30° = \frac{\sqrt{3}}{2};$

$\cos 150° = \cos(90 + 60) = -\sin 60° = -\frac{\sqrt{3}}{2};$

$ctg225° = ctg(180 + 45) = ctg45° = 1;$

$tg240° \cdot \cos 150° = \sqrt{3} \cdot \left(-\frac{\sqrt{3}}{2}\right) = -1{,}5.$ Javobi: B.

23. $tg\ 60^{\circ} \cos 15^{\circ} - \sin 15^{\circ}) \cdot 7\sqrt{2}$ ning qiymatini toping.

A) 16 B) 12 C) 18 D) 14 E) 10

Yechilishi: $(tg60° cos15° - sin15°) \cdot 7\sqrt{2} =$

$= \frac{\sin 60 \cos 15 - \cos 60 \sin 15}{\cos 60} \cdot 7\sqrt{2} = \frac{\sin 45^{\circ}}{\cos 60^{\circ}} \cdot 7\sqrt{2} = 14.$

Javobi: D.

24. $\frac{1-\cos 2\alpha}{1+tg^2\alpha}$ ni soddalashtiring.

A) $\sin^2 2\alpha$ B) $\frac{1}{2}\sin^2 2\alpha$ C)$\cos^2 2\alpha$

D) $\frac{1}{2}\cos^2 2\alpha$ E) $\frac{1}{2}\sin^2 \alpha$

Yechilishi: $\frac{1-\cos 2\alpha}{1+tg^2\alpha} = \frac{\sin^2\alpha+\cos^2\alpha-\cos^2\alpha+\sin^2\alpha}{\frac{1}{\cos^2\alpha}} =$

$= 2\sin^2\alpha\cos^2\alpha = \frac{1}{2}(2\sin\alpha \cdot \cos\alpha)^2 = \frac{1}{2}\sin^2 2\alpha.$

Javobi: B.

25. $1 - \sin x - \cos 2x = 0 \quad (x \in [0; 2\pi])$ tenglamaning ildizlari yig'indisini toping.

A) $3{,}5\pi$ B) $4{,}2\pi$ C) 4π D) $3{,}8\pi$ E) $4{,}3\pi$

Yechilishi: $1 - \sin x - \cos 2x = 0 \quad (x \in [0; 2\pi]).$

$1-\sin x-\cos^2 x+\sin^2 x=0;$

$\sin^2 x-\sin x+(1-\cos^2 x)=0;$

$2\sin^2 x-\sin x=0 \Rightarrow \begin{cases}\sin x=0\\ \sin x=\frac{1}{2}\end{cases} \Rightarrow$

$\Rightarrow \begin{cases}x=\pi n;\\ x=(-1)^n\frac{\pi}{6}-\pi n.\end{cases} \quad n=0 \Rightarrow \begin{cases}x=0°;\\ x=30°.\end{cases}$

$n=1 \Rightarrow \begin{cases}x=180°;\\ x=-30+180=150°.\end{cases}$

$n=2 \Rightarrow \begin{cases}x=360°;\\ x=30+360°.\end{cases}$

$0+30+180+150+360=720°=4\pi.$ Javobi: C.

26. $tg\left(arc\ tg\frac{1}{3}+arc\ tg\frac{1}{9}\right)$ ning qiymatini hisoblang.

A) $\frac{7}{13}$ B) $\frac{8}{13}$ C) $\frac{5}{13}$ D) $\frac{4}{13}$ E) $\frac{6}{13}$

Yechilishi: $tg\left(arc\ tg\frac{1}{3}+arc\ tg\frac{1}{9}\right)=\frac{\frac{1}{3}+\frac{1}{9}}{1-\frac{1}{3}\cdot\frac{1}{9}}=$

$=\frac{4}{9}\cdot\frac{27}{26}=\frac{6}{13}.$ Javobi: E.

27. $1\le\frac{tg\,3x+tg\,x}{1-tg\,3x\,tgx}\le\sqrt{3}\quad(0<x<\pi)$ tengsizlikning eng katta va eng kichik yechimlari yig'indisini toping.

A) $\frac{\pi}{7}$ B) $\frac{43}{48}\pi$ C) $\frac{5\pi}{48}$ D) $\frac{7\pi}{48}$ E) $\frac{3\pi}{16}$

Yechilishi: $1\le tg4x\le\sqrt{3}\quad(0<x<\pi).$

$-\frac{\pi}{2}<4x<\frac{\pi}{2} \Rightarrow -\frac{\pi}{8}<x<\frac{\pi}{8}.$

1) $tg4x\ge 1 \Rightarrow \frac{\pi}{4}\le 4x<\frac{\pi}{2} \Rightarrow \frac{\pi}{16}\le x<\frac{\pi}{8};$

2) $tg4x\le\sqrt{3} \Rightarrow -\frac{\pi}{2}<4x\le\frac{\pi}{3} \Rightarrow$

$\Rightarrow -\frac{\pi}{8}<x\le\frac{\pi}{12} \Rightarrow x=\frac{\pi}{16};\frac{\pi}{12}; \quad \frac{\pi}{16}+\frac{\pi}{12}=\frac{7\pi}{48}.$

Javobi: D.

28. $a = 64$ bo'lganda, $\frac{a^{\frac{3}{4}}-8a^{\frac{1}{3}}\cdot b}{a^{\frac{2}{3}}+2a^{\frac{1}{3}}b^{\frac{1}{3}}+4b^{\frac{2}{3}}} : \left(1-\frac{2b^{\frac{1}{3}}}{a^{\frac{1}{3}}}\right) - 4\,a^{\frac{2}{3}}$ ning qiymatini hisoblang.

A) -46 B) -48 C) -44 D) -50 E) -42

Yechilishi: $\frac{a^{\frac{3}{4}}-8a^{\frac{1}{3}}\cdot b}{a^{\frac{2}{3}}+2a^{\frac{1}{3}}b^{\frac{1}{3}}+4b^{\frac{2}{3}}} : \left(1-\frac{2b^{\frac{1}{3}}}{a^{\frac{1}{3}}}\right) - 4\,a^{\frac{2}{3}} =$

$= \frac{\sqrt[3]{a^4}-8\sqrt[3]{a}\cdot b}{\sqrt[3]{a^2}+2\sqrt[3]{a}\sqrt[3]{b}+4\sqrt[3]{b^2}} \cdot \frac{\sqrt[3]{a}}{\sqrt[3]{a}-2\sqrt[3]{b}} - 4\sqrt[3]{a^2} =$

$= \frac{\sqrt[3]{a}(a-8b)}{\sqrt[3]{a^2}+2\sqrt[3]{a}\sqrt[3]{b}+4\sqrt[3]{b^2}} \cdot \frac{\sqrt[3]{a}}{\sqrt[3]{a}-2\sqrt[3]{b}} - 4\sqrt[3]{a^2} =$

$= \frac{\sqrt[3]{a}[(\sqrt[3]{a})^3-(2\sqrt[3]{b})^3]}{\sqrt[3]{a^2}+2\sqrt[3]{a}\sqrt[3]{b}+4\sqrt[3]{b^2}} \cdot \frac{\sqrt[3]{a}}{\sqrt[3]{a}-2\sqrt[3]{b}} - 4\sqrt[3]{a^2} =$

$= \frac{\sqrt[3]{a}\left(\sqrt[3]{a}-2\sqrt[3]{b}\right)\left(\sqrt[3]{a^2}+\sqrt[3]{a}\cdot 2\cdot\sqrt[3]{b}+4\sqrt{b^2}\right)}{\sqrt[3]{a^2}+2\sqrt[3]{a}\sqrt[3]{b}+4\sqrt[3]{b^2}} \cdot \frac{\sqrt[3]{a}}{\sqrt[3]{a}-2\sqrt[3]{b}} - 4\sqrt[3]{a^2} =$

$= \frac{\sqrt[3]{a^2}}{1} - 4\sqrt[3]{a^2} = -3\sqrt[3]{a^2} = -3\sqrt[3]{64^2} = -3\sqrt[3]{(2^6)^2} =$

$= -3\cdot 2^4 = -48.$ Javobi: B.

29. $\frac{2^{2x-1}\cdot 2^{2x+2}}{2^{3x-3}} = 64$ tenglamaning ildizi 12 dan qancha kam?

A) 8 B) 9 C) 6 D) 10 E) 4

Yechilishi: $\frac{2^{2x-1}\cdot 2^{2x+2}}{2^{3x-3}} = 2^6 \Rightarrow 2^{4x+1-3x+3} = 2^6 \Rightarrow$

$\Rightarrow x = 2 \Rightarrow 12-2 = 10.$ Javobi: D.

30. $\frac{1}{8}\cdot 2^{4x-2} > (\sqrt{2})^{10}$ tengsizlikni qanoatlantiruvchi eng kichik butun sonni toping.

A) 2 B)1 C) 3 D) 4 E) 5

Yechilishi: $2^{-3}\cdot 2^{4x-2} > 2^5 \Rightarrow 2^{4x-5} > 2^5 \Rightarrow$

$\Rightarrow 2 > 1 \Rightarrow 4x > 10 \Rightarrow x > 2{,}5 \Rightarrow x = 3.$

Javobi: C.

31. Agar $2^{x^2} \cdot 2^{y^2} = 64$ va $2^{xy} = \sqrt{8}$ bo'lsa, $|x + y|$ ning qiymati toping.

A) 4,5 B) 3,5 C) 2,5 D) 4 E) 3

Yechilishi: $\begin{cases} x^2 + y^2 = 6 \\ x \cdot y = \frac{3}{2} \end{cases} \Rightarrow |x + y|^2 = x^2 + y^2 +$

$+2xy = 9 = |x + y| = 3.$ Javobi: E.

32. $\ln(3^{\log_3 0{,}64} + 8^{\log_8 0{,}36})$ ning qiymati -11 dan qancha ko'p?

A) 10 B) 9 C) 11 D) 12 E) 13

Yechilishi: $\ln\left(3^{\log_3 0{,}64} + 8^{\log_8 0{,}36}\right) =$

$= \ln(0{,}64 + 0{,}36) = \ln 1 = 0.$ Javobi: C.

33. $2\log_4 8 - 3\log_8 4 + \log_2 32 + 18$ ni hisoblang.

A) 22 B) 24 C) 26 D) 20 E) 28

Yechilishi: $2\log_4 8 - 3\log_8 4 + \log_2 32 + 18 =$

$= 2 \cdot \frac{1}{2} \cdot 3 - 3 \cdot \frac{1}{3} \cdot 2 + 5 + 18 = 24.$ Javobi: B.

34. Agar $\log_4 \frac{(2-x)^2}{(3-x)^3} = -3 \log_4|3 - x|$ bo'lsa, x-27 ni hisoblang.

A) -25 B) -29 C) -26 D) -24 E) -28

Yechilishi: $\frac{(2-x)^2}{(3-x)^3} = |3 - x|^{-3};$

1) $|3 - x| > 0 \Rightarrow x < 3;$

2) $\frac{(2-x)^2}{(3-x)^3} > 0 \Rightarrow \begin{cases} x \neq 2; \\ (3 - x)^3 > 0 \Rightarrow x < 3. \end{cases}$

3) $\frac{(2-x)^2}{(3-x)^3} = \frac{1}{(3-x)^3} \Rightarrow (2 - x)^2 = 1 \Rightarrow$

$\Rightarrow \begin{cases} 2 - x = -1 \\ 2 - x = 1 \end{cases} \Rightarrow \begin{cases} x \neq 3 \\ x = 1 \end{cases} \Rightarrow x = 1 \Rightarrow -26.$

Javobi: C.

35. $10^{\lg(x-2)-2} < 4$ tengsizlikning eng katta butun yechimini toping.

A) 400 B) 401 C) 398 D) 402 E) 404

Yechilishi: $10^{\lg(x-2)-2} < 4 \Rightarrow x > 2;$

$\frac{10^{\lg(x-2)}}{10^2} < 4 \Rightarrow 10^{\lg(x-2)} < 4 \cdot 100 \Rightarrow$

$\Rightarrow x - 2 < 400 \Rightarrow x < 402 \Rightarrow x = 401.$

Javobi: B.

36. Agar $\begin{cases} x^{\lg y} = 1000 \\ \log_y x = 3 \end{cases}$ bo'lsa, y ning qiymatini toping.

A) 10 B) 0,01 C) 10 $yoki$ 0,1

D) 30 E) $qiymati\ yo'q$

Yechilishi: $\begin{cases} x^{\lg y} = 1000 \\ \log_y x = 3 \end{cases} \Rightarrow \begin{vmatrix} x > 0 \\ y > 0 \\ y \neq 1 \end{vmatrix} \Rightarrow$

$\Rightarrow \begin{cases} \lg y \lg x = \lg 10^3 \\ \frac{\lg x}{\lg y} = 3 \end{cases} \Rightarrow \begin{cases} \lg y \cdot 3 \cdot \lg y = 3 \\ \lg x = 3 \lg y \end{cases} \Rightarrow$

$\Rightarrow \lg^2 y = 1 \Rightarrow \lg y = \pm 1 \Rightarrow \begin{cases} y_1 = \frac{1}{10}; \\ y_2 = 10. \end{cases}$ Javobi: C.

37. Agar $\log_a 8 = 3$ va $\log_b 243 = 5$ bo'lsa, ab ning qiymatini toping.

A) 4 B) 5 C) 6 D) 8 E)7

Yechilishi: $\begin{cases} \log_a 8 = 3 \\ \log_b 243 = 5 \end{cases} \Rightarrow \begin{cases} 8 = a^3 \\ 243 = b^5 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} a = 2; \\ b = 3. \end{cases} \Rightarrow a \cdot b = 6.$ Javobi: C.

38. Eng kichik musbat davrga ega bo'lgan funksiyani ko'rsating.

A) $y = \sin\frac{4}{3}x$ B) $y = \cos\frac{5}{3}x$ C) $y = ctg\frac{3}{2}x$

D) $y = \sin x \cos x$ E) $y = tg\frac{2}{3}x$

Yechilishi: $C)\ \ y = ctg\frac{3}{2}x => \frac{\pi}{\frac{3}{2}} = \frac{2\pi}{3} = 120^{\circ}$.

Javobi: C.

39. Toq funksiyani ko'rsating.

A) $f(x) = \cos^2 x - \cos x$

B) $f(x) = \cos x + \sin x$

C) $f(x) = \sin^2 x\, tg\, x - 2x$

D) $f(x) = e^x + \ ctgx$

E) $f(x) = \lg(|x| + 1)$

Yechilishi: $f(-x) = (\sin(-x))^2 tg\ (-x) - 2\ (-x) =$

$= -\sin^2 x\, tgx + 2x = \ -(\sin^2 x\, tgx - 2x)$.

Javobi: C.

40. $f(x) = \log_{x^2}(x-1) + \sqrt{2-x}$ funksiyaning aniqlanish sohasini toping.

A) [1; 2] B) (1; 2) C) [1;2) D) (1; 2] E) (1; 1,5]

Yechilishi: $f(x) = \log_{x^2}(x-1) + \sqrt{2-x} =>$

$=> \ x \neq -1, 0; 1; \ \ x > 1; \ \ x \leq 2 \ \ (1; 2]$. Javobi: D.

41. $f(x) = \ \log_2(x^2 - 2x + 5)$ funksiyaning qiymatlar sohasini toping.

A) $(5; \infty)$ B) $[\log_2 5\,;\ \infty)$ C) $(2;\ \infty)$

D) $(\log_2 6\,;\ \infty)$ E) $[2; \infty)$

Yechilishi: $f(x) = \ \log_2(x^2 - 2x + 5) =$

$=> \log_2[(x-1)^2 + 4]\,;\ \ x = 1 => f(x) = 2 =>$

$=> [2; +\infty)$. Javobi: E.

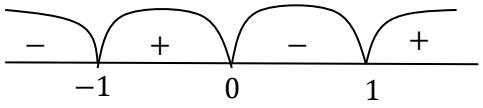
42. $f(x) = \frac{1}{6}x^6 - \frac{1}{2}x^2 + 4$ funksiyanining minimumlari yig'indisini toping.

A) $4\frac{2}{3}$ B) $7\frac{1}{3}$ C) $6\frac{2}{3}$ D) $3\frac{2}{3}$ E) $5\frac{1}{3}$

Yechilishi: $f(x)=\frac{1}{6}x^6-\frac{1}{2}x^2+4 \Rightarrow \begin{cases} f'(x)=0 \\ x^5-x=0 \end{cases} \Rightarrow$

$\Rightarrow x(x^4-1)=0 \Rightarrow$

$$\begin{cases} x=0 \\ x=-1 \\ x=1 \end{cases} \Rightarrow \begin{cases} f(0)=4; \\ f(-1)=\frac{11}{3}; \\ f(1)=\frac{11}{3}. \end{cases}$$



$f(-1)+f(1)=\frac{22}{3}=7\frac{1}{3}$.

Javobi: B.

43. Argumentning $f(x)=\frac{1}{3}x^3+3x^2$ funksiya kamayadigan barcha qiymatlari OX o'qiga qo'yilganda, qanday uzunlikdagi kesma hosil bo'ladi?

A) 4 B) 5 C) 6 D) 3 E) 7

Yechilishi: $f(x)=\frac{1}{3}x^3+3x^2 \Rightarrow f'(x)\le 0 \Rightarrow$

$x^2+6x\le 0 \Rightarrow \begin{cases} x=0 \\ x=-6 \end{cases} \Rightarrow [-6;0]$. Javobi: C.

44. Ikki moddiy nuqta $S_1(t)=2t^3-5t^2-3t(m)$ va $S_2(t)=\ 2t^3-53-11t+7\ (m)$ qonuniyatlar tezlanishini (m/c^2) toping.

A) 10 B) 8 C) 14 D) 9 E) 11

Yechilishi: 1) $S_1(t)=2t^3-5t^2-3t \Rightarrow$

$\Rightarrow v_1=6t^2-10t-3;$

2) $S_2(t)=\ 2t^3-3t^2-11t+7 \Rightarrow$

$\Rightarrow v_2=6t^2-6t-11;$

3) $v_1=v_2 \Rightarrow t=2;\ \ a=(v_1)'=12t-10 \Rightarrow$

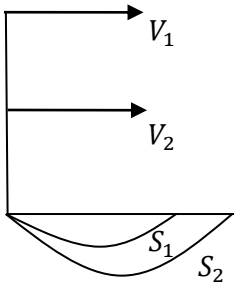
$\Rightarrow a=12\cdot 2-10=14.$ Javobi: C.

45. Ikki jism to'g'ri chiziq bo'ylab bir vaqtning o'zida bitta nuqtadan bir yo'nalishda $V_1(t) = 3t^2 - 5\ (m/c)$ va $V_2 = 3t^2 + 2t + 1\ (m/c)$ qonuniyatlariga ko'ra harakatlana boshladi. Harakat boshlangandan 4 sekund o'tgach, bu jismlar orasidagi masofa (m) qanchaga teng bo'ladi?

A) 38 B) 42 C) 40 D) 36 E) 44

Yechilishi: $S_1(t) = \int v_1(t)dt = \int (3t^2 - 5)dt =$

$= 3 \cdot \frac{t^3}{3} - 5t = t^3 - 5t;$



$S_1(4) = 4^3 - 5 \cdot 4 = 44;$

$S_2(t) = \int v_2(t)dt =$

$= \int 3t^2 + 2t + 1)\ dt =$

$= 3 \cdot \frac{t^3}{3} + 2 \cdot \frac{t^2}{2} + t = t^3 + t^2 + t;$

$S_2(4) = 4^3 + 4^2 + 4 = 64 + 16 + 4 = 84;$

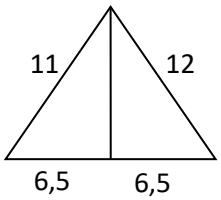
$S_2 - S_1 = 84 - 44 = 40.$ Javobi: C.

46. Tomonlari 11, 12 va 13 ga teng bo'lgan uchburchakning katta tomoniga tushurilgan medianisi uzunligini toping.

A) 10 B) 9 C) 8,5 D) 9,5 E) 8

Yechilishi: $m = \frac{1}{2}\sqrt{2 \cdot 11^2 + 2 \cdot 12^2 - 13^2} =$

$= \frac{1}{2}\sqrt{2 \cdot 121 + 2 \cdot 144 - 169} =$



$= \frac{1}{2}\sqrt{242 + 288 - 169} =$

$= \frac{1}{2}\sqrt{361} = \frac{19}{2} = 9{,}5.$ Javobi: D.

47. $\vec{b}$ vektor $\vec{a}$ (1; 2; 2) vektorga collinear hamda bu vektorlarning skalyar ko'paytmasi 36 ga teng. $\vec{b}$ vektorning uzunligini toping.

A) 3 B) 4 C) 12 D) 6 E) 5

Yechilishi: $\vec{b} = \lambda\vec{a} = \lambda\{1; 2; 2\} = \{\lambda; 2\lambda; 2\lambda\};$

$\vec{a} \cdot \vec{b} = 36 => \{1; 2; 3\} \cdot \{\lambda; 2\lambda; 2\lambda\} = 36 =>$

$=> \lambda + 4\lambda + 4\lambda = 36 => \lambda = 4 => \vec{b} = \{4; 8; 8\} =>$

$=> |\vec{b}| = \sqrt{4^2 + 8^2 + 8^2} = \sqrt{16 + 64 + 64} = 12.$

Javobi: C.

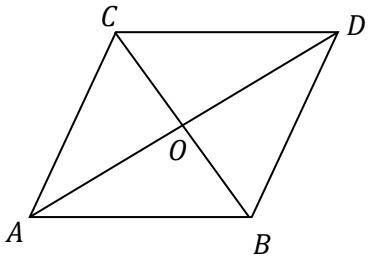
48. Parallegrammning perimetri 44 ga teng. Uning diagonallari parallelogrammni to'rtta uchburchakka ajratadi. Shu uchburchaklardan ikkitasining perimetrlari ayirmasi 2 ga teng. Parallelogrammning katta tomoni uzunligini toping.

A) 10 B) 12 C) 8 D) 10,5 E) 8,5

Yechilishi: $2(AB + AD) = 44 =>$

$=> AD = 22 - AB;$

$AB + AO + OB - (AD + AO + OD) = 2 => AB + AO + OB - AD - AO - OB = 2 =>$



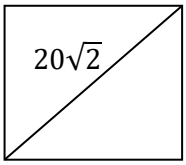
$=> AB - (22 - AB) = 2 => 2AB = 24 => AB = 12.$

Javobi: B.

49. Kvadratning tomoni 20 ga teng. Unga ichki va tashqi chizilgan aylanalar orasidagi yuzani toping.

A) 96π B) 110π C) 100π D) 108π E) 98π

Yechilishi: $\begin{cases} R = 10\sqrt{2} \\ r = 10 \end{cases} =>$



$=> \begin{cases} S_1 = \pi R^2 200\pi \\ S_2 = \pi r^2 100\pi \end{cases} =>$

$=> S_1 - S_2 = 100\pi.$ Javobi: C.

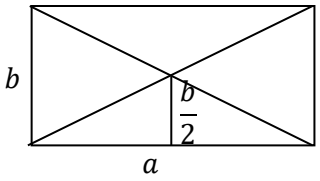
50. To'g'ri to'rtburchakka diagonallar o'tkazish natijasida u to'rtta uchburchakka ajratilildi. Shu uchburchakdan birining yuzi 27 ga teng. To'g'ri to'rtburchakning yuzini toping.

A) 112 B) 108 C) 111 D) 96 E) 102

Yechilishi:

$27 = \frac{1}{2} \cdot a \cdot \frac{b}{2} => 27 = \frac{1}{4} \cdot ab =>$

$=> ab = 108.$



Javobi: B.

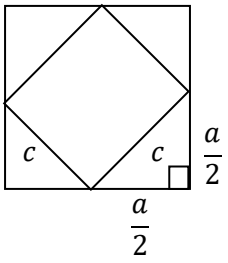
51. Kvadratga ichki chizilgan to'rtburchakning uchlari kvadrat tomonlarining o'rtalarida yotadi. Agar to'rtburchakning yuzi 26 ga teng bo'lsa, kvadratning yuzi qancha bo'ladi?

A) 70 B) 74 C) 77 D) 72 E) 76

Yechilishi: $a - kvadrat\ tomoni;$

$c^2 = 36 => c = 6;\ \left(\frac{a}{2}\right)^2 + \left(\frac{a}{2}\right)^2 = c^2 =>$

$=> \frac{1}{2}a^2 = c^2 => S = a^2 = 72.$



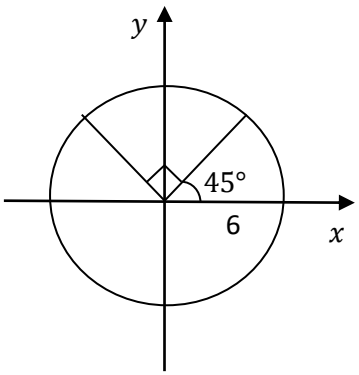
Javobi: D.

52. $y = |x|$ funksiyaning grafigi va $x^2 + y^2 = 36$ tenglama bilan berilgan aylananing kichik yoyi bilan chegaralangan shaklning yuzini toping.

A) 8π B) 10π C) $8{,}5\pi$ D) 7π E) 9π

Yechilishi: $\begin{cases} y = |x|; \\ x^2 + y^2 = 36. \end{cases}$

$S_{sektor} = \frac{\pi \cdot 6^2 \cdot 90°}{360°} = 9\pi.$

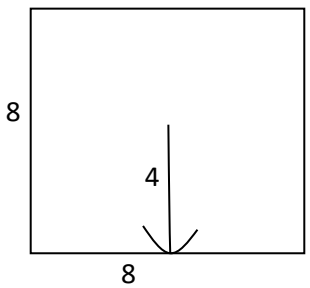


Javobi: E.

53. Kubga ichki chizilgan sharning hajmi $85\frac{1}{3}\pi$ ga teng. Shu kubning sirtini toping.

A) 382 B) 386 C) 385

D) 384 E) 388



Yechilishi: $\frac{4}{3}\pi r^3 = 85\frac{1}{3}\pi =>$

$=> \frac{4}{3}r^3 = \frac{256}{3} =>$

$=> r^3 = 64 => r = 4 =>$

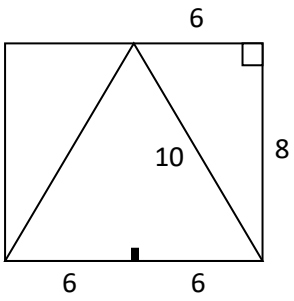
$=> a = 8 =>$

$=> S_T = 6a^2 = 384.$ Javobi: D.

54. Asosining radiusi 6 ga teng bo'lgan silindrga konus ichki chizilgan. Konusning asosi silindrning asosi bilan, uchi esa silindrning ustki asosining markazi bilan ustma-ust tushadi. Konusning yon sirti 60π ga teng. Silindrning yon sirtini toping.

A) 92π B) 94π C) 96π D) 98π E) 90π

Yechilishi: $\pi Rl = 60\pi => l = 10;$

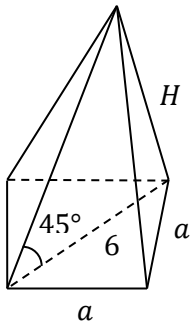


$S_{yon\ sirt} = 2\pi RH = 2\pi \cdot 6 \cdot 8 = 96\pi.$

Javobi: C.

55. Piramidaning asosi kvadratdan iborat. Kvadratning diagonali 6 ga teng. Piramidaning yon qirralaridan biri uning asosiga perpendikulyar. Piramidaning katta yon qirrasi va asos tekisligi orasidagi burchak 45° ga teng. Piramidaning hajmini toping.

A) 32 B) 34 C) 38 D) 40 E) 36



Yechilishi:

$a\sqrt{2} = 6 => a = \frac{6}{\sqrt{2}} = 3\sqrt{2};$

$S_{asos} = a^2 = 18;\ \frac{H}{6} = tg\ 45^\circ => H = 6.$

$V = \frac{1}{3} \cdot S_{asos} \cdot H = \frac{1}{3} \cdot 18 \cdot 6 = 36.$

Javobi: E.

5-axborotnoma

1. $\frac{0,13}{0,00013}+\frac{0,02}{0,0005}-\frac{0,7}{0,0014}$ ni hisoblang.

A) 540 B) 580 C) 620 D) 1400 E) 740

Yechilishi: $\frac{0,13}{0,00013}+\frac{0,02}{0,0005}-\frac{0,7}{0,0014}=$

$=\frac{13000}{13}\cdot\frac{200}{5}-\frac{7000}{14}=540.$ Javobi: A.

2. $\frac{\sqrt{196}\cdot\sqrt{19,6}}{\sqrt{0,196}\cdot\sqrt{1,96}}$ ni hisoblang.

A) 1000 B)100 C) 196 D) 10 E) 19,6

Yechilishi: $\sqrt{\frac{19600\cdot19600}{196\cdot196}}=\frac{19600}{196}=100.$ Javobi: B.

3. $\frac{3}{17},\frac{8}{13},\frac{16}{19}$ sonlarga bo'linganda, bo'linma butun son chiqadigan eng kichik natural son nechaga teng?

A) 48 B) 24 C) 36 D) 60 E) 96

Yechilishi: $x:\frac{3}{17}=x\cdot\frac{17}{3}$; $Shuningdek, x\cdot\frac{13}{8}$ va $x\cdot\frac{19}{16}$ $bo'lishi\ e'tiborga\ olinsa, izlanayotgan\ x\ butun\ son$ $3,8,16$ $sonlariga\ karrali\ bo'lishi\ kerak.$

$Demak,\ x=48.$ Javobi: A.

4. $\frac{8+2\sqrt{2}}{4+\sqrt{125}}$ kasr qisqartirilgandan keyin, quyidagilarning qaysi biriga teng bo'ladi?

A) $\frac{\sqrt{2}}{2}$ B) $\frac{\sqrt{2}}{4}$ C) $\frac{2}{\sqrt{2}}$ D) $\sqrt{2}+1$ E) $\frac{\sqrt{2}+1}{2}$

Yechilishi: $\frac{8+\sqrt{8}}{4+\sqrt{128}}=\frac{(8+\sqrt{8})(8-\sqrt{8})}{(4+\sqrt{128})(8-\sqrt{8})}=\ =$

$\frac{64-8}{32-4\sqrt{8}+8\sqrt{128}-\sqrt{128\cdot8}}=\frac{56}{32-8\sqrt{2}+64\sqrt{2}-32}=\frac{56}{56\sqrt{2}}=\frac{1}{\sqrt{2}}=$

$= \frac{\sqrt{2}}{2}$. Javobi: A.

5.$((\sqrt[4]{2} - \sqrt[4]{8})^2 + 5) \cdot ((\sqrt[4]{2} + \sqrt[4]{8})^2 - 5)$ ni hisoblang.

A) 17 B) 16 C) 20 D) $17\sqrt{2}$ E) 25

Yechilishi: $[(\sqrt[4]{2} - \sqrt[4]{8})^2 + 5] \cdot [(\sqrt[4]{2} + \sqrt[4]{8})^2 - 5] =$

$= (\sqrt[4]{2^2} - 2\sqrt[4]{2^4} + \sqrt[4]{2^6} + 5)(\sqrt[4]{2^2} + 2\sqrt[4]{2^4} + \sqrt[4]{2^6} - 5 =$

$= [(\sqrt[4]{2^2} + \sqrt[4]{2^6}) + 1] \cdot [(\sqrt[4]{2^2} + \sqrt[4]{2^6}) - 1] = (\sqrt[4]{2^2} +$

$+\sqrt[4]{2^6})^2 - 1 = 2 + 2 \cdot 2^2 + 2^3 - 1 = 17.$ Javobi: A.

6.$5^a = 3$ va $75^b = 81$ bo'lsa, a va b orqali ifodalang.

A) $\frac{2b}{4-b}$ B) $\frac{b}{4+b}$ C) $\frac{3b}{b-4}$ D) $\frac{2b}{4+b}$ E) $\frac{b}{4-b}$

Yechilishi: $\begin{cases} 5^a = 3 \\ 75^b = 81 \end{cases} => \begin{cases} a \lg 5 = \lg 3 \\ b \lg 3 \cdot 5^2 = \lg 3^4 \end{cases} => =>$

$\begin{cases} a = \frac{\lg 3}{\lg 5} \\ b = \frac{4 \lg 3}{\lg 3 + 2 \lg 5} \end{cases} => b \lg 3 + 2b \lg 5 = 4 \lg 3 =>$

$=> -b \lg 3 + 4 \lg 3 = 2b \lg 5 => \lg 3 = \frac{2b \lg 5}{4-b};$

$U\ holda\ \ a \lg 5 = \frac{2b}{4-b} \lg 5 => a = \frac{2b}{4-b}.$ Javobi: A.

7.5 ta sonning o'rta arifmetigi 13 ga teng. Shu sonlarga qaysi son qo'shilsa, ularning o'rta arifmatigi 19 ga teng bo'ladi?

A) 49 B) 40 C) 46 D) 54 E) 38

Yechilishi: $\begin{cases} \frac{a_1 + \cdots + a_5}{5} = 13 \\ \frac{a_1 + \cdots + a_5 + x}{6} = 19 \end{cases} =>$

$=> \begin{cases} a_1 + \cdots + a_5 = 65 \\ 65 + x = 6 \cdot 19 \end{cases} => x = 49.$ Javobi: A.

8.a soni $b^2 - 3$ bilan to'g'ri proporsional. $b = 5$ bo'lganda, $a = 88$ bo'lsa, $b = -3$ bo'lganda, a soni nechaga teng bo'ladi?

A) 24 B) 6 C) 18 D) 12 E) 36

Yechilishi: $a = t(b^2 - 3) => 88 = t\,(5^2 - 3) =>$

$=> t = 4 => a = 4((-3)^2 - 3) = 24.$ Javobi: A.

9. $mn^2 = 18$ va $m^2k = 20$ bo'lib, m, n va k natural sonlar bo'lsa, n ni toping.

A) 3 B) 2 C) 5 D) 4 E) 6

Yechilishi: $\begin{cases} mn^2 = 18 \\ m^2k = 20 \end{cases} =>$

$$\begin{cases} m = \frac{18}{n^2} => n = 1\ yoki\ 3 \\ m \cdot 1^2 = 18 => m = 18 \\ m \cdot 3^2 = 18 => m = 2 \end{cases} => \begin{cases} m = 2 \\ n = 3 \end{cases} => k = 5.$$

Javobi: A.

10. $\frac{\sqrt[3]{26-15\sqrt{3}}\cdot(2-\sqrt{3})}{7-4\sqrt{3}}$ ni soddalashtiring.

A) 1 B) $\frac{1}{3}$ C) $2-\sqrt{3}$ D) 2 E) 3

Yechilishi: 1) $\sqrt[3]{26-15\sqrt{3}}$ *dan quyidagi uslubda ildiz chiqariladi*:

$26 - 15\sqrt{3} = \left(a - b\sqrt{3}\right)^3 = a^3 - 3\sqrt{3}a^2b + 9ab^2 -$

$-3\sqrt{3}b^3 => \begin{cases} a^3 + 9ab^2 = 26; \\ -3\sqrt{3}a^2b - 3\sqrt{3}b^3 = -15\sqrt{3} \end{cases} =>$

$=> \begin{cases} a^3 + 9ab^2 = 26 \\ a^2b + b^3 = 5 \end{cases}$ *sistemaning natural yechim – lari* $a = 2,\ b = 1$ *lar topiladi.*

U holda $26 - 15\sqrt{3} = (2-\sqrt{3})^3.$

2) $\frac{\sqrt[3]{26-15\sqrt{3}}\cdot(2-\sqrt{3})}{7-4\sqrt{3}} = \frac{\sqrt[3]{(2-\sqrt{3})^3}(2-\sqrt{3})}{7-4\sqrt{3}} = 1.$ Javobi: A.

11.Agar $2a^2 + 2b^2 = 5ab$ va $b > a > 0$ bo'lsa, $\frac{a+b}{a-b}$ kasrning qiymati nechaga teng?

A) -3 B) 3 C) 2 D) 4 E) -2

Yechilishi: $2a^2 + 2b^2 = 5ab;\ \ b > a > 0 \Rightarrow$

$\Rightarrow a^2 + b^2 = 2{,}5 \cdot ab;$

$\frac{a+b}{a-b} = x \Rightarrow a + b = x(a - b) \Rightarrow$

$a^2 + 2ab + b^2 = x^2(a^2 - 2ab + b^2) \Rightarrow$

$4{,}5 \cdot ab = x^2 0{,}5 \cdot ab \Rightarrow x = \pm 3 \Rightarrow \begin{cases} x = -3 \\ x = 3 \end{cases} \Rightarrow$

$\Rightarrow a + b = -3\ (a - b) = a + b = -3a + 3b \Rightarrow$

$\Rightarrow 4a = 2b \Rightarrow b = 2a \Rightarrow b > a \Rightarrow x = -3.$

Javobi: A.

12.Agar $\sqrt{5} = m$ va $\sqrt{7} = n$ bo'lsa, $\sqrt{560}$ ni m va n orqali ifodalang.

A) $4mn$ B) $2mn$ C) $6mn$ D) $8mn$ E) $16mn$

Yechilishi: $m = \sqrt{5};\ \ n = \sqrt{7};\ \ m \cdot n = \sqrt{35};$

$\sqrt{560} = \sqrt{35 \cdot 16} = 4\sqrt{35} = 4mn.$ Javobi: A.

13.$xy = \frac{5}{12}$ va $36 < \frac{5}{y} < 84$ bo'lsa, x ning butun qiymatlari ko'paytmasini toping.

A) 120 B) 60 C) 90 D) 180 E) 210

Yechilishi: $x \cdot y = \frac{5}{12} \Rightarrow y = \frac{5}{12x};$

$36 < \frac{5}{y} < 84 \Rightarrow 36 < 5 : \frac{5}{12x} < 84 \Rightarrow$

$36 < 12x < 84 \Rightarrow 3 < x < 7 \Rightarrow x = 4;\ 5;\ 6 \Rightarrow$

$\Rightarrow 4 \cdot 5 \cdot 6 = 120.$ Javobi: A.

14.$x^3 - 3x^2 - 4x + 12$ ko'phad quyidagilarning qaysi biriga bo'linmaydi?

A) $x+3$ B) $x-3$ C) $x+2$

D) $x-2$ E) x^2-x-6

Yechilishi: $x^2(x-3)-4(x-3)=(x-3)(x^2-4)=$

$=(x-3)(x-2)(x+2)$. Javobi: A.

15.Massasi 36 kg bo'lgan mis va rux qotishmasining tarkibida 45% mis bor. Qotishma tarkibida 60% mis bo'lishi uchun unga yana necha kg mis qo'shish kerak?

A) 13,5 B) 14 C) 12 D) 15 E) 12,8

Yechilishi: $\begin{cases}36\cdot 0{,}45=16{,}2\ kg\ mis\\ 36\cdot 0{,}55=19{,}8\ kg\ rux\end{cases}=>$

$=>\begin{cases}36+x\to 100\%\\ 16{,}2+x\to 60\%\end{cases}=>x=13{,}5\ kg.$ Javobi: A.

16.a ning qanday qiymatida $x^2-(a-2)x-a-1=0$ tenglama ildizlari kvadratlarining yig'indisi eng kichik qiymatga ega bo'ladi?

A) 1 B) 2 C) $\frac{1}{2}$ D) 4 E) 3

Yechilishi:$x^2-(a-2)x-a-1=0$;

$\begin{cases}x_1+x_2=a-2\\ x_1\cdot x_2=-(a+1)\end{cases}=>(x_1+x_2)^2=(a-2)^2=>$

$=>x_1^2+x_2^2=(a-2)^2-2x_1\cdot x_2=a^2-4a+4+$

$+2(a+1)=a^2-4a+4+2a+2=a^2-2a+6=$

$=(a-1)^2+5=>a=1.$ Javobi: A.

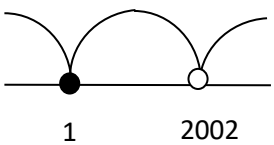
17.$\frac{1}{x-2002}\le\frac{x}{x-2002}$ tengsizlikni yeching.

A) $(-\infty;1]\cup(2002;\infty)$ B) $(-\infty;1]$ C) $(2002;\infty)$

D) $[1;2002)$ E) $(-\infty;0)$

Yechilishi: $\frac{1}{x-2002}\le\frac{x}{x-2002}=>\frac{x}{x-2002}-\frac{1}{x-2002}\ge 0=>$

$=>\frac{x-1}{x-2002}\ge 0=>\begin{cases}x=1;\\ x\ne 2002.\end{cases}$



$(-\infty; 1] \cup (2002; +\infty)$.

Javobi: A.

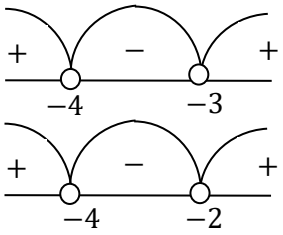
18.a ning qanday qiymatlarida $1 < \frac{3a+10}{a+4} < 2$ tengsizlik o'rinli bo'ladi?

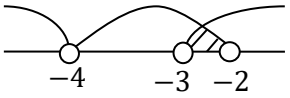
A) (-1,5; 4) B) $(-7; -1{,}5)$ C) $(-7; 4)$

D) $\emptyset$ E) $(-3; -2)$

Yechilishi: $1 < \frac{3a+10}{a+4} < 2 =>$

$$=> \begin{cases} \frac{3a+10}{a+4} - 1 > 0 \\ \frac{3a+10}{a+4} - 2 < 0 \\ a \neq -4 \end{cases}$$





$(-3; -2)$. Javobi: E.

19.$(x+2)^2 - 2|x+2| - 3 = 0$ tenglama ildizlarining yig'indisi nechaga teng?

A) -4 B) 6 C) -6 D) 4 E) -5

Yechilishi: $(x+2)^2 - 2|x+2| - 3 = 0 =>$

$$=> \begin{cases} (x+2)^2 + 2(x+2) - 3 = 0; \\ (x+2)^2 - 2(x+2) - 3 = 0. \end{cases} x + 2 = y =>$$

$$=> \begin{cases} y^2 + 2y - 3 = 0 \\ y^2 - 2y - 3 = 0 \end{cases} => \begin{cases} y_1 = 1;\ y_2 = -3 \\ y_1 = -1;\ y_2 = 3 \end{cases} =>$$

$x = -1; -5; -3; 1; => x_1 + x_2 = -5 + 1 = -4.$

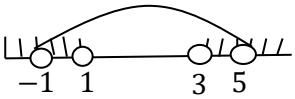
Javobi: A.

20.$1 < |x-2| < 3$ tengsizlikning butun yechimlari yig'indisini toping.

A) -4 B) 6 C) -6 D) 4 E) -5

Yechilishi: $\begin{cases} |x-2|>1 \Rightarrow \begin{cases} x-2>1 \\ x-2<-1 \end{cases} \Rightarrow \\ |x-2|<3 \Rightarrow -3<x-2<3 \end{cases}$

$\Rightarrow \begin{cases} x>3 \\ x<1 \\ -1<x<5 \end{cases}$



$(-1;1)\cup(3;5)$. Javobi: D.

21.$x^2-(a+2)x+a+7=0$ tenglama ildizlariga teskari sonlar yig'indisi $\frac{7}{12}$ ga teng bo'lsa, a ni toping.

A) 5 B) 6 C) 7 D) $\frac{5}{12}$ E) 2

Yechilishi: $x^2-(a+2)x+a+7=0$

$\begin{cases} x_1+x_2=a+2; \\ x_1\cdot x_2=a+7; \\ \frac{1}{x_1}+\frac{1}{x_2}=\frac{7}{12} \Rightarrow \frac{x_1+x_2}{x_1\cdot x_2}=\frac{7}{12} \Rightarrow \frac{a+2}{a+7}=\frac{7}{12} \Rightarrow \end{cases}$

$12a+24=7a+49 \Rightarrow 5a=25 \Rightarrow a=5$. Javobi: A.

22.$y=x^2+4(a-2)x+5$ parabolaning uchi $x+a=0$ to'g'ri chiziqda yotsa, a ning qiymatini toping.

A) 4 B) 8 C) -4 D) -2 E) 1

Yechilishi: $\begin{cases} y=x^2+4(a-2)x+5 \\ x=-a \end{cases} \Rightarrow$

$\Rightarrow x=-\frac{b}{2a}=-\frac{4a-8}{2\cdot 1}=4-2a \Rightarrow$

$4-2a+a=0 \Rightarrow a=4$. Javobi: A.

23.$y=(a-2)\cdot x^2-(a-2)\cdot x+6$ va istalgan x haqiqiy son uchun $y>5$ bo'lsa, a ning qiymatini toping.

A) (2; 6) B) (1; 5) C) [2; 6) D) (0;5) E) $\emptyset$

Yechiishi: $y=(a-2)\cdot x^2-(a-2)\cdot x+6;$

$(a-2)\cdot x^2-(a-2)\cdot x+6>5;$

$(a-2)\cdot x^2-(a-2)\cdot x+1>0.$

Bu tengsizlik doimo o′rinli bo′lishi uchun

$\begin{cases} a-2>0 \\ D=(a-2)^2-4\cdot(a-2)<0 \end{cases}$ *bo′lishi kerak.*

Bundan $(a-2)(a-2-4)<0 \Rightarrow$

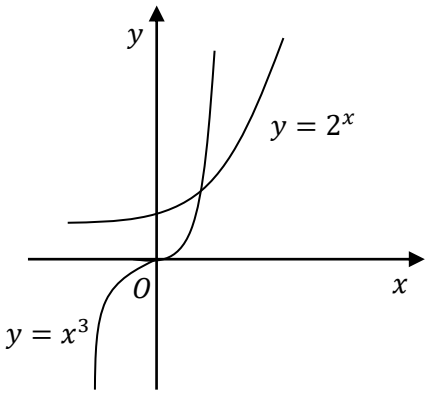
$\Rightarrow (a-2)(a-6)<0 \Rightarrow (2;6)$. Javobi: A.

24.$2^x = x^3$ tenglama nechta haqiqiy ildizga ega?

A) 2 B) 1 C) 3 D) $\emptyset$ E) *aniqlab bo′lmaydi*

Yechilishi: $2^x = x^3 \Rightarrow 2^x > 0; \Rightarrow x > 0; x \neq 1.$

Tenglikning ikkita tomoni ikkita funksiya ko′rini – shida yozib olinadi: $\begin{cases} y=2^x; \\ y=x^3. \end{cases}$



Bu funksiyalarning grafig – lari bitta nuqtada kesishadi.

Javobi: B.

25.Uchburchakning tomonlari 9; 15 va x ga teng. Uchburchakning yarim perimetri qaysi oraliqqa tegishli bo'ladi?

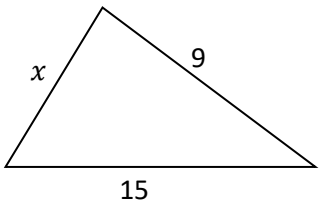
A) (15; 24) B) (6; 28) C) (9; 15)

D) (30; 48) E) (18; 30)

Yechilishi: $\begin{cases} x+9>15 \\ 9+15>x \end{cases} = \begin{cases} x>6 \\ x<24 \end{cases} \Rightarrow$

$\Rightarrow x = 8;$

$\frac{8+9+15}{2} = 16 \in (15;24)$. Javobi: A.



26.Agar arifmetik progressiyaning dastlabki n ta hadining yig'indisi $S_n = \frac{n^2}{2} - 3n$ formula bilan topilsa, uning umumiy hadi qanday ifodalanadi?

A) $n - 3{,}5$ B) $\frac{1}{2}n + 3{,}5$ C) $3n - 0{,}5$

D) $n + 3{,}5$ E) $2n + 0{,}5$

Yechilishi: $S_n = \frac{n^2}{2} - 3n;\ \ a_n = ?$

$S_{n-1} = \frac{(n-1)^2}{2} - 3(n-1) = \frac{n^2-2n+1}{2} - 3n + 3 =$

$= \frac{n^2-2n+1-6n+6}{2} = \frac{n^2}{2} - 4n + 3{,}5; \quad a_n = S_n - S_{n-1} =$

$= \frac{n^2}{2} - 3n - \frac{n^2}{2} + 4n - 3{,}5 = n - 3{,}5.$ Javobi: A.

27.Arifmetik progressiyaning oltinchi hadi 10 ga, datslabki 16 ta hadining yig'indisi 200 ga teng. Bu progressiyaning 12-hadini toping.

A) 16 B) 14 C) 18 D) 20 E) 15

Yechilishi: $a_6 = 10;\ \ S_{16} = 200;\ \ a_{12} = ?$

$\frac{a_1+a_{16}}{2} \cdot 16 = 200; \quad a_1 + a_1 + 15d = 25 \Rightarrow$

$\Rightarrow \begin{cases} 2a_1 + 15d = 25 \\ a_1 + 5d = 10 \end{cases} \Rightarrow \begin{cases} 2a_1 + 15d = 25 \\ 2a_1 + 10d = 20 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 5d = 5 \\ d = 1 \end{cases} \Rightarrow a_1 = 5;\ a_{12} = a_1 + 11d = 16.$

Javobi: A.

28.O'suvchi geometrik progressiyani tashkil etuvchi uchta musbat sonning yig'indisi 42, bu sonlarning 2 asosga ko'ra logarifmlarining yig'indisi 9 ga teng. Progressiyaning maxrajini toping.

A) 4 B) 2 C) 3 D) 7 E) 2,4

Yechilishi: $\begin{cases} b_1 + b_1q + b_1q^2 = 42 \\ b_1 \cdot b_1q \cdot b_1q^2 = 2^9 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} b_1(q^2 + q + 1) = 42 \\ (b_1q)^3 = (2^3)^3 \end{cases} \Rightarrow \begin{cases} b_1(q^2 + q + 1) = 42 \\ b_1 = \frac{8}{q} \end{cases} \Rightarrow$

$\Rightarrow 4q^2 - 17q + 4 = 0 \Rightarrow \begin{cases} q = \frac{1}{4} < 1; \\ q = 4. \end{cases}$ Javobi:A.

29.x_1 va x_2 sonlar $x^2+3x+k=0$ tenglamaning ildizlari $\frac{x_1}{x_2}=-\frac{2}{5}$ bo'lsa, k ning qiymatini toping.

A) -10 B) -7 C) -12 D) -8 E) -6

Yechilishi: $x^2+3x+x=0;\ \frac{x_1}{x_2}=-\frac{2}{5}\Rightarrow$

$x_1=-\frac{2}{5}x_2;\quad x_1+x_2=-3\Rightarrow -\frac{2}{5}x_2+x_2=-3\Rightarrow$

$\Rightarrow\ -2x_2+5x_2=-15\Rightarrow 3x_2=-15\Rightarrow$

$\Rightarrow x_2=-5\Rightarrow\ x_1=2\Rightarrow x_1\cdot x_2=k\Rightarrow k=-10.$

Javobi: A.

30.$f(x)=9^x+5\cdot 3^{-2x}$ funksiya qiymatlari to'plamini ko'rsating.

A) $[2\sqrt{5};\ \infty)$ B) $(0;\ \infty)$ C) $[5;\ \infty)$

D) $[6;\ \infty)$ E) $[3\sqrt{5};\ \infty)$

Yechilishi: $f(x)=9^x+5\cdot 3^{-2x}\ =9^x+\frac{5}{9^x}=\frac{9^{2x}+5}{9^x}$.

$f'(x)=\frac{9^x\ln 9(9^{2x}-5)}{9^{2x}}\Rightarrow\ 9^{2x}-5=0\Rightarrow 3^{4x}=5\Rightarrow$

$\Rightarrow (3^x)^4=5\Rightarrow 3^x=\sqrt[4]{5}\ \Rightarrow$

$x\log_3 3=\log_3\sqrt[4]{5}\Rightarrow x=\log_3\sqrt[4]{5}.\quad U\ holda$

$f\left(\log_3\sqrt[4]{5}\right)=\frac{9^{2\log_3\sqrt[4]{5}}+5}{9^{\log_3\sqrt[4]{5}}}=\frac{3^{\log_3\left(\sqrt[4]{5}\right)^4}+5}{3^{\log_3 9\sqrt[4]{5})^2}}=\frac{5+5}{\sqrt{5}}=\frac{10\sqrt{5}}{5}=$

$=2\sqrt{5}\Rightarrow\left[2\sqrt{5};+\infty\right).$ Javobi: A.

31.$f(x)=\sqrt{3^x-4^x}$ funksiyaning aniqlanish sohasini toping.

A) $(-\infty;0]$ B) $(0;1)$ C) $[0;1)$ D) $[0;\infty)$ E) $\{0\}$

Yechilishi: $f(x)=\sqrt{3^x-4^x}\ \Rightarrow\ 3^x-4^x\geq 0\ \Rightarrow\Rightarrow$

$3^x\geq 4^x\Rightarrow x\lg 3\geq x\lg 4\ \Rightarrow x\lg 3-x\lg 4\ \geq 0\ \Rightarrow$

$\Rightarrow x(\lg 3-\lg 4)\geq 0\begin{cases}x\leq 0\\ \lg 3-\lg 4<0\end{cases}\Rightarrow(-\infty;0].$

Javobi: A.

32.$f(x)=\frac{2x}{1+x^2}$ funksiyaning qiymatlari to'plamini aniqlang.

A) $[-1;1]$ B) $[0;1]$ C) R D) $[-1;0]$ E) $[0;\infty)$

Yechilishi: $f(x)=\frac{2x}{1+x^2} \Rightarrow f'(x)=\frac{2-2x^2}{(1+x^2)^2} \Rightarrow$

$\Rightarrow \begin{cases} 2-2x^2=0 \\ (1+x^2)^2 \neq 0 \end{cases} \Rightarrow x^2=1 \Rightarrow \begin{cases} x_1=-1 \\ x_2=1 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} f(-1)=-1 \\ f(1)=1 \end{cases} \Rightarrow [-1;1]$. Javobi: A.

33.$y=4+\frac{16}{\pi}\cdot arc\sin(3x-2)$ funksiyaning eng kichik qiymatini toping.

A) -4 B) 4 C) -2 D) 0 E) -6

Yechilishi: $y=4+\frac{16}{\pi}\cdot arc\sin(3x-2)=$

$=4+\frac{16}{\pi}\cdot\left(-\frac{\pi}{2}\right)=4-8=-4$. Javobi: A.

34.$y=ax^2+c$ funksiyaning grafigi $A(-1;\ -3)$ va $B(3;0)$ nuqtalardan o'tishi ma'lum bo'lsa, $\frac{c}{a}$ ning qiymati nechaga teng?

A) -9 B) 9 C) -8 D) -10 E) $\frac{8}{27}$

Yechilishi: $y=ax^2+c \Rightarrow \begin{cases} -3=a\cdot(-1)^2+c \\ 0=a\cdot 3^2+c \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} c+a=-3 \\ c+9a=0 \end{cases} \Rightarrow \begin{cases} a=0{,}375 \\ c=-3{,}375 \end{cases} \Rightarrow \frac{c}{a}=-9.$

Javobi: A.

35.Qaysi javobda toq funksiya ko'rsatilgan?

A) $y=2^x-2^{-x}$ B) $y=3^x+3^{-x}$ C) $y=\sin x^2$

D) $y=\sin^2 2x+\sqrt{4-x^2}$ E) $y=3arctgx+1$

Yechilishi: $y(-x)=2^{-x}-2^{-(-x)}=2^{-x}-2^x=$

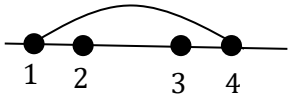
$= -(2^x - 2^{-x})$. Javobi: A.

36.Nechta butun son $y = \arcsin\frac{2x-5}{3}$ funksiyaning aniqlanish sohasiga tegishli?

A) 4 B) 3 C) 2 D) 1 E) 5

Yechilishi: $y = arc\sin\frac{2x-5}{3} => -1 \le \frac{2x-5}{3} \le 1 =>$

$$=> \begin{cases} \frac{2x-5}{3} \ge -1 \\ \frac{2x-5}{3} \le 1 \end{cases} => \begin{cases} 2x-2 \ge 0 \\ 2x-8 \le 0 \end{cases} => \begin{cases} x \ge 1 \\ x \le 4 \end{cases} => [1;4];$$



Javobi: A.

37.$y = \log_3(1 - 2\cos x)$ funksiyaning qiymatlari to'plamini aniqlang.

A) $(-\infty; 1]$ B) $(0; 1)$ C) $(0; 3)$

D) $(0; 1]$ E) $[1; 3]$

Yechilishi: $y = \log_3(1 - 2\cos x) =>$

$=> 1 - 2\cos x > 0 => \cos x < \frac{1}{2} => \frac{\pi}{3} < x < \frac{5\pi}{3}.$

$y' = \frac{2\sin x}{(1-2\cos x)\ln 3} => \sin x = 0 => x = \pi n, =>$

$$=> \begin{cases} x \ne 0 \\ x = \pi \end{cases} => y(\pi) = \log_3(1+2) = 1; (-\infty; 1].$$

Javobi: A.

38.$\frac{\lg(\sin^2 x)}{\lg(25-x^2)} = 0$ tenglama nechta ildizga ega?

A) 4 B) 5 C) 3 D) 2 E) $cheksiz\ ko'p$

Yechilishi: $\frac{\lg(\sin^2 x)}{\lg(25-x^2)} = 0 => \begin{cases} \lg(\sin^2 x) = 0; \\ \lg(25-x^2) \ne 0; \end{cases}$

$Logarifmning\ aniqlanish\ sohasi\ topiladi$:

$$\begin{cases} \mathrm{Sin}^2 x = 0 \\ 25 - x^2 > 0 \\ 25 - x^2 \neq 1 \end{cases} => \begin{cases} \frac{1}{2}(1 - \cos 2x) = 1 \\ x^2 < 25 \\ x^2 \neq 24 \end{cases} =>$$

$$=> \begin{cases} \cos 2x = -1 \\ -5 < x < 5 \\ x \neq \pm\sqrt{24} \end{cases} => \begin{cases} 2x = \pi + 2\pi k, k \in Z \\ -5 < x < 5 \\ x \neq \pm\sqrt{24} \end{cases} =>$$

$$=> \begin{cases} x = \frac{\pi}{2} + \pi k, k \in Z; \\ -5 < x < 5 \\ x \neq \pm\sqrt{24} \end{cases} \quad k = -2;\ -1; 0; 1\ bo'lganda$$

$yechim\ 4\ ta\ bo'ladi.$ Javobi: A.

39.$\log_5 \log_5 \sqrt[5]{\sqrt[5]{\sqrt[5]{\sqrt[5]{5}}}}$ ni hisoblang.

A) -4 B) $\frac{1}{5}$ C) $-\frac{1}{4}$ D) 4 E) -2

Yechilishi: $\log_5 \log_5 \sqrt[5]{\sqrt[5]{\sqrt[5]{\sqrt[5]{5}}}} = \log_5 \log_5 5^{\frac{1}{5^4}} =$

$= \log_5 5^{-4} = -4.$ Javobi: A.

40.Agar $\sin\alpha\left(1 - 2\ \sin^2\frac{\alpha}{2}\right) = \frac{1}{3}$ bo'lsa,

$\cos\left(\frac{\pi}{4} - \alpha\right)\sin(\frac{3\pi}{4} - \alpha)$ni hisoblang.

A) $\frac{5}{6}$ B) $\frac{3}{4}$ C) $\frac{4}{5}$ D) $\frac{\sqrt{3}}{4}$ E) $\frac{\sqrt{3}}{2}$

Yechilishi: $\sin\alpha\left(1 - 2\ \sin^2\frac{\alpha}{2}\right) = \frac{1}{3} =>$

$\sin\alpha \cdot \cos\alpha = \frac{1}{3} => 2\sin\alpha\cos\alpha = \frac{2}{3} => \sin 2\alpha = \frac{2}{3};$

$\cos\left(\frac{\pi}{4} - \alpha\right)\sin\left(\frac{3\pi}{4} - \alpha\right) = \left(\cos\frac{\pi}{4}\cos\alpha + \sin\frac{\pi}{4}\sin\alpha\right) \cdot$

$\cdot \left(\sin\frac{3\pi}{4}\cos\alpha - \cos\frac{3\pi}{4}\sin\alpha\right) = \frac{\sqrt{2}}{2}(\cos\alpha + \sin\alpha) \cdot$

$\cdot \frac{\sqrt{2}}{2}(\cos\alpha + \sin\alpha) = \frac{1}{2}(\cos\alpha + +\sin\alpha)^2 =$

$= \frac{1}{2}(1 + \sin 2\alpha) = \frac{1}{2}\left(1 + \frac{2}{3}\right) = \frac{5}{6}.$ Javobi: A.

41. $8^{\sin^2 x} - 2^{\cos^2 x} = 0$ tenglamani yeching.

A) $\pm\frac{\pi}{6} + \pi n,\ n \in Z$ B) $\frac{\pi}{6} + \pi n,\ n \in Z$

C) $-\frac{\pi}{6} + \pi n,\ n \in Z$ D) $\frac{\pi}{4} + \pi n,\ n \in Z$

E) $-\frac{\pi}{4} + \pi n,\ n \in Z$

Yechilishi: $8^{\sin^2 x} - 2^{\cos^2 x} = 0 => 3\sin^2 x = \cos^2 x =>$

$=> ctg^2 x = 3 => ctgx = \pm\sqrt{3} =>$

$=> x = \pm\frac{\pi}{6} + \pi n, n \in Z.$ Javobi: A.

42. $\cos^2\left(\frac{\pi x}{6}\right) + \sqrt{2x^2 - 5x - 3} = 0$ tenglamani yeching.

A) 3 B) $\frac{3}{2}$ C) $-\frac{1}{2}$ D) -3 E) $\frac{1}{2}$

Yechilishi: $\cos^2\left(\frac{\pi}{6}\cdot x\right) + \sqrt{2x^2 - 5x - 3} = 0. =>$

$$=> \begin{cases} \cos^2\left(\frac{\pi}{6}\cdot x\right) = 0 \\ \sqrt{2x^2 - 5x - 3} = 0 \end{cases} => \begin{cases} \cos\frac{\pi x}{6} = 0 \\ 2x^2 - 5x - 3 = 0 \end{cases} => =$$

$$> \begin{cases} \frac{\pi x}{6} = \frac{\pi}{2} + \pi k \\ x_1 = -\frac{1}{2} \\ x_2 = 3 \end{cases} => \begin{cases} x = 3 + 6k \\ x_1 = -\frac{1}{2} \\ x_2 = 3 \end{cases} => x = 3.$$ Javobi: A.

43. $\frac{|\cos x|}{\cos x} = \cos 2x - 1$ tenglama $[\pi; 2\pi]$ kesmada nechta idizga ega?

A) 1 B) 2 C) 3 D) 4 E) $\emptyset$

Yechilishi: $\frac{|\cos x|}{\cos x} = \cos 2x - 1 => \begin{cases} -1 = \cos 2x - 1 \\ 1 = \cos 2x - 1 \\ \cos x \neq 0 \end{cases} =>$

$=> \begin{cases} \cos 2x = 0 \\ \cos 2x \neq 2 \\ x \neq \frac{\pi}{2} + \pi k, k \in Z \end{cases} => 2x = \frac{\pi}{2} + \pi k, k \in Z =>$

$=> \begin{cases} x = \frac{\pi}{4} + \frac{\pi}{2} k, k \in Z; \\ x \neq \frac{\pi}{2} + \pi k, k \in Z. \end{cases}$ $k = 2 => x = \frac{5\pi}{4}$ $ildiz$;

$k = 3 => x = \frac{7\pi}{4}$ $chet\ ildiz$. Javobi: A.

44.$\cos(-7{,}9\pi) \cdot tg(-1{,}1\pi) - \sin 5{,}6\pi \cdot ctg 4{,}4\pi$ ni soddalashtiring.

A) 0 B) 1 C) -1 D) $\sqrt{2}$ E) $-\sqrt{2}$

Yechilishi: $\cos(-7{,}9\pi) \cdot tg(-1{,}1\pi) - \sin 5{,}6\pi \cdot ctg 4{,}4\pi = -\cos 7{,}9\pi \cdot tg 1{,}1\pi - \sin 5{,}6\pi \cdot ctg 4{,}4\pi =$

$= -\cos\left(8\pi - \frac{79\pi}{10}\right) \cdot tg\left(\pi - \frac{11\pi}{10}\right) — \sin\left(6\pi - \frac{56\pi}{10}\right) \cdot$

$\cdot ctg\left(4\pi - \frac{44\pi}{10}\right) = -\cos\frac{\pi}{10} \cdot tg\left(-\frac{\pi}{10}\right) \cdot \sin\left(-\frac{4\pi}{10}\right) \cdot$

$\cdot ctg\left(-\frac{4\pi}{10}\right) = \cos\frac{\pi}{10} \cdot tg\frac{\pi}{10} - \sin\frac{4\pi}{10} \cdot ctg\frac{4\pi}{10} =$

$= \sin\frac{\pi}{10} - \cos\frac{4\pi}{10} = \sin\left(\frac{\pi}{2} - \frac{\pi}{10}\right) - \cos\frac{2\pi}{5} =$

$= \cos\frac{4\pi}{10} - \cos\frac{2\pi}{5} = 0.$ Javobi: A.

45.$\sin(2arc\ tg3) - \cos(2arc\ tg2)$ ni hisoblang.

A) 1,2 B) 1,4 C) -0,8 D) 0,8 E) 1,6

Yechilishi: $\sin(2arc\ tg3) - \cos(2arc\ tg2) =$

$= \frac{2tg\ arc\ tg3}{1+(tg\ arc\ tg3)^2} - \frac{1-(tg\ arc\ tg2)^2}{1+(tg\ arc\ tg2)^2} = \frac{6}{1+9} - \frac{1-4}{1+4} = \frac{6}{10} + \frac{3}{5} =$

$= \frac{12}{10} = 1{,}2.$ Javobi: A.

46.$4\cos 20° - \sqrt{3} ctg 20°$ ni hisoblang.

A) -1 B)1 C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) $2\sqrt{3}$

Yechilishi: $4\cos 20° - \sqrt{3}ctg20° = 4\cos 20° - \sqrt{3}\frac{\cos 20°}{\sin 20°} = \frac{2\cdot 2\sin 20°\cdot\cos 20° - tg60°\cdot\cos 20°}{\sin 20°} =$

$= \frac{2\sin 40° - \frac{\sin 60°\cos 20°}{\cos 60°}}{\sin 20°} = \frac{2\sin 40° - 2\sin 60°\cos 20°}{\sin 20°} =$

$= \frac{2\sin 40° - 2\cdot\frac{1}{2}(\sin 80° + \sin 40°)}{\sin 20°} = \frac{\sin 40° - \sin 80°}{\sin 20°} =$

$= \frac{2\cos\frac{120°}{2}\cdot\sin\frac{-40°}{2}}{\sin 20°} = -1.$ Javobi: A.

47.Agar $y = 4 - \sqrt[3]{x^2}$ bo'lsa, $y'(-\frac{8}{27})$ni hisoblang.

A) 1 B) $\frac{2}{3}$ C) -1 D) $-\frac{2}{3}$ E) 3

Yechilishi: $y' = -\frac{2}{3}x^{\frac{2}{3}-1} = -\frac{2}{3}\cdot x^{-\frac{1}{3}} = -\frac{2}{3\sqrt[3]{x}} =>$

$=> y'\left(-\frac{8}{27}\right) = -\frac{2}{3\sqrt[3]{-\left(\frac{2}{3}\right)^3}} = 1.$ Javobi: A.

48.$f(x) = \int_0^x \cos^2 t\, dt$ funksiyaning hosilasini toping.

A) $\cos^2 x$ B) $\frac{1}{2}\cos 2x$ C) $\cos 2x - 1$

D) $1 + \cos 2x$ E) $1 - \cos 2x$

Yechilishi: $f(x) = \int_0^x \cos^2 t\, dt = \int_0^x \frac{1}{2}(1 + \cos 2t\, dt =$

$= \frac{1}{2}t\Big|_0^x + \frac{1}{4}\sin 2t\Big|_0^x = \frac{1}{2}x + \frac{1}{4}\sin 2x;$

$f'(x) = \frac{1}{2}(1 + \cos 2x) = \cos^2 x.$ Javobi: A.

49.Agar $a = \int_1^4 \frac{dx}{\sqrt{x}}$ va $b = \int_1^8 \frac{dx}{\sqrt[3]{x}}$ bo'lsa, ab ko'paytma nechaga teng?

A) 9 B) 3 C) 6 D) 8 E) 12

Yechilishi: $a = \int_1^4 x^{-\frac{1}{2}}dx = \frac{x^{\frac{1}{2}}}{\frac{1}{2}}|_1^4 = 2\left[\sqrt{4} - \sqrt{1}\right] = 2;$

$b = \int_1^8 x^{-\frac{1}{3}}\,dx = \frac{x^{\frac{2}{3}}}{\frac{2}{3}}|_1^8 = \frac{3}{2}\left[\sqrt[3]{64} - \sqrt[3]{1}\right] = \frac{9}{2};\ a \cdot b = 9.$

Javobi: A.

50.$\overrightarrow{e_1}$ va $\overrightarrow{e_2}$ o'zaro perpendikulyar birlik vektorlar bo'lsa, $\left|\overrightarrow{e_1} - \frac{2(\overrightarrow{e_1}+2\overrightarrow{e_2})}{5}\right|$ ni hisoblang.

A) 1 B) 2 C) 3 D) $\frac{1}{2}$ E) 2,5

Yechilishi: $\overrightarrow{e_1} \perp \overrightarrow{e_2};\ |\overrightarrow{e_1}| = |\overrightarrow{e_2}| = 1$;

$\left|\overrightarrow{e_1} - \frac{2(\overrightarrow{e_1}+2\overrightarrow{e_2})}{5}\right| = \left|\frac{5\overrightarrow{e_1}-2\overrightarrow{e_1}-4\overrightarrow{e_2}}{5}\right| = \left|\frac{3\overrightarrow{e_1}-4\overrightarrow{e_2}}{5}\right| =>$

$=> \left|\overrightarrow{e_1} - \frac{2(\overrightarrow{e_1}+2\overrightarrow{e_2})}{5}\right|^2 = \left|\frac{3\overrightarrow{e_1}-4\overrightarrow{e_2}}{5}\right|^2 = \frac{9\overrightarrow{e_1}^2+16\overrightarrow{e_2}^2-24\overrightarrow{e_1}\overrightarrow{e_2}}{25} =$

$= \frac{25}{25} = 1.$ Javobi: A.

51.To'g'ri to'rtburchak yuzini ifodalaydigan son uning perimetrini ifodalaydigan sonning 120% iga teng. Agar to'g'ri to'rtburchakning asosi balandligidan 2 birlik uzun bo'lsa, uning yuzini toping.

A) 24 B) 15 C) 35 D) 8 E) 48

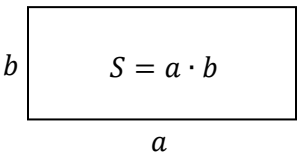
Yechilishi: $p = 2(a + b);$

$a = b + 2;\ S = \frac{120}{100} \cdot p;$

$U\ holda\ (b + 2) \cdot b =$

$= 1{,}2 \cdot 2(b + 2 + b) =>$

$=> b = 4;\ a = 6.$ Javobi: A.



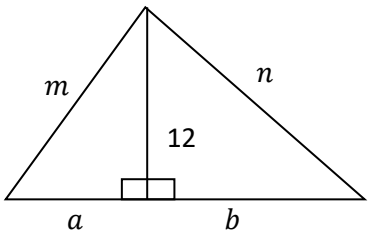
52.Uchburchakning balandligi 12 ga teng bo'lib, u asosini 5:16 nisbatda bo'ladi. Agar asosning uzunligi 21 ga teng bo'lsa, uchburchakning perimetrini toping.

A) 54 B) 52 C) 56 D) 108 E) 48

Yechilishi: $\frac{a}{b} = \frac{5}{16} => a = \frac{5}{16} \cdot b;\ a + b = 21;$

$\frac{5}{16}b + b = 21 => 21b = 21 \cdot 16 =>$

$=> b = 16 => a = 5;$



$m^2 = 12^2 + 5^2 = 169 => m = 13;$

$n^2 = 12^2 + 16^2 =$

$= 44 + 256 = 400 => n = 20;$

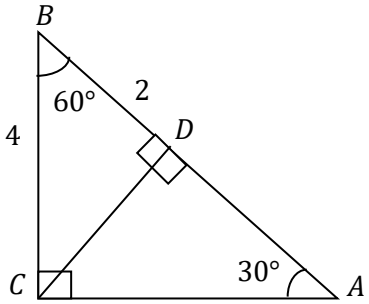
$P = 21 + 13 + 20 = 54.$ Javobi: A.

53.ABC to'g'ri burchakli uchburchakda gepotenuzaga CD balandlik o'tkazilgan. Agar $\angle B = 60^\circ$ va $BD = 2$ bo'lsa, gepotenuzaning uzunligini toping.

A) 8 B) 9 C) 6 D) 7 E) 10

Yechilishi: $\frac{BD}{BC} = \cos 60° =>$

$=> BC = 4;$

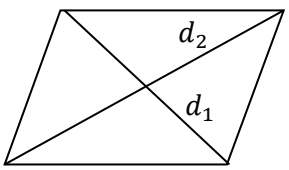


$\frac{BC}{AB} = \sin 30° => AB = 8.$ Javobi: A.

54.Parallelogramm diagonallarining yig'indisi 8 ga teng. Parallelogramm barcha tomonlari kvadratlari yig'indisining eng kichik qiymatlarini toping.

A) 32 B) 30 C) 64 D) 48 E) 34

Yechilishi: $d_1 + d_2 = 8 => d_1 = 8 - d_2;$



$d_1^2 + d_2^2 = 2(a^2 + b^2) =>$

$=> y = d_1^2 + d_2^2 = (8 - d_2)^2 + d_2^2 =$

$= 64 - 16d_2 + d_2^2 + d_2^2 =>$

$=> y = 2d_2^2 - 16d_2 + 64 =>$

$=> y' = 4d_2 - 16 => 4d_2 - 16 = 0 =>$

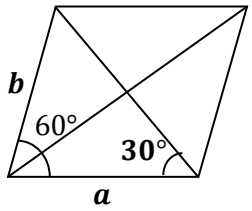
$=> d_2 = 4 =>\ d_1 = 8 - 4 = 4;$

$2(a^2+b^2)=4^2+4^2=32$. Javobi: A.

55.Parallelogrammning diagonali uning o'tmas burchagini 1:3 nisbatda bo'ladi. Agar parallelogrammning perimetri 60 ga, o'tkir burchagi 60° ga teng bo'lsa, uning katta tomonini toping.

A) 20 B) 18 C) 22 D) 25 E) 24

Yechilishi: $60^\circ+x+3x=180^\circ \Rightarrow x=30^\circ$;



$2(a+b)=60 \Rightarrow b=30-a$;

$a=2b \Rightarrow a=2(30-a) \Rightarrow$

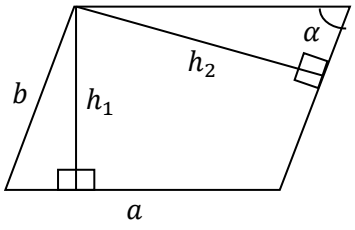
$\Rightarrow a=60-2a \Rightarrow 3a=60 \Rightarrow$

$\Rightarrow a=20$. Javobi: A.

56.Parallelogrammning o'tkir burchagi α 30° dan katta emas. Qo'shni tomonlarga o'tkazilgan ikkita balandligining ko'paytmasi 10 ga teng. Shu parallelogram yuzasining eng katta qiymati nechaga teng bo'lishi mumkin?

A) 20 B) $10\sqrt{3}$ C) $10\sqrt{2}$ D) $5\sqrt{3}$ E) $20\sqrt{2}$

Yechilishi: $\alpha \le 30^\circ$; $h_1 \cdot h_2 = 10$;



$To'g'riburchakli\ uchburchaklardan$

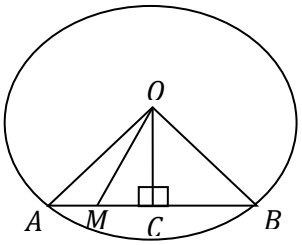
$$\begin{cases} \frac{h_1}{b}=\sin\alpha \\ \frac{h_2}{a}=\sin\alpha \end{cases} \Rightarrow \begin{cases} h_1=b\cdot\sin\alpha \\ h_2=a\cdot\sin\alpha \end{cases} \Rightarrow$$

$\Rightarrow h_1\cdot h_2=a\cdot b\cdot\sin^2\alpha \Rightarrow a\cdot b=\frac{10}{\sin^2\alpha}$;

$S=a\cdot b\cdot\sin\alpha=\frac{10}{\sin^2\alpha}\cdot\sin\alpha \Rightarrow \frac{10}{\sin\alpha}=20$. Javobi: A.

57.Radiusi 15 ga teng bo'lgan doira ichida uning markazidan 7 birlik masofadagi M nuqtadan AB=27 uzunlikdagi vatar o'tkazilgan. AB vatardan M nuqta ajratgan kesmalar uzunliklarining ko'paytmasini toping.

A) 176 B) 168 C)184 D) 172 E)170



Yechilishi: $OA = OB = 15;\ AB = 27;\ OM = 7; AC = BC = 13{,}5.$

$OC^2 = OB^2 - BC^2 = 42{,}75;$

$MC^2 = OM^2 - OC^2 =$

$= 49 - 42{,}75 = 6{,}25; MC = \sqrt{6{,}25};$

$AM = 13{,}5 - \sqrt{6{,}25};\ BM = AB - AM =$

$= 27 - 13{,}5 + \sqrt{6{,}25} = 13{,}5 + \sqrt{6{,}25};$

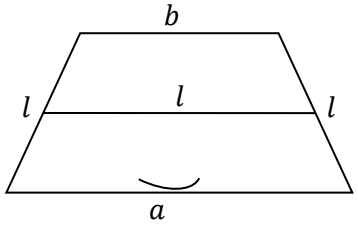
$AM \cdot BM = \left(13{,}5 - \sqrt{6{,}25}\right) \cdot \left(13{,}5 + \sqrt{6{,}25}\right) =$

$13{,}5^2 - 6{,}25 = 182{,}25 - 6{,}25 = 176.$ Javobi: A.

58.Ayalanaga tashqi chizilgan teng yonli trapetsiyaning perimetri 60 ga teng. Trapetsiyaning o'rta chizig'ini toping.

A) 15 B) 30 C) 20

D) 18 E) 12



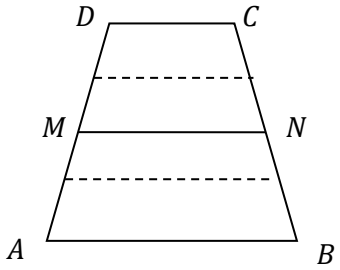
Yechilishi:

$a + b = 2l \Rightarrow \quad 4l = 60 \Rightarrow$

$\Rightarrow\ l = 15.$ Javobi: A.

59.ABCD tarpetsiyaning o'rta chizig'i uni o'rta chiziqlari 13 va 17 bo'lgan ikkita trapetsiyaga ajratadi. ABCD trapetsiyaning katta asosini toping.

A) 19 B) 21 C) 18 D) 30 E) 23



Yechilishi:
$$\begin{array}{r} MN + AB = 34 \\ - \quad MN + CD = 26 \\ \hline AB - CD = 8 \end{array}$$

$$\begin{array}{r} MN + AB = 34 \\ + \quad MN + CD = 26 \\ \hline 2MN + AB + CD = 60 \end{array}$$

$AB + CD = 2MN;$

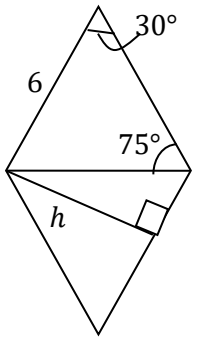
$AB + CD + AB + CD = 60 \Rightarrow AB + CD = 30;$

$$\begin{array}{r} AB + CD = 30 \\ + \quad AB - CD = 8 \\ \hline 2AB = 38 \end{array} \Rightarrow AB = 19.$$

Javobi: A.

60.Rombning perimateri 24 ga teng bo'lib, diagonallaridan biri uning tomoni bilan 75°li burchak teshkil etadi. Rombning qarama-qarshi tomonlari orasidagi masofani toping.

A) 3 B) 4 C) 3,2 D) 3,5 E) 3,6



Yechilishi:

$P = 4a \Rightarrow 4a = 24 \Rightarrow a = 6;$

$\frac{h}{a} = \sin 30° \Rightarrow h = 3.$ Javobi: A

61.Silindrning hajmi 120π ga , yon sirti 60π ga teng. Silindr asosining radiusini toping.

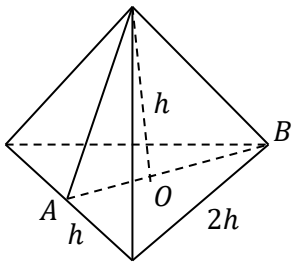
A) 4 B) 5 C) 6 D) 4,2 E) 3,8

Yechilishi: $\begin{array}{l} \pi R^2 H = 120\pi \\ 2\pi RH = 60\pi \end{array} \Rightarrow \frac{\pi R^2 H}{2\pi RH} = \frac{120\pi}{60\pi} \Rightarrow R = 4.$

Javobi: A.

62.Muntazam uchburchakli piramidaning balandligi asosining tomonidan ikki marta kichik. Piramidaning yon yog'i asos tekisligi bilan qanday burchak tashkil etadi?

A) 60° B) 30° C) 15° D) 45° E) 75°



Yechilishi: $AB^2 = 4h^2 - h^2 = 3h^2 \Rightarrow$

$\Rightarrow AB = \sqrt{3}h;$

$AO = \frac{1}{3}AB = \frac{\sqrt{3}}{3}h;\ \frac{h}{AO} = tg\alpha \Rightarrow$

$\Rightarrow tg\alpha = h{:}\frac{\sqrt{3}h}{3} = h \cdot \frac{3}{\sqrt{3}h} = \sqrt{3} \Rightarrow$

$\Rightarrow \alpha = 60^\circ.$ Javobi: A.

63.$a = 2\log_2 5$, $b = 3\log_{\frac{1}{8}} \frac{1}{23}, c = 4\log_{\frac{1}{4}} \frac{5}{26}$ sonlarni o'sish tartibida joylashtiring.

A) $b < a < c$ B) $a < b < c$ C) $b < c < a$

D) $c < b < a$ E) $c < a < b$

Yechilishi: $a = \log_2 25$; $b = -\log_2 \frac{1}{23} = \log_2 23$;

$c = -2\ \log_2 \frac{5}{26} = \log_2 \frac{676}{25} = \log_2 27{,}04$; $b < a < c$.

Javobi: A.

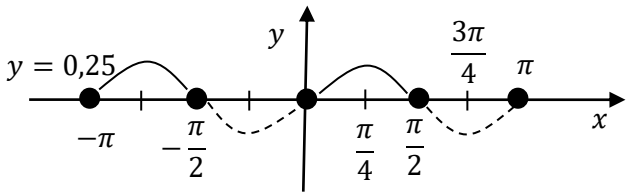
6-axborotnoma

1. $y = \sin x \cdot \cos x$ funksiya grafigining $[-\pi;\ \pi]$ kesmaga tegishli qismida ordinatasi 0,25 ga teng bo'lgan nechta nuqta bor?

A) 4 B) 6 C) 3 D) 8 E) $cheksiz\ ko'p$

Yechilishi: $y = \sin x \cdot \cos x = \frac{1}{2}\sin 2x$;

$$\begin{cases} y = 0{,}25 \\ y = \frac{1}{2}\sin 2x \end{cases} =>$$



$$=> \begin{cases} y = \frac{1}{4}; \\ \frac{1}{2}\sin 2x = \frac{1}{4} => \end{cases}$$

$$=> \sin 2x = \frac{1}{2} => 2x = (-1)^k \arcsin\frac{1}{2} + \pi k, k \in Z =>$$

$$=> 2x = (-1)^k \frac{\pi}{6} + \pi k, k \in Z =>$$

$$=> x = (-1)^k\ \frac{\pi}{12} + \frac{\pi}{2}k, k \in Z. k = -2; -1; 0; 1\ larda$$

$o'rinli.\ Demak, yechim\ 4\ ta.$ Javobi: A.

2. $\dfrac{0,(4) + 0,(41) + 0,(42) + 0,(43)}{0,(5) + 0,(51) + 0,(52) + 0,(53)}$ ni hisoblang.

A) $\frac{170}{211}$ B) $\frac{83}{103}$ C) $\frac{63}{107}$ D) $\frac{65}{106}$ E) $\frac{27}{46}$

Yechilishi: $\left(\frac{4}{9} + \frac{41}{99} + \frac{42}{99} + \frac{43}{99}\right) : \left(\frac{5}{9} + \frac{51}{99} + \frac{52}{99} + \frac{53}{99}\right) =$

$= \frac{44+41+42+43}{99} \cdot \frac{99}{55+51+52+53} = \frac{170}{211}$. Javobi: A.

3. $1 \cdot 4 + 2 \cdot 8 + 3 \cdot 12 + \cdots + 20 \cdot 80$ yig'indida har bir qo'shiluvchining ikkinchi ko'paytuvchisi bittadan kamaytirilsa, bu yig'indi qanchaga kamayadi?

A) 60 B) 120 C) 210 D) 375 E) 465

Yechilishi: $1 \cdot 4 + 2 \cdot 8 + 3 \cdot 12 + \cdots + 20 \cdot 80 =$

$= 4(1 + 2^2 + 3^2 + \cdots + 20^2) = 4 + 16 + 36 + 64 + \cdots + 1600;$

$1 \cdot 3 + 2 \cdot 7 + 3 \cdot 11 + 4 \cdot 15 + \cdots + 20 \cdot 79 = 3 + 14 + 33 + 60 + \cdots + 1580;$

$farq: \ 1, 2, 3, 4, \ldots, 20 => S_{20} = \frac{1 \cdot\cdot 20}{2} \cdot 20 = 210.$

Javobi: C.

4. $\frac{2}{7}, \frac{4}{11}, \frac{6}{13}$ va $\frac{8}{19}$ sonlariga bo'linganda, bo'linma butun son chiqadigan eng kichik natural sonni toping.

A) 6 B) 12 C) 18 D) 24 E) 48

Yechilishi: $\frac{2}{7}, \frac{4}{11}, \frac{6}{13}, \frac{8}{19}, => a: \frac{2}{7} = \frac{7a}{2}; => a = 24.$

Javobi: D.

5. Agar $\frac{29}{31} + \frac{38}{41} + \frac{47}{51} = a$ bo'lsa, $\frac{2}{31} + \frac{3}{41} + \frac{4}{51}$ quyidagilardan qaysi biriga teng?

A) $3 - a$ B) $4 - a$ C) $5 - a$ D) $3 - \frac{a}{2}$ E) $4 - \frac{a}{2}$

Yechilishi: $\frac{29}{31} + \frac{38}{41} + \frac{47}{51} = a; \ \frac{2}{31} + \frac{3}{41} + \frac{4}{51} = x;$

$a + x = \frac{29}{31} + \frac{2}{31} + \frac{38}{41} + \frac{3}{41} + \frac{47}{51} + \frac{4}{51} = 3 =>$

$=> a + x = 3 => x = 3 - a.$ Javobi: A.

6. Qanday son $\frac{2}{5}$ qismining $\frac{2}{5}$ qismidan 2 ayrilsa, 6 soni hosil bo'ladi?

A) 20 B) 50 C) 25 D) 15 E) 18

Yechilishi: $\frac{2}{5} \cdot x \cdot \frac{2}{5} - 2 = 6 => x = 50.$ Javobi: B.

7. $\frac{x^3y + 2x^2y - 3xy}{x^3 + 5x^2 + 6x} : \frac{1 - x^2}{x^2 + 3x + 2}$ ni soddalashtiring.

A) $\frac{y}{x}$ B) $-x$ C) $-y$ D) x E) y

Yechilishi: $\frac{x^3y+2x^2y-3xy}{x^3+5x^2+6x} \cdot \frac{x^2+3x+2}{1-x^2} = \frac{xy(x^2+2x-3)}{x(x^2+5x+6)} \cdot$

$\cdot \frac{x^2+3x+2}{1-x^2} = \frac{y(x-1)(x+3)}{(x+3)(x+2)} \cdot \frac{(x+1)(x+2)}{(1-x)(1+x)} = -y.$ Javobi: C.

8. Agar $\frac{4x^2-4xy+3y^2}{2y^2+2xy-5x^2} = 1$ bo'lsa, $\frac{x+y}{x-y}$ ning qiymati nimaga teng?

A) 2 B) -2 C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) -1

Yechilishi: $\frac{4x^2-4xy+3y^2}{2y^2+2xy-5x^2} = 1 =>$

$=> 4x^2 - 4xy + 3y^2 = 2y^2 + 2xy - 5x^2 =>$

$=> (3x)^2 - 6xy + y^2 = 0 => (3x - y)^2 = 0 =>$

$y = 3x => \frac{x+y}{x-y} = \frac{x+3x}{x-3x} = -2.$ Javobi: B.

9. $7^6 - 27$ soni quyidagilarning qaysi biriga qoldiqsiz bo'linadi?

A) 51 B) 49 C) 45 D) 23 E) 13

Yechilishi: $7^6 - 27 = (7^2)^3 - 3^3 =$

$= 46 \cdot (49^2 + 49 \cdot 3 + 3^2) => 23.$ Javobi: D.

10. Avtomobil butun yo'lning $\frac{3}{7}$ qismini 1 soatda, qolgan qismini 1,5 soatda bosib o'tdi. Uning birinchi tezligi ikkinchi tezligidan necha marta katta?

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{9}{8}$ D) $\frac{8}{9}$ E) $\frac{5}{4}$

Yechilishi: $\begin{cases} \frac{3}{7} \cdot S = v_1 \cdot 1 \\ \frac{4}{7} \cdot S = v_2 \cdot 1{,}5 \end{cases} => \begin{cases} v_1 = \frac{3S}{7} \\ v_2 = \frac{8S}{21} \end{cases} => \frac{v_1}{v_2} = \frac{9}{8}.$

Javobi: C.

11. Nodirda bor pulning $\frac{1}{8}$ qismi Jahongirdagi pulning $\frac{1}{2}$ qismiga teng. Nodir pulning necha foizini Jahongirga bersa, ularning pullari teng bo'ladi?

A) 25 B) 37,5 C) 40 D) 50 E) 62,5

Yechilishi: $\frac{1}{8}x = \frac{1}{2}y \Rightarrow x = 4y;\ 100\% - a\% =$
$= 25\% + a\% \Rightarrow 2a\% = 75\% \Rightarrow a\% = 37{,}5\%.$

Javobi: B.

12. Agar $2^a = 5$ va $20^b = 125$ bo'lsa, b va a orqali ifodalang.

A) $\frac{3-a}{2a}$ B) $\frac{a}{3-a}$ C) $\frac{2a}{3-a}$ D) $\frac{3a}{2+a}$ E) $\frac{3-a}{a}$

Yechilishi: $\begin{cases} 2^a = 5 \\ 20^b = 125 \end{cases} \Rightarrow \begin{cases} a\lg 2 = \lg\frac{10}{2} \\ b\lg 2 \cdot 10 = 3\lg\frac{10}{2} \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} a\lg 2 = 1 - \lg 2 \\ b(1+\lg 2) = 3(1-\lg 2) \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} \lg 2(a+1) = 1 \\ b + b\lg 2 = 3 - 3\lg 2 \end{cases} \Rightarrow \begin{cases} \lg 2 = \frac{1}{a+1} \\ \lg 2 = \frac{3-b}{3+b} \end{cases} \Rightarrow$

$\Rightarrow \frac{1}{a+1} = \frac{3-b}{3+b} \Rightarrow b = \frac{3a}{2+a}.$ Javobi: D.

13. $f\left(\frac{3x-2}{2}\right) = x^2 - x - 1.\ f(0) - ?$

A) $-\frac{5}{9}$ B) $-\frac{13}{9}$ C) $-\frac{7}{9}$ D) -1 E) $-\frac{11}{9}$

Yechilishi: $f\left(\frac{3x-2}{2}\right) = x^2 - x - 1 \Rightarrow \frac{3x-2}{2} = 0 \Rightarrow$

$\Rightarrow x = \frac{2}{3};\quad f(0) = \frac{4}{9} - \frac{2}{3} - 1 = -\frac{11}{9}.$ Javobi: E.

14. $4^{x+1} - 2^{x+4} + 3 \cdot 2^{x+2} + 48 = 0$ tenglamani yeching.

A) 1 B) 2 C) 3 D) 4 E) $\emptyset$

Yechilishi: $2^{2x} \cdot 2^2 - 2^x \cdot 2^4 + 3 \cdot 2^x \cdot 2^2 + 48 = 0$

$4 \cdot 2^{2x} - 16 \cdot 2^x + 12 \cdot 2^x + 48 = 0$

$(2^x)^2 - 2^x + 12 = 0 \Rightarrow 2^x = y \Rightarrow$

$y^2 - y + 12 = 0 \Rightarrow D < 0.$ Javobi: E.

15. $\sqrt[3]{x + \sqrt[3]{x + \sqrt[3]{x + \cdots}}} = 4$ tenglamani yeching.

A) 56 B) 48 C) 60 D) 54 E) 64

Yechilishi: $\sqrt[3]{x + \sqrt[3]{x + \sqrt[3]{x + \cdots}}} = 4 \Rightarrow$

$x + \sqrt[3]{x + \sqrt[3]{x + \cdots}} = 64 \Rightarrow x = 64 - \sqrt[3]{x + \sqrt[3]{x + \cdots}} =$

$= 64 - 4 = 60.$ Javobi: C.

16. $|x - 4| > |x + 4|$ tengsizlikni yeching.

A) $(-4;\ 4)$ B) $(0; 4) \cup (4;\ \infty)$ C) $(-4;\ \infty)$ D) $(-\infty;\ -4) \cup (-4; 0)$ E) $(-\infty; 0)$

Yechilishi: $|x - 4|^2 > |x + 4|^2 \Rightarrow$

$x^2 - 8x + 16 > x^2 + 8x + 16 \Rightarrow 16x < 0 \Rightarrow x < 0.$

Javobi: E.

17. $c_n = a \cdot k^{n-5} (a > 0)$ sonlar ketma-ketliginining umumiy hadi bo'lib, $c_2 \cdot c_8 = 16$ bo'lsa, *a* nimaga teng?

A) 2 B) 4 C) 5 D) 6 E) 8

Yechilishi: $c_n = a \cdot k^{n-5} (a > 0);\ C_2 \cdot C_8 = 16 \Rightarrow$

$\Rightarrow ak^{2-5} \cdot ak^{8-5} = 16 \Rightarrow a^2 \cdot k^0 = 16 \Rightarrow a = 4.$

Javobi: B.

18. Arifmetik progressiyada $a_1 = 1;\ a_5 = 5 + x$ va $a_{15} = 10 + 3x$ bo'lsa, a_{37} ni toping.

A) -53 B) -54 C) -55 D) -56 E) -57

Yechilishi: $a_1 = 1;\ a_5 = 5 + x;\ a_{15} = 10 + 3x;\ a_{37} = ?$

$\begin{cases} a_1 + 4d = 5 + x \\ a_1 + 14d = 10 + 3x \end{cases} \Rightarrow \begin{cases} 4d = 4 + x \ /\cdot 3 \\ 14d = 9 + 3x \end{cases} \Rightarrow$

$\frac{-\ 12d = 12 + 3x}{14d = 9 + 3x} \Rightarrow 2d = -3 \Rightarrow d = -\frac{3}{2} \Rightarrow a_{37} = a_1 + 36d =$

$= 1 + 36 \cdot \left(-\frac{3}{2}\right) = -53.$ Javobi: A.

19. $f'(x) = 6x^3 - 8x + 3\ ,\ f(2) = 0; f(-2) = ?$

A) 10 B) 12 C) -12 D) 18 E) -18

Yechilishi: $f'(x) = 6x^3 - 8x + 3\ , F(2) = 0; f(-2) = ?$

$F(x) = \int (6x^3 - 8x + 3)dx = 6 \cdot \frac{x^4}{4} - 8 \cdot \frac{x^2}{2} +$

$+3x + c \Rightarrow F(x) = \frac{3}{2}x^4 - 4x^2 + 3x + c \Rightarrow$

$\Rightarrow F(2) = \frac{3}{2} \cdot 2^4 - 4 \cdot 2^2 + 3 \cdot 2 + c = 0 \Rightarrow$

$\Rightarrow c = -24 + 16 - 6 = -14;\ F(-2) = \frac{3}{2} \cdot (-2)^4 -$

$-4(-2)^2 + 3 \cdot (-2) - 14 = 24 - 16 - 6 - 14 = -12.$

Javobi: C.

20. $f(x) = \ln \sqrt{8 + x^2}\ .f'(1) = ?$

A) $\frac{1}{8}$ B) $\frac{1}{9}$ C) 0 D) $\frac{1}{2\sqrt{2}}$ E) $\frac{1}{6}$

Yechilishi: $f(x) = \ln \sqrt{8 + x^2}\ ;$

$f'(x) = \frac{2x}{\sqrt{8+x^2} \cdot 2\sqrt{8+x^2}} = \frac{x}{8+x^2} \Rightarrow f'(1) = \frac{1}{9}.$

Javobi: B.

21. $f(x) = |x^2 - 14x + 45|;\ \ f'(6) = ?$

A) 0 B) 5 C) 2 D) 7 E) *mavjud emas*

Yechilishi: $f(x) = |x^2 - 14x + 45|;\ \ f'(6) = ?$

$\begin{cases} f(x) = -x^2 + 14x - 45 \\ f(x) = x^2 - 14x + 45 \end{cases} \Rightarrow \begin{cases} f'(x) = -2x + 14 \\ f'(x) = 2x - 14 \end{cases} \Rightarrow$

$f'(6) = 2.$ Javobi: C.

22. Agar $f(x)=\frac{7x^2+ax+b}{x}$ funksiya grafigi (2; 0) nuqtada absisissa o'qiga urinib o'tsa, *a-b* nimaga teng?

A) 0 B) 20 C) -21 D) 28 E) -56

Yechilishi: $y=\frac{7x^2+ax+b}{x} => \begin{cases} x_0=2 \\ y_0=\frac{7\cdot 2^2+2a+b}{2}= \\ y_0=0 \end{cases}$

$=\frac{28+2a+b}{2} => 0=\frac{28+2a+b}{2} => 2a+b+28=0;$

$y'(x)=\frac{(14x+a)\cdot x-(7x^2+ax+b)\cdot 1}{x^2}=\frac{7x^2-b}{x^2} =>$

$=> y'(2)=\frac{28-b}{4} => y'(2)=0 => b=28 =>$

$=> 2a+28+28=0 => a=-28 => a-b=-56.$

Javobi: E.

23. $x=0,\ y=9-x^2\ va\ y=x^2+1$ chiziqlar bilan chegaralangan sohaning yuzini toping.

A) $10\frac{1}{3}$ B) $10\frac{2}{3}$ C) $13\frac{2}{3}$ D) $18\frac{1}{3}$ E) $21\frac{1}{3}$

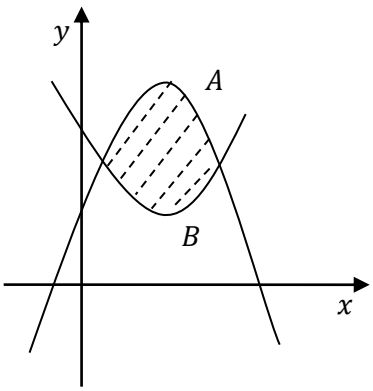
Yechilishi: $Integralning\ chegaralari\ aniqlanadi$:

$\begin{cases} y=9-x^2 \\ y=x^2+1 \end{cases} => 9-x^2=x^2+1 =$

$> 2x^2=8 =>$

$=> x=\pm 2.$

$A(0;9)\ va\ B(0;1)\ nuqtalar\ ordinatalari\ 9>1\ bo'lganligidan$



$S=\int_{-2}^{2}(9-x^2—x^2-1)dx =$

$=\int_{-2}^{2}(8-2x^2)dx=21\frac{1}{3}.$ Javobi: E.

24. $x=1,\ y=1-|x-1|\ va$

$y = -1 + |x - 1|$ chiziqlar bilan chegaralangan sohaning yuzini toping.

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) 1 D) $\frac{3}{2}$ E) 2

Yechilishi: $1 - |x - 1| = -1 + |x - 1| =>$

$=> 2|x - 1| = 2 => |x - 1| = 1 =>$

$x^2 - 2x + 1 = 1 =>$

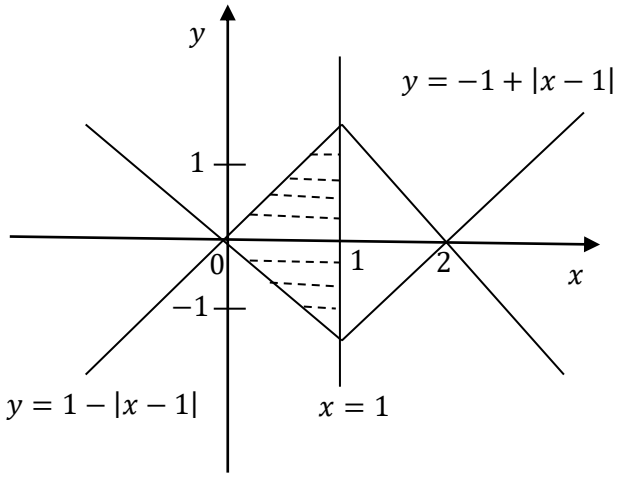
$=> x(x - 2) = 0 =>$

$=> x_1 = 0;\ x_2 = 2.$

$Demak,$

$S_\Delta = \frac{1}{2} \cdot a \cdot h =$

$= \frac{1}{2} \cdot 2 \cdot 1 = 1.$



Javobi: C.

25. $\int_0^1 \sqrt{x\sqrt{x\sqrt{x}}}\,dx$ ni hisoblang.

A) $\frac{1}{8}$ B) $\frac{8}{15}$ C) $\frac{17}{24}$ D) $\frac{24}{41}$ E) $\frac{12}{29}$

Yechilishi: $\sqrt{x\sqrt{x\sqrt{x}}} = \left(x\left(x\left(x^{\frac{1}{2}}\right)\right)^{\frac{1}{2}}\right)^{\frac{1}{2}} = x^{\frac{1}{2}} \cdot x^{\frac{1}{4}} \cdot x^{\frac{1}{8}} =$

$= x^{\frac{1}{2}+\frac{1}{4}+\frac{1}{8}} = x^{\frac{7}{8}}.\ \int_0^1 \sqrt{x\sqrt{x\sqrt{x}}}\,dx\ \int_0^1 x^{\frac{7}{8}}\,dx = \frac{8x^{\frac{15}{8}}}{15}\Big|_0^1 = \frac{8}{15}.$

Javobi: B.

26. Agar $\sin 37° = a$ bo'lsa $\sin 16°$ ni a orqali ifodalang.

A) $a^2 - 1$ B) $a - 1$ C) $2a^2 - 1$

D) $1 - 2a^2$ E) $aniqlab\ bo'lmaydi$

Yechilishi: $\sin 37° = a; => a^2 = \sin^2 37 =$

$= \frac{1}{2}(1 - \cos 74) = \frac{1}{2}(1 - \cos(90 - 16)) =$

$= \frac{1}{2}(1 - \sin 16°) => \sin 16 = 1 - 2a^2.$ Javobi: D.

27. To'g'ri to'rtburchak shaklidagi maydonning eni 32 m kanal qazildi. Agar shu maydonning yuzi 2 gektar bo'lsa, uning bo'yi necha m bo'ladi?

A) 610 B) 615 C) 620 D) 625 E) 630

Yechilishi: $32 \cdot a = 20000 => a = 625.$ Javobi: D.

28. Mehnat unumdorligi bir xil bo'lgan 2 ta ekskavator 35 m kanal qazidi. Birinchi ekskavator ikkinchisiga qaraganda uzunligi $1\frac{1}{2}$ marta ko'p kanal qazidi. Ikkinchi ekskavator necha m kanal qazigan?

A) 13 B) $13\frac{1}{2}$ C) 14 D) $14\frac{1}{2}$ E) 15

Yechilishi: $x + 1\frac{1}{2}x = 35 => \frac{5}{2}x = 35 => x = 14.$

Javobi: C.

29. 2 o'ram bir xil sim harid qilindi. Birinchi o'ram 3060 so'm, ikkinchi o'ram 1904 so'm turadi. Agar birinchi o'ram ikkinchi o'ramdan 17 m uzun bo'lsa, birinchi o'ramda necha m sim bor?

A) 40 B) 45 C) 47 D) 28 E) 35

Yechilishi: $\begin{array}{r} x + 17 - 3060 \\ -\quad x \quad - \quad 1904 \\ \hline 17m - 1156\ so'm \end{array} =>$

$=> 1m = 1156 : 17 = 68\ so'm.$ $3060 : 68 = 45\ m.$

Javobi: B.

30. $\frac{5}{7}$ qismi 4 ga teng bo'lgan sonni toping.

A) $5\frac{6}{7}$ B) $5\frac{1}{5}$ C) $5\frac{2}{5}$ D) $5\frac{3}{5}$ E) $5\frac{3}{7}$

Yechilishi: $\frac{5}{7} \cdot x = 4 \Rightarrow \quad x = 5\frac{3}{5}$. Javobi: D.

31. Avtomobilda 2 kunda mo'ljallangan yo'lning $\frac{6}{7}$ qismi bosib o'tildi. Bunda birinchi kuni ikkinchi kundagiga qaraganda 2 marta ko'p yo'lni o'tildi. Ikkinchi kuni yo'lning qancha qismi bosib o'tilgan?

A) $\frac{1}{7}$ B) $\frac{2}{7}$ C) $\frac{3}{7}$ D) $\frac{4}{7}$ E) $\frac{5}{7}$

Yechilishi: $2x + x = \frac{6}{7} \Rightarrow 3x = \frac{6}{7} \Rightarrow x = \frac{6}{21}$. Javobi: B.

32. Binoni 3 ta bo'yoqchi birgalikda bo'yadi. Birinchi binoning $\frac{5}{13}$ qismi yuzasini bo'yadi. Ikkinchisi esa, uchinchisiga nisbatan 3 marta ko'p yuzani bo'yadi. Uchinchi bo'yoqchi qancha qism yuzani bo'yagan?

A) $\frac{1}{18}$ B) $\frac{1}{13}$ C) $\frac{1}{9}$ D) $\frac{2}{13}$ E) $\frac{1}{6}$

Yechilishi: $S - \frac{5}{13} \cdot S = \frac{8}{13} \cdot S \Rightarrow 3x + x = \frac{8}{13} \cdot S \Rightarrow$

$\Rightarrow x = \frac{2}{13}S$. Javobi: D

33. 0,23 qismi 690 ga teng sonni toping.

A) 3000 B) 2500 C) 2800 D) 3500 E) 3200

Yechilishi: $0{,}23 \cdot x = 690 \Rightarrow x = 3000$. Javobi: A.

34. To'g'ri to'rtburchakning bo'yi 20% va eni 10% ga orttirilsa, uning yuzi necha prosent ortadi?

A) 30 B) 20 C) 27 D) 32 E) 35

Yechilishi: $S = a \cdot b;\ S_1 = \frac{100+20}{100} \cdot a \cdot \frac{100+10}{100} \cdot b =$

$= 1{,}2 \cdot 1{,}1 \cdot a \cdot b = 1{,}32 \cdot S \Rightarrow 32\%$. Javobi: D.

35. To'g'ri to'rtburchakning bo'yi 30% orttirilsa va eni 30% kamaytirilsa, uning yuzi qanday o'zgaradi?

A) $o'zgarmaydi$ B) $9\%\ kamayadi$

C) 15% $kamayadi$ D) 7% $kamayadi$

E) 7% $ortadi$

Yechilishi: $= a \cdot b;\ S_1 = \frac{100+30}{100} \cdot a \cdot \frac{100-30}{100} \cdot b =$

$= 1{,}3 \cdot 0{,}7 \cdot a \cdot b = 0{,}91 \cdot S => 9\%.$ Javobi: B.

36. 9,6 t yukni tushirish uchun bir necha ishchi jo'natildi. Lekin ulardan 2 tasi boshqa ishga yuborildi. Shu sababli qolgan har bir ishchi 0,24 t ko'p yuk tashidi. Agar har bir ishchi bir xil miqdordagi yuk tushirgan bo'lsa, yukni tushirishda necha kishi ishlagan?

A) 6 B) 9 C) 8 D) 12 E) 10

Yechilishi: $\frac{9{,}6}{x} = a;\ \frac{9{,}6}{x-2} = a + 0{,}24 =>$

$=> \frac{9{,}6}{x-2} = \frac{9{,}6}{x} + 0{,}24 => 9{,}6x = 9{,}6(x-2) + 0{,}24x \cdot$

$\cdot (x-2) => x = 10 => x - 2 = 8.$ Javobi: C.

37. 3, 6, 7 va 9 raqamlaridan ularni takrorlamasdan mumkin bo'lgan barcha 4 xonali sonlar tuzilgan. Bu sonlar ichida nechtasi 4 ga qoldiqsiz bo'linadi?

A) 2 B) 4 C) 6 D) 8 E) 12

Yechilishi: $Sonning\ 4\ ga\ qoldiqsiz\ bo'linish\ alomati\ e'tiborga\ olinadi$: 7936, 9736, 3976, 9376, 3796, 7396. Javobi: C.

38. 46 o'quvchi 10 ta qayiqda turistik sayrga jo'nashdi. Qayiqlarning bir qismi 4 o'rinli, qolganlari 6 o'rinli edi. Agar qayiqlardagi barcha o'rinlar band bo'lgan bo'lsa, nechta 4 o'rinli qayiq bo'lgan?

A) 4 B) 5 C) 6 D) 7 E) 8

Yechilishi: $x - 6\ o'rinli\ qayiqlar, y\ esa\ 4\ o'rinli\ qa -$

$yiqlar\ bo'lsa$: $\begin{cases} x+y=10 \\ 6x+4y=46 \end{cases} => -\begin{matrix} 4x+4y=40 \\ 6x+4y=46 \end{matrix} =>$

$2x=6 => x=3; y=7.$ Javobi: D.

39. $x^3+2x^2=x+2$ tenglama ildizlari yig'indisini toping.

A) -3 B) -2 C) -1 D) 1 E) 2

Yechilishi: $x^3+2x^2=x+2 =>\ x^2(x+2)-$

$-(x+2)=0 => (x+2)(x^2-1)=0 =>$

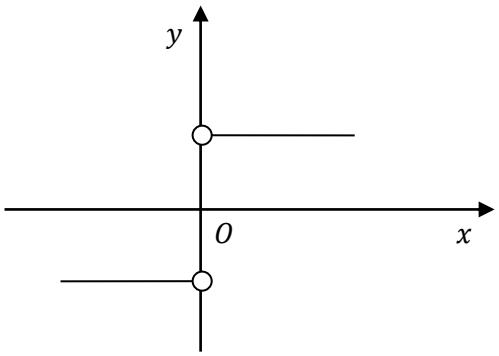
$\begin{cases} x_1=-2 \\ x_2=-1 \\ x_3=1 \end{cases} => x_1+x_2+x_3=-2.$ Javobi: B.

40. $y=\frac{x}{|x|}$ funksiyaning grafigi koordinatlar tekisligining qaysi choragida joylashgan?

A) III B) IV C) II, III D)I E) I, III

Yechilishi: $y=\frac{x}{|x|}=$

$=\begin{cases} 1, x>0\ bo'lsa; \\ mavjud\ emas, \quad x=0; \\ -1, \quad x<0 \quad bo'lsa. \end{cases}$



|, ||| Javobi: .E

41. $\begin{cases} 2x+3y=7 \\ 4x+6y=14 \end{cases}$ tenglamalar sistemasi nechta yechimga ega?

A) 1 B) 2 C) $yechimga\ ega\ emas$

D) $to'g'rijavob\ yo'q$ E) $cheksiz\ ko'pyechimga\ ega$

Yechilishi: $\begin{cases} 2x+3y=7 \\ 4x+6y=14 \end{cases} => \frac{2}{4}=\frac{3}{6}=\frac{7}{14} => \frac{1}{2}=\frac{1}{2}=\frac{1}{2}.$

Javobi: E.

42. $\frac{x+1}{x} \le 1$ tengsizlikni qanoatlantiruvchi *x* ning barcha qiymatlarini toping.

A) $-1 \le x < 0$ B) $x<0$ C) $-1<x<0$

D) $x > 0$ E) $x \geq 0$

Yechilishi: $x \neq 0$; $\frac{x+1}{x} - 1 \leq 0 \Rightarrow \frac{x+1-x}{x} \leq 0 \Rightarrow$

$\Rightarrow \frac{1}{x} \leq 0 \Rightarrow \begin{cases} 1 > 0 \\ x < 0 \end{cases} \Rightarrow -1 \leq x < 0$. Javobi: A.

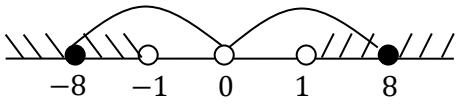
43. $y = \sqrt{\frac{8}{|x|} - 1} + \lg(x^2 - 1)$ funksiyaning aniqlanish sohasini toping.

A) $-8 < x < -1$ B) $1 < x < 8$ C) $-1 < x < 1$

D) $-8 \leq x < -1,\ 1 < x \leq 8$ E) $1 < x \leq 8$

Yechilishi: $y = \sqrt{\frac{8}{|x|} - 1} + \lg(x^2 - 1)$; $\begin{cases} \frac{8}{|x|} - 1 \geq 0 \\ x \neq 0 \\ x^2 - 1 > 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} |x| \leq 8 \\ x \neq 0 \\ x^2 > 1 \end{cases} \Rightarrow \begin{cases} -8 \leq x \leq 8 \\ x \neq 0 \\ |x| > 1 \Rightarrow \begin{cases} x > 1 \\ x < -1 \end{cases} \end{cases} \Rightarrow$



$[-8;\ -1) \cup (1;\ +8]$. Javobi: D.

44. 3602,1 sonini standart shaklda yozing.

A) $3{,}6 \cdot 10^3$ B) $0{,}36 \cdot 10^4$ C)$36{,}02 \cdot 10^2$

D) $3{,}6021 \cdot 10^3$ E)$3 \cdot 10^3$

Yechilishi: $3602{,}1 = 3{,}6021 \cdot 10^3$. Javobi: D.

45. $\sqrt{5^2 - 4^2} = \sqrt[x]{81}$ tenglamani yeching.

A) 2 B) 4 C) 3 D) 6 E) 5

Yechilishi: $\sqrt{5^2 - 4^2} = \sqrt[x]{81} \Rightarrow 3 = 3^{\frac{4}{x}} \Rightarrow x = 4$. Javobi: B.

46. $\sqrt[3]{1 - \sqrt{3}} \cdot \sqrt[6]{4 + 2\sqrt{3}}$ ni hisoblang.

A) $-\sqrt{2}$ B) $\sqrt[3]{2}$ C)$-\sqrt[3]{2}$ D) $\sqrt{2}$ E)$\sqrt[3]{3}$

Yechilishi: $\sqrt[3]{1-\sqrt{3}} \cdot \sqrt[6]{4+2\sqrt{3}} = \sqrt[6]{\left(1-\sqrt{3}\right)^2} \cdot$

$\cdot \sqrt[6]{4+2\sqrt{3}} = \sqrt[6]{\left(4-2\sqrt{3}\right)\left(4+2\sqrt{3}\right)} = \sqrt[6]{16-12} =$

$= \sqrt[6]{4} = \sqrt[3]{2}$. Javobi: B.

47. $\sqrt{2x^2+17} = x^2+1$ tenglamaning haqiqiy ildizlari ko'paytmasini toping.

A) 16 B) 4 C) -4 D) 8 E) -16

Yechilishi: $\sqrt{2x^2+17} = x^2+1 \Rightarrow 2x^2+17 = x^4 +$

$+2x^2+1 \Rightarrow x^4 = 2^4 \Rightarrow |x| = 2 \Rightarrow \begin{cases} x_1 = -2 \\ x_2 = +2 \end{cases} \Rightarrow$

$\Rightarrow -4$. Javobi: C.

48. $|x^2-5x| = 6$ tenglama ildizlarining yig'indisini toping.

A) 5 B) -6 C) 10 D) -5 E) -10

Yechilishi: $\begin{cases} x^2-5x+6=0 \\ x^2-5x-6=0 \end{cases} \Rightarrow \begin{cases} x_1 = 2; \ \ x_2 = 3 \\ x_3 = -1; \ x_4 = 6 \end{cases} \Rightarrow$

$\Rightarrow 10$. Javobi: C.

49. Daryo oqimi bo'yicha motorli qayiqda 28 km va oqimga qarshi 25 km o'tildi. Bunda butun o'tilgan yo'lga sarflangan vaqt turg'un suvda 54 km ni o'tish uchun ketgan vaqtga teng. Agar daryo oqimining tezligi 2 km/soat bo'lsa, motorli qayiqning turg'un suvdagi tezligini toping.

A) 10 B) 12 C) 18 D) 11 E) 15

Yechilishi: $\begin{matrix} (v+2)\cdot t_1 = 28 \\ (v-2)\cdot t_2 = 25 \end{matrix} \Rightarrow t_1 = \frac{28}{v+2}; \ \ t_2 = \frac{25}{v-2};$

$v \cdot t = 54 \Rightarrow t = \frac{54}{v}; \ \ t_1 + t_2 = t \Rightarrow \frac{28}{v+2} + \frac{25}{v-2} =$

$= \frac{54}{v} \Rightarrow v^2 - 6v - 216 = 0 \Rightarrow v = 18.$ Javobi: C.

50. x ning qanday qiymatlarida $y = x^2$ funksiyaning qiymati 9 dan katta bo'ladi?

A)$-3 < x < 3$ B) $x < -3$ C) $x > 3$

D) $x \leq -3$ E) $x < -3,\ x > 3$

Yechilishi: $x^2 > 9 \Rightarrow |x| > 3 \Rightarrow \begin{cases} x > 3; \\ x < -3. \end{cases}$ Javobi: E.

51. $|x^2 - 8| < 1$ tengsizlikni yeching.

A) $x < -\sqrt{7}$ B) $x > \sqrt{7}$ C) $-\sqrt{7} < x < \sqrt{7}$

D) $-3 < x < -\sqrt{7},\ \sqrt{7} < x < 3$ E) $-3 < x < 3$

Yechilishi: $-1 < x^2 - 8 < 1 \Rightarrow 7 < x^2 < 9 \Rightarrow$

$$\Rightarrow \begin{cases} x^2 > 7 \\ x^2 < 9 \end{cases} \Rightarrow \begin{cases} |x| > \sqrt{7} \\ |x| < 3 \end{cases} \Rightarrow \begin{cases} x > \sqrt{7} \\ x < -\sqrt{7} \\ -3 < x < 3 \end{cases} \Rightarrow$$

$\Rightarrow (-3;\ -\sqrt{7}) \cup (\sqrt{7};\ 3)$. Javobi: D.

52. $|x^2 + 2x| > 8$ tengsizlikni yeching.

A) $x < -4, x > 2$ B) $-4 < x < 2$ C) $x < -4$

D) $x > 2$ E) $x > -4$

Yechilishi: $\begin{cases} x^2 + 2x > 8 \\ x^2 + 2x < -8 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x^2 + 2x - 8 > 0 \Rightarrow x < -4; x > 2; \\ x^2 + 2x + 8 \not< 0 \Rightarrow (x+1)^2 + 7 > 0. \end{cases}$ Javobi: A

53. $((-17)^{-4})^{-6} : ((-17)^{-13})^{-2} - (\frac{1}{17})^2$ ni hisoblang.

A) $\frac{1}{289}$ B) $\frac{1}{17}$ C) 1 D) 0 E) $\frac{16}{17}$

Yechilishi: $((-17)^{-4})^{-6} : ((-17)^{-13})^{-2} - (\frac{1}{17})^2 =$

$= (-17)^{24} : (-17)^{26} - \frac{1}{17^2} = \frac{1}{17^2} - \frac{1}{17^2} = 0$. Javobi: D.

54. $1^{-0,43} - (0{,}008)^{-\frac{1}{3}} + (15{,}1)^0$ ni hisoblang.

A) 5 B) -3 C) -4 D) -5 E) -2

Yechilishi: $1^{-0,43} - (0{,}008)^{-\frac{1}{3}} + (15{,}1)^0 =$

$= 1 - \sqrt[3]{\frac{1000}{8}} + 1 = 2 - 5 = -3.$ Javobi: B.

55. $f(x) = \cos\frac{3x}{2} - \sin\frac{x}{3}$ funksiyaning eng kichik musbat davrini toping.

A) 6π B) $\frac{4\pi}{3}$ C) 8π D) 10π E) 12π

Yechilishi: $f(x) = \cos\frac{3x}{2} - \sin\frac{x}{3} => 2\pi:\frac{3}{2} = \frac{4\pi}{3};$

$2\pi:\frac{1}{3} = 6\pi => 12\pi.$ Javobi: E.

56. Arifmetik progressiyada $a_{10} = 56$ bo'lsa, uning dastlabki 19 ta hadlari yig'indisini toping.

A) 1024 B) 1032 C) 1056 D) 1064 E) 976

Yechilishi: $a_{10} = \frac{a_1+a_{19}}{2} = 56;\ S_{19} = 56 \cdot 19 = 1064.$

Javobi: D.

57. Ikkinchi hadi 6 ga teng, birinchi uchta hadining yig'indisi 26 ga teng o'suvchi geometrik progressiyaning uchinchi va birinchi hadlari ayirmasini toping.

A) 15 B) 16 C) 14 D) 13 E) 12

Yechilishi: $b_1,\ 6,\ b_3;\ b_1 + b_2 + b_3 = 26;\ b_3 - b_1 = ?$

$6 = b_1 q => b_1 = \frac{6}{q};\ b_3 = 6 \cdot q \quad \frac{6}{q} + 6 + 6q = 26 =>$

$=> \frac{6}{q} + 6q = 20 => 6q^2 - 20q + 6 = 0 =>$

$=> 3q^2 - 10q + 3 = 0 => \begin{cases} q_1 = \frac{1}{3} \\ q_2 = 3 \end{cases} => q = 3 =>$

$=> \begin{cases} b_1 = 2 \\ b_3 = 18 \end{cases} => b_3 - b_1 = 16.$ javobi: B.

58. $3^{3x-2} + 3^{3x+1} - 3^{3x} < 57$ tengsizlikni yeching.

A) $x > 1$ B) $x < 1\frac{1}{2}$ C) $x < 1$

D) $x > \frac{2}{3}$ E) $x < \frac{2}{3}$

Yechilishi: $\frac{3^{3x}}{9} + 3 \cdot 3^{3x} - 3^{3x} < 57 \Rightarrow 3^{3x} + 27 \cdot$

$\cdot 3^{3x} - 9 \cdot 3^{3x} < 9 \cdot 57 \Rightarrow 19 \cdot 3^{3x} < 9 \cdot 57 \Rightarrow$

$\Rightarrow 3^{3x} < 3^3 \Rightarrow x < 1.$ Javobi: C.

59. $\lg 5 = 0{,}7$ bo'lsa, $\log_5 10$ ni toping.

A) 0,3 B) $1\frac{3}{4}$ C) 1,4 D) $1\frac{3}{7}$ E) 1,7

Yechilishi: $lg5 = 0{,}7;\ \log_5 10 = \frac{lg10}{lg5} = \frac{1}{0{,}7}.$ Javobi: D.

60. $\log_{\frac{1}{3}}(2x - 3) > 1$ tengsizlikni yeching.

A)$1\frac{1}{2} < x < 1\frac{2}{3}$ B) $x > 1\frac{1}{2}$ C) $x > 1\frac{2}{3}$

D) $x < 1\frac{1}{2}$ E) $x < 2\frac{2}{3}$

Yechilishi: $\log_{\frac{1}{3}}(2x - 3) > 1;\ 1)\ 2x - 3 > 0 \Rightarrow x > 1\frac{1}{2};$

$2)\ 0 < \frac{1}{3} < 1;\ 3)\ 2x - 3 < \frac{1}{3} \Rightarrow x < 1\frac{2}{3}.$ Javobi: A.

61. $2x = arcctg(tgx)$ tenglamani yeching.

A) $\frac{\pi}{3}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{2\pi}{3}$ E) $\frac{3\pi}{4}$

Yechilishi: $2x = arc\ ctg(tg\ x) \Rightarrow$

$\Rightarrow ctg2x = ctg\ arc\ ctg(tg\ x) \Rightarrow ctg2x = tg\ x \Rightarrow$

$\Rightarrow \frac{1-tg^2x}{2tgx} = tg\ x \Rightarrow 3tg^2x = 1 \Rightarrow tg\ x = \frac{\sqrt{3}}{3}.$

Javobi: C.

62. $y = arc\sin\frac{2}{2+\sin x}$ funksiyaning aniqlanish sohasini toping.

A) $-\pi + 2\pi k \le x \le \pi + 2\pi k, k \in Z$

B) $x \le \pi + 2k\pi,\ k \in Z$

C) $x > 2\pi k,\ k \in Z$

D) $2\pi k \le x \le \frac{\pi}{2} + 2k\pi,\ k \in Z$

E) $2\pi k \le x \le \pi + 2\pi k,\ k \in Z$

Yechilishi: $y = arc\sin\frac{2}{2+\sin x} => \begin{cases} \frac{2}{2+\sin x} \ge -1 \\ \frac{2}{2+\sin x} \le 1 \end{cases} =>$

$=> \frac{2-2-\sin x}{2+\sin x} \le 0 => \begin{cases} -\sin x \le 0 \\ 2+\sin x > 0 \end{cases} => \sin x \ge 0 =>$

$=> 2\pi k \le x \le \pi + 2\pi k,\ k \in z.$ Javobi: E.

63. Qanday eng kichik o'tkir burchak $\sin(2x + 45°) = \cos(30° - x)$ tenglamani qanoatlantiradi?

A) 25° B) 5° C) 45° D) 30° E) 15°

Yechilishi: $\sin(2x + 45°) = \cos(30° - x);\ x = 15° =>$

$=> \sin 75° = \cos 15° = \cos(90 - 75°) = \sin 75°.$

Javobi: E.

64. $y = \sqrt{4\cos^2 2x - 3}$ funksiyaning aniqlanish sohasini toping.

A) $-\frac{\pi}{3} + 2\pi \le x \le \frac{\pi}{3} + 2\pi n, n \in Z$

B) $-\frac{\pi}{12} + \frac{\pi n}{2} \le x \le \frac{\pi}{12} + \frac{\pi n}{2}, n \in Z$

C) $-\frac{\pi}{6} + \frac{\pi n}{2} \le\ x \le \frac{\pi}{6} + \frac{\pi n}{2}, n \in Z$

D) $-\frac{\pi}{4} + \pi n \le\ x \le \frac{\pi}{4} + \pi n, n \in Z$

E) $-\frac{\pi}{3} + \pi n \le\ x \le \frac{\pi}{3} + \pi n, n \in Z$

Yechilishi: $y = \sqrt{4\cos^2 2x - 3} \Rightarrow 4\cos^2 2x - 3 \geq 0 \Rightarrow$

$\Rightarrow \cos^2 2x \geq \frac{3}{4} \Rightarrow |\cos 2x| \geq \frac{\sqrt{3}}{2} \Rightarrow \begin{cases} \cos 2x \geq \frac{\sqrt{3}}{2} \\ \cos 2x \leq -\frac{\sqrt{3}}{2} \end{cases} \Rightarrow$

$-\frac{\pi}{6} + \pi n \leq 2x \leq \frac{\pi}{6} + \pi n, n \in Z \Rightarrow$

$\Rightarrow -\frac{\pi}{12} + \frac{\pi n}{2} \leq x \leq \frac{\pi}{12} + \frac{\pi n}{2}, n \in Z.$ Javobi: B.

65. $\cos^6 x + \sin^6 x = 4\sin^2 2x$ tenglamani yeching.

A) $\pm arc\sin\frac{\sqrt{2}}{\sqrt{19}} + k\pi, k \in Z$

B) $\pm \arcsin\frac{2}{\sqrt{17}} + k\pi, k \in Z$

C) $\pm \arcsin\frac{3}{\sqrt{19}}\ 2k\pi, k \in Z$

D) $\pm\frac{1}{2}\arcsin\frac{2}{\sqrt{19}} + \frac{k\pi}{2}, k \in Z$

E) $\pm\frac{1}{2}\arcsin\frac{3}{\sqrt{19}} + \frac{k\pi}{2}, k \in Z$

Yechilishi: $\cos^6 x + \sin^6 x = 4\sin^2 2x \Rightarrow$

$\Rightarrow 1 - \frac{3}{4}\sin^2 2x = 4\sin^2 2x \Rightarrow \sin^2 2x = \frac{4}{19} \Rightarrow$

$\Rightarrow |\sin 2x| = \frac{2}{\sqrt{19}} \Rightarrow \sin 2x = \pm\frac{2}{\sqrt{19}} + \pi k \Rightarrow$

$\Rightarrow x = \pm\frac{1}{2} arc\sin\frac{2}{\sqrt{19}} + \frac{\pi k}{2}\ ,\ k \in Z.$ Javobi: D.

66. $\sin\left(arc\sin\frac{1}{2} + arc\cos\frac{1}{2}\right)$ ni hisoblang.

A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) 1 D) $\frac{1}{2}$ E) $\frac{1}{4}$

Yechilishi: $\sin\left(arc\sin\frac{1}{2} + arc\cos\frac{1}{2}\right) = \sin arc\sin\frac{1}{2} \cdot$

$\cdot \cos arc\cos\frac{1}{2} + \cos arc\sin\frac{1}{2}\sin arc\cos\frac{1}{2} =$

$= \frac{1}{2}\cdot\frac{1}{2} + \sqrt{1-\frac{1}{4}}\cdot\sqrt{1-\frac{1}{4}} = \frac{1}{4} + 1 - \frac{1}{4} = 1.$ Javobi: C.

67. $y = arc\cos|x-2|$ funksiyaning aniqlanish sohasini toping.

A) $1 \le x \le 3$ B) $x > 1$ C) $x < 3$

D) $2 \le x \le 3$ E) $2 < x \le 3$

Yechilishi: $y = arc\cos|x-2| \Rightarrow -1 \le |x-2| \le 1 \Rightarrow$

$$\Rightarrow \begin{cases} |x-2| \ge -1 \\ |x-2| \le 1 \end{cases} \Rightarrow \begin{cases} x-2 \ge -1 \\ x-2 \le 1 \\ -1 \le x-2 \le 1 \end{cases} \Rightarrow 1 \le x \le 3.$$

Javobi: A.

68. $y = \sin^3 2x$ funksiyaning hosilasini toping.

A) $3\sin^2 2x \cdot \cos 2x$ B) $6\sin^2 2x \cdot \cos 2x$

C) $-6\sin^2 2x \cdot \cos 2x$ D) $6\sin 2x \cdot \cos^2 2x$ E) $3\sin 4x$

Yechilishi: $y = \sin^3 2x \Rightarrow y' = 3\sin^2 2x \cdot \cos 2x \cdot 2 \Rightarrow$

$\Rightarrow y' = 6\sin^2 2x\cos 2x$. Javobi: B.

69. $y = x^2 - 2x$ parabolaga uning biror nuqtasida o'tkazilgan urinmaning burchak koeffitsienti 4 ga teng. Shu urinmaning tenglamasini toping.

A) $y = 4x - 4$ B) $y = 4x + 9$ C) $y = 4x + 4$

D) $y = 4x - 5$ E) $y = 4x - 9$

Yechilishi: $y = x^2 - 2x;\ k = 4;\quad y' = 2x - 2 \Rightarrow$

$\Rightarrow k = y'(x_0) = 2x_0 - 2 \Rightarrow 2x_0 - 2 = 4 \Rightarrow$

$\Rightarrow x_0 = 3 \Rightarrow y_0 = x_0^2 - 2x_0 \Rightarrow y_0 = 3^2 -$

$-2 \cdot 3 = 3;\ y - 3 = 4(x-3) \Rightarrow y - 3 = 4x - 12 \Rightarrow$

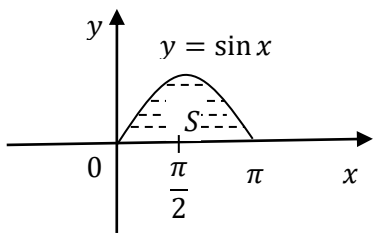
$\Rightarrow y = 4x - 9$. Javobi: E.

70. $x \in [0;\pi]$ da $y = \sin x$ funksiyaning grafigi va x o'qi bilan chegaralangan yuzani toping.

A) 1 B) 1,5 C)2 D)2,5 E) 3

Yechilishi: $x \in [0;\ \pi];\ y = \sin x$;

$S = \int_0^{\pi} \sin x\, dx = -\cos x \,|_0^{\pi} =$



$= -[\cos\pi - \cos 0] = 2$. Javobi: C.

71. Ikki to'g'ri chiziqning keishishidan hosil bo'lgan burchaklarning nisbati 5:4 ga teng. Shu burchaklardan kichigini toping.

A) 70° B) 80° C) 60° D) 65° E) 50°

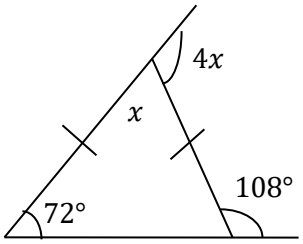
Yechilishi: $5x + 4x = 180 => 9x = 180 => x = 20$.

Javobi: B.

72. Teng yonli uchburchakning uchidagi tashqi burchagi o'sha uchidagi ichki burchagidan 4 marta katta. Uchburchakning asosidagi tashqi burchagi necha gradus?

A) 108° B) 110° C) 98° D) 102° C) 112°

Yechilishi:



$5x = 180 => x = 36$.

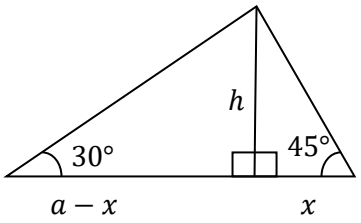
Javobi: A.

73. Asosi a va unga yopishgan burchaklari 30° va 45° bo'lgan uchburchakning yuzini toping.

A) $\frac{a^2(\sqrt{2}-1)}{4}$ B) $\frac{a^2(\sqrt{2}+1)}{4}$ C) $\frac{a^2(\sqrt{3}-1)}{4}$

D) $\frac{a^2(\sqrt{3}+1)}{4}$ E) $\frac{a^2\sqrt{2}}{8}$

Yechilishi: $\frac{h}{x} = tg45° => h = x;$



$\frac{h}{a-x} = tg30° => \frac{h}{a-h} = \frac{1}{\sqrt{3}} =>$

$=> \sqrt{3}h = a - h =>$

$=> h(\sqrt{3}+1) = a => h = \frac{a}{\sqrt{3}+1} => S = \frac{1}{2} \cdot a \cdot \frac{a}{\sqrt{3}+1} =$

$= \frac{a^2(\sqrt{3}-1)}{2\cdot(3-1)} = \frac{a^2(\sqrt{3}-1)}{4}$. Javobi: C.

74. Asosi a va unga tushirilgan balandligi h ga teng bo'lgan uchburchak ichiga parallelogram shunday chizilganki,

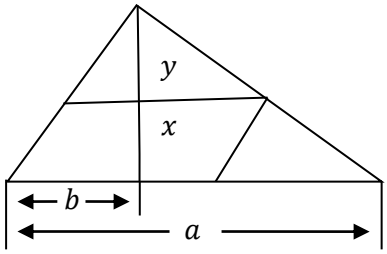
parallelogrammning bir tomoni a asosda yotadi. Shu parallelogrammning yuzi eng katta qiymatga ega bo'lishi uchun uning asosini qanday tanlab olish kerak?

A) $\frac{a\sqrt{3}}{2}$ B) $\frac{a}{3}$ C) $\frac{a\sqrt{2}}{2}$ D) $\frac{a}{4}$ E) $\frac{a}{2}$

Yechilishi: $Asos\ b\ ga\ nisbatan\ funksiya\ hosil\ qilinadi.$

$h = x + y => x = h - y => S = b \cdot x.\ Uchburchaklar\ o'xshashligidan\ k = \frac{h}{y}; k = \frac{a}{b} =>$

$=> \frac{h}{y} = \frac{a}{b} => y = \frac{bh}{a};$



$x = h - \frac{bh}{a} => S = b \cdot \left(h - \frac{bh}{a}\right) =$

$= bh - \frac{b^2h}{a};\quad S' = h - \frac{2bh}{a} =>$

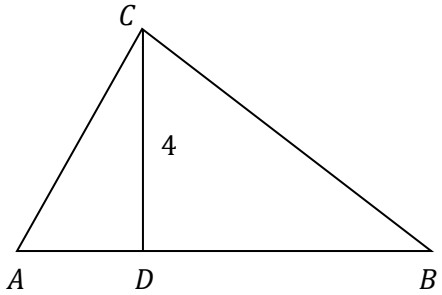
$=> h - \frac{2bh}{a} = 0 => \frac{2bh}{a} = h => 2bh = ah => b = \frac{a}{2}.$

Javobi: E.

75. Uchburchakning balandligi 4 ga teng. Bu balandlik uchburchakni perimetrlari mos ravishda 16 va 23 ga teng bo'lgan ikkita uchburchakka ajratadi. Berilgan uchburchakning perimatrini toping.

A) 31 B) 30 C) 28 D) 32 E) 34

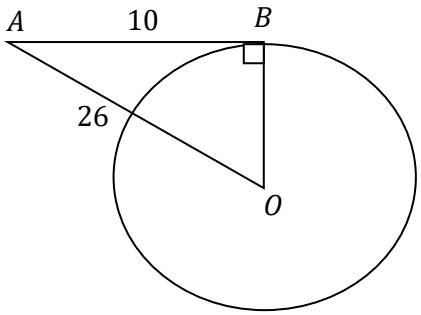
Yechilishi:



$$AC + AD + 4 = 16$$
$$\underline{DB + BC + 4 = 23}$$
$$AC + AD + DB + BC + 8 = 39$$
$$AC + AB + BC = 31.$$

Javobi: A.

76. Markazi O nuqtada bo'lgan aylanaga A nuqratadan AB urinma o'tkazilgan. Agar AB= 10 sm, OA=26 sm bo'lsa, aylananing uzunligini toping.



A) 36π B) 40π C) 46π

D) 48π E) 50π

Yechilishi: $R^2 = 26^2 - 10^2 =$

$= 576 => R = 24;$

$l = 2\pi R = 48\pi.$

Javobi: D.

77. $\vec{a}(-2; 4)$ va $\vec{b}(6; 3)$ vektorlar orasidagi burchakning kosinusini toping.

A) 1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{2}}{2}$ E) 0

Yechilishi: $\cos(\vec{a}\,\hat{;}\,\vec{b}) = \frac{-2\cdot 6+4\cdot 3}{\sqrt{(-2)^2+4^2}\sqrt{6^2+3^2}} =$

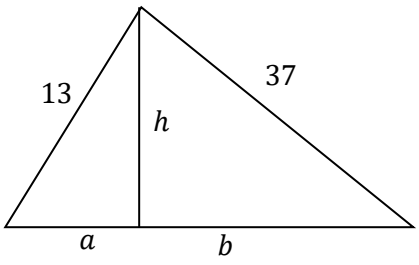
$= \frac{-12+12}{\sqrt{20}\sqrt{45}} = 0 => 90°.$ Javobi: E.

78. Berilgan nuqtadan tekislikka uzunliklari 13 va 37 sm bo'lgan ikkita og'ma o'tkazilgan. Og'malarning tekislikdagi proeksiyalarining nisbati 1:7 kabi bo'lsa, tekislikdan berilgan nuqtagacha bo'lgan masofani toping.

A) 12 B) 11,5 C) 11 D) 10,5 C) 9

Yechilishi: $\frac{a}{b} = \frac{1}{7} => b =$

$7a;$ $\begin{cases} h^2 = 13^2 - a^2 \\ h^2 = 37^2 - b^2 \end{cases} =>$



$13^2 - a^2 = 37^2 - 49a^2 =>$

$=> 48a^2 = 1369 - 169 =>$

$=> 48a^2 = 1200 => a^2 = 25 => h^2 = 169 - 25 =>$

$=> h^2 = 144 => h = 12.$ Javobi: A.

79. Ikkita to'g'ri burchakli parallelepiped mos ravishda 4; 6; h va 8; 2; (2h-1) o'lchamlarga ega. h ning qanday qiymatida parallelepipedlarning hajmlari teng bo'ladi?

A) 4 B) 2 C) $\frac{1}{8}$ D) $\frac{4}{5}$ E) 1

Yechilishi: $4 \cdot 6 \cdot h = 8 \cdot 2 \cdot (2h-1) =>$

$=> 3h = 4h - 2 => h = 2.$ Javobi: B.

80. Qirrasi 6 ga teng muntazam tetraedrning to'la sirti nimaga teng?

A) $12\sqrt{3}$ B) $18\sqrt{3}$ C) $27\sqrt{3}$ D) $36\sqrt{3}$ E) $72\sqrt{3}$

Yechilishi: $S_{\Delta} = \frac{6^2\sqrt{3}}{4} = 9\sqrt{3} => S_T = 4S_{\Delta} = 36\sqrt{3}.$

Javobi: D

81. Tomoni 2 ga teng bo'lgan kvadratdan silindr o'ralgan. Bu silindr asosining yuzini toping.

A) $\frac{2}{\pi}$ B) $\frac{1}{2\pi}$ C) $\frac{1}{\pi}$ D) $\frac{1}{3\pi}$ E) $\frac{1}{4\pi}$

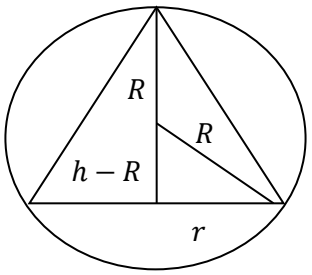
Yechilishi: $2\pi R = 2 => R = \frac{1}{\pi}; S = \pi \cdot \frac{1}{\pi^2} = \frac{1}{\pi}.$

Javobi: C.

82. Radiusi R ga teng bo'lgan shar ichiga chizilgan eng katta hajmga ega bo'lgan konusning balandligini toping.

A) $\frac{2}{3}R$ B) $\frac{1}{3}R$ C) $1\frac{2}{3}R$ D) $\frac{\sqrt{3}}{2}R$ E) $1\frac{1}{3}R$

Yechilishi: $Balandlik\ h\ ga\ nisbatan\ funksiya\ ho-sil\ qilinadi. r^2 = R^2 - (h-R)^2 =$



$= R^2 - h^2 + 2hR - R^2 = 2Rh - h^2;$

$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(2Rh - h^2) \cdot h =$

$= \frac{1}{3}\pi(2Rh^2 - h^3) =>$

$=> V' = \frac{1}{3}\pi(4Rh - 3h^2) => V' = 0 =>$

$=> \frac{1}{3}\pi \neq 0 => 4Rh = 3h^2 => 4R = 3h =>$

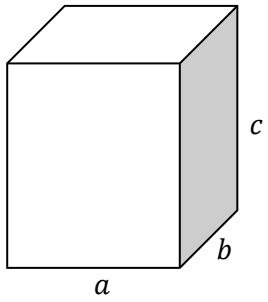
$=> h = \frac{4}{3}R => h = 1\frac{1}{3}R.$ Javobi: E.

83. Agar to'g'ri burchakli parallelepipedning bo'yi va enini 10% ga orttirib, balandligi 10% ga kamaytirilsa, uning hajmi qanday o'zgaradi?

A) 8,1% $ga\ kamayadi$ B) 9,1% $ga\ kamayadi$

C) $o'zgarmaydi$ D) 8,9% $ga\ ortadi$

E) 9,1 % $ga\ ortadi$



Yechilishi: $V = a \cdot b \cdot c$.

$a_1 = \frac{100+10}{100} \cdot a = 1{,}1a;$

$b_1 = \frac{100+10}{100} \cdot b = 1{,}1b;$

$c_1 = \frac{100-10}{100} \cdot c = 0{,}9c.$

$V_1 = a_1 \cdot b_1 \cdot c_1 = 1{,}1 \cdot 1{,}1 \cdot 0{,}9 \cdot a \cdot b \cdot c = 1{,}089V.$

Javobi: D.

7-axborotnoma

1. $\cos 15^\circ - \sin 15^\circ = \frac{a}{4\cdot\cos 15^\circ}$. a =?

A) $\sqrt{3}$ B) $\sqrt{3}+1$ C) $\sqrt{3}+2$

D) $\sqrt{3}+3$ E) $\sqrt{3}+4$

Yechilishi: $\cos 15^\circ - \sin 15^\circ = \frac{a}{4\cdot\cos 15^\circ}$ =>

$$=> a = \sqrt{2}\sin\left(45^\circ - 15^\circ\right)\cdot 4\cos 15^\circ = 4\cdot\frac{\sqrt{2}}{2}\cos 15^\circ =$$

$$= 4\cdot\sin 45^\circ\cos 15^\circ = 4\cdot\frac{1}{2}\left[\sin 60^\circ + \sin 30^\circ\right] = \sqrt{3}+1.$$

Javobi: B.

2. $x^2 + y^2 - 5x - 6y + 4 = 0$ aylananing ordinata o'qidan ajratgan kesma uzunligini toping.

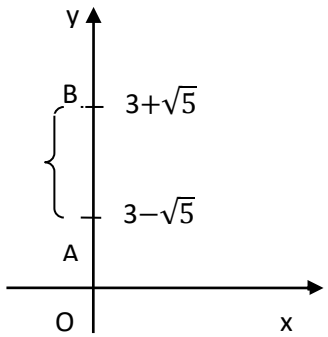
A) $\sqrt{3}$ B) 4 C) $2\sqrt{5}$ D) 5 E) 3

Yechilishi: $\begin{cases} x^2 + y^2 - 5x - 6y + 4 = 0 \\ x = 0 \end{cases}$ =>

$y^2 - 6y + 4 = 0$ =>

$$=> \begin{cases} y_1 = 3 - \sqrt{5}; \\ y_2 = 3 + \sqrt{5}. \end{cases}$$

$AB = 3 + \sqrt{5} - \left(3 + \sqrt{5}\right) = 2\sqrt{5}.$

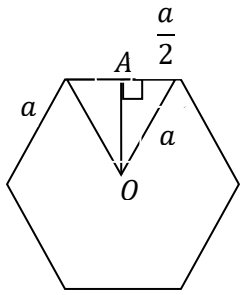


Javobi: C.

3. Muntazam oltiburchak ichidagi ixtiyoriy nuqtadan uning tomonlari yotgan to'g'ri chiziqlargacha bo'lgan masofalar yig'indisi 9 ga teng.Shu oltiburchakning perimetrini toping.

A) $5\sqrt{3}$ B) $4{,}5\sqrt{3}$ C) $6\sqrt{3}$ D) $5{,}5\sqrt{3}$ E) $4\sqrt{3}$

Yechilishi: $OA = \frac{9}{6} = \frac{3}{2}; R = a.$ $U\ holda$



$a^2 = \frac{a^2}{4} + \frac{9}{4} \Rightarrow 4a^2 = a^2 + 9 \Rightarrow$

$\Rightarrow a = \sqrt{3}.\ P = 6\sqrt{3}.$ Javobi: C.

4. $\frac{0,(40)+0,(41)+0,(42)+0,(43)}{0,(50)+0,(51)+0,(52)+0,(53)}$ ni hisoblang.

A) $\frac{170}{211}$ B) $\frac{83}{103}$ C) $\frac{63}{107}$ D) $\frac{65}{106}$ E) $\frac{27}{46}$

Yechilishi: $\left(\frac{40}{99} + \frac{41}{99} + \frac{42}{99} + \frac{43}{99}\right) : \left(\frac{50}{99} + \frac{51}{99} + \frac{52}{99} + \frac{53}{99}\right) =$

$= \frac{83}{103}.$ Javobi:B.

5. $1 \cdot 4 + 2 \cdot 8 + 3 \cdot 12 + \cdots + 30 \cdot 120$ yig'indida har bir qo'shiluvchining ikkinchi ko'paytuvchisi bittadan kamaytirilsa, bu yig'indi qanchaga kamayadi?

A) 60 B) 120 C) 210 D) 375 E) 465

Yechilishi: $1 \cdot 4 + 2 \cdot 8 + 3 \cdot 12 + \cdots + 30 \cdot 120;$
$1 \cdot 3 + 2 \cdot 7 + 3 \cdot 11 + \cdots + 30 \cdot 119.$

$1 + 2 + 3 + \cdots + 30 \Rightarrow S_{30} = \frac{1+30}{2} \cdot 30 = 465.$

Javobi: E.

6. $\frac{2}{7}, \frac{4}{11}$ va $\frac{6}{13}$ sonlariga bo'lganda, bo'linma butun son chiqadigan eng kichik natural sonni toping.

A) 6 B) 12 C) 18 D) 24 E) 48

Yechilishi: $a: \frac{2}{7} = \frac{7a}{2} \Rightarrow a: 2; 4; 6; \Rightarrow a = 12.$ Javobi: B.

7. 2002^{2002} sonni 5 ga bo'lganda, qoldiq nimaga teng?

A) 0 B) 1 C) 2 D) 3 E) 4

Yechilishi: 1) $2002^{2002}: 5 = (400 \cdot 5 + 2)^{2002};$

2) 2002^{2002} $da\ 2\ ning\ takrorlanish\ soni\ topiladi$:

$\underline{2;\ 4;\ 8;\ 16;}\ 2.$ $Har\ 4\ ta\ sondan\ so'ng\ oxirigi\ raqam\ takrorlanadi. Demak, takrorlanish\ soni\ 4\ ga\ teng;$

3) $daraja$ 2002 $takrorlanish\ soni$ 4 $ga\ bo'linadi$:

$2002 = 500 \cdot 4 + 2.$ $Qoldiq$: 2.

4) $qoldiq\ izlanayotgan\ raqmni\ aniqlaydi$:

$2; 4; 8; 16 - takrorlanishda\ ikkinchi\ o'rinda$ 4.

Javobi: E.

8. Agar $\frac{29}{31} + \frac{38}{41} + \frac{47}{51} + \frac{56}{61} = a$ bo'lsa, $\frac{2}{31} + \frac{3}{41} + \frac{4}{51} + \frac{5}{61}$ quyidagilardan qaysi biriga teng?

A) $3 - a$ B) $4 - a$ C) $5 - a$ D) $3 - \frac{a}{2}$ E) $4 - \frac{a}{2}$

Yechilishi: $+\begin{matrix}\frac{29}{31} + \frac{38}{41} + \frac{47}{51} + \frac{56}{61} = a \\ \frac{2}{31} + \frac{3}{41} + \frac{4}{51} + \frac{5}{61} = x\end{matrix} \Rightarrow a + x = 4 \Rightarrow$

$\Rightarrow x = 4 - a.$ Javobi: B.

9. Qanday son $\frac{2}{5}$ qismining $\frac{2}{5}$ qismiga 2 qo'shilsa, 6 soni hosil bo'ladi?

A) 20 B) 50 C) 25 D) 15 E) 18

Yechilishi: $x \cdot \frac{2}{5} \cdot \frac{2}{5} + 2 = 6 \Rightarrow \frac{4x}{25} = 4 \Rightarrow x = 25.$

Javobi: C.

10. $\frac{x^3y+2x^2y-3xy}{x^3+5x^2+6x} : \frac{x^2-1}{x^2+3x+2}$ ni soddalashtiring.

A) $\frac{y}{x}$ B) $-x$ C) $-y$ D) x E) y

Yechilishi: $\frac{x^3y+2x^2y-3xy}{x^3+5x^2+6x} : \frac{x^2-1}{x^2+3x+2} =$

$= \frac{xy(x^2+2x-3)}{x(x^2+5x+6)} \cdot \frac{x^2+3x+2}{x^2-1} = \frac{y(x-1)(x+3)}{(x+3)(x+2)} \cdot \frac{(x+1)(x+2)}{(x-1)(x+1)} = y.$

Javobi: E.

11. Agar $x = \sqrt[8]{\frac{32\sqrt{2}}{\sqrt{8}}}$ bo'lsa, quyidagilardan qaysi biri butun son bo'ladi?

A) x B) x^2 C) x^3 D) x^5 E) x^7

Yechilishi: $x = \sqrt[8]{\frac{32\sqrt{2}}{\sqrt{8}}} = \sqrt[8]{\frac{2^5 \cdot 2^{\frac{1}{2}}}{2^{\frac{3}{2}}}} = \sqrt[8]{2^{5+\frac{1}{2}-\frac{3}{2}}} =$

$= \sqrt[8]{2^4} = \sqrt{2} \Rightarrow x^2 = 2.$ Javobi: B.

12. $\frac{\sqrt[3]{3^x+3^x+3^x}}{\sqrt{3^x+3^x+3^x}} = \frac{1}{3}.$ $x = ?$

A) 4 B) 5 D) 6 C) 7 E) 8

Yechilishi: $\frac{\sqrt[3]{3^x+3^x+3^x}}{\sqrt{3^x+3^x+3^x}} = \frac{1}{3} \Rightarrow \sqrt[6]{\frac{(3\cdot 3^x)^2}{(3\cdot 3^x)^3}} = \frac{1}{3} \Rightarrow$

$\Rightarrow \frac{1}{3\cdot 3^x} = (\frac{1}{3})^6 \Rightarrow \frac{1}{3^x} = \frac{1}{3^5} \Rightarrow x = 5.$ Javobi: B.

13. Agar $\frac{4x^2-4xy+3y^2}{2y^2+2xy-5x^2} = 1$ bo'lsa, $\frac{x+y}{y-z}$ ning qiymati nimaga teng?

A) 2 B) -2 C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) -1

Yechilishi: $\frac{4x^2-4xy+3y^2}{2y^2+2xy-5x^2} = 1 \Rightarrow 4x^2 - 4xy + 3y^2 =$

$= 2y^2 + 2xy - 5x^2 \Rightarrow 9x^2 - 6xy + y^2 = 0 \Rightarrow$

$\Rightarrow (3x - y)^2 = 0 \Rightarrow y = 3x;$ $\frac{x+y}{y-x} = \frac{4x}{2x} = 2.$

Javobi: A.

14. $7^6 + 27$ soni quyidagilarning qaysi biriga qoldiqsiz bo'linadi?

A) 51 B) 49 C) 45 D) 23 E) 13

Yechilishi: $7^6 + 27 = (7^2)^3 + 3^3 =$

$= (49 + 3)(49^2 - 49 \cdot 3 + 9).$ Javobi: E.

15. Avtomobil butun yo'lning $\frac{3}{7}$ qismini 1 soatda, qolgan qismini 2 soatda bosib o'tdi. Uning birinchi tezligi ikkinchi tezligidan necha marta katta?

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{9}{8}$ D) $\frac{8}{9}$ E) $\frac{5}{4}$

Yechilishi: $\begin{cases} v_1 = \frac{3}{7}S \\ 2v_2 = \frac{4}{7}S \end{cases} => \begin{cases} v_1 = \frac{3S}{7} \\ v_2 = \frac{2S}{7} \end{cases} => \frac{v_1}{v_2} = \frac{3}{2}.$

Javobi: B.

16. Nodirda bor pulning $\frac{1}{8}$ qismi, Jahongirdagi pulning $\frac{1}{4}$ qismiga teng. Nodir pulining necha foizini Jahongirga bersa, ularning pullari teng bo'ladi?

A) 25 B) 37,5 C) 40 D) 50 E) 62,5

Yechilishi: $\frac{1}{8}x = \frac{1}{4}y => x = 2y => 100 - a\% =$

$= 50 + a\% => 2a\% = 50 => a\% = 25\%.$ Javobi: A.

17. Agar $2^a = 5$ va $20^b = 125$ bo'lsa, a ni b orqali ifodalang.

A) $\frac{3-b}{2b}$ B) $\frac{b}{3-b}$ C) $\frac{2b}{3-b}$ D) $\frac{3b}{2+b}$ E) $\frac{3-b}{b}$

Yechilishi: $\begin{cases} 2^a = 5 \\ 20^b = 125 \end{cases} => \begin{cases} a\lg 2 = \lg\frac{10}{2} \\ b\lg 20 = \lg 5^3 \end{cases} =>$

$=> \begin{cases} a\lg 2 = 1 - \lg 2 \\ b(1 + \lg 2) = 3(1 - \lg 2) \end{cases} =>$

$=> \begin{cases} \lg 2\,(a+1) = 1 \\ b\lg 2 + 3\lg 2 = 3 - b \end{cases} => \begin{cases} \lg 2 = \frac{1}{a+1} \\ \lg 2 = \frac{3-b}{b+3} \end{cases} =>$

$=> \frac{1}{a+1} => \frac{3-b}{3+b}.$ Javobi: C

18. $f\left(\frac{3x-2}{2}\right) = x^2 - x - 1.$ $f(1) - ?$

A) $-\frac{5}{9}$ B) $-\frac{13}{9}$ C) $-\frac{7}{9}$ D) -1 E) $-\frac{11}{9}$

Yechilishi: $f\left(\frac{3x-2}{2}\right) = x^2 - x - 1;$ $f(1) = ?$

$\frac{3x-2}{2} = 1 \Rightarrow 3x = 4 \Rightarrow x = \frac{4}{3}$; $f(1) = (\frac{4}{3})^2 - \frac{4}{3} - 1 =$

$= \frac{16}{9} - \frac{4}{3} - 1 = \frac{16-12-9}{9} = -\frac{5}{9}$. Javobi: A.

19. $4^{x+1} - 2^{x+4} + 3 \cdot 2^{x+2} = 48$ tenglamani yeching.

A) 1 B) 2 C) 3 D) 4 E) ∅

Yechilishi: $4 \cdot 4^x - 2^4 \cdot 2^x + 3 \cdot 2^x \cdot 2^2 = 48 \Rightarrow$

$\Rightarrow 4 \cdot 2^{2x} - 16 \cdot 2^x + 12 \cdot 2^x = 48 \Rightarrow$

$\Rightarrow 2^{2x} - 2^x - 12 = 0 \Rightarrow 2^x = y \Rightarrow y^2 - y - 12 \Rightarrow$

$\Rightarrow y_{1,2} = \frac{1}{2} \pm \sqrt{\frac{1}{4} + 12} = \frac{1}{2} \pm \frac{7}{2}; \Rightarrow 2^x = 2^2 \Rightarrow$

$\Rightarrow x = 2; \ 2^x \neq -3$. Javobi: B.

20. $\sqrt[3]{x\sqrt[3]{x\sqrt[3]{x\ldots}}} = 8$ tenglamani yeching.

A) 56 B) 48 C) 60 D) 54 E) 64

Yechilishi: $\sqrt[3]{x\sqrt[3]{x\sqrt[3]{x\ldots}}} = 8$; $\sqrt[3]{x\sqrt[3]{x \cdot x^{\frac{1}{3}}\ldots}} =$

$= \sqrt[3]{x\sqrt[3]{x^{1+\frac{1}{3}}}} = \sqrt[3]{x \cdot x^{\frac{1}{3}+\frac{1}{3^2}}\ldots} = \sqrt[3]{x^{1+\frac{1}{3}+\frac{1}{3^2}}\ldots} =$

$= x^{\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+\cdots} \Rightarrow \frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \cdots = \frac{\frac{1}{3}}{1-\frac{1}{3}} = \frac{1}{3} : \frac{2}{3} = \frac{1}{2} \Rightarrow$

$\Rightarrow x^{\frac{1}{2}} = 8 \Rightarrow \sqrt{x} = 8 \Rightarrow x = 64$. Javobi: E.

21. $\log_{\sqrt{5}}(4^x - 6) - \log_{\sqrt{5}}(2^x - 2) = 2$ tenglamani yeching.

A) $\frac{3}{2}$ B) $\frac{5}{4}$ C) 2 D) 2,5 E) 3

Yechilishi: $\log_{\sqrt{5}}(4^x - 6) - \log_{\sqrt{5}}(2^x - 2) = 2 \Rightarrow$

$\Rightarrow \begin{cases} 4^x > 6 \\ 2^x > 2 \end{cases} \Rightarrow x > 1. \quad \frac{2^{2x}-6}{2^x-2} = \sqrt{5}^2 \Rightarrow$

$\Rightarrow 2^{2x-6} = 5 \cdot 2^x - 10 \Rightarrow 2^{2x} - 5 \cdot 2^x + 4 = 0 \Rightarrow$

$\Rightarrow 2^x = y \Rightarrow y^2 - 5y + 4 = 0 \Rightarrow \begin{cases} y_1 = 1 \\ y_2 = 4 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 2^x = 1 \\ 2^x = 4 \end{cases} \Rightarrow \begin{cases} x = 0 \ \ chet\ ildiz; \\ x = 2\ ildiz. \end{cases}$ Javobi: C.

22. $|x-4| < |x+4|$ tengsizlikni yeching.

A) $(-4;4)$ B) $(0;4) \cup (4;\infty)$ C) $(0;\infty)$

D) $(-\infty;-4) \cup (-4;0)$ E) $(-\infty;-4)$

Yechilishi: $Tengsizlikning\ ikkala\ tomoni\ kvadratga\ ko'tariladi$: $|x-4|^2 < |x+4|^2 \Rightarrow 16x > 0 \Rightarrow$

$\Rightarrow x > 0 \Rightarrow (0;\infty)$. Javobi: C.

23. $c_n = a \cdot k^{n-5}$ $(a > 0)$ sonlar ketma-ketligining umumiy hadi bo'lib, $c_2 \cdot c_8 = 36$ bo'lsa, a nimaga teng?

A) 2 B) 4 C) 5 D) 6 E) 8

Yechilishi: $c_n = a \cdot k^{n-5}$ $(a > 0)$; $c_2 \cdot c_8 = 36$; $a = ?$;

$c_2 = a \cdot k^{-3}$; $c_8 = a \cdot k^3 \Rightarrow ak^{-3} \cdot ak^3 = 36$.

Javobi: D.

24. Arifmetik progressiyada $a_1 = 1$, $a_5 = 5 + x$ va $a_{15} = 10 + 3x$ bo'lsa, a_{39} ni toping.

A) -53 B) -54 C) -55 D) -56 E) -57

Yechilishi: $\begin{cases} a_1 = 1 \\ a_5 = a_1 + 4d \\ a_{15} = a_1 + 14d \end{cases} \Rightarrow \begin{cases} 1 + 4d = 5 + x \\ 1 + 14d = 10 + 3x \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 4d = 4 + x \\ 14d = 9 + 3x \end{cases} \Rightarrow \begin{cases} -12d = 12 + 3x \\ 14d = 9 + 3x \end{cases} \Rightarrow$

$\Rightarrow 2d = -3 \Rightarrow d = -\frac{3}{2} \Rightarrow$

$a_{39} = a_1 + 38 \cdot d = -56$. Javobi: D.

25. $\sqrt{\frac{3}{2}} + \sqrt{\frac{2}{3}} + \frac{2}{3}\sqrt{\frac{2}{3}} + \cdots$ ni hisoblang.

A) $\frac{\sqrt{6}}{2}$ B) $\frac{3\sqrt{6}}{2}$ C) $\frac{2\sqrt{6}}{3}$ D) $\frac{2\sqrt{3}}{3}$ E) $\frac{2\sqrt{2}}{3}$

Yechilishi: $\sqrt{\frac{3}{2}}+\sqrt{\frac{2}{3}}+\frac{2}{3}\sqrt{\frac{2}{3}}+\cdots=$

$=\frac{\sqrt{3}}{\sqrt{2}}+\frac{2}{3}\cdot\frac{\sqrt{3}}{\sqrt{2}}+(\frac{2}{3})^2\cdot\frac{\sqrt{3}}{\sqrt{2}}+\cdots=\frac{\sqrt{3}}{\sqrt{2}}:\left(1-\frac{2}{3}\right)=\frac{\sqrt{3}}{\sqrt{2}}\cdot 3=$

$=\frac{3\sqrt{3}}{\sqrt{2}}=\frac{3\sqrt{6}}{2}$. Javobi: B.

26. $f'(x)=6x^3-8x+3,\ f(-2)=0.\ f(2)=?$

A)10 B) 12 C) -12 D) 18 E) -18

Yechilishi: $Aslida\ [F(x)]'=f(x)\ bo'lishini\ e'tiborga\ olgan\ holda\ masala\ shartini\ o'nglab\ yozib\ olamiz$:

$f(x)=6x^3-8x+3;\ \ F(-2)=0;\ \ F(2)=?$

$F(x)=\int f(x)dx=\frac{3}{2}x^4-4x^2+3x+C=>$

$F(-2)=\frac{3}{2}(-2)^4-4(-2)^2+3(-2)+C=>$

$F(2)=\frac{3}{2}\cdot 16-4\cdot 4+6-2=24-16+4=12.$

Javobi: B.

27. $f(x)=\ln\sqrt{8+x^2}.\ \ f'(0)-?$

A) $\frac{1}{8}$ B) $\frac{1}{9}$ C) 0 D) $\frac{1}{2\sqrt{2}}$ E) $\frac{1}{6}$

Yechilishi: $f'(x)=\frac{1}{\sqrt{8+x^2}}\cdot\frac{1}{2\sqrt{8+x^2}}\cdot 2x=\frac{x}{8+x^2}\ =>$

$=> f'(0)=0.$ Javobi: C.

28. 28. $f(x)=|x^2-14x+45|.\ \ f'(9)-?$

A) 0 B) 4 C) 2 D)7 E) $mavjud\ emas$

Yechilishi: $Funksiya\ modulsiz\ yoziladi$:

$f(x)=\left|(x-5)\cdot|x-9|\right|=>$

$$=>\begin{cases}-x^2+14x-45, agar(x-5)(x-9)<0\ bo'lsa;\\ 0,\ \ agar\ (x-5)(x-9)=0\ bo'lsa;\\ x^2-14x+45, agar\ (x-5)(x-9)>0\ bo'lsa;\end{cases}$$

$U\ holda\ \begin{cases} f'(x) = -2x + 14 \\ f'(x) = 2x - 14 \end{cases} => \begin{cases} f'(9) = -4; \\ f'(x) = 4. \end{cases}$

Javobi: B.

29. k ning qaday qiymatlarida $f(x) = x^3 - kx^2 + 3x - 1$ funksiya o'suvchi bo'ladi?

A$(-\infty; -3) \cup (3; \infty)$ B) $(-\infty; 4)$ C) $(-2; 2)$ D)[-3;3] E) $(3; \infty)$

Yechilishi: $f'(x) \geq 0 => 3x^2 - 2kx + 3 \geq 0 =>$

$=> 3(x + \frac{-2k}{2\cdot 3})^2 - \frac{(-2k)^2 - 4\cdot 3\cdot 3}{4\cdot 3} \geq 0 =>$

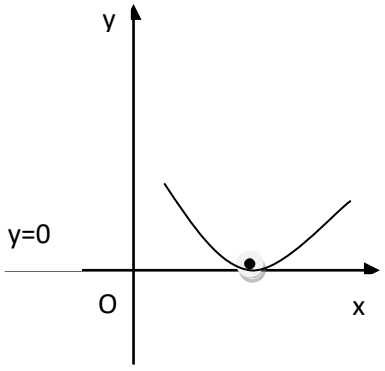
$=> 3(x - \frac{k}{3})^2 - \frac{k^2-9}{3} \geq 0 => \frac{k^2-9}{3} \leq 0 => k^2 \leq 9 =>$

$=> |k| \leq 3 => -3 \leq k \leq 3.$ Javobi: D.

30. Agar $\frac{7x^2+ax+b}{x}$ funksiya grafigi (2;0) nuqtada abtsessa o'qiga urinib o'tsa, $a + b$ nimaga teng?

A) 0 B) 20 C) -21 D) 28 E) -56

Yechilishi: 1) $y = \frac{7x^2+ax+b}{x}$;



$(x_0; y_0) = (2; 0) =>$

$=> 0 = \frac{7\cdot 2^2 + a\cdot 2 + b}{2} =>$

$=> \frac{28+2a+b}{2} = 0 => 2a + b + 28 = 0;$

2) (Ox): $\begin{cases} y = kx + b \\ y = 0 \quad k = 0 \end{cases}; y' = \frac{(14x+a)x - (7x^2+ax+b)\cdot 1}{x^2} =$

$= \frac{7x^2-b}{x^2};\ y'(2) = \frac{28-b}{4} => k = \frac{28-b}{4} => \frac{28-b}{4} = 0 =>$

$=> b = 28 => 2a + 28 + 28 = 0 => a = -28 =>$

$=> a + b = 0.$ Javobi: A.

31. $y = 9 - x^2$ va $y = x^2 + 1$ chiziqlar bilan chegaralangan sohaning yuzini toping.

A) $10\frac{1}{3}$ B) $10\frac{2}{3}$ C) $13\frac{2}{3}$ D) $18\frac{1}{3}$ E) $21\frac{1}{3}$

Yechilishi: $y = 9 - x^2;\ y = x^2 + 1;\ 9 - x^2 = x^2 + 1 =>$

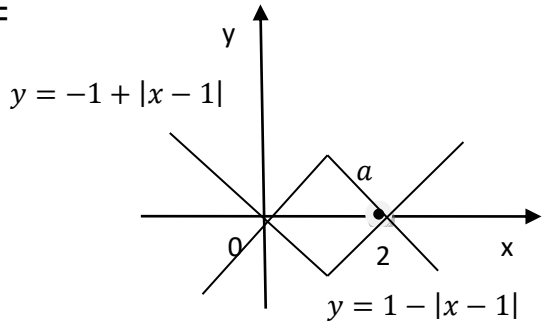
$=> \begin{cases} x_1 = -2 \\ x_2 = 2 \end{cases} => \begin{cases} a = -2 \\ b = 2 \end{cases} => S = \int_{-2}^{2}[9 - x^2 - -x^2 - 1]dx = \int_{-2}^{2}[8 - 2x^2]dx = 8x|_{-2}^{2} - \frac{2}{3}x^3|_{-2}^{2} =$

$= 8[2 + 2] - \frac{2}{3}[8 + 8] = 32 - \frac{32}{3} = \frac{64}{3} = 21\frac{1}{3}$. Javobi: E.

32. $y = 1 - |x - 1|$ va $y = -1 + |x - 1|$ chiziqlar bilan chegaralangan sohaning yuzini toping.

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) 1 D) $\frac{3}{2}$ E) 2

Yechilishi: $Hosil\ bo'lgan\ soha\ kvadrat. Uning\ diago - nali\ 2\ ga\ teng. Demak, tomoni\ a = \sqrt{2}$.



$S = a^2 = 2$. Javobi: E.

33. $\int_0^1 \sqrt{x\sqrt[3]{x\sqrt[4]{x}}}\,dx$ ni hisoblang.

A) $\frac{1}{8}$ B) $\frac{8}{15}$ C) $\frac{17}{24}$ D) $\frac{24}{41}$ E) $\frac{12}{29}$

Yechilishi: $\sqrt{x\sqrt[3]{x\sqrt[4]{x}}} = \left(x\left(x(x)^{\frac{1}{4}}\right)^{\frac{1}{3}}\right)^{\frac{1}{2}} = x^{\frac{1}{2}} \cdot x^{\frac{1}{6}} \cdot x^{\frac{1}{24}} =$

$= x^{\frac{1}{2}+\frac{1}{6}+\frac{1}{24}} = x^{\frac{17}{24}}.\quad \int_0^1 \sqrt{x\sqrt[3]{x\sqrt[4]{x}}}dx = \int_0^1 x^{\frac{17}{24}}\,dx =$

$= \frac{1}{\frac{17}{24}+1} \cdot x^{\frac{17}{24}+1}|_0^1 = \frac{24}{41}$. Javobi: D.

34. $\cos 37^\circ = a$ bo'lsa, $\sin 16^\circ$ ni a orqali ifodalang.

A) $a^2 - 1$ B) $a - 1$ C) $2a^2 - 1$

D) $1 - 2a^2$ E) $aniqlab\ bo'lmaydi$

Yechilishi: $a = \cos 37^\circ => a^2 = \cos^2 37^\circ =$

$= \frac{1}{2}\left(1 + \cos 74^\circ\right) = \frac{1}{2}(1 + \cos(90° - 16°)) =$

$= \frac{1}{2}\left(1 + \sin 16^\circ\right) => \sin 16^\circ = 2a^2 - 1.$ Javobi: C.

35. $\cos 15^\circ + \sin 15^\circ = \frac{a}{4\cos 15^\circ}.$ a =?

A) $\sqrt{3}$ B) $\sqrt{3} + 1$ C) $\sqrt{3} + 2$ D) $\sqrt{3} + 3$ E) $\sqrt{3} + 4$

Yechilishi: $\cos 15^\circ + \sin 15^\circ = \frac{a}{4\cos 15^\circ};$

$a = 4\ \cos^2 15° + 4 \sin 15° \cos 15^\circ =$

$= 4 \cdot \frac{1}{2}(1 + \cos 30°) + 2 \cdot \sin 30 = 2\left(1 + \frac{\sqrt{3}}{2}\right) + 1 =$

$= \sqrt{3} + 3.$ Javobi: D.

36. $(\cos x + 5)(3 - \cos x)$ funksiyaning eng katta qiymatini toping.

A) 8 B) 12 C) 15 D) 16 E) 24

Yechilishi: $(\cos x + 5)(3 - \cos x) => \begin{cases} \cos x = 0; \\ \cos x = -1; \\ \cos x = 1. \end{cases}$

$Bulardan:$ 16. Javobi: D.

37. α o'tkir burchakning sinusi $\frac{3}{5}$ ga teng. Shu burchakka qo'shni burchakning kosinusini toping.

A) $-\frac{4}{5}$ B) $-\frac{3}{4}$ C) $\frac{4}{5}$ D) $\frac{3}{4}$ E) $-\frac{2}{3}$

Yechilishi: $\sin\alpha = \frac{3}{5};$ $\cos(180 - \alpha) = -\cos\alpha =$

$= -\cos \arcsin\frac{3}{5} = -\sqrt{1 - (\frac{3}{5})^2} = -\frac{4}{5}.$ Javobi: A.

38. $\sqrt{1+\log_3\sqrt{x}\cdot\log_x 9}+\sqrt{2}=0$ tenglamani yeching.

A) $\frac{1}{3}$ B) 9 C) 3 D) $\frac{1}{3};9$ E) $\frac{1}{3};3$

Yechilishi: $\sqrt{1+\log_3\sqrt{x}\cdot\log_x 9}+\sqrt{2}=0;$

$Aniqlanish\ soha\ topiladi$: $\begin{cases} x>0; \\ x\neq 1; \\ 1+\log_3\sqrt{x}\geq 0 \end{cases} =>$

$\log_3\sqrt{x}\geq -1 => \sqrt{x}\geq\frac{1}{3} => |x|\geq\frac{1}{9} => \begin{cases} x\geq\frac{1}{9}; \\ x\leq -\frac{1}{9}. \end{cases}$

$\left(0;\frac{1}{9}\right]\cup\left[\frac{1}{9};1\right)\cup(1;\infty).$

2) $\sqrt{1+\frac{1}{2}\log_3 x}\cdot 2\log_x 3+\sqrt{2}=0 => \sqrt{1+\frac{1}{2}\log_3 x}\cdot$

$\cdot\frac{2}{\log_3 x}+\sqrt{2}=0; \quad \left(1+\frac{\log_3 x}{2}\right)\cdot\frac{4}{\log_3{}^2 x}=2 =>$

$=> \log_3{}^2 x-\log_3 x-2=0 => \begin{cases} x_1=\frac{1}{3}\ ildiz; \\ x_2=9\ chet\ ildiz. \end{cases}$

Javobi: A.

39. $\sqrt{\cos 2x+\sqrt{3}\cdot\sin x}=-2\cos x$ tenglamani yeching.

A) $\frac{2\pi}{3}+2k\pi,\ k\in Z$ B) $\frac{\pi}{3}+2k\pi, k\in Z$

C) $(-1)^k\frac{\pi}{3}+k\pi, k\in Z$ D) $(-1)^k\frac{2\pi}{3}+2k\pi, k\in Z$ E) $\emptyset$

Yechilishi: $\sqrt{\cos 2x+\sqrt{3}\cdot\sin x}=-2\cos x.$

$Tenglikning\ ikkala\ tomoni\ kvadratga\ ko'tariladi$:

$\begin{cases} \cos 2x+\sqrt{3}\sin x=4\cos^2 x; \\ -2\cos x\geq 0. \end{cases} =>$

$$=>\begin{cases}\cos^2 x-\sin^2 x+\sqrt{3}\sin x=4(1-\sin^2 x)\\ \cos x\le 0\end{cases}=>$$

$$=>\begin{cases}1-\sin^2 x-\sin^2 x+\sqrt{3}\sin x-4+4\sin^2 x=0\\ \cos x\le 0\end{cases}=>$$

$$=>\begin{cases}2\sin^2 x+\sqrt{3}\sin x-3=0=>\sin x=y;\\ \cos x\le 0.\end{cases}$$

$2y^2+\sqrt{3}y-3=0=>y_{1,2}=\frac{-\sqrt{3}\pm\sqrt{3+4\cdot 2\cdot 3}}{2\cdot 2}=\frac{-\sqrt{3}\pm 3\sqrt{3}}{4};$

$y_1=-\sqrt{3};\ \ y_2=\frac{\sqrt{3}}{2}.\quad \begin{cases}\sin x\neq -\sqrt{3};\\ \sin x=\frac{\sqrt{3}}{2}.\\ \cos x\le 0\end{cases}=>$

$$=>\begin{cases}x=\frac{2\pi}{3}+2\pi k, k\in Z;\\ \left[\frac{\pi}{2};\frac{3\pi}{2}\right].\end{cases}$$ Javobi: A.

40. $x^2+y^2-5x-6y+4=0$ aylananing absessa o'qidan ajratgan kesma uzunligini toping.

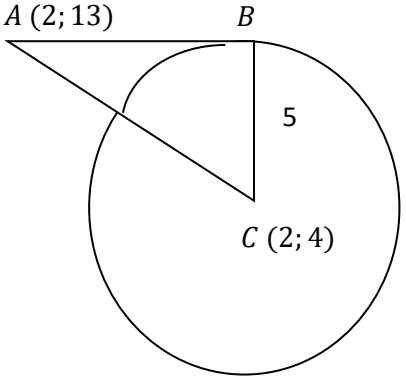
A) $\sqrt{3}$ B) 4 C) $2\sqrt{5}$ D) 5 E) 3

Yechilishi: $\begin{cases}x^2+y^2-5x-6y+4=0\\ y=0\end{cases}=>$

$x^2-5x+4=0\ =>\begin{cases}x_1=1\\ x_2=4\end{cases}=>\ \ x_2-x_1=3.$

Javobi: E.

41. $A(2;13)$ nuqtadan $x^2+y^2-4x-8y-5=0$ aylanaga urinma o'tkazilgan. A nuqtadan urinish nuqtasiga bo'lgan masofani toping.



A) $3\sqrt{5}$ B) $2\sqrt{14}$ C) 6

D) $4\sqrt{2}$ E) $\sqrt{41}$

Yechilishi:

$x^2-4x+2^2-2^2+y^2-8y+$

$+4^2 - 4^2 - 5 = 0 =>$

$=> (x-2)^2 + (y-4)^2 = 5^2;$

$R = BC = 5; \quad C(2;4);$

$$\left|\overrightarrow{AC}\right| = \sqrt{(2-2)^2 + (4-13)^2} = 9.$$

$AB^2 = AC^2 - BC^2 = 9^2 - 5^2 = 56 = 4 \cdot 14 =>$

$=> AB = 2\sqrt{14}.$ Javobi: B.

42. $\frac{\frac{2}{9}+3,6(1)}{1,91(6)-1\frac{5}{6}}$ ni hisoblang.

A) 46 B) 51 C) $\frac{23}{72}$ D) 42 E) 1

Yechilishi: $\left(\frac{2}{9}+\frac{361-36}{90}\right):\left(\frac{1916-191}{900}-\frac{11}{6}\right)=\left(\frac{2}{9}+\frac{325}{90}\right):$

$:\left(\frac{1725}{900}-\frac{11}{6}\right)=\frac{345}{90}\cdot\frac{900}{75}=46.$ Javobi: A.

43. $\frac{2}{5\cdot7}+\frac{2}{7\cdot9}+\frac{2}{9\cdot11}+\cdots+\frac{2}{73\cdot75}$ ni hisoblang.

A) $\frac{16}{75}$ B) $\frac{28}{75}$ C) $\frac{1}{5}$ D) $\frac{14}{75}$ E) $\frac{2}{5}$

Yechilishi: $\frac{2}{5\cdot7}+\frac{2}{7\cdot9}+\frac{2}{9\cdot11}+\cdots+\frac{2}{73\cdot75}=\frac{1}{5}-\frac{1}{7}+\frac{1}{7}-\frac{1}{9}+$

$+\frac{1}{9}-\frac{1}{11}+\cdots+\frac{1}{73}-\frac{1}{75}=\frac{1}{5}-\frac{1}{75}=\frac{14}{75}.$ Javobi: D.

44. $\frac{3+25x}{3x+7}=5$ tenglamani yeching.

A) -3,2 B) 1,5 C) $-1\frac{1}{5}$ D) 3,2 E) -3

Yechilishi: $\frac{3+25x}{3x+7}=5 \Rightarrow 3+25x=15x+35 \Rightarrow$

$\Rightarrow 10x=32 \Rightarrow x=3,2.$ Javobi: D.

45. Rombning yuzi 24 ga, diagonallarining nisbati 0,75 ga teng. Shu rombning tomonini toping.

A) 7 B) 4 C) 5 D) 10 E) 9

Yechilishi: $24=\frac{1}{2}d_1d_2; \quad \frac{d_1}{d_2}=\frac{3}{4} \Rightarrow d_1=\frac{3}{4}d_2;$

$48 = \frac{3}{4} d_2 d_2 \Rightarrow d_2^2 = 64 \Rightarrow d_2 = 8 \Rightarrow d_1 = 6 \Rightarrow$

$\Rightarrow d_1^2 + d_2^2 = 4a^2 \Rightarrow a = 5.$ Javobi: C.

46. To'rtburchakli muntazam piramidaning balandligi 15 ga, diagonal kesimining yuzi 120 ga teng. Shu piramidaning hajmini toping.

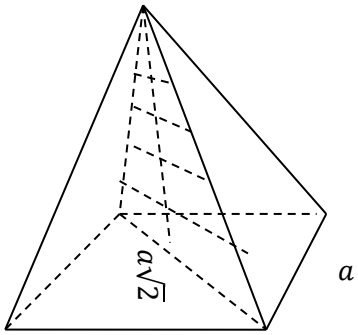
A) 640 B) 1280 C) 980 D) 600 E) 720

Yechilishi: $120 = \frac{1}{2} \cdot a\sqrt{2} \cdot 15 \Rightarrow$

$a = \frac{16}{\sqrt{2}} \Rightarrow S_{asos} = a^2 = 128;$

$V = \frac{1}{3} \cdot 128 \cdot 15 = 640.$

Javobi: A.



47. $\sin\frac{\alpha}{2} = \frac{1}{2}\sqrt{2-\sqrt{3}}$ bo'lsa, $\cos\alpha$ ning qiymatini hisoblang.

A) $\frac{\sqrt{2}}{2}$ B) $2 - \frac{\sqrt{3}}{2}$ C) $2 + \frac{\sqrt{3}}{2}$ D) $-\frac{\sqrt{3}}{2}$ E) $\frac{\sqrt{3}}{2}$

Yechilishi: $\sin\frac{\alpha}{2} = \frac{1}{2}\sqrt{2-\sqrt{3}} \Rightarrow$

$$\begin{cases} \sin\frac{\alpha}{2} = \frac{1}{2}\sqrt{2-\sqrt{3}}; \\ \sin\frac{\alpha}{2} = \sqrt{\frac{1}{2}(1-\cos\alpha}\,; \end{cases} \Rightarrow$$

$\Rightarrow \left(\frac{1}{2}\sqrt{2-\sqrt{3}}\right)^2 = \left(\sqrt{\frac{1}{2}(1-\cos\alpha}\right)^2 \Rightarrow$

$\Rightarrow \frac{1}{4}\left(2-\sqrt{3}\right) = \frac{1}{2}(1-\cos\alpha) \Rightarrow$

$\Rightarrow \frac{1}{2}\left(2-\sqrt{3}\right) = 1-\cos\alpha \Rightarrow \cos\alpha = 1 - 1 + \frac{\sqrt{3}}{2} \Rightarrow$

$\Rightarrow \cos\alpha = \frac{\sqrt{3}}{2}.$ Javobi: E.

48. $\left(1{,}7 : \left(1\frac{2}{3}x - 3{,}75\right)\right) : \frac{8}{25} = 1\frac{5}{12}$ tenglamani yeching.

A) 5,2 B) $5\frac{3}{4}$ C) 4 D) $4\frac{1}{3}$ E) 4,5

Yechilishi: $\left(1{,}7:\left(1\frac{2}{3}x-3{,}75\right)\right):\frac{8}{25}=1\frac{5}{12}$;

$\frac{17}{10}:\left(\frac{5x}{3}-\frac{375}{100}\right)=\frac{17}{12}\cdot\frac{8}{25}\ \Rightarrow\ \frac{17}{10}\cdot\frac{12}{20x-45}=\frac{34}{75}\ \Rightarrow$

$\Rightarrow\frac{34\cdot3}{25(4x-9)}=\frac{34}{75}\Rightarrow 75\cdot34\cdot3=34\cdot25\cdot(4x-9)\Rightarrow$

$\Rightarrow 4x=18\ \Rightarrow\ x=4{,}5.$ Javobi: E.

49. $y=\frac{3}{4}\cos^2(x-\frac{\pi}{4})-1$ funksiyaning qiymatlar sohasini toping.

A) $\left[-\frac{3}{4};\frac{3}{4}\right]$ B) [-1; 0] C) [-1; -0,25]

D) [0,25; 0] E) $\left[\frac{1}{4};1\right]$

Yechilishi: $y=\frac{3}{4}\cos^2\left(x-\frac{\pi}{4}\right)-1\Rightarrow$

$\Rightarrow 0\le\cos^2\left(x-\frac{\pi}{4}\right)\le 1.$ $y_{min}=\frac{3}{4}\cdot0-1=-1;$

$y_{max}=\frac{3}{4}\cdot1-1=\frac{3}{4}-1=$

$=\frac{3-4}{4}=-0{,}25.$ $E(y)=[-1;-0{,}25].$ Javobi: C.

50. $\sqrt{11-4\sqrt{7}}$ ni soddalashtiring.

A) $\sqrt{7}+2$ B) $\sqrt{7}-2$ C) $\sqrt{7}-1$

D) $2-\sqrt{7}$ E) $\sqrt{7}$

Yechilishi: $\sqrt{11-4\sqrt{7}}=\sqrt{11-\sqrt{112}}=\sqrt{\frac{11+\sqrt{11^2-112}}{2}}-$

$-\sqrt{\frac{11-\sqrt{11^2-112}}{2}}=\sqrt{\frac{11+3}{2}}-\sqrt{\frac{11-3}{2}}=\sqrt{7}-2.$ Javobi: B.

51. $\left(\left(a^{-\frac{3}{2}}b\right)(ab^{-2})^{-\frac{1}{2}}(a^{-1})^{-\frac{2}{3}}\right)^3$ ni soddalashtiring.

A) $\frac{1}{a^4b^6}$ B) a^4b^6 C) $\frac{a^4}{b^6}$ D) $\frac{b^6}{a^4}$ E) a^2b^3

Yechilishi: $\left(\left(a^{-\frac{3}{2}}b\right)(ab^{-2})^{-\frac{1}{2}}(a^{-1})^{-\frac{2}{3}}\right)^3 =$

$= (\frac{b}{a\sqrt{a}} \cdot \frac{b}{\sqrt{a}} \cdot \sqrt[3]{a^2})^3 = (\frac{b^2}{a^2} \cdot \sqrt[3]{a^2})^3 = \frac{b^6}{a^4}$. Javobi: D.

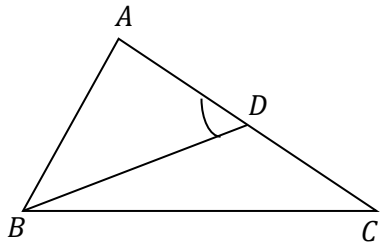
52. Uchlari $A(3;-2;1), B(3;0;2)$ va $C(1;2;5)$ nuqtalarda bo'lgan uchburchakning BD madianasi va AC tomoni orasidagi burchakning kattaligini toping.

A) 45° B) 30° C) 60° D) $\arccos\frac{\sqrt{2}}{3}$ E) $\arccos\frac{\sqrt{3}}{3}$

Yechilishi: *Kesmani teng ikkiga bo'lish formulasidan D nuqtaning koordinatalari topiladi.*

$x = \frac{3+1}{2} = 2;\ y = \frac{-2+2}{2} = 0;$

$z = \frac{1+5}{2} = 3 => D(2;0;3).$



$\overrightarrow{DA} = \{3-2;-2-0;1-3\} =$

$= \{1;\ -2;\ -2\};$

$\left|\overrightarrow{DA}\right| = \sqrt{1^2+(-2)^2+(-2)^2} = 3;$

$\overrightarrow{DB} = \{3-2;0-0;2-3\} =$

$\{1;0;\ -1\};\ \ \left|\overrightarrow{DB}\right| = \sqrt{2};$

$\overrightarrow{DA} \cdot \overrightarrow{DB} = \{1;-2;-2\} \cdot \{1;0;-1\} = 1 \cdot 1 + (-2) \cdot 0 +$

$+(-2) \cdot (-1) = 3;$

$\cos\left(\overrightarrow{DA};\overrightarrow{DB}\right) = \frac{\overrightarrow{DA} \cdot \overrightarrow{DB}}{\left|\overrightarrow{DA}\right| \cdot \left|\overrightarrow{DB}\right|} = \frac{3}{3 \cdot \sqrt{2}} = \frac{\sqrt{2}}{2} => \angle ADB = 45°.$

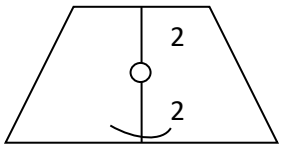
Javobi: A.

53. Radiusi 2 ga teng bo'lgan aylanaga, yuzi 20 ga teng bo'lgan teng yonli trapetsiya teshqi chizilgan. Shu trapetsiyaning yon tomonini toping.

A) 7 B) 10 C) 5 D) 6 E) 8

Yechilishi: $a+b=2l \Rightarrow \frac{a+b}{2}=l;$

$20=l\cdot 4 \Rightarrow l=5.$



Javobi: C.

54. Silindrning yon sirti yoyilganda, diagonali 12 ga teng bo'lgan to'g'ri to'rtburchakdan iborat bo'lib, bu diagonal asos tekisligi bilan 30° li burchak tashkil etadi. Shu silindrning hajmini toping.

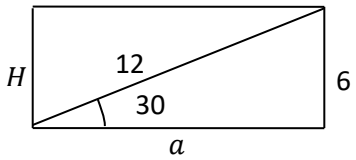
A) $\frac{182\sqrt{3}}{\pi}$ B) 91π C) $\frac{91}{\pi}$ D) $\frac{162}{\pi}$ E) 182π

Yechilishi: $a^2=144-36=108 \Rightarrow$

$a=\sqrt{108};\ \sqrt{108}=2\pi R \Rightarrow$

$\Rightarrow R=\frac{\sqrt{27}}{\pi};\ V=\pi R^2 H=$

$=\pi\cdot\frac{27}{\pi^2}\cdot 6=\frac{162}{\pi}.$ Javobi: D.



55. $\sin 87^\circ-\sin 59^\circ-\sin 96^\circ+\sin 61^\circ$ ni soddalashtiring.

A) $\sqrt{3}\sin 1^\circ$ B) $\sin 1^\circ$ C) $-\sqrt{2}\sin 1^\circ$

D) 0 E) $\sin 2^\circ$

Yechilishi: $\sin 87^\circ-\sin 59^\circ-\sin 96^\circ+\sin 61^\circ=$

$=\sin 87-\sin 93+\sin 61-\sin 59=2\cos\frac{87+93}{2}\cdot$

$\cdot\sin\frac{87-93}{2}+2\cos\frac{61+59}{2}\sin\frac{61-59}{2}=2\cdot\frac{1}{2}\cdot\sin 1^\circ.$ Javobi: B.

56. $\frac{x+8}{3}=x-\frac{x-3}{x}$ tenglama ildizlari ayirmasining modulini toping.

A) 5,5 B) 5 C) 3,5 D) 4 E) 2,5

Yechilishi: $\frac{x+8}{3}=x-\frac{x-3}{x} \Rightarrow x^2+8x=$

$=3x^2-3x+9 \Rightarrow 2x^2-11x+9=0 \Rightarrow \begin{cases} x_1=1; \\ x_2=\frac{9}{2}. \end{cases}$

$|x_1 - x_2| = 3{,}5$. Javobi: C.

57. m ning qanday qiymatida $y = mx + 2$ to'g'ri chiziq va $y = -5x^2$ parabola absissasi $x = -1$ bo'lgan nuqtada kesishadi?

A) 3 B) -3 C) -7 D) 7 E) 5

Yechilishi: $\begin{cases} y = mx + 2 \\ y = -5x^2 \\ x = -1 \end{cases} => \begin{cases} mx + 2 = -5x^2 \\ x = -1 \end{cases} =>$

$=> -m + 2 = -5 => m = 7.$ Javobi: D.

58. $y = \frac{\sqrt{x^2-5x+6}}{\lg(x+5)^2} + \frac{1}{\arccos(x+3)}$ funksiyaning aniqlanish sohasini toping.

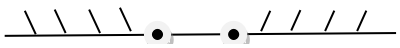
A) (-4; -2] B) $(-\infty; 2) \cup [3; \infty)$

C) $(-\infty; -3) \cup (-3; 2]$ D) (-4; -2)

E) $(-\infty; -5) \cup (-5; 2] \cup [3; \infty)$

Yechilishi: $y = \frac{\sqrt{x^2-5x+6}}{\lg(x+5)^2} + \frac{1}{\arccos(x+3)};$

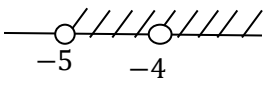
1) $x^2 - 5x + 6 \geq 0 => \begin{cases} x = 2; \\ x = 3. \end{cases}$



$yoki\ (-\infty; 2] \cup [3; \infty).$

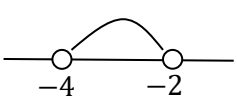
2) $\lg(x + 5)^2 \neq 0 =>$

$=> \begin{cases} x + 5 > 0 => x > -5 => x \neq -5; \\ \lg(x + 5) \neq 0 => x + 5 \neq 1 => x \neq -4; \end{cases}$



$yoki\ (-5; -4) \cup (-4; \infty).$

3) $\arccos(x + 3) => -1 < x + 3 < 1 => -4 < x < -2$



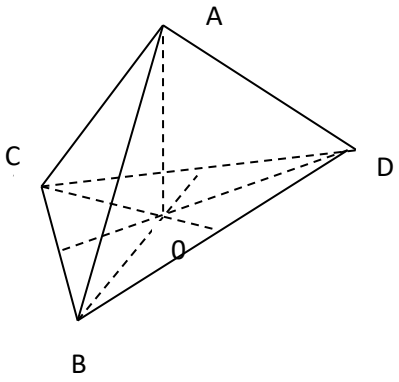
$yoki\ (-4; -2).$

$1), 2)\ va\ 3)\ lardan\ D(y) = (-4; -2)$. Javobi: D.

59. Uchburchakli piramidaning uchlari A(3; 0; 1), B(-1; 4; 1), C(5; 2; 3) va D(0;-5;4) nuqtalarda joylashgan. O-nuqta BCD uchburchak medianalarining kesishgan nuqtasi. $\overrightarrow{OA}$ vektorning uzunligini aniqlang.

A) 2,5 B) $\frac{7}{3}$ C) $\frac{\sqrt{53}}{3}$ D) $5\sqrt{2}$ E) $\frac{\sqrt{51}}{3}$

Yechilishi: $Uchburchak\ media-nalari\ kesishish\ nuqtasining\ koordinatalarini\ topish\ for-mulalaridan\ foydalaniladi.$



$x = \frac{-1+5+0}{3} = \frac{4}{3}; y = \frac{4+2-5}{3} = \frac{1}{3};$

$z = \frac{1+3+4}{3} = \frac{8}{3}$ =>

$O\left(\frac{4}{3}; \frac{1}{3}; \frac{8}{3}\right)$; $\overrightarrow{AO} = \left\{-\frac{5}{3}; \frac{1}{3}; \frac{5}{3}\right\}$ =>=> $\left|\overrightarrow{AO}\right| = \frac{\sqrt{51}}{3}$.

Javobi: E.

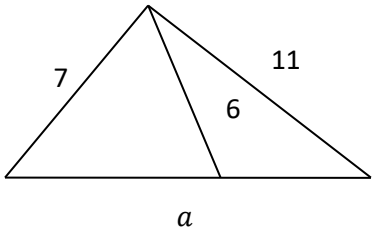
60. Ikkita kvadrat yuzlarining nisbati 25:9 kabi. Birinchi kvadratning tomoni ikkinchi kvadratning tomonidan 10 birlik uzun. Kichik kvadrat tomonining uzunligini toping.

A) 25 B) 15 C)16 D) 12 E) 10

Yechilishi: $k^2 = \frac{25}{9} => k = \frac{5}{3}; \frac{a+10}{a} = \frac{5}{3}$ => $a = 15$.

Javobi: B.

61. Uchburchakning tomonlari 7 va 11 ga, uchinchi tomoniga tushirilgan medianasi 6 ga teng. Uchburchakning uchinchi tomonini toping.



A) 12 B) 8 C) 14 D) 10 E) 13

Yechilishi: $Medianani\ topish$

$formulasiga\ asosan$:

$6 = \frac{1}{2}\sqrt{2 \cdot 7^2 + 2 \cdot 11^2 - a^2} \Rightarrow$

$\Rightarrow a = 14.$ Javobi: C.

62. q ning qanday qiymatida $x^2 - 8x + q = 0$ tenglama ildizlari kvadratlarining yig'indisi 34 ga teng bo'ladi?

A) 15 B) -12 C) 12 D) -15 E) 9

Yechilishi: $x^2 - 8x + q = 0 \Rightarrow \begin{cases} x_1 + x_2 = 8 \\ x_1 \cdot x_2 = q \end{cases} \Rightarrow$

$x_1^2 + x_2^2 = 64 - 2x_1x_2 \Rightarrow 34 = 64 - 2q \Rightarrow q = 15.$

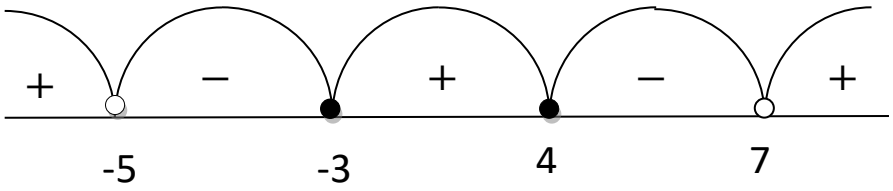
Javobi: A.

63. $\frac{x^2-x-12}{x^2-2x-35} \leq 0$ tengsizlikning butun sonlardan iborat yechimlaridan eng kattasidan eng kichigining ayirmasini toping.

A) 10 B) 12 C) 11 D) 9 E) 7

Yechilishi: $\frac{x^2-x-12}{x^2-2x-35} \leq 0 \Rightarrow \frac{(x+3)(x-4)}{(x+5)(x-7)} \leq 0 \Rightarrow$

$\Rightarrow \begin{cases} x = -3; \\ x = 4; \\ x \neq -5; \\ x \neq 7. \end{cases}$



$6 - (-4) = 10.$ Javobi: A.

64. Arifmetik progressiyada $a_7 = 9$. Progressiyaning ayirmasi qanday bo'lganda, a_1a_2 ko'paytmaning qiymati eng kichik bo'ladi?

A) 9 B) $-\frac{31}{30}$ C) $\frac{10}{11}$ D) $\frac{33}{20}$ E) $d > 3$

Yechilishi: $a_1 + 6d = 9 \Rightarrow a_1 = 9 - 6d;$

$y = a_1 \cdot a_2 = a_1(a_1 + d) = a_1^2 + a_1 d = (9 - 6d)^2 +$
$+(9 - 6d) \cdot d = 30 \cdot d^2 - 99d + 81 \Rightarrow$
$\Rightarrow y' = 60d - 99 \Rightarrow d = \frac{33}{20}$. Javobi: D.

65. $\frac{2^{19} \cdot 27^3 + 15 \cdot 4^9 \cdot 9^4}{6^9 \cdot 2^{10} + 12^{10}}$ ni hisoblang.

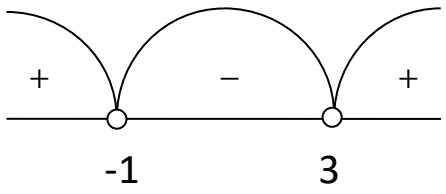
A) 1 B) 2 C) $\frac{1}{3}$ D) $\frac{2}{3}$ E) $\frac{1}{2}$

Yechilishi: $\frac{2^{19} \cdot 3^9 + 5 \cdot 3 \cdot 2^{18} \cdot 3^8}{2^9 \cdot 3^9 \cdot 2^{10} + 3^{10} \cdot 2^{20}} = \frac{2^{18} \cdot 3^9 (2+5)}{2^{19} \cdot 3^9 (1+3 \cdot 2)} = \frac{1}{2}$. Javobi: E.

66. $y = x^3 - 3x^2 - 9x + 12$ funksiyaning ekstremal qiymatlari ayirmasini toping.

A) 20 B) 12 C) 4 D) 2 E) 32

Yechilishi: $y = x^3 - 3x^2 - 9x + 12 \Rightarrow$
$y' = 3x^2 - 6x - 9 \Rightarrow x^2 - 2x - 3 = 0 \Rightarrow$
$\Rightarrow \begin{cases} x_1 = -1 \\ x_2 = 3 \end{cases} \Rightarrow \begin{cases} y(-1) = -1 - 3 + 9 + 12 = 17; \\ y(3) = 27 - 27 - 27 + 12 = -15. \end{cases}$



$y(-1) - y(3) = 32$. Javobi: E.

67. Agar $\lg 5 = a$ va $\lg 3 = b$ bo'lsa, $\log_{30} 8$ ni a va b orqali ifodalang.

A) $\frac{a}{2a+3b}$ B) $\frac{b-3}{1-2a}$ C) $\frac{3a-3}{b+2}$ D) $\frac{3(1-a)}{1+b}$ E) $\frac{a-1}{3a+b}$

Yechilishi: $\log_{30} 8 = \frac{\lg 2^3}{\lg 10 \cdot 3} = \frac{3 \lg 2}{1 + \lg 3} = \frac{3 \lg \frac{10}{5}}{1+b} = \frac{3(1 - \lg 5)}{1+b} =$
$= \frac{3(1-a)}{1+b}$. Javobi: D.

68. $\frac{1}{x} + 1 + x + x^2 + \cdots + x^n + \cdots = 4{,}5$ $(|x| < 1)$ tenglamani yeching.

A) $\frac{1}{8};\frac{1}{4}$ B) $\frac{1}{3};\frac{3}{5}$ C) $\frac{2}{3};\frac{1}{2}$ D) $\frac{1}{3};\frac{2}{3}$ E) $\frac{1}{4};\frac{1}{2}$

Yechilishi: $\frac{1}{x}+1+x+x^2+\cdots+x^n+\cdots=4{,}5 \Rightarrow$

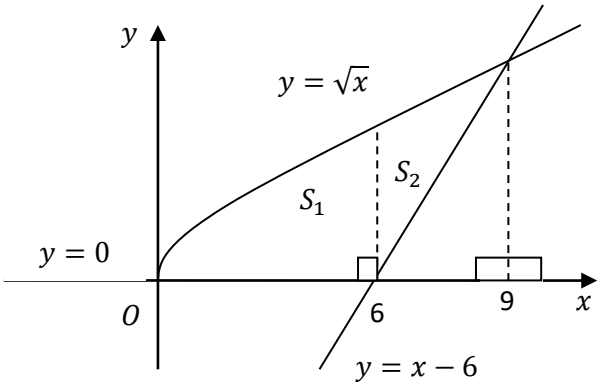
$\Rightarrow 4{,}5=\frac{1}{x}+\frac{1}{(1-x)} \Rightarrow \ 4{,}5=\frac{1}{x-x^2} \Rightarrow$

$\Rightarrow 4{,}5x^2-4{,}5x+1=0 \Rightarrow x_1=\frac{1}{3};x_2=\frac{2}{3}$. Javobi: D.

69. $y=\sqrt{x},\ y=x-6$ va $y=0$ chiziqlar bilan chegaralangan shaklning yuzini toping.

A) 18,5 B) 36 C) 4,5 D) 18 E) 13,5

Yechilishi:



1) $\begin{cases} y=\sqrt{x} \\ y=x-6 \end{cases} \Rightarrow \sqrt{x}=x-6 \Rightarrow$

$\Rightarrow x=x^2-12x+36 \Rightarrow x^2-13x+36=0 \Rightarrow$

$\Rightarrow \begin{cases} x_1=4 \ \ chet\ ildiz; \\ x_2=9\ ildiz. \end{cases}$

2) $\begin{cases} y=x-6 \\ y=0 \end{cases} \Rightarrow \ x-6=0 \Rightarrow x=6;$

3) $S_1=\int_0^6 \sqrt{x}\,dx=\frac{x^{\frac{1}{2}+1}}{\frac{3}{2}}\Big|_0^6=\frac{2}{3}\sqrt{x^3}\Big|_0^6=\frac{2}{3}\cdot 6\sqrt{6}=4\sqrt{6};$

4) $S_2=\int_6^9\left[\sqrt{x}-(x-6)\right]dx=\int_6^9 x^{\frac{1}{2}}dx-\int_6^9 xdx+$

$+6\int_6^9 dx=\frac{2}{3}\sqrt{x^3}\Big|_6^9-\frac{1}{2}x^2\Big|_6^9+6x\Big|_6^9=\frac{2}{3}\left[\sqrt{9^3}-\sqrt{6^3}\right]-$

$-\frac{1}{2}[9^2-6^2]+6[9-6]=18-4\sqrt{6}-\frac{45}{2}+18=$

$= \frac{27}{2} - 4{,}6;$

5) $S = S_1 + S_2 = 13{,}5.$ Javobi: E.

70. $f(x) = 2x^3 + 7{,}5x^2 - 9x$ funksiyaning kamayish oraliqlarini toping.

A) $(0{,}5; \infty)$ B) $[-3; 0{,}5]$ C) $(-\infty;\ 3] \cup [0{,}5;\ \infty)$

D) $(-\infty; 3]$ E) $(-\infty;\ \infty)$

Yechilishi: $f(x) = 2x^3 + 7{,}5x^2 - 9x \Rightarrow f'(x) \le 0 \Rightarrow$

$\Rightarrow 6x^2 + 15x - 9 \le 0 \Rightarrow 2x^2 + 5x - 3 \le 0 \Rightarrow$

$\Rightarrow \begin{cases} x_1 = 0{,}5 \\ x_2 = -3 \end{cases} \Rightarrow [-3; 0{,}5].$ Javobi: B.

71. $\log_2 \sqrt[3]{x+1} < \log_8 16$ tengsizlikni yeching.

A) (-∞; 15) B) $(-1;\ \infty)$ C) $(3;\ \infty)$

D) $(-1; 3)$ E) (-1; 15)

Yechilishi: $\log_2 \sqrt[3]{x+1} < \log_8 16 \Rightarrow$

$\Rightarrow \log_2 \sqrt[3]{x+1} < \log_{2^3} 16 \Rightarrow \log_2 \sqrt[3]{x+1} =$

$= \frac{1}{3}\log_2 16 \Rightarrow \log_2 \sqrt[3]{x+1} = \log_2 \sqrt[3]{16} \Rightarrow$

$\sqrt[3]{x+1} < \sqrt[3]{16} \Rightarrow x + 1 < 16 \Rightarrow (-\infty; 15)$. Javobi: A.

72. $y = |x-2| + 2x - 3x^2$ funksiyaning eng katta qiymatini toping.

A) $2\frac{1}{12}$ B) 10 C) $-1\frac{1}{4}$ D) $\frac{1}{2}$ E) $-\frac{1}{12}$

Yechilishi: $y = |x-2| + 2x - 3x^2 \Rightarrow$

$\Rightarrow \begin{cases} y = -x + 2 + 2x - 3x^2 \\ y = x - 2 + 2x - 3x^2 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} y = 2 + x - 3x^2 \\ y = -2 + 3x - 3x^2 \end{cases} \Rightarrow \begin{cases} y' = 1 - 6x \\ y' = 3 - 6x \end{cases} \Rightarrow$

$=> \begin{cases} x = \frac{1}{6} \\ x = \frac{1}{2} \end{cases} => y\left(\frac{1}{2}\right) = \frac{7}{4} = 1\frac{3}{4};\ y\left(\frac{1}{6}\right) = 2\frac{1}{12}.$ Javobi: A.

73. a parametrning qanday qiymatlarida $7\sin x - 5\cos x = a$ tenglama yechimga ega bo'ladi?

A) $-1 \le a \le 1$ B) $-\sqrt{24} \le a \le \sqrt{24}$ C) $0 \le a \le 1$

D) $2 \le a \le 12$ E) $-\sqrt{74} \le a \le \sqrt{74}$

Yechilishi: $7\sin x - 5\cos x = a;$

$-\sqrt{7^2+5^2} \le a \le \sqrt{7^2+5^2} => -\sqrt{74} \le a \le \sqrt{74}.$

Javobi: E.

74. $f(x) = (3x^2 + x)\cos 2x$ bo'lsa, $f'(0) + f'\left(-\frac{\pi}{2}\right)$ ni hisoblang.

A) $-3\pi + 2$ B) 0 C) 3π D) $3\pi - 1$ E) $3\pi^2 + \pi$

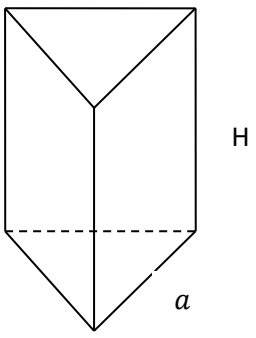
Yechilishi: $f(x) = (3x^2 + x)\cos 2x;$

$f'(x) = (6x+1)\cdot\cos 2x - 2\cdot(3x^2+x)\cdot\sin 2x;$

$f'(0) = 1;\ f'\left(-\frac{\pi}{2}\right) = 3\pi - 1.$

$f'(0) + f'\left(-\frac{\pi}{2}\right) = 1 + 3\pi - 1 = 3\pi.$ Javobi: C.

75. Uchburchakli muntazam prizmaning hajmi ϑ ga teng. Asosining tomoni qanday bo'lganda, prizmaning to'la sirti eng kichik bo'ladi?



A) $\sqrt[3]{2V}$ B) $\sqrt{4V}$ C) $\sqrt[3]{4V}$

D) $\sqrt{2V}$ E) $\sqrt[3]{V}$

Yechilishi: $\frac{a^2\sqrt{3}}{4}\cdot H = V => H = \frac{4V}{a^2\sqrt{3}};$

$S_T = S_{yon} + 2\cdot S_{asos} = 3a\cdot H + 2\cdot$

$\cdot\frac{a^2\sqrt{3}}{4} = 3a\cdot\frac{4V}{a^2\sqrt{3}} + \frac{a^2\sqrt{3}}{2};$

$S_T' = -\frac{4\sqrt{3}V}{a^2} + \sqrt{3} \cdot \text{a} \Rightarrow$

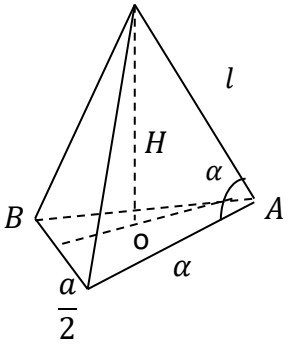
$\Rightarrow \sqrt{3}\text{a}^3 = 4\sqrt{3}\,\text{V} \Rightarrow a = \sqrt[3]{4\text{V}}$. Javobi: C.

76. Muntazam uchburchakli prizmaning yon qirrasi l ga teng va asos tekisligi bilan α burchak hosil qiladi. Piramidaning hajmini toping.

A) $l^3\sqrt{2}tg\alpha$ B) $\frac{l^3\sqrt{3}}{4}\sin 2\alpha$ C) $\frac{l^3\sqrt{3}}{8}\sin 2\alpha$

D) $\frac{l^3\sqrt{3}}{8}\sin 2\alpha \cos\alpha$ E) $\frac{l^3\sqrt{3}}{4}tg\alpha \cos\alpha$

Yechilishi: $\frac{H}{l} = \sin\alpha$; $H = l \cdot \sin\alpha$;



$\frac{OA}{l} = \cos\alpha \Rightarrow OA = l \cdot \cos\alpha$;

$AB = OA + \frac{1}{2}OA = \frac{3}{2} \cdot l \cdot \cos\alpha$;

$AB^2 = a^2 - \frac{a^2}{4} = \frac{3a^2}{4} \Rightarrow$

$AB = \frac{a\sqrt{3}}{2} \cdot \frac{3}{2} \cdot l \cdot \cos\alpha = \frac{\sqrt{3}}{2}a \Rightarrow$

$a = \sqrt{3} \cdot l \cdot \cos\alpha$;

$V = \frac{1}{3}SH = \frac{1}{3} \cdot \frac{\sqrt{3}}{4} \cdot 3 \cdot l^2 \cdot \cos^2\alpha \cdot l \cdot \sin\alpha =$

$= \frac{\sqrt{3}}{4}l^3 \cdot \frac{1}{2} \cdot 2\sin\alpha\cos\alpha \cdot \cos\alpha = \frac{\sqrt{3}}{8}l^3 \cdot \sin 2\alpha \cdot \cos\alpha.$

Javobi: D.

77. $1+2\sin\frac{\pi x}{3} = 0$ $(2 < x < 4)$ tenglamaning yechimini toping.

A) 2,5; 3,5 B) $3\frac{1}{2}$ C) $3\frac{1}{4}$; 4 D) 3 E) $\emptyset$

Yechilishi: $\sin\frac{\pi x}{3} = -\frac{1}{2}$ $(2 < x < 4)$;

$\frac{\pi x}{3} = (-1)^{k+1}\frac{\pi}{6} + \pi k \Rightarrow x = (-1)^{k+1}\frac{1}{2} + 3k$;

$k = 1 \Rightarrow x = \frac{1}{2} + 3 = 3\frac{1}{2}$. Javobi: B.

78. m ning qanday qiymatlarida $4x^2-(3+2m)x+2=0$ tenglamaning ildizlaridan biri ikkinchisidan sakkiz marta kichik bo'ladi?

A) 3 B) -6 C) -6; 3 D) 3; 5 E) -6; -3

Yechilishi: $4x^2-(3+2m)x+2=0 \Rightarrow$

$\Rightarrow x^2-\frac{3+2m}{4}x+\frac{1}{2}=0.$ $\begin{cases} x_1+x_2=\frac{3+2m}{4}; \\ x_1\cdot x_2=\frac{1}{2}; \\ x_1=8x_2. \end{cases}$

$U\ holda\ 8x_2\cdot x_2=\frac{1}{2} \Rightarrow x_2^2=\frac{1}{16} \Rightarrow x_2=\pm\frac{1}{4} \Rightarrow$

$\Rightarrow x_1=\pm 2 \Rightarrow \begin{cases} x_1-2; & x_2=-\frac{1}{4}; \\ x=2; & x_2=\frac{1}{4}. \end{cases}$

1) $-\frac{1}{4}-2=\frac{3+2m}{4} \Rightarrow m=-6;$

2) $\frac{1}{4}+2=\frac{3+2m}{4} \Rightarrow m=3.$ Javobi: C.

79. $3^x\cdot 9+3^x\cdot 27\le 972$ tengsizlikning natural sonlardan iborat yechimlari yig'indisini toping.

A) 1 B) 3 C) 6 D) 10 E) 15

Yechilishi: $3^x\cdot 9+3^x\cdot 27\le 972 \Rightarrow 36\cdot 3^x\le 972 \Rightarrow$

$\Rightarrow 3^x\le 3^3 \Rightarrow x=1;2;3.$ Javobi: C.

80. $f(x)=8x^3-5$funksiyaning grafigi M(1; 4) nuqtadan o'tuvchi boshlang'ich funksiyasini toping.

A) $2x^4-5x+7$ B) $24x^2+\frac{1}{6}$ C) $2x^4-5x$

D) $2x^4-5x+1$ E) $4x^4-5x+7$

Yechilishi: $F(x)=\int f(x)dx=8\cdot\frac{x^4}{4}-5x+C \Rightarrow$

$\Rightarrow F(x)=2x^4-5x+C \Rightarrow 4=2\cdot 1^4-5\cdot 1+C \Rightarrow$

$\Rightarrow C=7 \Rightarrow F(x)=2x^4-5x+7.$

Javobi: A.

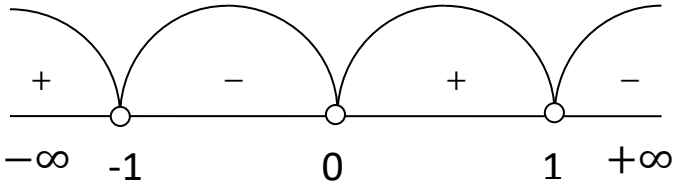
81. $y = -x^4 + 2x^2 + 5$ funksiyaning qiymatlar to'plamini toping.

A) $(-\infty; 6]$ B) $(-\infty; 6)$ C) $[5; 6]$ D) $(-\infty; 5]$ E) $(-\infty; \infty]$

Yechilishi: $y = -x^4 + 2x^2 + 5 \Rightarrow y' = -4x^3 + 4x \Rightarrow$

$4x - 4x^3 = 0 \Rightarrow x(4 - 4x^2) = 0 \Rightarrow \begin{cases} x = 0 \\ x = -1 \\ x = 1 \end{cases}$

Funksiya hosila – sining oraliq – lardagi ishora – lari aniqlanadi.



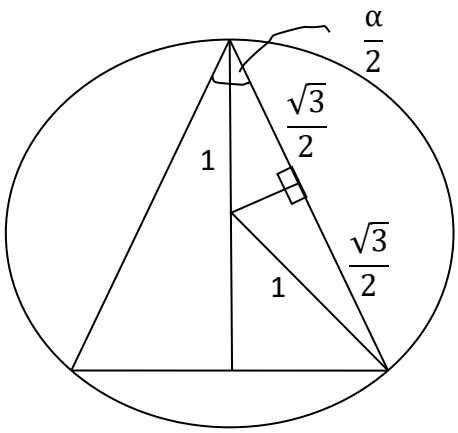
$y_{max}(-1) = -(-1)^4 + 2(-1)^2 + 5 = 6 \Rightarrow$

$y_{min}(0) = 5;$

$y_{max}(1) = 6.$ $[5; 6]$. Javobi: C.

82. Radiusi 1 ga teng bo'lgan sharga, yasovchisi $\sqrt{3}$ ga teng bo'lgan konus ichki chizildi. Shu konus o'q kesimining uchidagi burchakning kattaligini toping.

A) 90° B) 30° C) 45° D) 60° E) $\arccos\frac{2}{3}$



Yechilishi: $\frac{\sqrt{3}}{2} : 1 = \cos\frac{\alpha}{2} \Rightarrow$

$\Rightarrow \cos\frac{\alpha}{2} = \frac{\sqrt{3}}{2} \Rightarrow \frac{\alpha}{2} = 30^\circ \Rightarrow$

$\Rightarrow \alpha = 60^\circ$. Javobi: D.

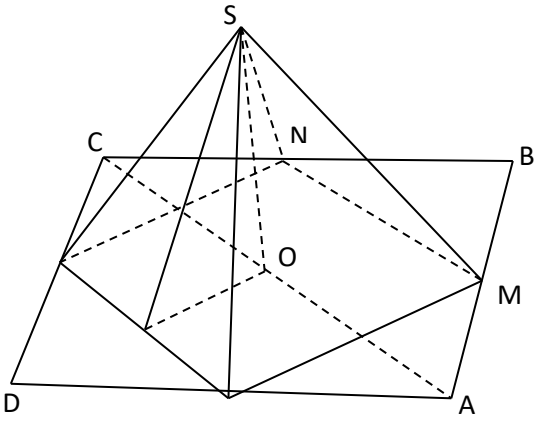
83. Kubning ostki asosidagi tomonlarining o'rtalari ketma-ket tutashtirildi. Hosil bo'lgan to'rtburchakning uchlari kub ustki

asosining markazi bilan tutashtirildi. Agar kubning qirrasi a ga teng bo'lsa, hosil bo'lgan piramidaning to'la sirtini toping.

A) $\frac{2a^2}{3}$ B) $3a^2$ C) $1{,}5a^2$ D) $2a^2$ E) $\frac{2a^2\sqrt{3}}{3}$

Yechilishi: $AB = a \Rightarrow$

$AC = a\sqrt{2} \Rightarrow \quad MN = \frac{a\sqrt{2}}{2};$



$OD = \frac{MN}{2} \Rightarrow$

$\Rightarrow OD = \frac{a\sqrt{2}}{4}; SO = a;$

$SD^2 = SO^2 + OD^2 =$

$= a^2 + \frac{2a^2}{16} \Rightarrow SD = \frac{3a}{2\sqrt{2}};$

$S_{yon} = \frac{1}{2} \cdot 4 \cdot \frac{a\sqrt{2}}{2} \cdot \frac{3a}{2\sqrt{2}} = \frac{3}{2}a^2;$

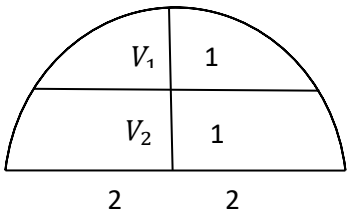
$S_{asos} = MN^2 = \frac{1}{2}a^2;$

$S_T = S_{yon} + S_{asos} = 2a^2.$ Javobi: D.

84. Radiusi 2 ga teng bo'lgan yarim shar balandligining o'rtasidan yarim sharning asosiga parallel tekislik o'tkazilgan. Hosil bo'lgan shar qatlamining hajmini toping.

A) $\frac{10}{3}\pi$ B) $\frac{11}{3}\pi$ C) 4π D) 3π E) $\frac{13}{3}\pi$

Yechilishi: $V = \frac{4}{3}\pi \cdot 2^3 = \frac{32}{3}\pi;\ \frac{V}{2} = \frac{16}{3}\pi;$



$Integral\ usulida\ (Oy) ga\ nisbatan\ yechish:\ V = V_1 + V_2;$

$x^2 + y^2 = 2^2 \Rightarrow \quad x = \sqrt{4 - y^2};$

$V = \pi \int_0^2 (\sqrt{4 - y^2})^2 dy =$

$= \pi \int_0^2 (4 - y^2) dy =$

$= \pi \left[4y - -\frac{1}{3}y^3\right] |_0^2 = \pi \left[8 - \frac{8}{3}\right] =$

$= \frac{16}{3}\pi;$

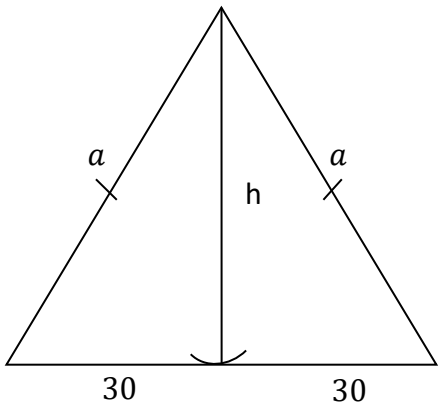
$V_1 = \pi \int_1^2 (4 - y^2)dy = \pi \left[4y - \frac{1}{3}y^3\right]|_1^2 = \pi \left[4(2 - -1) - \frac{1}{3}(8 - 1)\right] = \pi \left(4 - \frac{7}{3}\right) = \frac{5\pi}{3};$ $V_2 = V - V_1 =$

$= \frac{16\pi}{3} - \frac{5\pi}{3} = \frac{11\pi}{3}.$ Javobi: B.

85. Teng yonli uchburchakka ichki chizilgan aylananing markazi uning balandligini 17:15 nisbatda bo'ladi. Uchburchakning asosi 60 ga teng. Shu doiraning yuzini toping.

A) $56{,}25\pi$ B) $22{,}5\pi$ C) 900π D) 15π E) 64π

Yechilishi: *Uchburchakka ichki chizilgan aylananing markazi bissiktrisalarning kesishish nuqtasida bo'ladi. Bissiktri – salar kesishish nuqtasida* $\frac{a+b}{c}$ *nisbatda bo'linadi.*



$\frac{a+b}{c} = \frac{17}{15} => \frac{2a}{60} = \frac{17}{15} =>$

$=> a = 34;$ $h^2 = 34^2 - 30^2 => h = 16;$

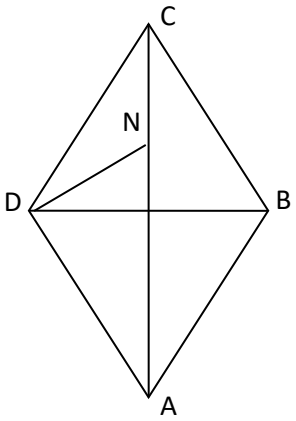
$S = \frac{1}{2} \cdot 60 \cdot 16 = 480;$ $r = \frac{2S}{a+b+c} = \frac{2 \cdot 480}{68+60} = 7{,}5;$

$S = \pi r^2 = 56{,}25\pi.$ Javobi: A.

8-axborotnoma

1. $ABCD$ rombning diagonallari 5 va 12 ga teng. Katta diagonali AC da N nuqta olingan va $AN:NC = 4:1$. AND uchburchakning yuzini toping.

A) 11 B) 12 C) 12,5 D) 13 E) 13,25



Yechilishi: $\frac{AN}{NC} = \frac{4}{1} \Rightarrow AN = 4NC \Rightarrow$

$\Rightarrow \begin{cases} NC = x; \\ AN = 4x. \end{cases} \Rightarrow 4x + x = 12 \Rightarrow$

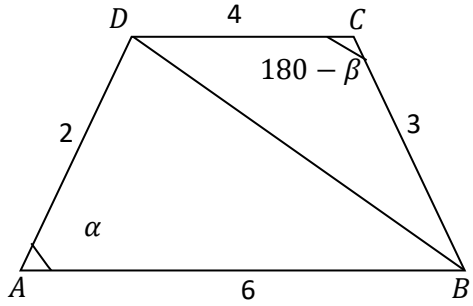
$\Rightarrow 5x = 12 \Rightarrow x = \frac{12}{5} \Rightarrow 4x = \frac{48}{5};$

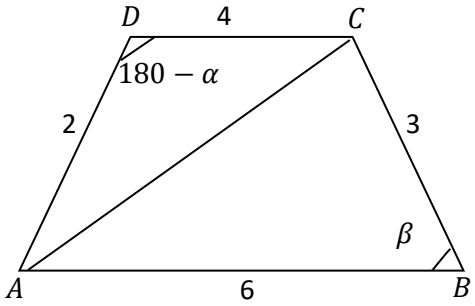
$S = \frac{1}{2} \cdot \frac{48}{5} \cdot 2{,}5 = 12.$ Javobi: B.

2. $ABCD$ $(AB \parallel DC)$ trapetsiyada $AB = 6, BC = 3, CD = 4$ va $DA = 2$ bo'lsa, C burchakning kosinusini toping.

A) $\frac{\sqrt{5}}{4}$ B) $-\frac{\sqrt{5}}{4}$ C) $-\frac{3}{4}$ D) $\frac{3}{4}$ E) $-\frac{\sqrt{5}}{4}$

Yechilishi: $Kosinuslar\ teoremasidan\ foydalaniladi.$





$1) BD^2 = 2^2 + 6^2 - 2 \cdot 2 \cdot 6 \cos\alpha \Rightarrow$

$\Rightarrow BD^2 = 40 - 24\cos\alpha$
$\Rightarrow BD^2 = 25 + 24\cos\beta$ $\Rightarrow BD^2 = 3^2 + 4^2 - 2 \cdot 3 \cdot$

$\cdot 4 \cdot \cos 180 \Rightarrow 40 - 24\cos\alpha = 25 + 24\cos\beta \Rightarrow$

$\Rightarrow \cos\alpha + \cos\beta = \frac{15}{24} \Rightarrow \cos\alpha = \frac{15}{24} - \cos\beta$;

2) $AC^2 = 20 + 16\cos\alpha$; $AC^2 = 45 - 36\cos\beta \Rightarrow$

$\Rightarrow 16\cos\alpha + 36\cos\beta = 25 \Rightarrow$

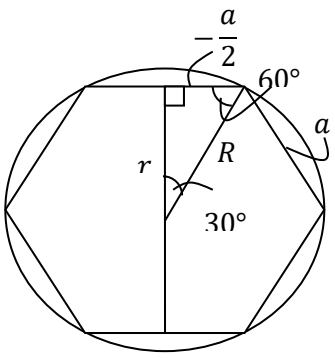
$\Rightarrow 16\left(\frac{15}{24} - \cos\beta\right) + 36\cos\beta = 25 \Rightarrow \cos\beta = \frac{3}{4} \Rightarrow$

$\Rightarrow \cos\angle C = \cos(180 - \beta) = -\frac{3}{4}$. Javobi: C.

3. Muntazam oltiburchak ichidagi ixtiyoriy nuqtadan uning tomonlari yotgan to'g'ri chiziqlargacha bo'lgan masofalar yig'indisi 9 ga teng bo'lsa, shu oltiburchakning yuzini toping.

A) $5\sqrt{3}$ B) $4{,}5\sqrt{3}$ C) $6\sqrt{3}$ D) $5{,}5\sqrt{3}$ E) $4\sqrt{3}$

Yechilishi: $r = \frac{9}{6} = \frac{3}{2}$;



$32 = \frac{a}{2 \cdot tg30^\circ} \Rightarrow a = \frac{3}{2} \cdot 2 \cdot \frac{\sqrt{3}}{2} = \sqrt{3}$;

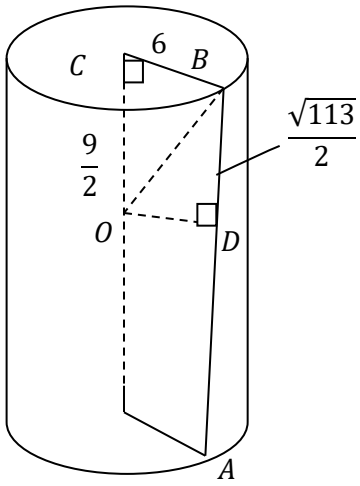
$S = 6S_{\triangle} = 6 \cdot \frac{\sqrt{3}^2 \cdot \sqrt{3}}{4} = 4{,}5\sqrt{3}$.

Javobi: B.

4. Uzunligi $\sqrt{113}$ ga teng bo'lgan AB kesmaning uchlari radiusi 6 ga, balandligi 9 ga teng silindrning pastki va yuqori asosidagi aylanalarda yotadi. Silindr markaziy o'qidan AB kesmagacha bo'lgan eng qisqa masofani toping.

A) $\sqrt{30}$ B) $\sqrt{29}$ C) $\sqrt{28}$ D) $\sqrt{27}$ E) $\sqrt{26}$

Yechilishi:



$OB^2 = 6^2 + \left(\frac{9}{2}\right)^2 = \frac{225}{4}$;

$OD^2 = OB^2 - DB^2 =$

$\frac{225}{4} - \frac{113}{4} = \frac{112}{4} = 28 \Rightarrow$

$\Rightarrow OD = \sqrt{28}$.Javobi: C.

5. $a = \sqrt{49 \cdot 63 \cdot 24}$ va

$b = \sqrt[3]{512 \cdot 49 \cdot 56}$ sonlarining eng katta umumiy bo'luvchisi shu sonlarning eng kichik umumiy karralisining necha foizini tashkil etadi?

A) 2,5 B) 2,(5) C) 2,7 D) 2,(7) E) 3

Yechilishi: $a = \sqrt{6 \cdot 7 \cdot 7 \cdot 9 \cdot 6 \cdot 4} = 6 \cdot 7 \cdot 3 \cdot 2 = 252;$

$b = \sqrt[3]{8^3 \cdot 7^2 \cdot 7 \cdot 2^3} = 8 \cdot 7 \cdot 2 = 112;$

$$\begin{array}{r|l} 252 & 2 \\ 126 & 2 \\ 63 & 3 \\ 21 & 3 \\ 7 & 7 \\ 1 & \end{array} \Rightarrow 252 = 2^2 \cdot 3^2 \cdot 7.$$

$$\begin{array}{r|l} 112 & 2 \\ 56 & 2 \\ 28 & 2 \\ 14 & 2 \\ 7 & 7 \\ 1 & \end{array} \Rightarrow 112 = 2^4 \cdot 7.$$

$D(252; 112) = 2^2 \cdot 7 = 28;$

$K(252; 112) = 2^4 \cdot 3^2 \cdot 7 = 1008;$ $\begin{matrix} 1008 \to 100\% \\ 28 \to x\% \end{matrix} \Rightarrow$

$\Rightarrow \quad x = 2,(7)\%.$ Javobi: D.

6. $\left(\sqrt[4]{13} \cdot \sqrt[3]{\frac{\sqrt[4]{13}-1}{(\sqrt[4]{13}+1)^2}} + \frac{\sqrt[4]{13}-1}{\sqrt[3]{(\sqrt{13}-1)^2}} \right)^{\frac{3}{5}} \cdot (\sqrt{13}-1)^{\frac{4}{5}}$ ni hisoblang.

A) $\sqrt{3}+1$ B) $\sqrt{3}-1$ C) 12 D) $(\sqrt{3}+1)^{-1}$

E) $2\sqrt{13}$

Yechilishi: $\left(\sqrt[4]{13}\cdot\frac{\sqrt[3]{\sqrt[4]{13}-1}}{\sqrt[3]{\left(\sqrt[4]{13}+1\right)^2}}+\frac{\sqrt[4]{13}-1}{\sqrt[3]{(\sqrt{13}-1)^2}}\right)^{\frac{3}{5}}\cdot$

$$\cdot(\sqrt{13}-1)^{\frac{4}{5}}=\left(\frac{\sqrt[4]{13}\cdot\sqrt[3]{\sqrt[4]{13}-1}}{\sqrt[3]{(\sqrt[4]{13}+1)^2}}+\frac{\sqrt[4]{13}-1}{\sqrt[3]{(\sqrt[4]{13}-1)^2\cdot(\sqrt[4]{13}+1)^2}}\right)^{\frac{3}{5}}\cdot$$

$$\cdot(\sqrt{13}-1)^{\frac{4}{5}}=\left(\frac{\sqrt[4]{13}\cdot\sqrt[3]{(\sqrt[4]{13}-1)(\sqrt[4]{13}-1)^2}+\sqrt[4]{13}-1}{\sqrt[3]{(\sqrt[4]{13}-1)^2}\cdot\sqrt[3]{(\sqrt[4]{13}+1)^2}}\right)^{\frac{3}{5}}\cdot$$

$$\cdot\left(\sqrt[4]{13}-1\right)^{\frac{4}{5}}=\left(\frac{\sqrt[4]{13}(\sqrt[4]{13}-1)+(\sqrt[4]{13}-1)}{\sqrt[3]{(\sqrt[4]{13}-1)^2}\cdot\sqrt[3]{(\sqrt[4]{13}+1)^2}}\right)^{\frac{3}{5}}\cdot$$

$$\cdot\left(\sqrt[4]{13}-1\right)^{\frac{4}{5}}=\left(\frac{(\sqrt[4]{13}-1)(\sqrt[4]{13}+1)}{(\sqrt[4]{13}-1)^{\frac{2}{3}}(\sqrt[4]{13}+1)^{\frac{2}{3}}}\right)^{\frac{3}{5}}\cdot\left(\sqrt[4]{13}-1\right)^{\frac{4}{5}}=$$

$$=\left[\left(\sqrt[4]{13}-1\right)\cdot\left(\sqrt[4]{13}+1\right)^{-\frac{2}{3}}\cdot\left(\sqrt[4]{13}+1\right)\cdot\left(\sqrt[4]{13}+\right.\right.$$

$$\left.\left.+1\right)^{-\frac{2}{3}}\right]^{\frac{3}{5}}\cdot(\sqrt{13}-1)^{\frac{4}{5}}=\left[\left(\sqrt[4]{13}-1\right)^{\frac{1}{3}}\cdot\left(\sqrt[4]{13}+1\right)^{\frac{1}{3}}\right]^{\frac{3}{5}}\cdot$$

$$\cdot\left(\sqrt{13}+1\right)^{\frac{4}{5}}=\left[\left(\sqrt[4]{13}-1\right)^{\frac{1}{5}}\cdot\left(\sqrt[4]{13}+1\right)^{\frac{1}{5}}\right]\cdot\left(\sqrt[4]{13}-1\right)^{\frac{4}{5}}\cdot\cdot$$

$$\left(\sqrt[4]{13}+1\right)^{\frac{4}{5}}=\left(\sqrt[4]{13}-1\right)\left(\sqrt[4]{13}+1\right)=\sqrt{13}-1.$$

Javobi: A.

7. Sement va qumdan iborat 30 kg qorishmaning 60% ini sement tashkil etadi. Qorishmaning 40% i sementdan iborat bo'lishi uchun qorishmaga qancha qum qo'shish kerak?

A) 10 B) 12 C) 15 D) 18 E) 20

Yechilishi: $\begin{matrix} 30-100\% \\ S_1-\ 60\% \end{matrix} => \ S_1 = 18kg;$

$\begin{matrix} 30+q-100\% \\ 18-40\% \end{matrix} => \ q = 15kg.$ Javobi: C.

8. Ikki sonning yig'indisi 15 ga teng, ularning o'rta arifmetigi shu sonlarning o'rta geometrigidan 25% ga katta. Shu sonlar kvadratlarining yig'indisini toping.

A) 117 B) 153 C) 113 D) 173 E) 133

Yechilishi: $\begin{cases} x+y=15 \\ \frac{x+y}{2} = 1{,}25\sqrt{xy} \end{cases} =>$

$=> \begin{cases} y = 15-x \\ 15 = 2{,}5\sqrt{x(15-x)} \end{cases} => \sqrt{15x-x^2} = 6 =>$

$=> x^2-15x+36=0 => x=12;\ y=15-12=3.$

$x^2+y^2 = 12^2+3^2 = 153.$ Javobi: B.

9. $\frac{2}{2+\sqrt[3]{2}+\sqrt[3]{4}}$ kasrning maxrajini irratsionallikdan qutqaring.

A) $2-\sqrt[3]{4}$ B) $1-\sqrt[3]{4}$ C) $1+\sqrt[3]{4}$ D) $\sqrt[3]{2}$

E) $\sqrt[3]{4}$

Yechilishi: $\frac{2}{2+\sqrt[3]{2}+\sqrt[3]{4}} = \frac{2[(\sqrt[3]{4}+1)-(\sqrt[3]{2}+1)]}{[(\sqrt[3]{4}+1)+(\sqrt[3]{2}+1)]\cdot[(\sqrt[3]{4}+1)-(\sqrt[3]{2}+1)]} =$

$\frac{2(\sqrt[3]{4}-\sqrt[3]{2})}{(\sqrt[3]{4}+1)^2-(\sqrt[3]{2}+1)^2} = \frac{2\sqrt[3]{4}\left(1-\sqrt[3]{\frac{1}{2}}\right)}{\sqrt[3]{4}} = 2\left(1-\sqrt[3]{\frac{1}{2}}\right) = 2-\sqrt[3]{4}.$

Javobi: A.

10. $\frac{0,1(6)+0,(6)}{0,(3)+1,1(6)}(x+1) = 0{,}3(8)x$ tenglamani yeching.

A) 2,(6) B) -2,(6) C) 3,(6) D) -3,(6) E) -3,(3)

Yechilishi: $\frac{\frac{15}{90}+\frac{6}{9}}{\frac{3}{9}+\frac{105}{90}} \cdot (x+1) = \frac{35}{90}\cdot x \ =>$

$\Rightarrow \frac{5}{9}(x+1)=\frac{7}{18}x \Rightarrow 10x+10=7x \Rightarrow$

$\Rightarrow x=-3,(3)$. Javobi: E.

11. $\frac{3x-2}{4}+\frac{2x+3}{2}-2{,}5x+2=0$ tenglamani yeching.

A) $\emptyset$ B) 4 C) 10 D) -10 E) $Yechimlari\ cheksiz\ ko'p$

Yechilishi: $3x-2+4x+6-10x+8=0 \Rightarrow x=4$.

Javobi: B.

12. m ning qanday qiymatida $\frac{mx+9}{x}\geq -10$ tengsizlikning eng katta manfiy yechimi -3 ga teng bo'ladi?

A) -9 B) -8 C) -7 D) -6 E) -5

Yechilishi: $\frac{m\cdot(-3)+9}{-3}\geq -10 \Rightarrow m-3\geq -10 \Rightarrow$

$\Rightarrow m\geq -7$. Javobi: C.

13. $\frac{a+2a+3a+\cdots+na}{n^2-2n-3}-\left(\sqrt{ab}-\frac{ab}{a+\sqrt{ab}}\right):\frac{2(\sqrt{ab}-b)}{a-b}$ ni soddalashtiring.

A) $a+n$ B) $\frac{3a}{2(n-3)}$ C) $\frac{2a}{3(n+1)}$ D) $\frac{a}{n-3}$ E) $n-a$

Yechilishi: $\frac{a+2a+3a+\cdots+na}{n^2-2n-3}-\left(\sqrt{ab}-\frac{ab}{a+\sqrt{ab}}\right):\frac{2(\sqrt{ab}-b)}{a-b}=$

$\frac{\frac{n+1}{2}\cdot a\cdot n}{(n+1)(n-3)}-\frac{a\sqrt{ab}}{2(\sqrt{ab}-b)}=\frac{n\cdot a}{2(n-3)}-\frac{a\sqrt{ab}}{\sqrt{a}(\sqrt{a}+\sqrt{b})}\cdot$

$\cdot\frac{(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})}{2\cdot\sqrt{b}(\sqrt{a}-\sqrt{b})}=\frac{na}{2(n-3)}-\frac{a}{2}=\frac{na-na+3a}{2(n-3)}=\frac{3a}{2(n-3)}$.

Javobi: B.

14. $\frac{x^2-2x\sqrt{3}-\sqrt[3]{4}+3}{x-\sqrt{3}}$ ifodaning $x=\sqrt{3}-\sqrt[3]{2}$ bo'lgandagi qiymatini toping.

A) $\sqrt{3}$ B) $\sqrt[3]{2}$ C) 1 D) 0 E) $\frac{\sqrt{3}}{2}$

Yechilishi: $x \neq \sqrt{3}$; $\frac{x^2-2x\sqrt{3}-\sqrt[3]{4}+3}{x-\sqrt{3}} = \frac{(x-\sqrt{3})^2-\sqrt[3]{4}}{x-\sqrt{3}} = \frac{(x-\sqrt{3}-\sqrt[3]{2})(x-\sqrt{3}+\sqrt[3]{2})}{x-\sqrt{3}} = \frac{(\sqrt{3}-\sqrt[3]{2}-\sqrt{3}-\sqrt[3]{2})(\sqrt{3}-\sqrt[3]{2}-\sqrt{3}+\sqrt[3]{2})}{\sqrt{3}-\sqrt[3]{2}-\sqrt{3}} = 0.$

Javobi: D.

15. a va b ning qanday qiymatlarida $\begin{cases} ax-5y=-1 \\ 6x+15y=b+3 \end{cases}$ tenglamalar sistemasi yechimga ega emas?

A) $a=2;\ b\neq 1$ B) $a=2;\ b\neq 0$

C) $a\neq 1;\ b=3$ D) $a=-2;\ b\neq 1$

E) $a=-2;\ b\neq 0$

Yechilishi: $\frac{a}{6} \neq -\frac{5}{15} => a \neq -2;\ -\frac{5}{15} \neq \frac{-1}{b+3} => b \neq 0.$

Javobi: E.

16. a ning qanday qiymatida $4x^2-15x+4a^2=0$ tenglamaning ildizlaridan biri ikkinchi ildizining kvadratiga teng bo'ladi?

A) $2\sqrt{2}$ B) $\pm 2\sqrt{2}$ C) $1{,}5\sqrt{1{,}5}$

D) $\pm 1{,}5\sqrt{1{,}5}$ E) $3\sqrt{2}$

Yechilishi: $4x^2-15x+4a^2=0 \ =>$

$x^2-\frac{15}{4}x+a^2=0 \ => \ \begin{cases} x_1+x_1^2=\frac{15}{4} \\ x_1\cdot x_1^2=a^2 \end{cases} =>$

$=> \begin{cases} 4x^2+4x-15=0 \ => x\neq -\frac{5}{2};\ x=\frac{3}{2} \\ a^2=x^3 \ => \ a^2=\left(\frac{3}{2}\right)^3 \ => a=\pm 1{,}5\sqrt{1{,}5}. \end{cases}$

Javobi: D.

17. $\frac{3x^2+4x-4}{x+2} = x^2-4x+4$ tenglama ildizlarining yig'indisini toping.

A) 10 B) -5 C) -4 D) 8 E) 7

Yechilishi: $\frac{3x^2+4x-4}{x+2} = x^2 - 4x + 4;\ \ x \neq -2;$

$\frac{3(x+2)\left(x-\frac{2}{3}\right)}{x+2} = x^2 - 4x + 4 \Rightarrow 3x - 2 =$

$= x^2 - 4x + 4 \Rightarrow x^2 - 7x + 6 = 0 \Rightarrow \begin{cases} x_1 = 1; \\ x_2 = 6. \end{cases}$

Javobi: E.

18. a ning nechta butun qiymatida $y = (x - 2a)^2 + a^2 - -9a + 14$ parabola uchining absissasi musbat, ordinatasi esa manfiy bo'ladi?

A) 1 B) 2 C) 4 D) 5 E) 6

Yechilishi: $y = (x - 2a)^2 + a^2 - 9a + 14 \Rightarrow$

$y = x^2 - 4ax + 5a^2 - 9a + 14;$

1) $x = -\frac{b}{2a} \Rightarrow -\frac{-4a}{2\cdot 1} > 0 \Rightarrow 2a > 0 \Rightarrow a > 0.$

2) $y = -\frac{b^2-4ac}{4a} \Rightarrow -\frac{16a^2-20a^2+36a-56}{4\cdot 1} < 0 \Rightarrow$

$\Rightarrow \frac{4a^2-36a+56}{4} < 0 \Rightarrow a^2 - 9a + 14 < 0 \Rightarrow$

$\Rightarrow \begin{cases} a_1 = 2; \\ a_2 = 7; \end{cases} \Rightarrow (2; 7) \Rightarrow a = 3,4,5,6.$ Javobi: C.

19. $x^2 - \frac{\sqrt{85}}{4}x + 1\frac{6}{16} = 0$ tenglamaning katta va kichik ildizlari kublarining ayirmasini toping.

A) -2 B) -1 C) 2 D) 1 E) $\frac{1}{2}(\sqrt{85} - 6)$

Yechilishi: $x^2 - \frac{\sqrt{85}}{4}x + 1\frac{6}{16} = 0 \Rightarrow \begin{cases} x_1 = \frac{\sqrt{85}-1}{8} \\ x_2 = \frac{\sqrt{85}+1}{8} \end{cases};$

$x_2^3 - x_1^3 = \left(\frac{\sqrt{85}+1}{8}\right)^3 - \left(\frac{\sqrt{85}-1}{8}\right)^3 = \left(\frac{\sqrt{85}+1}{8} - \frac{\sqrt{85}-1}{8}\right).$

$$\cdot\left(\left(\frac{\sqrt{85}+1}{8}\right)^2+\frac{\sqrt{85}+1}{8}\cdot\frac{\sqrt{85}-1}{8}+\left(\frac{\sqrt{85}-1}{8}\right)^2\right)=$$

$$=\frac{1}{4}\cdot\left(\frac{85+2\sqrt{85}+1}{64}+\frac{85-2\sqrt{85}+1}{64}+\frac{85-1}{64}\right)=\frac{1}{4}\cdot\frac{3\cdot85+1}{64}=$$

$=\frac{256}{256}=1$. Javobi: D.

20. Amallarni bajaring: $\left(1{,}75:\frac{2}{3}-\ 1\frac{3}{4}\cdot1\frac{1}{8}\right):\frac{7}{12}$.

A) 1,125 B) 1,2 C) 1,5 D) 0,75 E) $1\frac{1}{9}$

Yechilishi: $\left(1{,}75:\frac{2}{3}-\ 1\frac{3}{4}\cdot1\frac{1}{8}\right):\frac{7}{12}=\left(\frac{7}{4}\cdot\frac{3}{2}-\frac{7}{4}\cdot\frac{9}{8}\right)\cdot\frac{12}{7}=$

$=\left(\frac{3}{2}-\frac{9}{8}\right)\cdot\frac{7}{4}\cdot\frac{12}{7}=3\cdot\frac{3}{8}=\frac{9}{8}=1\frac{1}{8}=1{,}125$. Javobi: A.

21. $25\frac{1}{2}$ sonini 7; 8; 2 sonlariga mutanosib bo'laklarga bo'lgandagi eng kichik sonni toping.

A) 3 B) 4 C) 5 D) 3,5 E) 2,7

Yechilishi: $\frac{51}{2}\cdot\frac{1}{7}=3\frac{9}{14}$; $\frac{51}{3}\cdot\frac{1}{8}=\frac{51}{16}$; $\frac{51}{2}\cdot\frac{1}{2}=\frac{51}{4}$;

$7x+8x+2x=\frac{51}{2}=>x=\frac{51}{34}=>\ x=\frac{3}{2}$; $7x=\frac{21}{2}$;

$8x=\frac{24}{2}$; $2x=3$. Javobi: A.

22. Ikki sonning ko'paytmasi 2,88 ga teng. Birinchi ko'paytuvchi 0,3 ga, ikkinchi ko'paytuvchi 1,6 ga bo'linsa, ko'paytma necha bo'ladi?

A) 6 B) 10 C) 12 D) E) 8

Yechilishi: $x\cdot y=2{,}88;\ =>\ \frac{x}{0{,}3}\cdot\frac{y}{1{,}6}=\frac{x\cdot y}{0{,}48}=\frac{2{,}88}{0{,}48}=6.$

Javobi: A.

23. Hovuzga 3 ta quvur o'tkazilgan bo'lib, birinchi va ikkinchi quvurlar birgalikda hovuzni 12 soatda, birinchi va uchinchi quvurlar birgalikda hovuzni 15 soatda, ikkinchi va

uchunchi quvurlar birgalikda hovuzni 20 soatda to'ldiradi. Uchala quvur birgalikda ochilsa, hovuz necha soatda to'ladi?

A) 10 B) 8 C) 9 D) 11 E) 7

Yechilishi: $\begin{cases}\left(\frac{1}{a}+\frac{1}{b}\right)\cdot 12=1\\ \left(\frac{1}{a}+\frac{1}{c}\right)\cdot 15=1\\ \left(\frac{1}{b}+\frac{1}{c}\right)\cdot 20=1\end{cases} \Rightarrow \begin{cases}\frac{1}{a}+\frac{1}{b}=\frac{1}{12}\\ \frac{1}{a}+\frac{1}{c}=\frac{1}{15}\\ \frac{1}{b}+\frac{1}{c}=\frac{1}{20}\end{cases} \Rightarrow$

$\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)\cdot t=1 \Rightarrow \quad t=? \Rightarrow \ \frac{2}{a}+\frac{2}{b}+\frac{2}{c}=$

$=\frac{1}{12}+\frac{1}{15}+\frac{1}{20} \Rightarrow 2\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)=\frac{1}{5} \Rightarrow t=10.$

Javobi: A.

24. Ifodani soddalashtiring:

$\left(\frac{15}{\sqrt{6}+1}+\frac{4}{\sqrt{6}-2}-\frac{12}{3-\sqrt{6}}\right)\cdot\left(\sqrt{6}+11\right).$

A) -115 B) 127 C) 100 D) -116 E) $21\sqrt{6}$

Yechilishi: $\left(\frac{15}{\sqrt{6}+1}+\frac{4}{\sqrt{6}-2}-\frac{12}{3-\sqrt{6}}\right)\cdot\left(\sqrt{6}+11\right)=$

$=\left(\frac{15(\sqrt{6}-1)}{5}+\frac{4(\sqrt{6}+2)}{2}-\frac{12(3+\sqrt{6})}{3}\right)\cdot\left(\sqrt{6}+11\right)=$

$=\left(\sqrt{6}-11\right)\left(\sqrt{6}+11\right)=6-11^2=-115.$ Javobi: A.

25. Qotishma kumush va oltindan iborat bo'lib, o'zaro 3:5 nisbatda. Agar qotishmada 0,45 kg oltin bo'lsa, qotishmaning og'irligini (kg) toping.

A) 0,72 B) 0,21 C) 1,21 D) 0,8 E) 0,9

Yechilishi: $\frac{k}{O}=\frac{3}{5} \Rightarrow k=\frac{3}{5}\cdot O=\frac{3}{5}\cdot 0{,}45=0{,}27;$

$0{,}27+0{,}45=0{,}72.$ Javobi: A.

26. 0,4(6) qismi 360 sonining 0,6(4) qismiga teng sonini toping.

A) $497\frac{1}{7}$ B) $506\frac{2}{7}$ C) $400\frac{3}{7}$ D) $497\frac{5}{7}$ E) $497\frac{4}{7}$

Yechilishi: $0{,}4(6)\cdot x = 360\cdot 0{,}6(4) =>$

$\frac{42}{90}\cdot x = 360\cdot\frac{58}{90} => 42x = 360\cdot 58 => x = 497\frac{1}{7}$.

Javobi: A.

27. 0,2(18) ni oddiy kasr shaklida yozing.

A) $\frac{12}{55}$ B) $\frac{13}{55}$ C) $\frac{28}{99}$ D) $\frac{218}{900}$ E) $\frac{13}{45}$

Yechilishi: $0{,}2(18) = \frac{218-2}{990} = \frac{216}{990} = \frac{12}{55}$. Javobi: A.

28. 3591 sonini 1:0,3(8):1,(1):0,3(9):0,(72) kabi nisbatda bo'lganda hosil bo'ladigan eng katta sonni toping.

A) 1100 B) 990 C) 1000 D) 1020 E) 720

Yechilishi: $x + \frac{35}{90}x + \frac{10}{9}x + \frac{36}{90}x + \frac{72}{99}x = \frac{399}{110}x =>$

$=> \frac{399}{110}x = 3591 => x = 990 => \frac{10}{9}\cdot 990 = 1100.$

Javobi: A.

29. $1 + \frac{1}{10\cdot 11} + \frac{1}{11\cdot 12} + \frac{1}{12\cdot 13} + \frac{1}{13\cdot 14} + \frac{1}{14\cdot 15} + \frac{1}{15\cdot 16}$ ni hisoblang.

A) $1\frac{3}{80}$ B) 1,16 C) $1\frac{3}{40}$ D) $1\frac{7}{80}$ E) $1\frac{13}{80}$

Yechilishi: $1 + \frac{1}{10} - \frac{1}{11} + \frac{1}{11} - \frac{1}{12} + \cdots + \frac{1}{15} - \frac{1}{16} =$

$= 1 + \frac{1}{10} - \frac{1}{16} = \frac{80+8-5}{80} = \frac{83}{80} = 1\frac{3}{80}$. Javobi: A.

30. $4^{12} + 4^{12} + 4^{12} + 4^{12}$ yig'indining yarmini hisoblang.

A) 2^{25} B) 2^{24} C) 4^{48} D) $2\cdot 4^{16}$ E) 4^{25}

Yechilishi: $4^{12} + 4^{12} + 4^{12} + 4^{12} = 4\cdot 4^{12} =>$

$=> 2\cdot 4^{12} = 2\cdot 2^{24} = 2^{25}$. Javobi: A.

31. Tenglamani yeching: $2^{x-4} + 2^{x-2} + 2^{x-1} = 6{,}5 + 3{,}25 + 1{,}625 + \cdots$

A) 4 B) 2 C) 1 D) 0 E) $aniqlab\ bo'lmaydi$

Yechilishi: $2^{x-4} + 2^{x-2} + 2^{x-1} =$

$= 6{,}5 + 3{,}25 + 1{,}625 + \cdots ; => q = \frac{1}{2}. S = \frac{6{,}5}{1-\frac{1}{2}} = 13 =>$

$=> 2^x \left(\frac{1}{16} + \frac{1}{4} + \frac{1}{2}\right) = 13 => 2^x \cdot \frac{13}{16} = 13 =>$

$=> 2^x \cdot 2^{-4} \cdot 13 = 13 => 2^{x-4} = 2^0 =>$

$=> x - 4 = 0 \ => \quad x = 4.$ Javobi: A.

32. Umumiy daftarning bahosi oldin 15%, keyin 150 so'm arzonlashgach, 190 so'm bo'ldi. Daftarning oldingi bahosi necha so'm bo'lgan?

A) 400 B) 500 C) 350 D) 340 E) 450

Yechilishi: $x \cdot 0{,}85 - 150 = 190 \ => x = 400.$

Javobi: A.

33. $y\sqrt[3]{y\sqrt[3]{y\ldots}} = 2\sqrt{2}$ tenglamani yeching.

A) 2 B) $\sqrt{2}$ C) 3 D) 4 E) 5

Yechilishi: $\left(y\sqrt[3]{y\sqrt[3]{y\ldots}}\right)^3 = \left(2\sqrt{2}\right)^3 =>$

$=> y^3 \cdot y \cdot \sqrt[3]{y\ldots} = 16 \cdot \sqrt{2} => y^3 \cdot 2\sqrt{2} = 16\sqrt{2} =>$

$=> y^3 = 8 => y = \sqrt[3]{8} => y = 2.$ Javobi: A.

34. Agar $\begin{cases} x + y - \sqrt{xy} = 7 \\ x^2 + y^2 + xy = 133 \end{cases}$ bo'lsa, xy ning qiymatini toping.

A) 6 B) 42 C) 25 D) 81 E) 16

Yechilishi: $\begin{cases} x + y - \sqrt{xy} = 7 \\ x^2 + y^2 + xy = 133 \end{cases} =>$

$=> \begin{cases} x + y = 7 + \sqrt{xy} \\ x^2 + y^2 + xy = 133 \end{cases} =>$

$$=>\begin{cases}x^2+y^2+2xy=49+14\sqrt{xy}+xy\\ x^2+y^2+xy=133\end{cases}=>$$

$$=>\begin{cases}x^2+y^2+xy=49+14\sqrt{xy}\\ x^2+y^2+xy=133\end{cases}=>$$

$$=>49+14\sqrt{xy}=133=>14\sqrt{xy}=133-49=>$$

$=> xy=6.$ Javobi: A.

35. $(a+b+c)(ab+bc+ac)-abc$ ni ko'paytma shaklida yozing.

A) $(a+b)(b+c)(a+c)$ B) $a^2+b^2+c^2$

D) $(a+b)(b+c)(a-c)$ E) $a^2+b^2+c^2$

E) 0

Yechilishi: $a^2b+abc+a^2c+ab^2+b^2c+abc+$

$+abc+bc^2+ac^2-abc=a^2b+ab^2+a^2c+abc+$

$+b^2c+abc+ac^2+bc^2=ab(a+b)+ac(a+b)+$

$+bc(a+b)+c^2(a+b)=(a+b)(ab+ac+bc+$

$+c^2)=(a+b)\cdot[a(b+c)+c(b+c)]=(a+b)\cdot$

$\cdot(b+c)(a+c).$ Javobi: A.

36. Agar 1; $\sqrt{y}$; $3\sqrt{y}$+4 sonlari geometric progressiyaning ketma-ket hadlari bo'lsa, y ni toping.

A) 16 B) 9 C) 25 D) 4 E) 49

Yechilishi: $\sqrt{1\cdot\left(3\sqrt{y}+4\right)}=\sqrt{y}=>3\sqrt{y}+4=y=>$

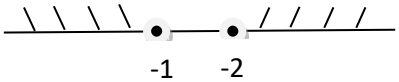
$=> y-4=3\sqrt{y}=> y^2-17y+16=0=>$

$=>\begin{cases}y_1=1\ chet\ ildiz;\\ y_2=16\ ildiz.\end{cases}$ Javobi: A.

37. $x^2+3x+2\geq 0$ tengsizlikni qanoatlantiruvchi eng kichik natural sonni toping.

A) 1 B) 2 C) 3 D) 5 E) 10

Yechilishi: $x^2+3x+2\geq 0 \Rightarrow \begin{cases} x_1=-1 \\ x_2=-2 \end{cases} \Rightarrow$



$(-\infty;-2]\cup[-1;\infty)$ *yoki* $x=1.$

Javobi: A.

38. $\sqrt{x}+\sqrt[4]{x}-12=0$ tenglamani yeching.

A) 81 B) 16 C) 25 D) 9 E) 256

Yechilishi: $\sqrt{x}+\sqrt[4]{x}-12=0;\quad \sqrt[4]{x}=y;\quad x\geq 0;$

$y^2+y-12=0 \Rightarrow \begin{cases} y_1=-4 \\ y_2=3 \end{cases} \Rightarrow \sqrt[4]{x}=3 \Rightarrow x=81.$

Javobi: A.

39. $4\cdot 9^x+12^x-3\cdot 16^x=0$ tenglamani yeching.

A) 1 B) -1; 1 C) 2 D) 3;4 E) 4

Yechilishi: $4\cdot 9^x+12^x-3\cdot 16^x=0 \Rightarrow$

$\Rightarrow \frac{4\cdot 9^x+12^x-3\cdot 16^x}{16^x}=0 \Rightarrow 4\cdot\left(\frac{3}{4}\right)^{2x}+\left(\frac{3}{4}\right)^{x}-3=0;$

$\left(\frac{3}{4}\right)^{x}=y;\ 4y^2+y-3=0 \Rightarrow \begin{cases} y_1=-1 \\ y_2=\frac{3}{4} \end{cases} \Rightarrow$

$\left(\frac{3}{4}\right)^{x}\neq -1;\ \left(\frac{3}{4}\right)^{x}=\frac{3}{4} \Rightarrow x=1.$ Javobi: A.

40. $\begin{cases} \frac{xy}{x+y}=\frac{10}{7} \\ \frac{yz}{y+z}=\frac{40}{13} \\ \frac{zx}{x+z}=\frac{5}{8} \end{cases}$ tenglamalar sistemasidan x ni toping.

A) $\frac{80}{79}$ B) $\frac{5}{7}$ C) $\frac{7}{13}$ D) $\frac{79}{80}$ E) $\frac{7}{5}$

Yechilishi: $\begin{cases} 7xy=10x+10y \\ 13yz=40y+40z \\ 8xz=5x+5z \end{cases} \Rightarrow \begin{cases} y=\frac{10x}{7x-10} \\ z=\frac{5x}{8x-5} \end{cases} \Rightarrow$

$=>\ \ 13\cdot\frac{10x}{7x-10}\cdot\frac{5x}{8x-5}=40\left(\frac{10x}{7x-10}+\frac{5x}{8x-5}\right)\ =>$

$79x^2-80x=0\ \ =>\ \begin{cases}x=0\ \ chet\ ildiz;\\ x=\frac{80}{79}.\end{cases}$ Javobi: A.

41. $\frac{c-2\sqrt{c}+1}{\sqrt{c}-1}$ kasrni qisqartiring.

A) $\sqrt{c}-1$ B) $c-1$ C) $c+1$ D) $\sqrt{c}+1$ E) 1

Yechilishi: $\frac{c-2\sqrt{c}+1}{\sqrt{c}-1}=\frac{\left(\sqrt{c}-1\right)^2}{\sqrt{c}-1}=\sqrt{c}-1.$ Javobi: A.

42. $x^2+3x+\frac{6}{2-3x-x^2}=1$ tenglama butun ildizlarining yig'indisini toping.

A) -3 B) 1 C) -5 D) 3 E) 4

Yechilishi: $x^2+3x+\frac{6}{2-3x-x^2}=1\ =>$

$=>x^2+3x-1=\frac{6}{2-3x-x^2}\ =>(x^2+3x-1)\cdot$

$\cdot(x^2+3x-2)=6=>\left[\left(x+\frac{3}{2}\right)^2-\frac{13}{4}\right]\cdot$

$\left[\left(x+\frac{3}{2}\right)^2-\frac{17}{4}\right]=6\ =>\left(x+\frac{3}{2}\right)^4-\frac{15}{2}\left(x+\frac{3}{2}\right)^2+$

$+\frac{221}{16}=6\ =>16\left(x+\frac{3}{2}\right)^4-120\left(x+\frac{3}{2}\right)^2+$

$+125=0=>\left(x+\frac{3}{2}\right)^2=y=>$

$=>16y^2-120y+125=0=>$

$=>y_1=\frac{5}{4};\ y_2=\frac{25}{4};\ x_{1;2}+\frac{3}{2}=\pm\frac{\sqrt{5}}{2};\ x_{3;4}+\frac{3}{2}=\pm\frac{5}{2}=>$

$=>\begin{cases}x_3=-\frac{5}{2}-\frac{3}{2}=-4\\ x_4=\frac{5}{2}-\frac{3}{2}=1\end{cases}=>x_3+x_4=-3.$ Javobi: A.

43. Agar $a=\log_5 4$ va $b=\log_5 3$ bo'lsa, $\log_{25}12$ ni a va b orqali ifodalang.

A) $\frac{a+b}{2}$ B) $\frac{a-b}{4}$ C) $\frac{ab}{2}$ D) $\frac{a^2+b}{4}$ E) $\frac{a^2-b^2}{5}$

Yechilishi: $a = \log_5 4$; $b = \log_5 3$; $\log_{25} 12 =$

$= \frac{\log_5 3 \cdot 4}{\log_5 5^2} = \frac{\log_5 3 + \log_5 4}{2} = \frac{a+b}{2}$. Javobi: A.

44. Agar $a + a^{-1} = 3$ bo'lsa, $a^2 + a^{-2}$ ni hisoblang.

A) 7 B) 4 C) 9 D) 13 E) 12

Yechilishi: $a + a^{-1} = 3 \Rightarrow a + \frac{1}{a} - 3 = 0 \Rightarrow$

$\Rightarrow a^2 - 3a + 1 = 0 \Rightarrow a_1 = \frac{3-\sqrt{5}}{2}; \; a_2 = \frac{3+\sqrt{5}}{2}; \Rightarrow$

$\Rightarrow a^2 + a^{-2} = \left(\frac{3+\sqrt{5}}{2}\right)^2 + \frac{1}{\left(\frac{3+\sqrt{5}}{2}\right)^2} = \frac{2 \cdot 49 + 42\sqrt{5}}{2(7+3\sqrt{5})} =$

$= \frac{7(14+6\sqrt{5})}{14+6\sqrt{5}} = 7.$ Javobi: A.

45. Agar $a + a^{-1} = 5$ bo'lsa, $a^3 + a^{-3}$ ni hisoblang.

A) 110 B) 70 C) 80 D) 90 E) 100

Yechilishi: $a + a^{-1} = 5 \Rightarrow a^2 - 5a + 1 = 0 \Rightarrow$

$\Rightarrow a_1 = \frac{5-\sqrt{21}}{2}; \; a_2 = \frac{5+\sqrt{21}}{2}; \; a^3 + a^{-3} = \left(\frac{5+\sqrt{21}}{2}\right)^3 +$

$+ \frac{1}{\left(\frac{5+\sqrt{21}}{2}\right)^3} = \frac{6050+1320\sqrt{21}}{55+12\sqrt{21}} = \frac{110(55-12\sqrt{21})}{55+12\sqrt{21}} = 110.$

Javobi: A.

46. $y = -2x^2 + 5x - 3$ funksiyaning eng katta qiymatini toping.

A) $\frac{1}{8}$ B) $\frac{1}{4}$ C) 5 D) -3 E) $\frac{1}{2}$

Yechilishi: $y = -2x^2 + 5x - 3 \Rightarrow y' = -4x + 5 \Rightarrow$

$\Rightarrow y' = 0 \Rightarrow 4x = +5 \Rightarrow x = +\frac{5}{4} \Rightarrow$

$\Rightarrow y\left(+\frac{5}{4}\right) = -2\left(+\frac{5}{4}\right)^2 + \frac{25}{4} - 3 = \frac{1}{8};$

$yoki\ \ y = -\frac{b^2-4ac}{4a} = -\frac{25-4(-2)(-3)}{4(-2)} = \frac{1}{8}$. Javobi: A.

47. $\lg(2^x + x + 4) = x - x\lg 5$ tenglamani yeching.

A) -4 B) -3 C) -2 D) 1 E) 2

Yechilishi: $\lg(2^x + x + 4) = x - x\lg 5 \ \Rightarrow$

$\lg(2^x + x + 4) = x\lg 10 - x\lg 5 \ \Rightarrow$

$\Rightarrow \lg(2^x + x + 4) = \lg\frac{10^x}{5^x} \Rightarrow \lg(2^x + x + 4) =$

$= \lg\frac{5^x \cdot 2^x}{5^x} \Rightarrow 2^x + x + 4 = 2^x \Rightarrow \ x = -4.$

Javobi: A.

48. $f(x) = x^4 + x^3 - 13{,}5x^2 + 2003$ bo'lsa, $f'(x) \le 0$ tengsizlikning eng kichik natural yechimini toping.

A) 1 B) 2 C) 3 D) 4 E) 5

Yechilishi: $f(x) = x^4 + x^3 - 13{,}5x^2 + 2003 \ \Rightarrow$

$f'(x) = 4x^3 + 3x^2 - 27x \ \Rightarrow$

$\Rightarrow \ x(4x^2 + 3x - 27) \le 0 \ \Rightarrow \ \ x = 1.$ Javobi: A.

49. $ab \cdot \left(\frac{a^{1-n}}{b^n} - \frac{b^{1-n}}{a^n}\right)^{\frac{1}{n}} \cdot \frac{1}{\sqrt[n]{a-b}}$ ni soddalashtiring.

A) 1 B) ab C) $\sqrt{ab}$ D) 0 E) $\sqrt{a-b}$

Yechilishi: $ab \cdot \left(\frac{a^{1-n}}{b^n} - \frac{b^{1-n}}{a^n}\right)^{\frac{1}{n}} \cdot \frac{1}{\sqrt[n]{a-b}} =$

$ab\sqrt[n]{\frac{a}{(ab)^n} - \frac{b}{(ab)^n}} \cdot \frac{1}{\sqrt[n]{a-b}} = ab \cdot \frac{\sqrt[n]{a-b}}{ab} \cdot \frac{1}{\sqrt[n]{a-b}} = 1.$

Javobi: A.

50. Agar arifmetik progressiyada $a_1, a_2, \dots, a_{16}, a_{17} = 136$ bo'lsa, $a_6 + a_{12}$ ni hisoblang.

A) 16 B) 10 C) 12 D) 10 E) 32

Yechilishi: $a_1, a_2, \dots, a_{16}, a_{17} \Rightarrow a_1 + a_{17} = a_6 + a_{12};$

$136 = \frac{a_1 + a_{17}}{2} \cdot 17 \ \Rightarrow \ \ a_1 + a_{17} = 16.$ Javobi: A.

51. Agar $\log_x(4x-3) \geq 2$ bo'lsa, x ning natural sonlar to'plamiga tegishli ildizlari yig'indisini toping.

A) 5 B) 6 C) 7 D) 4 E) 3

Yechilishi: $\log_x(4x-3) \geq 2 \Rightarrow$

$$\Rightarrow \begin{cases} x > 0; \\ x \neq 1; \\ 4x-3 > 0 \Rightarrow x > \frac{3}{4}. \end{cases}$$

$x^2 - 4x + 3 \leq 0 \Rightarrow \begin{cases} x = 1; \\ x = 3. \end{cases}$

$yoki\ (1;3] \Rightarrow 2+3=5.$ Javobi: A.

52. $y = \frac{x}{2} - \sqrt{x}$ funksiyaning [0; 16] kesmadagi eng katta qiymatini hisoblang.

A) 4 B) 8 C) -3 D) 5 E) 12

Yechilishi: $\begin{cases} y = \frac{1}{2}x - \sqrt{x} \\ x \geq 0 \end{cases} \Rightarrow y' = \frac{1}{2} - \frac{1}{2\sqrt{x}} \Rightarrow$

$$\Rightarrow \begin{cases} y' = 0 \\ \frac{1}{2\sqrt{x}} = \frac{1}{2} \end{cases} \Rightarrow \frac{1}{\sqrt{x}} = 1 \Rightarrow \sqrt{x} = 1 \Rightarrow x = \pm 1 \Rightarrow$$

$\Rightarrow x = 1 \in [0;16];\ y(0) = \frac{1}{2} \cdot 0 - \sqrt{0} = 0;$

$y(1) = -\frac{1}{2};\ y(16) = 8 - 4 = 4.$ Javobi: A.

53. $\sin\frac{\pi}{8} \cdot \cos\frac{\pi}{8} \cdot tg\frac{\pi}{8} \cdot ctg\frac{9\pi}{8}$ ni hisoblang.

A) $\frac{1}{2\sqrt{2}}$ B) $\sqrt{2}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{3}}{2}$ E) -1

Yechilishi: $\sin\frac{\pi}{8} \cdot \cos\frac{\pi}{8} \cdot tg\frac{\pi}{8} \cdot ctg\frac{9\pi}{8} = \frac{1}{2} \cdot 2\sin\frac{\pi}{8} \cdot \cos\frac{\pi}{8} \cdot$

$\cdot tg\frac{\pi}{8} \cdot ctg\left(\pi + \frac{\pi}{8}\right) = \frac{1}{2}\sin\frac{\pi}{4} \cdot tg\frac{\pi}{8} \cdot ctg\frac{\pi}{8} = \frac{1}{2} \cdot \frac{\sqrt{2}}{2} \cdot 1 =$

$= \frac{\sqrt{2}}{4} = \frac{1}{2\sqrt{2}}.$ Javobi: A.

54. $\cos\alpha - \sin\alpha = 0{,}2$ bo'lsa, $\cos^3\alpha - \sin^3\alpha$ ni hisoblang.

A) 0,296 B) 0,3 C) 0,04 D) 0,324 E) 0,008

Yechilishi: $\cos\alpha - \sin\alpha = 0{,}2;$

$\cos^3\alpha - 3\cos^2\alpha\sin\alpha + +3\cos\alpha\sin^2\alpha - \sin^3\alpha =$

$= 0{,}008;$ $\cos^3\alpha - \sin^3\alpha = (\cos\alpha - \sin\alpha)(\cos^2\alpha +$

$+\cos\alpha\sin\alpha + \sin^2\alpha) = 0{,}2(1 + \cos\alpha\sin\alpha);$

$\cos^3\alpha - \sin^3\alpha = 0{,}008 + 3\cos^2\sin\alpha - 3\cos\alpha\sin^2\alpha =$

$= 0{,}008 + 3\cos\alpha\sin\alpha\,(\cos\alpha - \sin\alpha) =$

$= 0{,}008 + 3\cos\alpha\sin\alpha\cdot 0{,}2;$ $0{,}2(1 + \cos\alpha\sin\alpha) =$

$= 0{,}008 + 3\cdot 0{,}2\cdot\cos\alpha\sin\alpha => 0{,}2 + 0{,}2\sin\alpha\cos\alpha =$

$= 0{,}008 + 3\cdot 0{,}2\sin\alpha\cos\alpha => 2\cdot 0{,}2\sin\alpha\cos\alpha =$

$= 0{,}192 => \cos\alpha\sin\alpha = 0{,}48;$ $\cos^3\alpha - \sin^3\alpha =$

$= 0{,}2(1 + 0{,}48) = 0{,}296.$ Javobi: A.

55. Agar $\cos x = \frac{1}{\sqrt{10}}$ bo'lsa, $(1 + \mathrm{tg}^2 x)(1 - \sin^2 x) -$ $\sin^2 x$ ifodaning qiymatini toping.

A) 0,1 B) 0,2 C) 0,3 D) $\frac{2}{\sqrt{10}}$ E) $\frac{\sqrt{10}}{10}$

Yechilishi: $\cos x = \frac{1}{\sqrt{10}};$ $(1 + \mathrm{tg}^2 x)(1 - \sin^2 x) -$

$- \sin^2 x = \frac{1}{\cos^2 x}\cdot\cos^2 x - \sin^2 x = \cos^2 x = \frac{1}{10} = 0{,}1.$

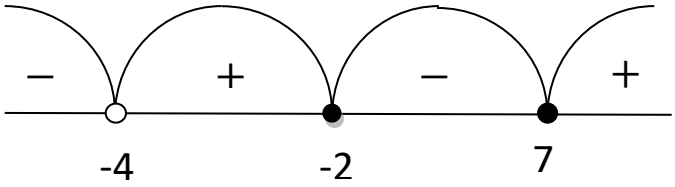
Javobi: A.

56. $\frac{x^2-5x-14}{x+4} \le 0$ tengsizlikni qanoatlantiruvchi natural son nechta?

A) 7 B) 8 C) 9 D) 5 E) 6

Yechilishi: $\frac{x^2-5x-14}{x+4} \le 0 =>$

$$\Rightarrow \begin{cases} x_1 = -2; \\ x_2 = 7; \\ x_3 \neq -4. \end{cases}$$



$x = 1, 2, 3, 4, 5, 6, 7;$

Javobi: A.

57. Agar $\sin\alpha + \cos\alpha = m$ bo'lsa, $\frac{1+\cos 2\alpha}{ctg\frac{\alpha}{2} - tg\frac{\alpha}{2}}$ ni m orqali ifodalang.

A) $\frac{m^2-1}{2}$ B) m^2+1 C) m^2-1 D) $2m^2$ E) $\frac{2m^2+1}{2}$

Yechilishi: 1) $\frac{1+\cos 2\alpha}{ctg\frac{\alpha}{2} - tg\frac{\alpha}{2}} = \frac{1+\cos^2\alpha - \sin^2\alpha}{\frac{1+\cos\alpha}{\sin\alpha} - \frac{1-\cos\alpha}{\sin\alpha}} = \frac{2\cos^2\alpha}{\frac{2\cos\alpha}{\sin\alpha}} =$

$= \frac{2\cos^2\alpha \cdot sin\alpha}{2\cos\alpha} = \sin\alpha\cos\alpha = \frac{1}{2}\cdot\sin 2\alpha;$

2) $\sin\alpha + \cos\alpha = m \Rightarrow \quad 1 + \sin 2\alpha = m^2 \Rightarrow$

$\Rightarrow \sin 2\alpha = m^2 - 1 \Rightarrow \frac{1+\cos 2\alpha}{ctg\frac{\alpha}{2} - tg\frac{\alpha}{2}} = \frac{m^2-1}{2}$. Javobi: A.

58. $\vec{p}$ va $\vec{q}$ vektorlar o'zaro 60° li burchak tashkil etadi. Agar $|\vec{p}| = 1,\ |\vec{q}| = 3$ bo'lsa, $|2\vec{p} - \vec{q}| \cdot \sqrt{7}$ ni hisoblang.

A) 7 B) $2\sqrt{7}$ C) $3\sqrt{7}$ D) 14 E) 21

Yechilishi: $(\vec{p}\,\hat{;}\,\vec{q}) = 60^\circ;\ |\vec{p}| = 1;\ |\vec{q}| = 3;$

$\left(|2\vec{p} - \vec{q}| \cdot \sqrt{7}\right)^2 = |2\vec{p} - \vec{q}|^2 \cdot 7 = 7(2\vec{p} - \vec{q})^2 =$

$= 7\left(\left|\overrightarrow{4p}\right|^2 - 4\vec{p}\vec{q} + |\vec{q}|^2\right) = 7 \cdot (4 \cdot 1^2 - 4 \cdot |\vec{p}||\vec{q}| \cdot$

$\cdot \cos(\vec{p}\,\hat{;}\,\vec{q}) + 3^2) = 7(4 - 4 \cdot 1 \cdot 3 \cdot \cos 60^\circ + 9 =$

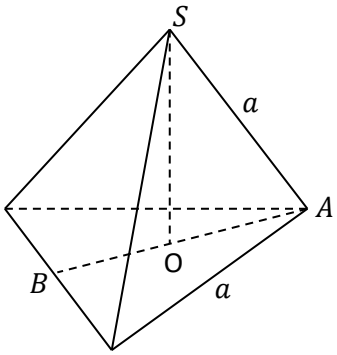
$= 7\left(4 - 12 \cdot \frac{1}{2} + 9\right) = 49 \Rightarrow |2\vec{p} - \vec{q}| \cdot \sqrt{7} = 7.$

Javobi: A.

59. Qirrasi a ga teng bo'lgan muntazam tetraedrning hajmini toping.

A) $\frac{a^3\sqrt{2}}{12}$ B) $\frac{a^3}{9\sqrt{3}}$ C) $\frac{a^3\sqrt{3}}{12}$ D) $\frac{a^3\sqrt{2}}{9}$ E) $\frac{a^3\sqrt{3}}{8}$

Yechilishi: $OA = \frac{2}{3}h = \frac{2}{3}\cdot\frac{\sqrt{3}a}{2} = \frac{\sqrt{3}a}{3}$;



$SO^2 = a^2 - OA^2 = a^2 - \frac{3}{9}a^2 = \frac{2a^2}{3}$;

$SO = \frac{\sqrt{2}a}{\sqrt{3}}$; $S_{asos} = \frac{\sqrt{3}a^2}{4}$;

$V = \frac{1}{3}\frac{\sqrt{3}a^2}{4}\cdot\frac{\sqrt{2}a}{\sqrt{3}} = \frac{\sqrt{2}a^3}{12}$.

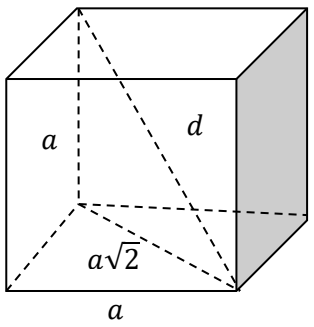
Javobi: A.

60. Kubning diagonali d ga teng bo'lsa, uning hajmi nimaga teng?

A) $\frac{d^3\sqrt{3}}{9}$ B) $\frac{d^3}{3}$ C) $\frac{d^3}{\sqrt{3}}$ D) $\frac{d^3}{6}$ E) $\frac{d^3}{3\sqrt{2}}$

Yechilishi: $d^2 = a^2 + 2a^2 = 3a^2 =>$

$=> a^2 = \frac{d^2}{3} => a = \frac{d}{\sqrt{3}} = \frac{\sqrt{3}d}{3}$;



$V = a^3 = \frac{3\sqrt{3}d^3}{27} = \frac{\sqrt{3}d^3}{9}$.

Javobi: A.

9-axborotnoma

1. $\frac{8x+19}{(x+3)^2(x^2+5x)} \geq \frac{1}{x^2+3x}$ tengsizlikning butun sonlardan iborat yechimlari nechta?

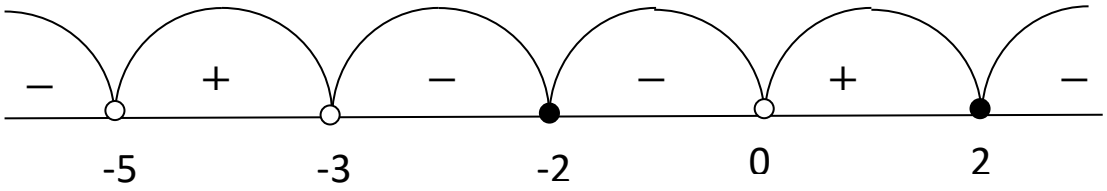
A)2 B) 3 C) 4 D) 5 E) 6

Yechilishi: $\frac{8x+19}{(x+3)^2(x^2+5x)} \geq \frac{1}{x^2+3x} =>$

$=> \frac{8x+19}{x(x+3)^2(x+5)} - \frac{1}{x(x+3)} \geq 0 => \frac{(2-x)(2+x)}{x(x+3)^2(x+5)} \geq 0 =>$

Kasr qatnshgan tengsizlikning x ning qiymatlari – dan hosil qilingan oraliqlardagi ishoralari aniqla – nadi. Tengsizlik noldan kichik bo'lmaganligi uchun yechim musbat oraliqlardan topiladi.

$$=> \begin{cases} x = 2; \\ x = -2; \\ x \neq 0; \\ x \neq -3; \\ x \neq -5. \end{cases}$$



$x = -4; -2; 1; 2.$ Javobi: C.

2. $4 < \frac{16x^2-4x+16}{x^2+1} < 15$ tengsizlikning tub sonlardan iborat yechimlari nechta?

A) 1 B) 2 C) 3 D) 4 E) *cheksiz ko'p*

Yechilishi: $4 < \frac{16x^2-4x+16}{x^2+1} < 15 =>$

$\Rightarrow 1 < \frac{4x^2-x+4}{x^2+1} < 3{,}75 \Rightarrow x = 2; 3.$ Javobi: B.

3. a ning qanday qiymatida $|x^2 - 2x - 3| = a$ tenglama uchta har xil haqiqiy ildizlarga ega?

A) $\emptyset$ B) 1 C) 2 D) 3 E) 4

Yechilishi: *Modulning asosiy formulasidan foyda – lanib, berilgan tenglamani quyidagi ko'rinishda yozib olamiz*:

$$\begin{cases} -x^2 + 2x + 3 = a \\ x^2 - 2x - 3 = a \end{cases} \Rightarrow \begin{cases} x^2 - 2x - 3 + a = 0; \\ x^2 - 2x - 3 - a = 0. \end{cases}$$

Uchta haqiqiy yechim olish uchun bu tenglama – lardan birining diskrimenanti noldan katta, ikkinchsiniki nolga teng bo'lishi kerak.

1) $\begin{cases} D_1 > 0 \Rightarrow 4 - 4(3-a) > 0 \Rightarrow a < 4; \\ D_2 = 0 \Rightarrow 4 - 4(3-a) = 0 \Rightarrow a = -4. \end{cases} \Rightarrow$

$\Rightarrow a = -4;$

2) $\begin{cases} D_1 = 0 \Rightarrow 4 - 4(3-a) = 0 \Rightarrow a = 4; \\ D_2 > 0 \Rightarrow 4 - 4(3-a) > 0 \Rightarrow a > -4. \end{cases} \Rightarrow$

$\Rightarrow a = 4.$

Javobi: E.

4. m ning qanday qiymatida $3x^2 - 21x + m = 0$ tenglama ildizlari kvadratlarining yig'indisi 25 ga teng bo'ladi?

A) 36 B) -36 C) 24 D) 42 E) -42

Yechilishi: $3x^2 - 21x + m = 0 \Rightarrow x^2 - 7x + \frac{m}{3} = 0 \Rightarrow$

$$\Rightarrow \begin{cases} x_1 + x_2 = 7 \\ x_1 \cdot x_2 = \frac{m}{3} \end{cases} \Rightarrow x_1^2 + x_2^2 + 2x_1 \cdot x_2 = 49 \Rightarrow$$

$$\Rightarrow 25 + 2 \cdot \frac{m}{3} = 49 \Rightarrow \frac{m}{3} = 12 \Rightarrow m = 36.$$

Javobi: A.

5. $x^2 - 2ax + a^2 - 1 = 0$ tenglamaning ikkala ildizi -2 va 4 orasida joylashgan bo'lsa, a ning qiymati qaysi oraliqda o'zgaradi?

A) (-3; 3) B) (-1; 5) C) (-3; -1) ∪ (3; 5)
D) (-1; 3) E) (0; 3)

Yechilishi: $x^2 - 2ax + a^2 - 1 = 0;$

1) $x = -2 \Rightarrow \ 4 + 4a + a^2 - 1 = 0 \Rightarrow$

$\Rightarrow a^2 + 4a + 3 = 0 \ \Rightarrow \begin{cases} a_1 = -1; \\ a_2 = -2. \end{cases}$

2) $x = 4 \ \Rightarrow \ 16 - 8a + a^2 - 1 = 0 \ \Rightarrow \begin{cases} a_1 = 3; \\ a_2 = 5. \end{cases}$

3) $Parabola\ uchining\ absissasi\ x = -\frac{b}{2a} = 1.$

$Bu\ nuqta\ oraliq\ markazida\ yotishi\ kerak$:

$a_1 + a_1 = -1 + 3 = 2 \Rightarrow a_1 = 1.$

$Demak, a \in (-1; 3).$ Javobi: D.

6. $\begin{cases} x^3 + y^3 = 35 \\ x^2y + xy^2 = 30 \end{cases}$ tenglamalar sistemasining yechimlaridan iborat barcha x va y larning yig'indisini toping.

A) 0 B) 2 C) 6 D) 10 E) 12

Yechilishi: $\begin{cases} x^3 + y^3 = 35 \\ x^2y + xy^2 = 30 \ (\cdot 3) \end{cases} \Rightarrow$

$\Rightarrow + \begin{matrix} x^3 + y^3 = 35 \\ 3x^2y + 3xy^2 = 90 \end{matrix} \Rightarrow \ x^3 + \ 3x^2y + 3xy^2 +$

$+y^3 = 125 \ \Rightarrow (x + y)^3 = 5^3 \ \Rightarrow x + y = 5 \ \Rightarrow$

$\Rightarrow \begin{cases} x = 2 \\ y = 3 \end{cases} va \begin{cases} x = 3 \\ y = 2 \end{cases}$ Javobi: D.

7. Ikkita ishchi birgalikda ishlab, ma'lum ishni 12 kunda tamomlaydi. Agar ishchilarning bittasi shu ishning yarmini bajargandan keyin, ikkinchi ishchi qolgan yarmini bajarsa, shu

ishni 25 kunda tamomlashi mumkin. Ishchilardan biri boshqasiga qaraganda necha marta tez ishlaydi?

A) 1,2 B) 1,5 C) 1,6 D) 1,8 E) 2,0

Yechilishi: $\begin{cases} \left(\frac{1}{x}+\frac{1}{y}\right)\cdot 12=1 \\ \frac{1}{x}\cdot a=\frac{1}{2} \\ \frac{1}{y}(15-a)=\frac{1}{2} \end{cases} \Rightarrow \begin{cases} \frac{1}{x}+\frac{1}{y}=\frac{1}{12} \\ x=2a \\ y=50-2a \end{cases} \Rightarrow$

$\Rightarrow a-kun; \Rightarrow \frac{1}{2a}+\frac{1}{50-2a}=\frac{1}{12} \Rightarrow$

$a^2-25a+150=0 \Rightarrow \begin{cases} a_1=10 \\ a_2=15 \end{cases} \Rightarrow \begin{cases} x_1=20; \\ x_2=30. \end{cases}$

$\begin{cases} y_1=30; \\ y_2=20. \end{cases} \Rightarrow Demak,\ x:y=30:20 \Rightarrow x:y=1{,}5.$

Javobi: B.

8. $(x^2+x-4)(x^2+x+4)=9$ tenglama ildizlarining ko'paytmasini toping.

A) 16 B) 4 C) -4 D) 5 E) -5

Yechilishi: $(x^2+x-4)(x^2+x+4)=9$

$[(x^2+x)-4]\cdot[(x^2+x)+4]=9;$

$(x^2+x)^2-4^2=9 \Rightarrow x^2+x=\pm 5 \Rightarrow$

$\Rightarrow \begin{cases} x^2+x+5=0 \Rightarrow D<0 \\ x^2+x-5=0 \Rightarrow x_1=-\frac{1+\sqrt{21}}{2};\ x_2=\frac{\sqrt{21}-1}{2} \end{cases} \Rightarrow$

$\Rightarrow x_1\cdot x_2=-5.$ Javobi: E.

9. $\sqrt{\frac{x^2-2}{x}} \le 1$ tengsizlikning butun sonlardan iborat yechimlari nechta?

A) $\emptyset$ B) 1 C) 2 D) 3 E) $cheksiz\ ko'p$

Yechilishi: $\sqrt{\frac{x^2-2}{x}} \le 1 \Rightarrow \frac{x^2-x-2}{x} \le 0 \Rightarrow$

$=> \begin{cases} x_1 = -1 \\ x_2 = 2 \\ x \neq 0 \end{cases} => \ x = -1;\ 2.$ Javobi: C.

10. $(x^2 - 25)\sqrt{6 - 2x} = 0$ tenglama ildizlarining yig'indisini toping.

A) 2 B) -2 C) 3 D) 8 E) -8

Yechilishi: $(x^2 - 25)\sqrt{6 - 2x} = 0 \ => \begin{cases} x^2 - 25 = 0 \\ 6 - 2x \geq 0 \end{cases} =>$

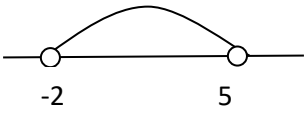
$=> \begin{cases} x = \pm 5 \\ x \leq 3 \end{cases} => \begin{cases} x_1 = -5 \\ x_2 \neq 5 \\ x_3 = 3 \end{cases} => \ x_1 + x_2 = -2.$

Javobi: B.

11. $|x^2 - 3x| < 10$ tengsizlikning butun sonlardan iborat yechimlari yig'indisini toping.

A) 6 B) 7 C) 9 D) 12 E) 16

Yechilishi: $|x^2 - 3x| < 10 => -10 < x^2 - 3x < 10 =>$



$=> \begin{cases} x^2 - 3x + 10 > 0; D < 0; \\ x^2 - 3x - 10 < 0 => \end{cases}$

$-1 + 0 + 1 + 2 + 3 + 4 = 9$. Javobi: C.

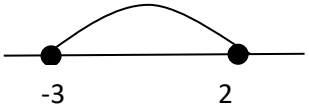
12. $\left(ctg\frac{\pi}{6}\right)^{4x-12} \leq \left(\frac{1}{3}\right)^{x^2-x}$ tengsizlikning butun sonlardan iborat yechimlaridan eng kattasini toping.

A) 2 B) 5 C) 6 D) 9 E) 11

Yechilishi: $\left(ctg\frac{\pi}{6}\right)^{4x-12} \leq \left(\frac{1}{3}\right)^{x^2-x} =>$

$=> \sqrt{3}^{2(2x-6)} \leq 3^{-x^2+x} => \ 3^{2x-6} \leq 3^{-x^2+x} =>$

$=> \begin{cases} 3 > 0 \\ 2x - 6 \leq -x^2 + x \end{cases} => \ x^2 + x - 6 \leq 0 =>$

$\Rightarrow \begin{cases} x_1 = 2; \\ x_2 = -3. \end{cases} \Rightarrow$ 

Javobi: A.

13. $\left|\sqrt{x+2} - 5\right| = 4$ tenglama ildizlarining yig'indisini toping.

A) 76 B) 78 C) 79 D) 81 E) 83

Yechilishi: $\begin{cases} \sqrt{x+2} - 5 = -4 \\ \sqrt{x+2} - 5 = 4 \end{cases} \Rightarrow \begin{cases} \sqrt{x+2} = 1 \\ \sqrt{x+2} = 9 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x + 2 \geq 0 \\ |x+2| = 1 \\ |x+2| = 81 \end{cases} \Rightarrow \begin{cases} x + 2 \geq 0 \\ x + 2 = \pm 1 \\ x + 2 = \pm 81 \end{cases} \Rightarrow$

$$\begin{cases} x \geq -2 \\ x = -1 - 2 \\ x = 1 - 2 \\ x = -81 - 2 \\ x = 81 - 2 \end{cases} \Rightarrow \begin{cases} x \geq -2 \\ x = -3 \\ x = -1 \\ x = -83 \\ x = 79 \end{cases} \Rightarrow 79 + (-1) = 78.$$

Javobi: B.

14. Agar $\sqrt[3]{1+\sqrt{x-1}} + \sqrt[3]{1-\sqrt{x-1}} = 2$ bo'lsa, $\frac{x}{x+2}$ ning qiymatini toping.

A) $\frac{2}{3}$ B) $-\frac{2}{3}$ C) $\frac{1}{3}$ D) $-\frac{1}{3}$ E) $\frac{3}{5}$

Yechilishi: $\sqrt[3]{1+\sqrt{x-1}} + \sqrt[3]{1-\sqrt{x-1}} = 2;$

1) $x - 1 \geq 0 \Rightarrow x \geq 1;$

2) $\left(\sqrt[3]{1+\sqrt{x-1}}\right)^3 = \left(2 - \sqrt[3]{1-\sqrt{x-1}}\right)^3 \Rightarrow \Rightarrow$

$1 + \sqrt{x-1} = 8 - 12\sqrt[3]{1-\sqrt{x-1}} +$

$+6\sqrt[3]{\left(1-\sqrt{x-1}\right)^2} - \left(1-\sqrt{x-1}\right) \Rightarrow$

$\Rightarrow 6\left(\sqrt[3]{1-\sqrt{x-1}}\right)^2 - 12\sqrt[3]{1-\sqrt{x-1}} + 6 = 0;$

$\left(\sqrt[3]{1-\sqrt{x-1}}-1\right)^2=0 \Rightarrow \sqrt[3]{1-\sqrt{x-1}}=1 \Rightarrow$

$\Rightarrow 1-\sqrt{x-1}=1 \Rightarrow \sqrt{x-1}=0 \Rightarrow$

$\Rightarrow |x-1|=0 \Rightarrow x=1.$ $\frac{x}{x+2}=\frac{1}{3}$. Javobi: C.

15. $\sqrt{25-x^2}+\sqrt{9-x^2}=9x^4+8$ tenglamaning ildizlari quyida keltirilgan oraliqlarning qaysi biriga tegishli?

A) [-3; -1] B) (-2; 0) C) [0; 2] D) (0; 2) E) (1; 3)

Yechilishi: $\sqrt{25-x^2}+\sqrt{9-x^2}=9x^4+8 \Rightarrow$

$\begin{cases}25-x^2\geq 0\\ 9-x^2\geq 0\end{cases} \Rightarrow \begin{cases}x^2\leq 25\\ x^2\leq 9\end{cases} \Rightarrow \begin{cases}-5\leq x\leq 5\\ -3\leq x\leq 3\end{cases} \Rightarrow$

$\Rightarrow -3\leq x\leq 3 \Rightarrow x=0 \Rightarrow$ Javobi: C.

16. $\sqrt{x+0{,}5}(4^{1+x}+4^{1-x}-17)=0$ tenglama ildizlarining ko'paytmasini toping.

A) 2,5 B) 1,5 C) 0,5 D) -0,5 E) -1

Yechilishi: $\sqrt{x+0{,}5}(4^{1+x}+4^{1-x}-17)=0 \Rightarrow$

$\Rightarrow \begin{cases}\sqrt{x+0{,}5}\geq 0\\ 4\cdot 4^x+\frac{4}{4^x}-17=0\end{cases} \Rightarrow$

$\Rightarrow \begin{cases}x+0{,}5\geq 0\\ 4\cdot(4^x)^2-17\cdot 4^x+4=0\end{cases} \Rightarrow |4^x=y| \Rightarrow$

$\Rightarrow \begin{cases}x\geq -0{,}5\\ 4y^2-17y+4=0\end{cases} \Rightarrow \begin{cases}y_1=\frac{1}{4}\\ y_2=4\end{cases} \Rightarrow$

$\Rightarrow \begin{cases}4^x=4^{-1}\\ 4^x=4\end{cases} \Rightarrow \begin{cases}x_1=-0{,}5\\ x_2=-1\\ x_3=1\end{cases} \Rightarrow x_1\cdot x_3=-0{,}5.$

Javobi: D.

17. $\frac{2\cdot 7^x}{7^{2x}-1}\geq\frac{7^x}{7^x-1}-\frac{1}{7^x+1}$ tengsizlikni yeching.

A) $(0;\infty)$ B) $(-\infty;0)$ C) $(-\infty;0]$

D) (-1; 1) E) (1; ∞)

Yechilishi: $\frac{2\cdot 7^x}{7^{2x}-1} \geq \frac{7^x}{7^x-1} - \frac{1}{7^x+1};\ x \neq 0.$

$\frac{2\cdot 7^x}{7^{2x}-1} - \frac{7^x}{7^x-1} + \frac{1}{7^x+1} \geq 0 \Rightarrow \frac{2\cdot 7^x-(7^x)^2-7^x+7^x-1}{(7^x-1)(7^x+1)} \geq 0 \Rightarrow$

$\Rightarrow \frac{-(7^x)^2+2\cdot 7^x-1}{(7^x-1)(7^x+1)} \geq 0 \Rightarrow \frac{(7^x)^2-2\cdot 7^x+1}{(7^x-1)(7^x+1)} \leq 0 \Rightarrow$

$\Rightarrow \frac{(7^x-1)^2}{(7^x-1)(7^x+1)} \leq 0 \Rightarrow (7^x-1)^2 \geq 0 \Rightarrow$

$\Rightarrow \begin{cases} x \neq 0 \\ 7^{2x}-1<0 \end{cases} \Rightarrow 7^{2x} < 7^0 \Rightarrow x < 0 \Rightarrow (-\infty; 0).$

Javobi: B.

18. $12\cdot 4^{x^2} - 2\cdot 4^{x^2+2} + 16\cdot 4^{x^2-2} = -19\cdot 4^{6x+2}$ tenglama ildizlarining yig'indisini toping.

A) 2 B) 6 C) -2 D) -6 E) 8

Yechilishi:

$12\cdot 4^{x^2} - 2\cdot 4^{x^2+2} + 16\cdot 4^{x^2-2} = -19\cdot 4^{6x+2};$

$12\cdot 4^{x^2} - 2\cdot 4^{x^2}\cdot 16 + 16\cdot 4^{x^2}\cdot \frac{1}{16} = -19\cdot 4^{6x}\cdot 16;$

$12\cdot 4^{x^2} - 32\cdot 4^{x^2} + 4^{x^2} = -19\cdot 16\cdot 4^{6x};$

$-19\cdot 4^{x^2} = -19\cdot 4^2\cdot 4^{6x} \Rightarrow 4^{x^2} = 4^{6x+2} \Rightarrow$

$\Rightarrow x^2 - 6x - 2 = 0 \Rightarrow x_1 + x_2 = 6.$

Javobi: B

19. $\log_{\frac{1}{3}} \frac{\sqrt{3}}{7+2\sqrt{10}} + \log_{\sqrt{3}} \frac{1}{\sqrt{5}+\sqrt{2}}$ ni hisoblang.

A) -1 B) -2 C) 2 D) $-\frac{1}{2}$ E) $\frac{1}{2}$

Yechilishi: $\log_{3^{-1}} \frac{\sqrt{3}}{7+2\sqrt{10}} + \log_{3^{\frac{1}{2}}} \frac{1}{\sqrt{5}+\sqrt{2}} = -\log_3 \frac{\sqrt{3}}{7+2\sqrt{10}} +$

$+ 2\log_3 \frac{1}{\sqrt{5}+\sqrt{2}} = \log_3 \frac{7+2\sqrt{10}}{\sqrt{3}} \cdot \frac{1}{7+2\sqrt{10}} = \log_3 3^{-\frac{1}{2}} = -\frac{1}{2}.$

Javobi: D.

20. Agar m ushbu $\log_{5+2x}(5x^2+19x+19)=2$ tenglama ildizlarining soni, x_0 shu tenglamaning musbat ildizi bo'lsa, $\frac{2m+4}{x_0}$ ning qiymatini toping.

A) 1 B) 2 C) $\frac{4}{3}$ D) $\frac{6}{5}$ E) $\frac{8}{3}$

Yechilishi: $\log_{5+2x}(5x^2+19x+19)=2;$

1) $\begin{matrix}5+2x>0 \\ 5+2x\neq 1\end{matrix} \Rightarrow \begin{matrix}x>-2{,}5; \\ x\neq -2;\end{matrix}$

$5x^2+19x+19>0;\ D<0;$

2) $5x^2+19x+19=25+20x+4x^2 \Rightarrow$

$x^2-x-6=0 \Rightarrow \begin{matrix}x_1\neq -2; \\ x_2=3.\end{matrix}$ $m=1;\ x_0=3 \Rightarrow$

$\Rightarrow \frac{2m+4}{x_0}=2.$ Javobi: B.

21. $\log_{4x}\frac{4}{x}+\frac{1}{log_x^2 4}=1$ tenglama ildizlarining yig'indisini toping.

A) $\frac{65}{16}$ B) $\frac{3}{8}$ C) $\frac{81}{16}$ D) $\frac{5}{8}$ E) $\frac{35}{16}$

Yechilishi: $\log_{4x}\frac{4}{x}+\frac{1}{log_x^2 4}=1.$

1) $Logarifmning\ aniqlanish\ sohasi\ topiladi$:

$x>0;\ x\neq\frac{1}{4};\ x\neq 1;$

2) $\frac{\log_4\frac{4}{x}}{\log_4 4x}+log_4^2 x=1 \Rightarrow$

$\Rightarrow \frac{\log_4 4-\log_4 x}{\log_4 4+\log_4 x}+log_4^2 x=1 \Rightarrow$

$\Rightarrow \frac{1-\log_4 x}{1+\log_4 x}+log_4^2 x=1 \Rightarrow \log_4 x\,[\log_4 x\,(1+$

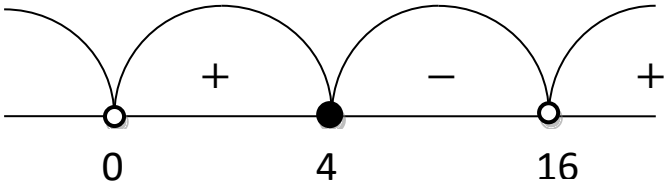
$+\log_4 x)-2]=0 \Rightarrow \begin{cases}\log_4 x=0 \\ log_4^2 x+\log_4 x-2=0\end{cases} \Rightarrow$

$$=> \begin{cases} x \neq 1; \\ x = 4; \\ x = \frac{1}{16}. \end{cases} Demak,\ 4 + \frac{1}{16} = \frac{65}{16}.$$ Javobi: A.

22. $\frac{\log_2 x-2}{\log_2 x-4} \leq 0$ tengsizlikning yechimlaridan nechtasi tub sonlardan iborat?

A) 2 B) 3 C) 4 D) 5 E) $cheksiz\ ko'p$

Yechilishi: $\frac{\log_2 x-2}{\log_2 x-4} \leq 0 \ => \ \begin{cases} x > 0 \\ \log_2 x = 2 \\ \log_2 x \neq 4 \end{cases} => \begin{cases} x > 0; \\ x = 4; \\ x \neq 16. \end{cases}$



$x = 5, 7, 11, 13.$

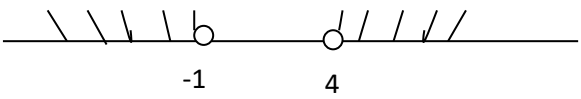
Javobi: C.

23. $|x-8|\left(\log_5(x^2-3x-4) + \frac{2}{\log_3 0{,}2}\right) \leq 0$ tengsizlikning yechimlaridan nechtasi butun sonlardan iborat?

A) $\emptyset$ B) 1 C) 2 D) 3 E) 5

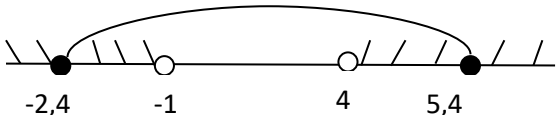
Yechilishi: $|x-8|(\log_5(x^2-3x-4) + \frac{2}{\log_3 0{,}2} \leq 0$

$$1) \begin{cases} |x-8| \geq 0 => x = 8; \\ (\log_5(x^2-3x-4) + \frac{2}{\log_3 0{,}2} \leq 0; \\ x^2-3x-4 > 0 \ => \ \begin{cases} x_1 = -1; \\ x_2 = 4. \end{cases} \end{cases} =>$$



2) $\log_5(x^2-3x-4) \leq 2 \cdot \log_5 3 \ =>$

$$=> \ x^2 - 3x - 13 \le 0 \ => \begin{cases} x_1 = \frac{3-\sqrt{61}}{2} \approx -2{,}4; \\ x_2 = \frac{3+\sqrt{61}}{2} \approx 5{,}4. \end{cases}$$



$x = -2; 5; 8.$

Javobi: C.

24. Arifmetik progressiyaning ikkinchi hadi -7 ga, beshinchi va sakkizinchi hadlarining ayirmasi -6 ga teng. Shu progressiyaning nechanchi hadi 9 ga teng bo'ladi?

A) 4 B) 7 C) 10 D) 12 E) 13

Yechilishi: $a_2 = -7; \ a_5 - a_8 = -6; \ a_n = 9;$

$$\begin{cases} a_1 + d = -7 \\ a_1 + 4d - (a_1 + 7d) = -6 \end{cases} => \begin{cases} a_1 = -9 \\ d = 2 \end{cases};$$

$a_n = a_1 + d(n-1) => 9 = -9 + 2n - 2 \ => \ n = 10.$

Javobi: C.

25. Geometrik progressiyaning birinchi hadi va maxraji 2 ga teng. Shu progressiyaning dastlabki nechta hadlari yig'indisi 1022 ga teng bo'ladi?

A) 5 B) 8 C) 9 D) 10 E) 11

Yechilishi: $b_1 = q = 2. \ S_n = \frac{b_1(q^n-1)}{q-1} =>$

$1022 = \frac{2(2^n-1)}{2-1} => 2^n = 512 \ => \ 2^n = 2^9 => \ n = 9.$

Javobi: C.

26. 7 ga bo'lganda, qoldig'i 2 ga teng bo'ladigan barcha ikki xonali sonlarning yig'indisini toping.

A) 640 B) 647 C) 650 D) 654 E) 700

Yechilishi: $a_1 = 16, a_n = 100 - 7 = 93.$

$Demak, 16, 23, 30, \dots, 93; \ 93 = 16 + 7(n-1) =>$

$\Rightarrow n = 12 \Rightarrow S_{12} = \frac{16+93}{2} \cdot 12 = 654.$ Javobi: D.

27. $\frac{\sin 106^\circ - \sin 14^\circ}{1 - 2\cos^2 22^\circ}$ ni hisoblang.

A) 1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $-\frac{1}{2}$ E) -1

Yechilishi: $\frac{\sin 106^\circ - \sin 14^\circ}{1 - 2\cos^2 22^\circ} = \frac{2\cos 60^\circ \sin 46^\circ}{-\cos 44^\circ} =$

$= \frac{\sin(90-44)}{-\cos 44^\circ} = -1.$ Javobi: E.

28. $\frac{1 - \sin^2\frac{\alpha}{8} - \cos^2\alpha - \sin^2\alpha}{4\sin^4\frac{\alpha}{16}}$ ni soddalashtiring.

A) $\operatorname{tg}^2\frac{\alpha}{16}$ B) 1 C) -1 D) $\operatorname{ctg}^2\frac{\alpha}{16}$ E) $-\operatorname{ctg}^2\frac{\alpha}{16}$

Yechilishi: $\frac{1 - \sin^2\frac{\alpha}{8} - (\cos^2\alpha + \sin^2\alpha)}{4\sin^4\frac{\alpha}{16}} = \frac{-\left(\sin 2\cdot\frac{\alpha}{16}\right)^2}{4\sin^4\frac{\alpha}{16}} =$

$= \frac{-\left(2\sin\frac{\alpha}{16}\cos\frac{\alpha}{16}\right)^2}{4\sin^4\frac{\alpha}{16}} = -\frac{4\sin^2\frac{\alpha}{16}\cos^2\frac{\alpha}{16}}{4\sin^4\frac{\alpha}{16}} = -\operatorname{ctg}^2\frac{\alpha}{16}.$ Javobi: E.

29. Agar $\alpha - \beta = \frac{\pi}{2}$ bo'lsa, $\frac{\sin\alpha - \sin\beta}{\cos\alpha + \cos\beta}$ ning qiymatini toping.

A) $\frac{1}{2}$ B) $\sqrt{2}$ C) $\frac{\sqrt{2}}{2}$ D) 1 E) 2

Yechilishi: $\alpha = \frac{\pi}{2} + \beta;$ $\frac{\sin\alpha - \sin\beta}{\cos\alpha + \cos\beta} = \frac{\sin\left(\frac{\pi}{2}+\beta\right) - \sin\beta}{\cos\left(\frac{\pi}{2}+\beta\right) + \cos\beta} =$

$= \frac{\cos\beta - \sin\beta}{\cos\beta - \sin\beta} = 1.$ Javobi: B.

30. $\cos 55^\circ \cdot \cos 65^\circ \cdot \cos 175^\circ$ ni hisoblang.

A) $-\frac{1}{8}$ B) $-\frac{\sqrt{3}}{8}$ C) $\frac{\sqrt{3}}{8}$

D) $-\frac{1}{8}\sqrt{2-\sqrt{3}}$ E) $-\frac{1}{8}\sqrt{2+\sqrt{3}}$

Yechilishi: $\cos 55^\circ \cdot \cos 65^\circ \cdot \cos 175^\circ =$

$= \cos 55^\circ \cdot \frac{1}{2}[\cos 110^\circ + \cos 240^\circ] = \frac{1}{2}\cos 55^\circ \cdot$

$\cdot\left[\cos 110^\circ - \frac{1}{2}\right] = \frac{1}{2}\cos 110^\circ \cos 55^\circ - \frac{1}{4}\cos 55^\circ =$

$= \frac{1}{2}\cdot\frac{1}{2}[\cos 55^\circ + \cos 165^\circ] - \frac{1}{4}\cos 55^\circ =$

$= \frac{1}{4}\cos(180 - 15^\circ) = -\frac{1}{4}\cos 15^\circ =$

$= -\frac{1}{4}\cdot\sqrt{\frac{1}{2}(1+\cos 30^\circ)} = -\frac{1}{4}\sqrt{\frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right)} =$

$= -\frac{1}{4}\cdot\sqrt{\frac{1}{2}\cdot\frac{2+\sqrt{3}}{2}} = -\frac{1}{8}\sqrt{2+\sqrt{3}}.$ Javobi: E

31. Agar $tg\frac{\alpha}{2} = -2$ bo'lsa, $\sin\alpha + 2\cos\alpha$ ning qiymatini hisoblang.

A) $\frac{1}{2}$ B) $-\frac{1}{2}$ C) -2 D) $\frac{4}{5}$ E) $-\frac{4}{5}$

Yechilishi: $tg\frac{\alpha}{2} = -2;\ \sin\alpha + 2\cos\alpha = \frac{2tg\frac{\alpha}{2}}{1+\mathrm{tg}^2\frac{\alpha}{2}} +$

$+2\cdot\frac{1-\mathrm{tg}^2\frac{\alpha}{2}}{1+\mathrm{tg}^2\frac{\alpha}{2}} = \frac{2\cdot(-2)}{1+(-2)^2} + 2\cdot\frac{1-(-2)^2}{1+(-2)^2} = -\frac{4}{5} + 2\cdot\ -\frac{3}{5} =$

$= -\frac{4}{5} - \frac{6}{5} = \frac{-4-6}{5} = -2.$ Javobi: C.

32. $ctgx + \frac{\sin x}{1+\cos x} = 2\ \left(-180^\circ < x < 180^\circ\right)$ tenglamaning ildizlari yig'indisini toping.

A) 150° B) 240° C) 135° D) 180° E) -150°

Yechilishi: $ctgx + \frac{\sin x}{1+\cos x} = 2\ \left(-180^\circ < x < 180^\circ\right);$

$\sin \neq 0;\ 1+\cos x \neq 0\ \Rightarrow\ \cos x \neq -1;$

$\cos x + \cos^2 x + \sin^2 x = 2\sin x\,(1+\cos x);$

$\cos x + 1 = 2\sin x + 2\sin x\cos x\,;$

$\cos x + \cos^2 x + \sin^2 x = 2\sin x\,(1+\cos x);$

$\cos x + 1 = 2\sin x\,(1+\cos x);$

$2\sin x\,(1+\cos x) - 1 - \cos x = 0;$

$2\sin x\,(1+\cos x)-(1+\cos x)=0;$

$(1+\cos x)(2\sin x-1)=0 \Rightarrow$

$\Rightarrow \begin{cases} \cos x \neq -1; \\ \sin x=\frac{1}{2} \Rightarrow x=(-1)^k\frac{\pi}{6}+\pi k,\ k\in Z. \end{cases}$

$k=0 \Rightarrow x_1=\frac{\pi}{6};\quad k=1 \Rightarrow x_2=150^\circ.$

$x_1+x_2=180^\circ.$ Javobi: D.

33. $\sin x\cdot tgx-2\sin x+tgx=2\ (-\pi\le x\le\pi)$ tenglamaning ildizlari nechta?

A) 0 B) 1 C) 2 D) 3 E) 4

Yechilishi: $\sin x\cdot tgx-2\sin x+tgx=2(-\pi\le x\le\pi);$

$\sin x\cdot tgx+tgx-2\sin x-2=0;$

$tgx(\sin x+1)-2(\sin x+1)=0;$

$(\sin x+1)(tgx-2)=0 \Rightarrow \begin{cases}\sin x=-1\\ tgx=2\end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x=-\frac{\pi}{2}+2\pi k \\ x=arctg2+\pi k \end{cases} \Rightarrow$

$\Rightarrow k=-1 \begin{cases} x=-\frac{5\pi}{2}=-450°; \\ x=63{,}5^\circ-180=116{,}5°. \end{cases}$

$k=0 \Rightarrow \begin{cases} x=-\frac{\pi}{2}=-90° \\ x=arctg2=63{,}5° \end{cases} \Rightarrow 3\ ta.$ Javobi: D.

34. $\sqrt{\log_{\frac{1}{4}}(x-1)+1}\cdot(\cos^2 2x-\sin^2 2x-1)=0$ tenglamaning ildizlari nechta?

A) $\emptyset$ B) 2 C) 3 D) 4 E) $cheksiz\ ko'p$

Yechilishi:

$\sqrt{\log_{\frac{1}{4}}(x-1)+1}\cdot(\cos^2 2x-\sin^2 2x-1)=0 \Rightarrow$

$$\Rightarrow \begin{cases} \sqrt{\log_{\frac{1}{4}}(x-1)+1}=0; \\ \cos^2 2x-\sin^2 2x-1=0; \end{cases}$$

$$1)\ \begin{cases} \log_{\frac{1}{4}}(x-1)+1\geq 0 \\ x-1>0 \end{cases} \Rightarrow \begin{cases} \log_{\frac{1}{4}}(x-1)\geq -1 \\ x>1 \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} x-1\leq 4 \\ x>1 \end{cases} \Rightarrow \begin{cases} x\leq 5 \\ x>1 \end{cases} \Rightarrow\ 1<x\leq 5;$$

$2)\ \cos 4x=1 \Rightarrow 4x=2\pi k \Rightarrow x=\frac{\pi}{2}k.$

$k=1 \Rightarrow x\approx 1{,}57;$

$k=2 \Rightarrow\ \ x=3{,}14;$

$k=3 \Rightarrow\ \ x=4{,}71;\quad x=5.$ Javobi: D.

35. $tg\left(\arcsin\left(-\frac{1}{3}\right)+\frac{\pi}{2}\right)$ ning qiymatini toping.

A) $\frac{\sqrt{2}}{4}$ B) $-\frac{\sqrt{2}}{4}$ C) $2\sqrt{2}$ D) $-2\sqrt{2}$ E) $\frac{\sqrt{3}}{4}$

Yechilishi: $tg\left(\arcsin\left(-\frac{1}{3}\right)+\frac{\pi}{2}\right)=tg\left(\frac{\pi}{2}-\arcsin\frac{1}{3}\right)=$

$$=ctg\arcsin\frac{1}{3}=\frac{\cos\arcsin\frac{1}{3}}{\sin\arcsin\frac{1}{3}}=\frac{\sqrt{1-\frac{1}{9}}}{\frac{1}{3}}=3\cdot\sqrt{\frac{8}{9}}=2\sqrt{2}.$$

Javobi: C.

36. Agar $|\vec{a}|=7, \left|\vec{b}\right|=17$ va $\left|\vec{a}-\vec{b}\right|=3\sqrt{35}$ bo'lsa, $\left|\vec{a}+\vec{b}\right|$ ning qiymatini toping.

A) 19 B) 20 C) $8\sqrt{3}$ D) $9\sqrt{2}$ E) $4\sqrt{6}$

Yechilishi: $\left|\vec{a}-\vec{b}\right|^2=\left(3\sqrt{35}\right)^2 \Rightarrow$

$\Rightarrow |\vec{a}|^2+\left|\vec{b}\right|^2-2\vec{a}\vec{b}=315 \Rightarrow 2\vec{a}\vec{b}=7^2+17^2-$

$-315=23;\ \left|\vec{a}+\vec{b}\right|^2=|\vec{a}|^2+\left|\vec{b}\right|^2+2\vec{a}\vec{b}=$

$=49+289+23=361\ \Rightarrow\ \left|\vec{a}+\vec{b}\right|=19.$ Javobi: A.

37. $\vec{a}(-3;\ 2;\ -4)$ va $\vec{b}(4;3;\ -2)$ lar teng yonli uchburchakning $C(-6;4;3)$ uchidan tushirilgan vektorlar. Shu uchburchakning C uchidan CD balandlik tushirilgan. D nuqtaning koordinatalari yig'indisini toping.

A) -1 B) 1 C) -2,5 D) 2,5 E) 3

Yechilishi: $C(-6;4;3); A(x_1;\ y_1; z_1);\ B(x_2;\ y_2; z_3)$

$\overrightarrow{CA} = \{x_1 + 6;\ y_1 - 4; z_1 - 3\};\ \ \overrightarrow{CA} = \vec{a}\ =>$

$$=> \begin{cases} x_1 + 6 = -3 \\ y_1 - 4 = 2 \\ z_1 - 3 = -4 \end{cases} => \ A(-9;6;\ -1);$$

$\overrightarrow{CB} = \{x_2 + 6;\ y_2 - 4; z_3 - 3\};\ \overrightarrow{CB} = \vec{b}\ =>$

$$=> \begin{cases} x_2 + 6 = 4 \\ y_2 - 4 = 3 \\ z_2 - 3 = -2 \end{cases} =>$$

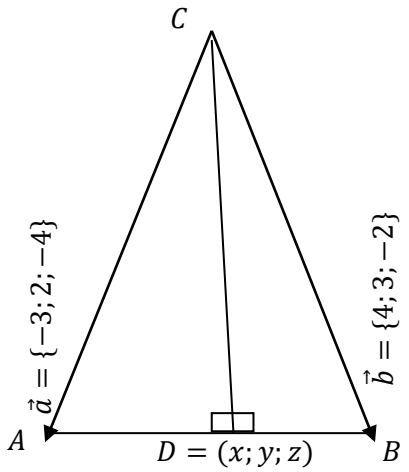
$=> \ B(-2;7;1);\ AD = DB\ dan$

$x = \frac{-9-2}{2} = -\frac{11}{2};\ \ y = \frac{6+7}{2} = \frac{13}{2};$

$z = \frac{-1+1}{2} = 0; D\left(-\frac{11}{2}; \frac{13}{2}; 0\right).$

$U\ holda\ x + y + z =$

$= -\frac{11}{2} + \frac{13}{2} + 0 = 1.$ Javobi: B.



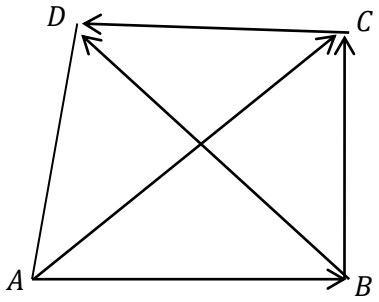
38. $\overrightarrow{AB}(-3;1;4), \overrightarrow{BC}(-2;\ 3;\ -7)$ va $\overrightarrow{CD}(5;\ -1;3)$ lar $ABCD$ to'rtburchakning tomonlari bo'lsa, shu to'rtburchakning diagonallaridan iborat vektorlar skalyar ko'paytmasining modulini toping.

A) 5 B) 9 C) 12 D) 2 E) 16

Yechilishi: $\overrightarrow{AB}\{-3;1;4\};$

$\overrightarrow{BC}\{-2;\ 3;\ -7\};\ \overrightarrow{CD}\{5;\ -1;3\};$

$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC} = \{-5;4;\ -3\};$

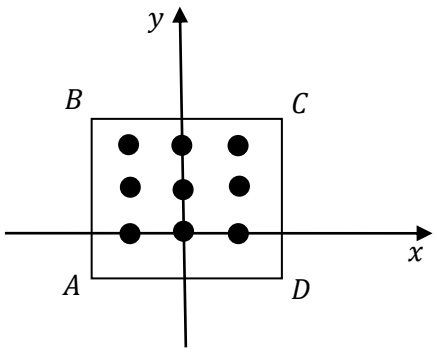


$\overrightarrow{BD} = \vec{B}C + \vec{C}D = \{3; 2; -4\};$

$\overrightarrow{AC} \cdot \overrightarrow{BD} = -15 + 8 + 12 = 5.$ Javobi: A.

39. Koordinatalari butun sonlardan iborat nechta nuqta uchlari $A(-1{,}5;\ -0{,}5), B(-1{,}5; 2{,}5), C(1{,}5; 2{,}5)$ va $D(1{,}5;\ -0{,}5)$ nuqtalarda bo'lgan to'g'ri to'rtburchakning ichida yotadi?

A) 15 B) 12 C) 9
D) 8 E) 6



Yechilishi: 9ta.
Javobi: C.

40. Nechta butun son $f(x) = \sqrt{\log_{0,5}(x-2)+2}$ funksiyaning aniqlanish sohasiga tegishli?

A) $\emptyset$ B) 1 C) 3 D) 4 E) 5

Yechilishi: $f(x) = \sqrt{\log_{0,5}(x-2)+2}$

1) $\begin{cases} x-2>0 \\ \log_{0,5}(x-2)+2 \geq 0 \end{cases} => \begin{cases} x>2; \\ \log_{0,5}(x-2) \geq -2 \end{cases} =>$

$=> x-2 \leq \left(\frac{1}{2}\right)^{-2} => x-2 \leq 4 => x \leq 6 =>$

$=> 2 < x \leq 6.$ Javobi: D.

41. $y = 4\cos 2x - 6\sin 2x + 5$ funksiyaning qiymatlar sohasiga tegishli tub sonlar nechta?

A) 2 B) 4 C) 5 D) 6 E) 7

Yechilishi: $y = 4\cos 2x - 6\sin 2x + 5.$

$y' = -8\sin 2x - 12\cos 2x => -8\sin 2x = 12\cos 2x;$

$tg2x = -\frac{3}{2} => 2x = arctg\left(-\frac{3}{2}\right) => 2x = -arctg\frac{3}{2};$

$y = 4 \cdot \cos\left(-arctg\frac{3}{2}\right) - 6 \cdot \sin\left(-arctg\frac{3}{2}\right) + 5 =$

$= \frac{4}{\sqrt{1+\frac{9}{4}}} + \frac{6\cdot\frac{3}{2}}{\sqrt{1+\frac{9}{4}}} + 5 = \frac{8}{\sqrt{13}} + \frac{18}{\sqrt{13}} + 5 = 2\sqrt{13} + 5 \approx$

$\approx 12,21 \ldots \Rightarrow \quad x = 2,3,5,7,11.$ Javobi: C.

42. Agar $f(x+1) = 3 - 2x$ va $f\big(\varphi(x)\big) = 6x - 3$ bo'lsa, $\varphi(x)$ funksiyani aniqlang.

A) $4 - 3x$ B) $3x - 4$ C) $4x + 3$

D) $4x - 3$ E) $6x - 8$

Yechilishi: $f(x+1) = 3 - 2x;\ f\big(\varphi(x)\big) = 6x - 3;$

$\varphi(x) = ?\ f(x)\ ni\ topish\ uchun\ x\ ning\ o'rniga\ x - 1$

$qo'yamiz: f(x+1-1) = 3 - 2(x-1) = 3 - 2x +$

$+2 = 5 - 2x;\ f(x) = 5 - 2x \Rightarrow f\big(\varphi(x)\big) = 5 -$

$-2\varphi(x) \Rightarrow 6x - 3 = 5 - 2\varphi(x) \Rightarrow 2\varphi(x) = 8 -$

$-6x \Rightarrow \varphi(x) = 4 - 3x.$ Javobi: A.

43. Agar $f(x) = \frac{\ln 2x}{x}$ bo'lsa, $f'(1)$ ni hisoblang.

A) $\frac{2}{e}$ B) $\ln 2$ C) $\frac{\ln 2}{e^2}$ D) $\ln 2 - 1$ E) $1 - \ln 2$

Yechilishi: $f(x) = \frac{\ln 2x}{x} \Rightarrow \quad f'(x) = \frac{\frac{1}{2x}\cdot(2x)'\cdot x - \ln 2x\cdot x'}{x^2} =$

$= \frac{1-\ln 2x}{x^2} \Rightarrow f'(x) = 1 - \ln 2.$ Javobi: E.

44. $A(1;4)$ nuqtadan $y = -2 - \frac{2}{x}$ funksiyaning grafigiga ikkita urinma o'tkazilgan. Urinish nuqtalari absissalarining yig'indisini toping.

A) -1 B) 1 C) $\frac{1}{3}$ D) $\frac{2}{3}$ E) $-\frac{2}{3}$

Yechilishi: $\boxed{y - y_0 = f'(x_0)(x - x_0)}$

1) $y = -2 - \frac{2}{x} \Rightarrow\ y_0 = -2 - \frac{2}{x_0^2}$

$y' = \frac{2}{x^2} \Rightarrow \quad y'(x_0) = \frac{2}{x^2};$

2) $4-\left(-2-\frac{2}{x_0}\right)=\frac{2}{x_0^2}(1-x_0) \Rightarrow\ x_0\neq 0;$

$6x_0^2+4x_0-2=0 \Rightarrow\ 3x_0^2+2x_0-1=0 \Rightarrow$

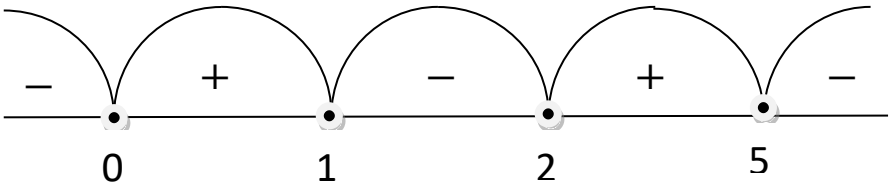
$\Rightarrow \begin{cases} x_{0_1}=-1 \\ x_{0_2}=\frac{1}{3} \end{cases} \Rightarrow\ x_{0_1}+x_{0_2}=-\frac{2}{3}.$ Javobi: E.

45. Agar $f'(x)=x(1-x)(x^2-7x+10)$ bo'lsa, $y=f(x)$ funksiyaning o'sish oraliqlari uzunliklari yig'indisini toping.

A) 1 B) 3 C) 4 D) 6 E) 8

Yechilishi:

$$f'(x)=x(1-x)(x^2-7x+10)\geq 0 \Rightarrow \begin{cases} x=0; \\ x=1; \\ x=2; \\ x=5. \end{cases}$$



Javobi: C.

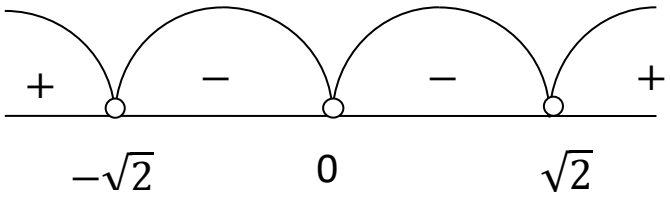
46. $f(x)=0{,}6x^5-2x^3-1$ funksiyaning maksimum va minimum nuqtalaridagi qiymatlari yig'indisini toping.

A) -3 B) -2 C) -1 D) 1 E) 2

Yechilishi: $f(x)=0{,}6x^5-2x^3-1 \Rightarrow$

$f'(x)=3x^4-6x^2 \Rightarrow \begin{cases} x^2=0 \\ x^2=2 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x_1=-\sqrt{2}; \\ x_2=0; \\ x_3=\sqrt{2}. \end{cases}$



$f\left(-\sqrt{2}\right)=1{,}6\sqrt{2}-1;\ \ f\left(\sqrt{2}\right)=-1{,}6-1 \Rightarrow$

$\Rightarrow f\left(-\sqrt{2}\right)+f\left(\sqrt{2}\right)=-2.$ Javobi: B.

47. $f(x)=\frac{4}{\sqrt{x^2+16}}$ $(-3\le x\le 3)$ funksiyaning eng kichik va eng katta qiymatlari ayirmasini toping.

A) -0,2 B) 0,2 C) 0,4 D) -0,8 E) 0,8

Yechilishi: $f(x)=\frac{4}{\sqrt{x^2+16}}$ $(-3\le x\le 3)\Rightarrow$

$\Rightarrow f'(x)=\frac{4x}{(x^2+16)\sqrt{x^2+16}}\Rightarrow 4x=0\Rightarrow x=0\Rightarrow$

$\Rightarrow \begin{cases} x=0 \\ x=\pm 3 \end{cases}\Rightarrow$ $f(\pm 3)=\frac{4}{5};\ f(0)=1\Rightarrow$

$\Rightarrow \frac{4}{5}-1=-0{,}2.$ Javobi: A.

48. $f(x)=x-1-\operatorname{ctg}^2 x$ funksiyaning boshlang'ich funksiyasini toping.

A) $\frac{x^2}{2}-ctgx+C$ B) $\frac{x^2}{2}+ctgx+C$

C) $\frac{x^2}{2}-tgx+C$ D) $\frac{x^2}{2}+tgx+C$ E) $x^2+ctgx+C$

Yechilishi: $f(x)=x-1-\operatorname{ctg}^2 x=x-(1+\operatorname{ctg}^2 x)=$

$=x-\frac{1}{\sin^2 x};\ F(x)=\frac{x^2}{2}+ctgx+C.$ Javobi: B.

49. $\int_4^9\left(\frac{2x}{5}+\frac{1}{2\sqrt{x}}\right)dx$ ni hisoblang.

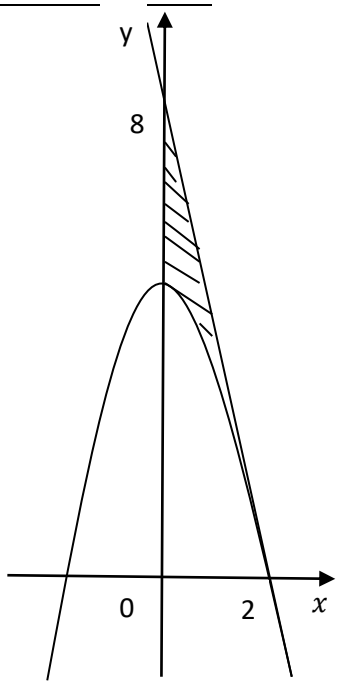
A) 5 B) 8 C) 10 D) 12 E) 14

Yechilishi: $\int_4^9\left(\frac{2x}{5}+\frac{1}{2\sqrt{x}}\right)dx=\frac{2}{5}\cdot\frac{x^2}{2}\int_4^9+\frac{1}{2}\int_4^9 x^{-\frac{1}{2}}dx=$

$=\frac{1}{5}[9^2-4^2]+\frac{1}{2}\cdot\frac{x^{-\frac{1}{2}+1}}{-\frac{1}{2}+1}\int_4^9=13+1=14.$ Javobi: E.

50. $y=4-x^2, y=-4x+8$ chiziqlar va Oy o'qi bilan chegaralangan shaklning yuzini toping.

A) 1,5 B) 2 C) $2\frac{2}{3}$ D) 3 E) $3\frac{1}{3}$



Yechilishi: $\begin{cases} y = 4 - x^2; \\ y = -4x + 8; \\ x = 0. \end{cases}$

$S = \int_0^2 [-4x + 8 - 4 + x^2]\, dx =$

$= \int_0^2 (x^2 - 4x + 4)\, dx =$

$= \left(\frac{1}{3}x^3 - 2x^2 + 4x\right)|_0^2 = \frac{8}{3} - 8 + 8 =$

$= 2\frac{2}{3}$. Javobi: C.

51. $ABCD(BC \parallel AD)$ trapetsiyaning diagonallari O nuqtada kesishadi. Agar $BO = 2, DO = 4$ va BOC uchburchakning yuzi 6 ga teng bo'lsa, shu trapetsiyaning yuzini toping.

A) 42 B) 48 C) 52 D) 54 E) 60

Yechilishi: $\triangle AOD \backsim \triangle BOC$ *dan foydalaniladi*:

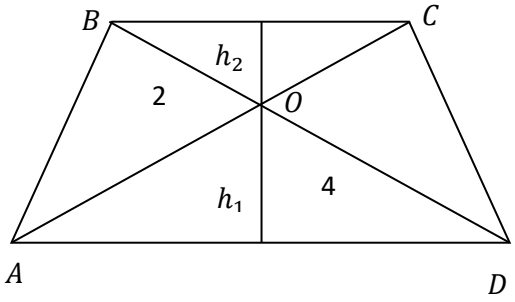
$\frac{AD}{BC} = \frac{4}{2} => AD = 2BC;$

$\frac{h_1}{h_2} = 2 => h_1 = 2 \cdot h_2;$

$6 = \frac{1}{2} \cdot BC \cdot h_2 =>$

$=> h_2 = \frac{12}{BC} => h_1 = \frac{24}{BC} =>$

$=> h = h_1 + h_2 = \frac{36}{BC};$



$S = \frac{2BC+BC}{2} \cdot \frac{36}{BC} = 54$. Javobi: D.

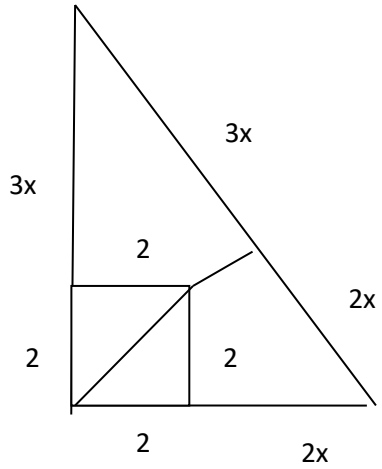
52. To'g'ri burchakli uchburchakka ichki chizilgan aylananing urinish nuqtasi gepotenuzani 2:3 nisbatda bo'ladi. To'g'ri burchak uchidan aylananing markazigacha bo'lgan masofa $2\sqrt{2}$ ga teng. Berilgan uchburchakning yuzini toping.

A) 12 B) 16 C) 18 D) 20 E) 24

Yechilishi: $(5x)^2 = (2 + 2x)^2 + (2 + 3x)^2 =>$

$=> x = 2;$

$S = \frac{1}{2} \cdot (2 + 2x)(2 + 3x) = 24.$

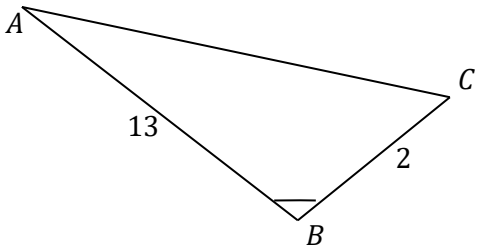


Javobi: E.

53. ABC uchburchakda $AB = 13, BC = 2$ va $\sin B = \frac{5}{13}$. Agar B burchak o'tmas burchak bo'lsa, AC tomonning uzunligini toping.

A) $5\sqrt{5}$ B) $\sqrt{193}$ C) $\sqrt{153}$ D) 15 E) $\sqrt{221}$

Yechilishi: $\angle B + \angle A + \angle C = 180^{\circ};$



$\angle B = 180 - (\angle A + \angle C);$

$\cos \angle B = -\cos(\angle A + \angle C);$

$\sin \angle B = \sin(\angle A + \angle C) = \frac{5}{13};$

$\angle B = \arcsin \frac{5}{13};$

$AC^2 = 13^2 + 2^2 - 2 \cdot 13 \cdot 2(-\cos \angle B) = 169 + 4 +$

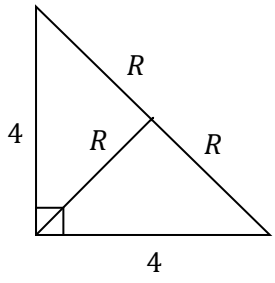
$+52 \cos \arcsin \frac{5}{13} = 173 + 52 \cdot \sqrt{1 - \frac{25}{169}} =$

$= 173 + 52 \cdot \frac{12}{13} = 221 \Rightarrow AC = \sqrt{221}.$ Javobi: E.

54. Uchburchakning ikkita burchagi 45° dan, unga tashqi chizilgan aylananing radiusi $\sqrt{8}$ ga teng. Shu uchburchaklarning perimetrini toping.

A) $2 + \sqrt{2}$ B) $2 \cdot (2 + \sqrt{2})$ C) $3 \cdot (2 + \sqrt{2})$

D) $4 \cdot (2 + \sqrt{2})$ E) $6 \cdot (2 + \sqrt{2})$



Yechilishi: $R = \sqrt{8} = 2\sqrt{2}.$

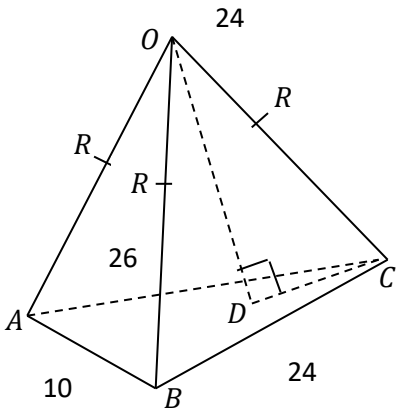
$P = 4 + 4 + 4\sqrt{2} = 4\left(2 + \sqrt{2}\right).$

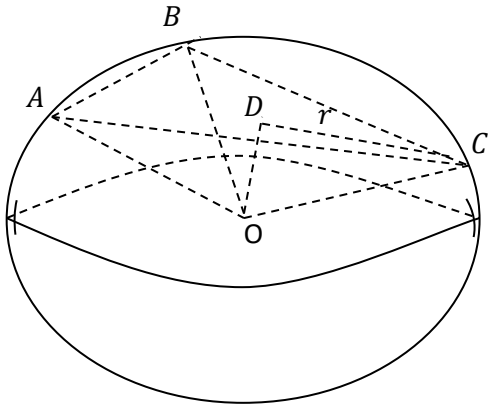
Javobi: D.

55. Sfera sirtidagi uchta nuqta orasidagi masofa 26, 24 va 10 ga, sfera sirtining yuzi esa 900π ga teng. Shu uchta nuqta orqali o'tgan tekislikdan sferaning markazigacha bo'lgan masofani toping

A) $2\pi\sqrt{14}$ B) $2\sqrt{14}$ C) $4\sqrt{14}$ D) 56π E) 56

Yechilishi: $AC = 26;\ BC = 24;\ AB = 10;\ S = 900\pi;$
$OA = OB = OC = R;\ CD = r;\ OD =?$





$p = \frac{26+24+10}{2} = 30 => S = \sqrt{30 \cdot 20 \cdot 4 \cdot 6} =$
$= \sqrt{5 \cdot 6 \cdot 4 \cdot 5 \cdot 4 \cdot 6} = 4 \cdot 5 \cdot 6 = 120;\ r = \frac{10 \cdot 26 \cdot 24}{4 \cdot 120} = 13;$
$900\pi = 4\pi R^2 => R = 15 =>\ OD^2 = R^2 - r^2 =$
$= 225 - 169 = 56 => OD = \sqrt{4 \cdot 14} = 2\sqrt{14}.$

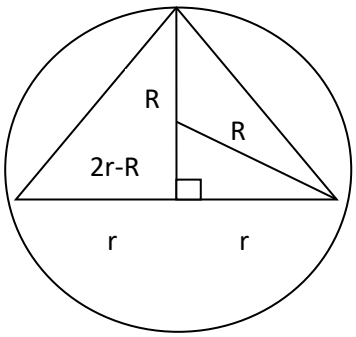
Javobi: B.

56. Sferaga balandligi asosining deametriga teng bo'lgan konus ichki chizilgan. Agar sfera sirtining yuzi 125 ga teng bo'lsa, konus asosining yuzini toping.

A) 10 B) 10π C) 15 D) 20 E) 20π

Yechilishi: $4\pi R^2 = 125 => R = \frac{5\sqrt{5}}{2\sqrt{\pi}}.$

$R^2 = (2r - R)^2 + r^2\ =>$
$=> R^2 = 4r^2 - 4r \cdot R + R^2 + r^2 =>$



$$=>\ 5r^2 = 4 \cdot r \cdot \frac{5\sqrt{5}}{2\sqrt{\pi}} =>$$

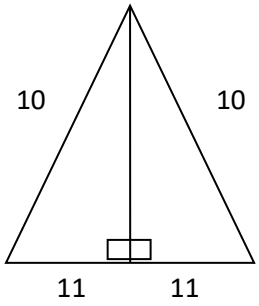
$$=>\ r = \frac{2\sqrt{5}}{\sqrt{\pi}}\ =>\ \ S = \pi r^2 = 20.$$

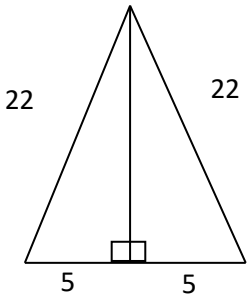
Javobi: D.

57. Teng yonli uchburchakning tomonlari 10 va 22 ga teng. Shu uchburchak o'zining simmetriya o'qi atrofida aylantirilganda hosil bo'lgan aylanish jismining to'la sirtini toping.

A) 105π B) 125π C) 135π D) 150π E) 160π

Yechilishi:



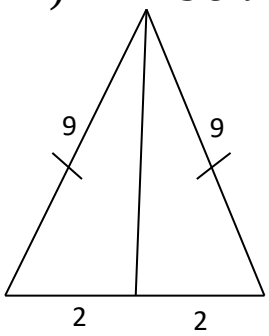


$S_T = \pi Rl + \pi R^2 = \pi \cdot 11 \cdot 10 + \pi \cdot 11^2 = 110\pi + 121\pi = 231\pi$. $S_T = \pi \cdot 5 \cdot 22 + \pi \cdot 5^2 = 135\pi$. Javobi: C.

58. Konus o'q kesimining ikki tomoni 4 va 9 ga teng. Shu konusning yon sirtini toping.

A) 12π B) 16π C) 18π D) 24π E) 36π

Yechilishi:



$S_{yon} = \pi Rl = \pi \cdot 2 \cdot 9 = 18\pi$.

Javobi: C.

59. Diagonallari 14 ta bo'lgan qavariq ko'pburchakning nechta tomoni bor?

A) 5 B) 6 C) 7 D) 8 E) 10

Yechilishi:

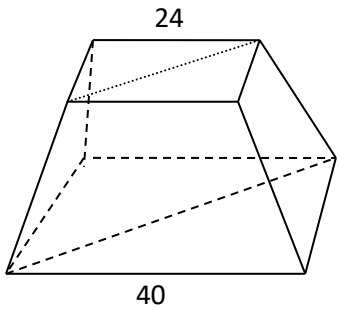
$$14 = \frac{n(n-3)}{2} \Rightarrow \; n^2 - 3n - 28 = 0 \Rightarrow \; n = 7.$$

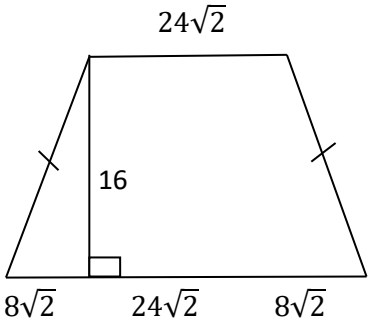
Javobi: C.

60. Muntazam to'rtburchakli kesik piramidaning balandligi 16 ga, asoslarining tomonlari 24 va 40 ga teng. Kesik piramidaning diagonallarini toping.

A) 48 B) 24 C) 36 D) 40 E) 27

Yechilishi:





$d^2 = 16^2 + (32\sqrt{2})^2 = 256 + 2048 = 2304;$

$d = 48.$ Javobi: A.

61. $x^2 + y^2 - 4x - 6y - 12 = 0$ formula bilan berilgan chiziqning uzunligini toping.

A) 10π B) 5π C) 8π D) 12π E) 25π

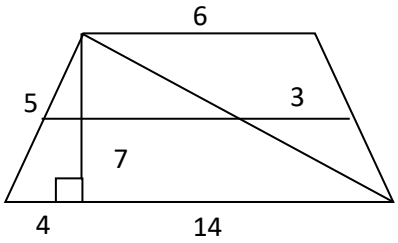
Yechilishi: $x^2 - 4x + 2^2 - 2^2 + y^2 - 6y + 3^2 - 3^2 - -12 = 0 \Rightarrow (x-2)^2 + (y-3)^2 = 5^2;\; l = 2\pi R = 10\pi.$

Javobi: A.

62. Teng yonli trapetsiyaning yon tomoni 5 ga, diagonali esa o'rta chizig'ini 3 va 7 ga teng bo'lgan kesmalarga ajratadi. Trapetsiyaning yuzini toping.

A) 30 B) 40 C) 45

D) 25 E) 50



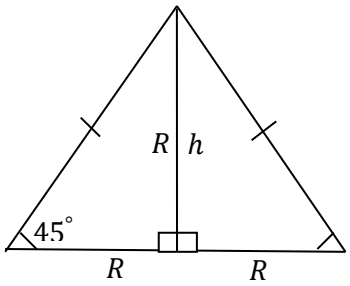
Yechilishi: $Trapetsiyaning\ o'rta\ chizig'i\ hosil\ bo'lgan\ uchbur-chaklarning\ ham\ o'rta\ chiziq -$

lari bo'ladi. Bulardan foydalanib trapetsiyaning kichik asosi 6, *katta asosi* 14 *ekanligi topiladi. Misr uchburchagi – dan trapetsiyaning balandligi kelib chiqadi.*

$h = 3 => S = \frac{14+6}{2} \cdot 3 = 30.$ Javobi: A.

63. Konus hajmining π ga nisbati 9 ga teng bo'lib, uning yasovchisi asos tekisligi bilan 45° li burchak tashkil qiladi. Konusning balandligini toping.

A) 3 B) 2 C) $\sqrt{3}$ D) 1,5 E) $\sqrt{5}$



Yechilishi: $\frac{V_k}{\pi} = 9 => V_k = 9\pi;$

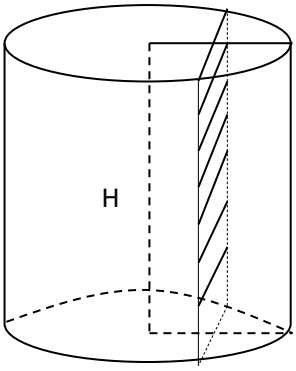
$9\pi = \frac{1}{3}\pi R^2 \cdot R => R = 3 => h = 3.$

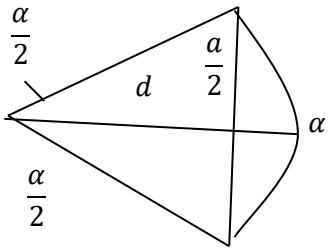
Javobi: A.

64. Balandligi H ga teng silind o'z o'qiga parallel va undan d masofada bo'lgan tekislik bilan kesilgan. Tekislik asos aylanasidan α ga teng yonni ajratadi. Kesimning yuzini toping.

A) $2Hdtg\frac{\alpha}{2}$ B) $Hdsin\alpha$ C) $2dHcos\alpha$

D) $Hdsin\frac{\alpha}{2}$ E) $2Hdsin\frac{\alpha}{2}$

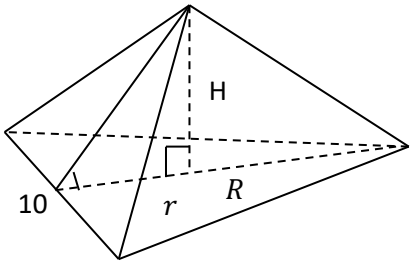




Yechilishi: $\frac{a}{2} : d = tg\frac{\alpha}{2} => a = 2dtg\frac{a}{2};\ S = aH = 2 \cdot H \cdot d \cdot tg\frac{\alpha}{2}.$ Javobi: A.

65. Uchburchakli muntazam piramida asosining tomoni 10 ga teng. Yon yog'i asos tekisligi bilan 45° li burchak hosil qiladi. Piramidaning balandligini toping.

A) $\frac{5}{\sqrt{3}}$ B) $5\sqrt{3}$ C) $4\sqrt{3}$ D) $5\sqrt{2}$ E) $4\sqrt{2}$



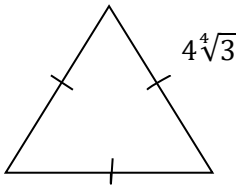
Yechilishi: $r = \frac{10\sqrt{3}}{6} = \frac{5\sqrt{3}}{3}$;

$H : r = tg45^\circ => H = \frac{5\sqrt{3}}{\sqrt{3}\sqrt{3}} =>$

$=> H = \frac{5}{\sqrt{3}}$. Javobi: A.

66. Tomonining uzunligi $4\sqrt[4]{3}$ bo'lgan muntazam uchburchakning yuzini yoping.

A) 12 B) 16 C) $24\sqrt{3}$ D) $12\sqrt{3}$ E) $8\sqrt{3}$



Yechilishi: $S = \frac{a^2 \cdot \sqrt{3}}{4} = \frac{\left(4\sqrt[4]{3}\right)^2 \cdot \sqrt{3}}{4} =$

$= \frac{16 \cdot \sqrt{3} \cdot \sqrt{3}}{4} = 12$. Javobi: A.

10-axborotnoma

1. $2001 \cdot 2004 - 2002 \cdot 2003$ ni hisoblang.

A) -2 B) 2 C) 0 D) 2000 E) 4

Yechilishi: $2001 \cdot 2004 - 2002 \cdot 2003 = (2002 - 1) \cdot$

$\cdot (2003 + 1) - 2002 \cdot 2003 = 2002 \cdot 2003 + 2002 -$

$-2003 - 1 - 2002 \cdot 2003 = -2.$ Javobi: A.

2. $1 \cdot 4 + 2 \cdot 6 + 3 \cdot 8 + \cdots + 10 \cdot 22$ yig'indining har bir hadidagi ikkinchi ko'paytuvchi 3 ta kamaytirilsa, yig'indi qanchaga kamayadi?

A) 165 B) 30 C) 15 D) 30 E) 16

Yechilishi: $-\dfrac{1 \cdot 4 + 2 \cdot 6 + 3 \cdot 8 + \cdots + 10 \cdot 22}{1 \cdot 1 + 2 \cdot 3 + 3 \cdot 5 + \cdots + 10 \cdot 19} =>$

$=> 3 + 6 + 9 + \cdots + 30 = 165.$ Javobi: A.

3. $\frac{0,07}{0,21} + \frac{0,4}{0,06} + \frac{0,9}{0,05}$ ifodaning qiymatini toping.

A) 25 B) 20 C) 15 D) 30 E) 16

Yechilishi: $\frac{0,07}{0,21} + \frac{0,4}{0,06} + \frac{0,9}{0,05} = \frac{7}{21} + \frac{40}{6} + \frac{90}{5} = 25.$

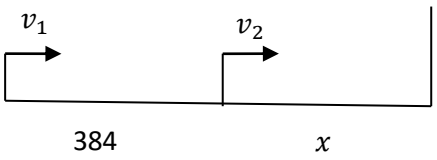
Javobi: A.

4. Orasidagi masofa 384 km bo'lgan ikki mashina bir vaqtda bir tomonga harakat qilmoqda. 12 soatdan keyin orqadagi mashina oldingi mashinaga yetib oldi. Keyingi mashinaning tezligi oldindagi mashinaning tezligidan qancha ortiq?

A) 32 B) 16 C) 28 D) 30 E) 42

Yechilishi:

$-\begin{matrix} 12v_1 = 384 + x \\ 12v_2 = x \end{matrix} =>$



$=> v_1 - v_2 = 32.$ Javobi: A.

5. Sinfdagi qizlar sonining o'g'il bolalar soniga nisbati $\frac{5}{7}$ bo'lsa, sinfdagi barcha o'quvchilar soni quyidagilarning qaysi biriga teng bo'lishi mumkin?

A) 36 B) 34 C) 32 D) 30 E) 28

Yechilishi: $5x + 7x = 36 => 12x = 36.$ Javobi: A.

6. Eritma tarkibida 60 g tuz bor. Unga 400 g toza suv qo'shilsa, tuzning konsentratsiyasi 1,5 marta kamayadi. Dastlabki eritma necha gramm bo'lgan?

A) 800 B) 840 C) 780 D) 900 E) 640

Yechilishi:

$$\begin{matrix} e \to 100\% \\ 60 \to x\% \end{matrix} => x = \frac{1}{e} \cdot 60 \cdot 100;$$

$$\begin{matrix} e + 400 \to 100\% \\ 60 \to \frac{x}{1{,}5}\% \end{matrix} => x = \frac{1{,}5}{э+400} \cdot 60 \cdot 100 =>$$

$=> x => 800..$ Javobi: A.

7. Ikki sonning yig'indisi 6 ga, ko'paytmasi 7 ga teng bo'lsa, bu sonlar kublarining yig'indisi nechaga teng bo'ladi?

A) 90 B) 48 C) 64 D) 72 E) 108

Yechilishi: $\begin{cases} x + y = 6 \\ x \cdot y = 7 \end{cases} =>$

$$\begin{cases} x^2 + y^2 = 36 - 2xy = 36 - 2 \cdot 7 = 22; \\ x^3 + y^3 = (x + y)(x^2 - xy + y^2) = 6 \cdot (22 - 7) = 90. \end{cases}$$

Javobi: A.

8. Agar $x = \frac{\sqrt{3}-1}{2}$ bo'lsa, $(x - 1)(x + 2)$ ifodaning qiymatini toping.

A) -1,5 B) 1,5 C) 3 D) -3 E) $2\sqrt{3}$

Yechilishi: $(x-1)(x+2)=x^2+x-2=\left(\frac{\sqrt{3}-1}{2}\right)^2+$

$+\frac{\sqrt{3}-1}{2}-2=\frac{4-2\sqrt{3}+2\sqrt{3}-2-8}{4}=-\frac{6}{4}=-1{,}5.$ Javobi: A.

9. n natural son va $n^2x^2+3n^3x+4=0$ tenglama ildizlarining o'rta arifmetigini o'rta geometrigiga nisbati -3 ga teng bo'lsa, n ning qiymatini toping.

A) 2 B) 1 C) 3 D) 4 E) 5

Yechilishi: $n^2x^2+3n^3x+4=0 \Rightarrow$

$\Rightarrow x^2+3nx+\frac{4}{n^2}=0 \Rightarrow \begin{cases} x_1+x_2=-3n \\ x_1\cdot x_2=\frac{4}{n^2} \end{cases} \Rightarrow$

$\Rightarrow \frac{x_1+x_2}{2}=-\frac{3n}{2};\ \sqrt{x_1\cdot x_2}=\frac{2}{n} \Rightarrow \frac{x_1+x_2}{2}:\sqrt{x_1x_2}=-3;$

$-\frac{3n}{2}:\frac{2}{n}=-3 \Rightarrow \Rightarrow n^2=4 \Rightarrow n=\pm 2 \Rightarrow n=2.$

Javobi: A.

10. a ning nechta butun qiymatida $\frac{a^4-9}{a^3-3a}:\frac{a^3+3a}{a-5a^2}$ ifodaning qiymati butun son bo'ladi?

A) 2 B) 3 C) 1 D) 4 E) 5

Yechilishi: $\frac{a^4-9}{a^3-3a}:\frac{a^3+3a}{a-5a^2}=\frac{(a^2-3)(a^2+3)}{a(a^2-3)}\cdot\frac{a(1-5a)}{a(a^2+3)}=$

$=\frac{1-5a}{a} \Rightarrow \frac{1}{a}-5 \Rightarrow a=\pm 1.$ Javobi: A.

11. $8^{n+2}\cdot 12^{n-3}$ ko'paytmaning natural bo'luvchilari soni 42 ga teng bo'lsa, n nechaga teng bo'ladi?

A) 4 B) 3 C) 2 D) 5 E) 6

Yechilishi: $8^{n+2}\cdot 12^{n-3}=2^{3n+6}\cdot 2^{2n-6}\cdot 3^{n-3}=$

$2^{5n}\cdot 3^{n-3}$; *Bo'luvchilari sonini topish uchun daraja ko'rsatgichlariga bir qo'shilib ko'paytiriladi*:

$(5n+1)(n-3+1)=42 \Rightarrow 5n^2-9n-44=0 \Rightarrow$

$\Rightarrow n=4.$ Javobi: A.

12. Agar $x = \frac{4}{5}m$ bo'lsa, $\frac{\sqrt{m+x}+\sqrt{m-x}}{\sqrt{m+x}-\sqrt{m-x}}$ ning qiymatini toping.

A) 2 B) $2m$ C) 4 D) -2 E) $4m$

Yechilishi: $\frac{\sqrt{m+x}+\sqrt{m-x}}{\sqrt{m+x}-\sqrt{m-x}} = \frac{(\sqrt{m+x}+\sqrt{m-x})\cdot(\sqrt{m+x}-\sqrt{m-x})}{(\sqrt{m+x}-\sqrt{m-x})^2} =$

$= \frac{x}{m-\sqrt{m^2-x^2}} = \frac{4m}{5}\cdot\frac{5}{2m} = 2.$ Javobi: A.

13. $\sqrt{x-2}+\sqrt{1-x} = 2$ tenglamani yeching.

A) $\emptyset$ B) 2 C) 1,2 D) 0,4 E) 0,9

Yechilishi: $\sqrt{x-2}+\sqrt{1-x} = 2 \Rightarrow \begin{cases} x-2 \geq 0 \\ 1-x \geq 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x \geq 2; \\ x \leq 1. \end{cases}$ $Tenglama\ yechimga\ ega\ emas.$ Javobi: A.

14. q ning qanday qiymatida $x^2 - x - q = 0$ tenglama ildizlari kublarining yig'indisi 19 ga teng bo'ladi?

A) 6 B) 5 C) 7 D) 4 E) 3

Yechilishi: $x^2 - x - q = 0 \Rightarrow$

$\begin{cases} x_1 + x_2 = 1 \Rightarrow\ x_1^2 + x_2^2 = 1 - 2x_1x_2; \\ x_1 \cdot x_2 = -q \end{cases}$

$x_1^3 + x_2^3 = 19 \Rightarrow (x_1 + x_2)(x_1^2 + x_2^2 - x_1x_2) = 19 \Rightarrow$

$\Rightarrow 1 - 2x_1x_2 - x_1x_2 = 19 \Rightarrow\ -3x_1x_2 = 18 \Rightarrow$

$\Rightarrow -3(-q) = 18 \Rightarrow q = 6.$ Javobi: A.

15. Agar $x < 0$ bo'lsa, $\sqrt{x^2-12x+36} - \sqrt{x^2}$ ni soddalashtiring.

A) 6 B) -6 C) $6-2x$ D) $2x-6$ E) 8

Yechilishi: $\sqrt{x^2-12x+36} - \sqrt{x^2} = |x-6| - |x| =$

$= -(x-6) + x = -x + 6 + x = 6.$ Javobi: A.

16. Dastlabki 100 ta natural sonlarni yozganda, 7 raqami necha marta takrorlanadi?

A) 10 B) 20 C) 19 D) 18 E) 17

Yechilishi: $1, 2, 3, \dots, 100.$

$7, 17, 27, 37, 47, 57, 67, \underbrace{70, \dots, 79}_{11\ ta}, 87, 97;$ Javobi: B.

17. $\frac{\sqrt{2}+1}{3+2\sqrt{2}} - \frac{\sqrt{2}-1}{3-2\sqrt{2}}$ ni soddalashtiring

A) 1 B) -1 C) 2 D) -2 E) $\sqrt{2}$

Yechilishi: $\frac{\sqrt{2}+1}{3+2\sqrt{2}} - \frac{\sqrt{2}-1}{3-2\sqrt{2}} = \frac{(\sqrt{2}+1)(3-2\sqrt{2})-(\sqrt{2}-1)(3+2\sqrt{2})}{9-8} =$

$= 3\sqrt{2} - 4 + 3 - 2\sqrt{2} - (3\sqrt{2} + 4 - 3 - 2\sqrt{2}) =$

$= \sqrt{2} - 1 - (\sqrt{2} + 1) = -2.$ Javobi: D.

18. Ikki sonning yig'indisi $2\sqrt{5}$ ga, ko'paytmasi esa 1,75 ga teng. Shu sonlardan kattasi kichigidan qanchaga katta?

A) $\sqrt{7}$ B) $\sqrt{15}$ C) $\sqrt{13}$ D) $\sqrt{17}$ E) $\sqrt{21}$

Yechilishi: $\begin{cases} x + y = 2\sqrt{5} \\ x \cdot y = 1{,}75 \end{cases} => \begin{cases} x = 2\sqrt{5} - y \\ (2\sqrt{5} - y)y = \frac{7}{4} \end{cases} =>$

$=> \begin{cases} x = 2\sqrt{5} - y \\ y^2 - 2\sqrt{5}y + \frac{7}{4} = 0 \end{cases} => \begin{cases} y_1 = \sqrt{5} - \frac{\sqrt{13}}{2} \\ y_2 = \sqrt{5} + \frac{\sqrt{13}}{2} \end{cases} =>$

$=> \begin{cases} x_1 = \sqrt{5} + \frac{\sqrt{13}}{2} \\ x_2 = \sqrt{5} - \frac{\sqrt{13}}{2} \end{cases} => x_1 - y_1 = \sqrt{13}.$ Javobi: C.

19. 7 ta kitob va 4 ta jurnalning birgalikdagi bahosi, 4 ta kitob va 7 ta jurnalning birgalikdagi bahosidan 525 so'm ortiq. Kitob jurnalga qaraganda qancha so'm qimmat turishini aniqlang.

A) 150 B) 175 C) 200 D) 125 C) 145

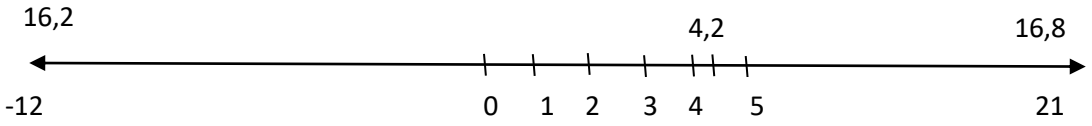
Yechilishi: $\begin{matrix} 7k + 4j = a + 525 \\ -\ 7j + 4k = a \end{matrix} =>$

$\Rightarrow 3(k-j)=525 \Rightarrow 175$. Javobi: B.

20. Son o'qida 4,2 sondan masofasi 17 dan oshmaydigan songacha bo'lgan oraliqda nechta butun son mavjud?

A) 21 B) 35 C) 32 D) 34 E) 33

Yechilishi:



33 ta. Javobi: E.

21. $x(x>0)$ ga teskari bo'lgan son x ning 36% ini tashkil etadi. x ning qiymatini toping.

A) $2\frac{1}{3}$ B) $1\frac{2}{3}$ C) $1\frac{1}{3}$ D) $2\frac{2}{3}$ E) $3\frac{1}{3}$

Yechilishi: $\frac{1}{x}=0{,}36\cdot x \Rightarrow x^2=\frac{1}{0{,}36} \Rightarrow x=\frac{1}{0{,}6}=1\frac{2}{3}$.

Javobi: B.

22. Mahsulotning narxi ketma-ket ikki marta 10% dan oshirildi. Keyinchalik bu mahsulotga talabning kamligi tufayli uning narxi 20% ga kamaytirildi. Mahsulotning keyingi bahosi dastlabki bahosiga qaraganda qanday o'zgargan?

A) $o'zgarmagan$ B) $1{,}2\%\ ga\ ortgan$

C) $1{,}8\%\ ga\ kamaygan$ D) $3{,}2\%\ ga\ kamaygan$

E) $3{,}2\%\ ga\ ortgan$

Yechilishi: $(1{,}1\cdot x)\cdot 1{,}1=1{,}21x;\ 1{,}21\cdot x\cdot 0{,}8=$

$=0{,}968x \Rightarrow 1-0{,}968=0{,}032$. Javobi: D.

23. Biznesmen o'z pulining 50% ini yo'qotdi. Qolgan puliga aksiya sotib olgach, u 40% daromad (foyda) oldi. Uning oxirgi puli dastlabki pulining necha foizini tashkil etadi?

A) 60 B) 70 C) 80 D) 100 E) 75

Yechilishi: $a\ so'm\ -100\% \Rightarrow 0{,}5\cdot a\cdot 1{,}4=0{,}7\cdot a$.

Javobi: B.

24. Eski traktor maydonni 6 soatda, yangisi esa 4 soatda haydaydi. Shu maydonni 3 ta eski va 2 ta yangi traktor qancha vaqtda haydaydi?

A) 1 $soatda$ B) 1,5 $soatda$ C) 2 $soatda$

D) 2,5 $soatda$ E) 45 $minutda$

Yechilishi: $\left(3 \cdot \frac{1}{6} + 2 \cdot \frac{1}{4}\right) t = 1 => t = 1.$ Javobi: A.

25. Ikki musbat sondan biri ikkinchisidan 60% ga katta. Shu sonlarning ko'paytmasi 1000 ga teng bo'lsa, ularning yig'indisini toping.

A) 100 B) 50 C) 75 D) 65 E) 55

Yechilishi: $x \ va \ 1{,}6x => 1{,}6x^2 = 1000 =>$

$=> x = 25; \ 1{,}6x = 40 => 25 + 40 = 65.$ Javobi: D.

26. Ikki sonning yig'indisi 18 ga, ko'paytmasi esa 61 ga teng. Shu sonlar kvadratlari ayirmasining modulini toping.

A) $70\sqrt{3}$ B) $72\sqrt{5}$ C) $64\sqrt{2}$ D) $76\sqrt{5}$ E) $80\sqrt{2}$

Yechilishi: $\begin{cases} x + y = 18 \\ x \cdot y = 61 \end{cases} => \begin{cases} x = 18 - y \\ y^2 - 18y + 61 = 0 \end{cases} =>$

$$=> \begin{cases} x_1 = 9 + 2\sqrt{5} \\ x_2 = 9 - 2\sqrt{5} \\ y_{1,2} = 9 \pm 2\sqrt{5} \end{cases} => |x_1^2 - y_1^2| = \left|81 + 36\sqrt{5} + 20 - \left(81 + 36\sqrt{5} + 20\right)\right| = 72\sqrt{5}.$$

$Xuddi \ shunday$:

$|x_2^2 - y_2^2| = 72{,}5.$ Javobi: B.

27. $(4x^2 - 7x - 5)(5x^2 + 13x + 3)(3x - x^2 - 8) = 0$ tenglamaning barcha haqiqiy ildizlari ko'paytmasini toping.

A) 1 B) 0 C) 0,75 D) -0,75 E) 1,25

Yechilishi: $(4x^2-7x-5)(5x^2+13x+3)(3x-$

$-x^2-8)=0;\ 4x^2-7x-5=0 \Rightarrow x_1=\frac{7-\sqrt{129}}{8};$

$x_2=\frac{7+\sqrt{129}}{8};\ 5x^2+13x+3=0 \Rightarrow\ x_3=\frac{-13-\sqrt{109}}{10};$

$x_4=\frac{-13+\sqrt{109}}{10};\ x^2-3x+8=0 \Rightarrow\ D<0;$

$x_1\cdot x_2\cdot x_3\cdot x_4=-0{,}75.$ Javobi: D.

28. $7x^2+(5k^2-8k-13)x-k^4=0$ tenglamaning ildizlari qarama-qarshi sonlar bo'ladigan k ning barcha qiymatlari yig'indisini aniqlang.

A) 1,2 B) 1,4 C) 1,6 D) 1,8 E) 2,4

Yechilishi: $7x^2+(5k^2-8k-13)x-k^4=0.$

$Qarama-qarshi\ sonlar\ yig'indisining\ nolga\ tengligi\ e'tiborga\ olinadi.\ U\ holda\ x_1+x_2=0 \Rightarrow$

$\Rightarrow -\frac{5k^2-8k-13}{7}=0 \Rightarrow 5k^2-8k-13=0 \Rightarrow$

$\Rightarrow \begin{cases}k_1=-1\\k_2=2{,}6\end{cases} \Rightarrow\ k_1+k_2=1{,}6.$ Javobi: C.

29. $13x^4-5x^2-17=0$ tenglamaning barcha ildizlari yig'indisining, barcha ildizlari ko'paytmasiga nisbatini toping.

A) 1 B) 0 C) $\frac{3}{2}$ D) $\frac{2}{3}$ E) $aniqlab\ bo'lmaydi$

Yechilishi: $13x^4-5x^2-17=0.$

$Bikvadrat\ tenglama\ ildizlari\ yig'indisining\ nolga\ tengligi\ e'tiborga\ olinadi.$ Javobi: B.

30. a ning nechta qiymatida $\begin{cases}(a-2)x+3y=5\\7x-18y=1\end{cases}$ tenglamalar sistemasi yechimga ega emas?

A) 1 B) 2 C) 4 D) $birorta\ ham\ qiymatida$

E) $cheksiz\ ko'p$

Yechilishi:

$\begin{cases}(a-2)x+3y=5;\\ 7x-18y=1.\end{cases}$ $Ikki\ to'g'ri\ chiziqning\ parallel-$

$lik\ sharti\ e'tiborga\ olinadi$: $\frac{a-2}{7}=\frac{3}{-18}=>$

$=>\frac{a-2}{7}=-\frac{1}{6}=>6a-12=-7=>a=\frac{5}{6}$. Javobi: A.

31. Agar $\begin{cases}|x+y|=5\\ xy=4{,}75\end{cases}$ bo'lsa, son o'qida x va y sonlari orasidagi masofani toping.

A) $\sqrt{6}$ B) $\sqrt{3}$ C) $\sqrt{5}$ D) $\sqrt{7}$ E) $\sqrt{13}$

Yechilishi: $\begin{cases}|x+y|=5\\ xy=4{,}75\end{cases}=>\begin{cases}x+y=5\\ xy=4{,}75\end{cases}=>$

$=>\begin{cases}x=5-y\\ (5-y)y=4{,}75\end{cases}=>y^2-5y+4{,}75=0=>$

$=>y_1=\frac{5-\sqrt{6}}{2};\ \ x_1=\frac{5+\sqrt{6}}{2}=>x_1-y_1=\sqrt{6}$. Javobi: A.

32. $\begin{cases}5^x+5^{-x}=13;\\ 28^x<17^x.\end{cases}$ $5^{-x}-5^x-?$

A) $\sqrt{135}$ B) $-\sqrt{145}$ C) $\sqrt{175}$ D) $\sqrt{165}$

E) $-\sqrt{155}$

Yechilishi: $\begin{cases}5^x+5^{-x}=13\\ 28^x<17^x=>x<0.\end{cases}$

1) $(5^x+5^{-x})^2=13^2=>5^{2x}+5^{-2x}+$

$+2\cdot5^x\cdot5^{-x}=169=>5^{2x}+5^{-2x}=167;$

2) $(5^{-x}-5^x)^2=5^{2x}+5^{-2x}-2\cdot5^{-x}\cdot5^x=$

$167-2=165;\ 5^{-x}-5^x=\sqrt{165}$.

Javobi: D.

33. $x^2+y^2=17;\ x^3y^3=343.\ x^4+y^4=?$

A) 167 B) 176 C) 187 D) 191 E) 205

Yechilishi: 1) $x^3y^3=343=>x\cdot y=7=>x^2y^2=49;$

2) $(x^2+y^2)^2=17^2 \Rightarrow x^4+y^4=289-2x^2y^2=$
$=191$. Javobi: D.

34. 30 kishidan 22 tasi o'yin to'garagida, 17 tasi esa xorda ashula aytadi. Nechta kishi faqat o'yin to'garagiga qatnashadi?

A) $aniqlab\ bo'lmaydi$ B) 8 C) 10 D) 12 E) 13

Yechilishi: $Til\ masalasiga\ iod\ formuladan\ foy-$
$dalaniladi: n=a+b-c \Rightarrow 30=22+17-c \Rightarrow c=$
$9\ kishi\ ikkala\ to'garakda\ ham\ qatnashadi.$

$Demak, 13\ kishi\ faqat\ o'yin\ to'garagiga$
$qatnashadi. Shuningdek, N(A\cap B)=N(A)+N(B)-$
$-N(A\cap B)=22+17-30=9\ kelib\ chiqadi.$

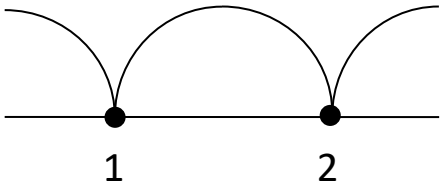
Javobi: E.

35. Soat 9^{00} da ma'lum marshrut bo'yicha tezligi 60 km/soat bo'lgan avtobus jo'natildi. Oradan 40 minut o'tgandan keyin, shu marshrut bo'yicha tezligi 80 km/soat bo'lgan ikkinchi avtobus jo'natildi. Soat nechada ikkinchi avtobus birinchi avtobusni quvib yetadi?

A) 10^{40} B) 11^{20} C) 11^{40} D) 12^{00} E) 12^{20}

Yechilishi: $60t=80\left(t-40\cdot\frac{1}{60}\right) \Rightarrow$
$\Rightarrow 60t=80\left(t-\frac{2}{3}\right) \Rightarrow 6t=8\cdot\frac{3t-2}{3} \Rightarrow$
$\Rightarrow 9t=12t-8 \Rightarrow 3t=8 \Rightarrow t=2\frac{2}{3} \Rightarrow$
$\Rightarrow 2\ soat\ 40\ min.$ $9^{\circ\circ}+2^{40}=11^{40}$. Javobi: C.

36. $x^3 \geq \frac{x^6+8}{9}$ tengsizlik nechta butun sonlarda o'rinli bo'ladi?



A) 1 B) 2 C) 3

D) 4 E) $cheksiz\ ko'p$

Yechilishi: $x^3 \geq \frac{x^6+8}{9} =>$

$=> 9x^3 \geq x^6 + 8 =>$

$=> (x^3)^2 - 9x^3 + 8 \leq 0 =>$

$=> x^3 = y =>$

$=> y^2 - 9y + 8 = 0 =>$

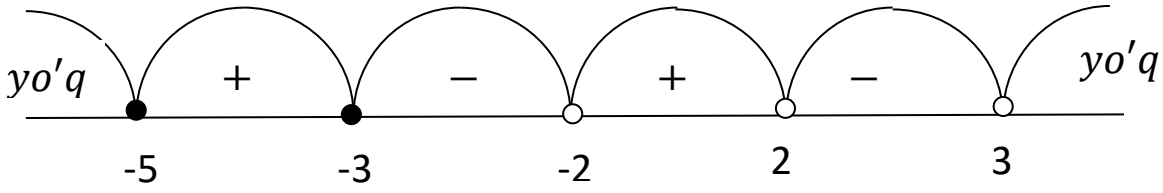
$=> \begin{cases} y_1 = 1 \\ y_2 = 8 \end{cases} => \begin{cases} x_1 = 1; \\ x_2 = 2. \end{cases}$ Javobi: B.

37. $\frac{(x^2-9)\cdot\sqrt{x+5}}{(x^2-4)\cdot\sqrt{3-x}} \leq 0$ tengsizlikni qanoatlantiradigan butun sonlarning yig'indisini toping.

A) 8 B) 0 C) 6 D) -6 E) -8

Yechilishi:

$$\frac{(x^2-9)\cdot\sqrt{x+5}}{(x^2-4)\cdot\sqrt{3-x}} \leq 0 => \begin{cases} x^2 - 9 = 0 \\ x + 5 \geq 0 \\ x \neq \pm 2 \\ x \neq 3 \\ x < 3 \end{cases} =>=> \begin{cases} x = \pm 3; \\ x \geq -5; \\ x \neq -2; \\ x \neq 2; \\ x \neq 3; \\ x < 3. \end{cases}$$



$x = -5; -3.$ Javobi: E.

38. $y = \frac{\ln(7-x^2)}{x+1}$ funksiyaning aniqlanish sohasiga tegishli butun sonlarning yig'indisini toping.

A) 0 B) 1 C) -1 D) 2 E) -2

Yechilishi: $y = \frac{\ln(7-x^2)}{x+1} => \begin{cases} 7 - x^2 > 0 \\ x + 1 \neq 0 \end{cases} =>$

$=> \begin{cases} |x| < \sqrt{7} \\ x \neq -1 \end{cases} => \begin{cases} -\sqrt{7} < x < \sqrt{7} \\ x \neq -1 \end{cases} =>$

$=> x = -2; -1; 0; 1; 2 => -2 + 0 + 1 + 2 = 1.$

Javobi: B.

39. 21 ta hadining yig'indisi 546 ga teng bo'lgan arifmetik progressiyaning o'n birinchi hadini toping.

A) 16 B) 24 C) 22 D) 26 E) 28

Yechilishi: $546 = \frac{a_1+a_{21}}{2} \cdot 21 => a_1 + a_{21} = 52 =>$

$=> a_{11} = \frac{52}{2} = 26.$ Javobi: D.

40. $tg\alpha = \frac{1}{2}. \sin\left(2\alpha + \frac{\pi}{4}\right) = ?$

A) $\frac{\sqrt{2}}{5}$ B) $\frac{2\sqrt{2}}{3}$ C) $\frac{2\sqrt{2}}{5}$ D) $\frac{3\sqrt{2}}{5}$ E) $\frac{7\sqrt{2}}{10}$

Yechilishi: $\sin\left(2\alpha + \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}(\sin 2\alpha + \cos 2\alpha) =$

$= \frac{\sqrt{2}}{2}\left(\frac{2tg\alpha}{1+tg^2\alpha} + \frac{1-tg^2\alpha}{1+tg^2\alpha}\right) = \frac{7\sqrt{2}}{10}.$ Javobi: E.

41. $\sin^2 x + \sin^2 4x = \sin^2 2x + \sin^2 3x$ tenglamani yeching.

A) $\frac{\pi n}{2}, n \in Z$ B) $\frac{\pi}{5} + \frac{2\pi n}{5}, n \in Z$

C) $\frac{\pi}{10} + \frac{2\pi n}{5}; \pi n, n \in Z$ D) $\frac{\pi n}{2}; \pm\frac{\pi}{3} + \frac{2\pi n}{3}, n \in Z$

E) $\frac{\pi}{10} + \frac{\pi n}{5}; \frac{\pi n}{2}, n \in Z$

Yechilishi: $\sin^2 x + \sin^2 4x = \sin^2 2x + \sin^2 3x;$

$\frac{1}{2}(1 - \cos 2x) + \frac{1}{2}(1 - \cos 8x) = \frac{1}{2}(1 - \cos 4x) +$

$+ \frac{1}{2}(1 - \cos 6x);\ \cos 2x + \cos 8x = \cos 4x + \cos 6x;$

$=> 2\cos 5x\,(\cos 3x - \cos x) = 0 =>$

$$\Rightarrow \begin{cases} \cos 5x = 0 \\ \cos 3x - \cos x = 0 \end{cases} \Rightarrow \begin{cases} \cos 5x = 0 \\ -2\sin 2x \sin x = 0 \end{cases} \Rightarrow$$

$$2\cos 5x \cos 3x = 2\cos 5x \cdot \cos x \Rightarrow$$

$$2\cos 5x\,(\cos 3x - \cos x) = 0 \Rightarrow$$

$$\Rightarrow \begin{cases} \cos 5x = 0 \\ \cos 3x - \cos x = 0 \end{cases} \Rightarrow \begin{cases} \cos 5x = 0 \\ -2\sin 2x \cdot \sin x = 0 \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} \cos 5x = 0 \\ \sin 2x = 0 \\ \sin x = 0 \end{cases} \Rightarrow \begin{cases} x = \frac{\pi}{10} + \frac{\pi n}{5} \\ x = \frac{\pi}{2} n \\ x = \pi n \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} x = \frac{\pi}{10} + \frac{\pi n}{5}; \\ x = \frac{\pi n}{2}. \end{cases} n \in Z.$$ Javobi: E.

42. $|\sin x| \le \frac{\sqrt{3}}{2}$ tengsizlikni yeching.

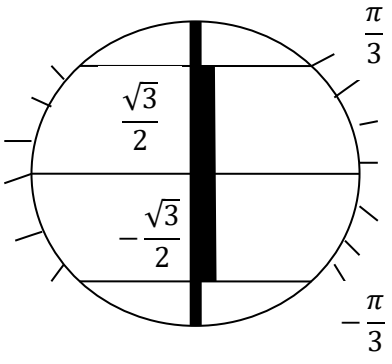
A) $\left[-\frac{\pi}{3} + \pi n; \frac{\pi}{3} + \pi n\right], n \in Z$

B) $\left[-\frac{\pi}{6} + \pi n; \frac{\pi}{6} + \pi n\right], n \in Z$

C) $\left[-\frac{\pi}{6} + 2\pi n, \frac{\pi}{6} + 2\pi n\right], n \in Z$

D) $\left[-\frac{\pi}{3} + 2\pi n; \frac{\pi}{3} + 2\pi n\right], n \in Z$

E) $\left[-\frac{\pi}{3} + \frac{\pi n}{2}; \frac{\pi}{3} + \frac{\pi n}{2}\right], n \in Z$



Yechilishi: $|\sin x| \le \frac{\sqrt{3}}{2} \Rightarrow$

$$\Rightarrow -\frac{\sqrt{3}}{2} \le \sin x \le \frac{\sqrt{3}}{2} \Rightarrow$$

$$\Rightarrow \left[-\frac{\pi}{3} + \pi n; \frac{\pi}{3} + \pi n\right], \ n \in Z.$$

Javobi: A.

43. $y = \sin^6 x + \cos^6 x$ funksiyaning eng kichik musbat davrini aniqlang.

A) 2π B) π C) $\frac{\pi}{2}$ D) $\frac{\pi}{4}$ E) $\frac{\pi}{3}$

Yechilishi: $y = \sin^6 x + \cos^6 x = 1 - \frac{3}{4}\sin^2 2x =$

$= 1 - \frac{3}{4} \cdot \frac{1}{2}(1 - \cos 4x) = \frac{3}{8}\cos 4x - \frac{5}{8} => \quad e.k.d =$

$= \frac{2\pi}{4} = \frac{\pi}{2}.$ Javobi: C.

44. $\sin^5 x + \cos^6 x = 1$ tenglamaning $\left[-\frac{7\pi}{4}; \frac{5\pi}{4}\right]$ kesmadagi eng katta va eng kichik ildizlari orasidagi ayirmani toping.

A) 2π B) $1{,}5\pi$ C) $3{,}5\pi$ D) 3π E) $2{,}5\pi$

Yechilishi: $\sin^5 x + \cos^6 x = 1 =>$

$$\begin{cases}\sin^5 x = 1\\ \cos^6 x = 1\end{cases} => \begin{cases}\sin x = 1\\ |\cos x| = 1\end{cases} => \begin{cases}x = \frac{\pi}{2} + 2\pi k\\ \cos x = \pm 1\end{cases} =>$$

$$=> \begin{cases}x = \frac{\pi}{2} + 2\pi k;\\ x = \pi k.\end{cases} \quad [-315;\ 225]$$

$$k = -1 => \begin{cases}x = -\frac{3\pi}{2};\\ x = -\pi.\end{cases}$$

$$k = 0 => \begin{cases}x = \frac{\pi}{2};\\ x = 0.\end{cases}$$

$$k = 1 => \begin{cases}x = \frac{5\pi}{2};\\ x = \pi.\end{cases}$$

$Eng\ katta\ yechim\ \pi\ dan,\ eng\ kichik\ yechim\ -\frac{3\pi}{2}$

$ayriladi:\ \pi - \left(-\frac{3\pi}{2}\right) = \frac{5\pi}{2} = 2{,}5\pi.$ Javobi: E.

45. $\sin 3x = \cos 5x$ tenglamani yeching.

A) $\frac{\pi}{15} + \frac{\pi n}{3}, n \in Z$

B) $\frac{\pi}{4} + \pi n; \frac{\pi}{16} + \frac{\pi n}{2}, n \in Z$

C) $\frac{\pi}{16} + \frac{\pi n}{4}; \frac{3\pi}{4} + \pi n, n \in Z$

D) $\frac{\pi}{4} + \frac{\pi n}{4}; \frac{3\pi}{4} + \frac{\pi n}{2}, n \in Z$

E) $\frac{\pi n}{2}; \frac{\pi}{4} + \pi n, n \in Z$

Yechilishi: $\sin 3x = \cos 5x =>$

$\sin 3x - \sin\left(\frac{\pi}{2} - 5x\right) = 0 =>$

$=> 2\cos\left(\frac{\pi}{4} - x\right) \cdot \sin\left(4x - \frac{\pi}{4}\right) = 0 =>$

$$=> \begin{cases} \cos\left(\frac{\pi}{4} - x\right) = 0 \\ \sin\left(4x - \frac{\pi}{4}\right) = 0 \end{cases} => \begin{cases} x - \frac{\pi}{4} = \frac{\pi}{2} + \pi n \\ 4x - \frac{\pi}{4} = \pi n \end{cases} =>$$

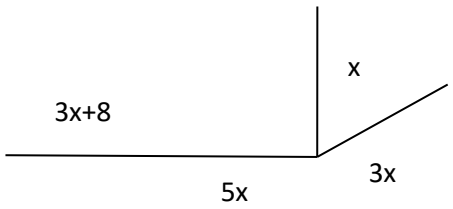
$$=> \begin{cases} x = \frac{3\pi}{4} + \pi n, n \in Z; \\ x = \frac{\pi}{16} + \frac{\pi n}{4}, n \in Z. \end{cases}$$ Javobi: C.

46. Zalning uzunligi, eni va balandliklarining nisbati 5: 3: 1 kabi. Zalning uzunligi uning enidan 8 m ko'p. Zalning hajmini (m^3) toping.

A) 930 B) 840 C) 960 D) 790 E) 920

Yechilishi:

$$\begin{cases} V = x \cdot 3x \cdot 5x = 15x^3 \\ V = x \cdot 3x(3x + 8) \end{cases} =>$$



$=> x \cdot 3x \cdot 5x =$

$= x \cdot 3x(3x + 8) =>$

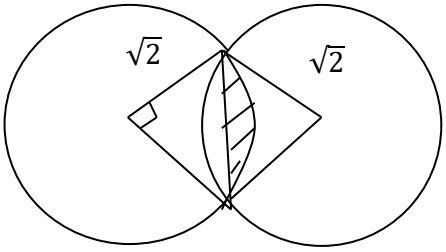
$=> 5x = 3x + 8 => x = 4 => V = 15 \cdot 4^3 = 960.$

Javobi: C.

47. Radiuslari $\sqrt{2}$ ga teng bo'lgan ikki doiraga uzunligi 2 ga teng bo'lgan umumiy vatar o'tkazildi. Shu doiralar umumiy qismining yuzini toping.

A) $\pi - 1$ B) $\frac{\pi}{2} - 1$ C) $\pi - 2$ D) $\frac{\pi}{2} - \frac{1}{2}$ E) $\frac{\pi - 3}{2}$

Yechilishi:



$S_{segment} = \frac{\sqrt{2}^2}{2}\left(\frac{\pi \cdot 90°}{180°} - \right.$

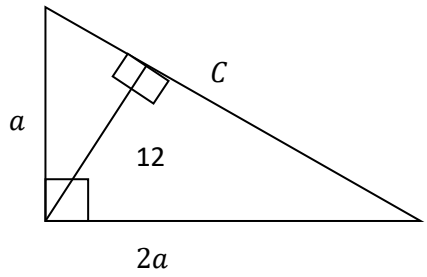
$\left. -\sin 90°\right) = \frac{\pi}{2} - 1;$

$2S_{segment} = \pi - 2.$ Javobi: C.

48. To'g'ri burchakli uchburchakning katetlaridan biri boshqasiga qaraganda 2 marta katta. Shu uchburchakning gepotenuzasiga tushirilgan balandligi 12 ga teng. Uchburchakning yuzini toping.

A) 180 B) 84 C) 120 D) 96 E) 108

Yechilishi: $S_\Delta = \frac{1}{2}a \cdot 2a = a^2;$



$c^2 = a^2 + 4a^2 => \ c = \sqrt{5}a.$

$S_\Delta = \frac{1}{2} \cdot 12 \cdot \sqrt{5}a \ =>$

$=> \ a^2 = 6\sqrt{5}a => a = 6\sqrt{5};$

$S = \left(6\sqrt{5}\right)^2 = 180.$ Javobi: A.

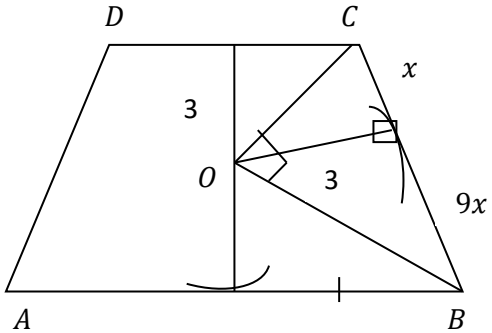
49. Teng yonli trapetsiyaga ichki chizilga aylana urinish nuqtasida yon tomonni 1:9 kabi nisbatda bo'ldi. Agar aylananing uzunligi 6π bo'lsa, trapetsiyaning perimetrini toping.

A) 20 B) 30 C) 40 D) 50 E) 60

Yechilishi: $Teng\ yonli\ trapetsiyaga\ aylana\ ichki$

$chizilganligi\ uchun: OA \perp$

$OB; AB + CD = AD + BC;$



$AD = BC.$

$6\pi = 2\pi r => r = 3;$

$3^2 = x \cdot 9x => x = 1;$

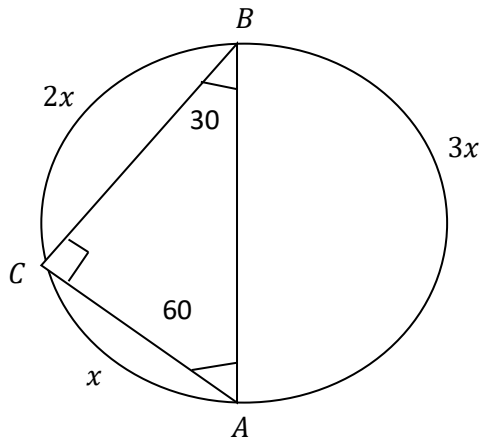
$P = AB + CD + AD + BC =$

$= 40.$ Javobi: C.

50. Uchburchakning uchlari unga tashqi chizilgan aylana to'la yoyini 1:2:3 nisbatda bo'lgan uchta bo'lakka ajratadi. Shu uchburchakning eng kichik tomoni $\sqrt[4]{6}$ ga teng bo'lsa, uning yuzini toping.

A) $2\sqrt{3}$ B) $3\sqrt{2}$ C) $2\sqrt{2}$ D) $1{,}5\sqrt{2}$ E) $2{,}5\sqrt{3}$

Yechilishi:



$x + 2x + 3x = 360° =>$

$=> 6x = 360° =>$

$=> x = 60°;$

$\frac{BC}{AC} = tg60° =>$

$=> BC = \sqrt[4]{6} \cdot \sqrt{3};$

$S_{\Delta} = \frac{1}{2} \cdot AC \cdot BC =$

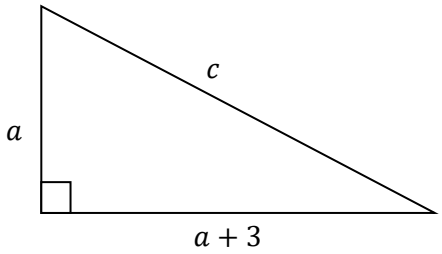
$= \frac{1}{2} \cdot \sqrt[4]{6} \cdot \sqrt[4]{6} \cdot \sqrt{3} =$

$= \frac{1}{2} \cdot \sqrt{6} \cdot \sqrt{3} = \frac{1}{2}\sqrt{18} = \frac{1}{2} \cdot 3\sqrt{2} = 1{,}5\sqrt{2}.$ Javobi: D.

51. To'g'ri burchakli uchburchakning katetlaridan biri ikkinchisiga qaraganda 3 birlik uzun, yuzi esa 18 ga teng. Shu uchburchakning gepotenuzasini toping.

A) 15 B) 12 C) 10 D) 9 E) 8

Yechilishi: $c^2 = a^2 + (a+3)^2 =$



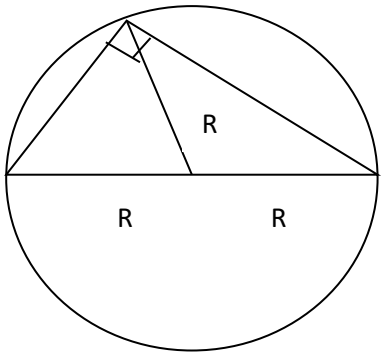
$= a^2 + a^2 + 6a + 9 =$

$= 2a^2 + 6a + 9;\ 18 = \frac{1}{2}a \cdot (a+3) =>$

$=> a^2 + 3a - 36 = 0 =>\ a = \frac{\sqrt{153}-3}{2};$

$c^2 = 81 => c = 9.$ Javobi: D.

52. Uchburchakka tashqi chizilgan aylananing uzunligi 7π ga teng. Uchburchakning katta tomoni aylananing diametriga teng bo'lsa, uning katta burchagidan tushirilgan medianasining uzunligini toping.



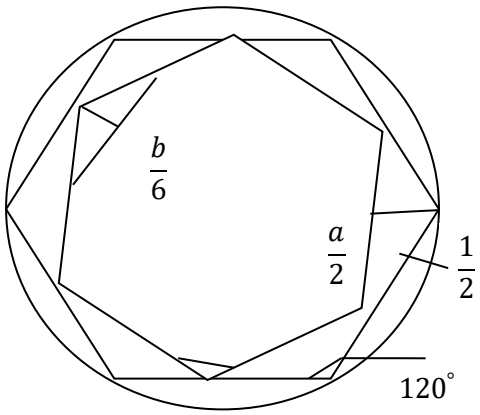
A) 2,5 B) 3 C) 3,5
D) 4 E) 4,5

Yechilishi: $7\pi = 2\pi R = R = 3{,}5.$

Javobi: C.

53. Muntazam oltiburchak tomonining uzunligi 1 ga teng. Shu oltiburchak tomonlarining o'rtalari ketma-ket tutashtirildi, so'ngra hosil bo'lgan oltiburchak tomonlarining o'rtalari yana ketma-ket tutashtirildi va h.k. Hosil bo'lgan barcha oltiburchaklar yuzlarining yig'indisini toping.

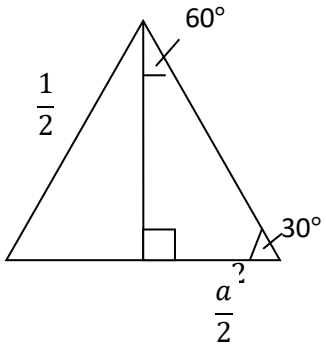
A) $3\sqrt{3}$ B) $2\sqrt{6}$ C) $2\sqrt{3}$
D) $3\sqrt{6}$ E) $6\sqrt{3}$

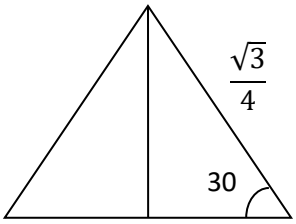


Yechilishi:

1) $6\alpha = 180(6-2) \Rightarrow$
$\Rightarrow \alpha = 120°;$

2) $\frac{a}{2} = \frac{1}{2} = \cos 30° \Rightarrow a = \frac{\sqrt{3}}{2};$





$3)\ \frac{b}{2}:\frac{\sqrt{3}}{4}=\cos 30°\Rightarrow \frac{b}{2}=\frac{\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{4}\Rightarrow b=\left(\frac{\sqrt{3}}{2}\right)^2;$

$Demak, tomonlar: 1, \frac{\sqrt{3}}{2}, \left(\frac{\sqrt{3}}{2}\right)^2, \ldots$ *cheksiz kama – yuvchi geometrik progressiya hosil qiladi.*

$1)\ S_6'=\frac{1}{2}\cdot 6\cdot 1^2\cdot \sin 60°=\frac{3\sqrt{3}}{2};$

2) $R_2\Rightarrow \frac{\sqrt{3}}{4}:R_2=\sin 30°\Rightarrow R_2=\frac{\sqrt{3}}{2}\Rightarrow$

$\Rightarrow S_6''=\frac{1}{2}\cdot 6\cdot\frac{3}{4}\cdot\sin 60°=\frac{9\sqrt{3}}{8};$

3) $R_3\Rightarrow \frac{3}{8}:R_3=\sin 30°\Rightarrow R_3=\frac{3}{4};\Rightarrow$

$S_6'''=\frac{1}{2}\cdot 6\cdot\frac{9}{16}\cdot\sin 60°=\frac{27\sqrt{3}}{32};$

$S_6', S_6'', S_6''', \ldots\Rightarrow \frac{3\sqrt{3}}{2}, \frac{9\sqrt{3}}{8}, \frac{27\sqrt{3}}{32}, \ldots\Rightarrow$

$\Rightarrow q=\frac{27\sqrt{3}}{32}:\frac{9\sqrt{3}}{8}=\frac{3}{4};\Rightarrow S=\frac{3\sqrt{3}}{2}:\left(1-\frac{3}{4}\right)=\frac{3\sqrt{3}}{2}\cdot\frac{4}{1}=$

$=6\sqrt{3}.$ Javobi: E.

54. Teng yonli trapetsiya asoslarining ayirmasi uning yon tomoniga teng. Shu trapetsiyaning katta burchagini toping.

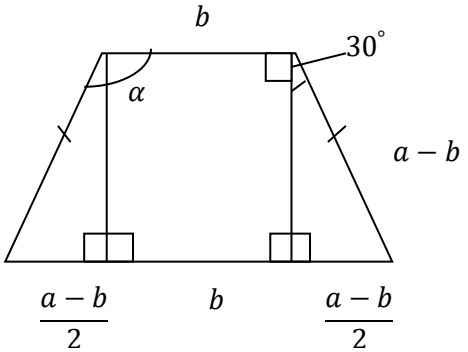
A) 120° B) 135° C) 150° D) 100°

E) *aniqlab bo'lmaydi*

Yechilishi:

$\Rightarrow \alpha=90+30=120°.$

Javobi: A.

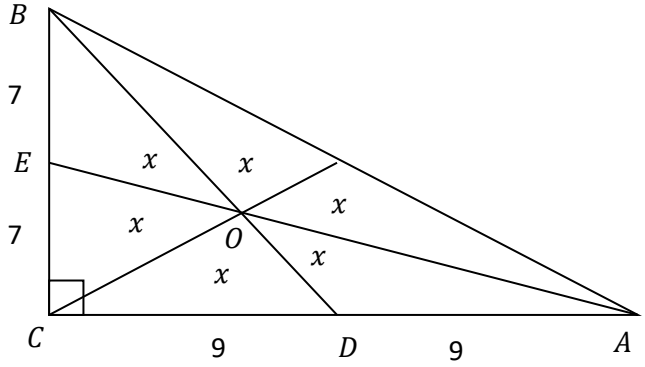


55. Tog'ri burchakli uchburchakning uzunligi 14 va 18 ga teng katetlariga tushirilgan

medianalari uni uchta uchburchakka va to'rtbuchakka ajratadi. To'rtburchakning yuzini toping.

A) 56 B) 64 C) 48 D) 72 E) 42

Yechilishi: $S_{\Delta ABC} = \frac{1}{2} \cdot 14 \cdot 18 = 126.$



Uchburchakning 3 ta medianasi uchburchak yuzini 6 ta tengdosh uchburchaklarga aj – ratadi:

$S_{\Delta COD} = \frac{1}{6} \cdot 126 = 21.$

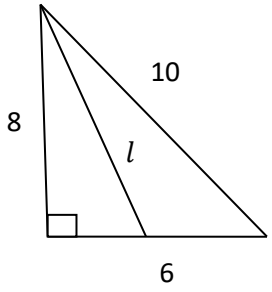
$S_{\square} = 2S_{COD} = 42.$

Javobi: E.

56. Gepotenuzasi 10 ga, katetlaridan biri 8 ga teng bo'lgan to'g'ri burchakli uchburchakning kichik burchagi uchidan o'tkazilgan bissektrisasining uzunligini toping.

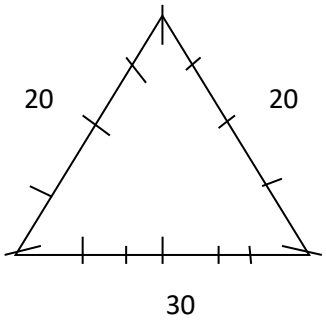
A) $\frac{3\sqrt{5}}{2}$ B) $\frac{2\sqrt{10}}{3}$ C) $\frac{8\sqrt{10}}{3}$ D) $\frac{5\sqrt{3}}{2}$ E) $\frac{8\sqrt{3}}{5}$

Yechilishi:



$l = \frac{\sqrt{8 \cdot 10 \cdot 24 \cdot 12}}{8+10} = \frac{8\sqrt{10}}{3}.$ Javobi: C.

57. Tomonlari 20; 20 va 30 m uchburchak shaklidagi maydonning atrofini o'rash uchun ustunlar o'rnatildi. Agar ustunlar o'rtasidagi masofa 5m dan bo'lsa, nechta ustun kerak bo'ladi?



A) 15 B) 14 C) 16
D) 13 E) 18

Yechilishi:

$P = 20 + 20 + 30 = 70;$

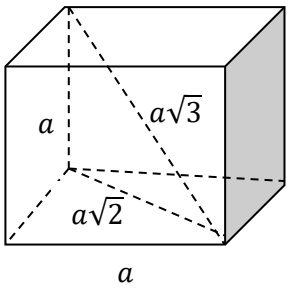
$70 : 5 = 14.$

Javobi: B.

58. Kubga tashqi chizilgan sharning hajmi unga ichki chizilgan sharning hajmidan necha marta katta?

A) 8 B) 4 C) $4\sqrt{2}$ D) $4\sqrt{3}$ E) $3\sqrt{3}$

Yechilishi:



$V_t = \frac{4}{3}\pi\left(\frac{a\sqrt{3}}{2}\right)^3 = \frac{\sqrt{3}\pi a^3}{2};$

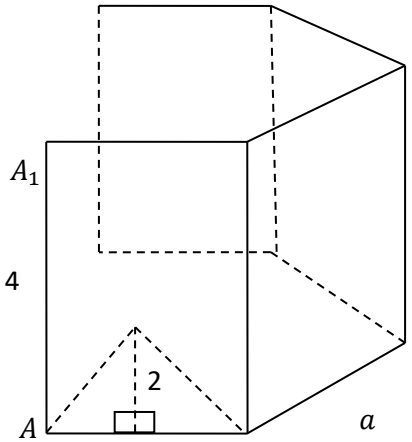
$V_i = \frac{4}{3}\pi\left(\frac{a}{2}\right)^3 = \frac{\pi a^3}{6};$

$V_t : V_i = 3\sqrt{3}.$ Javobi: E.

59. To'g'ri prizmaning hajmi 40 ga, unga ichki chizilgan sharning hajmi $\frac{32}{3}\pi$ ga teng. Prizmaning yon sirtini toping.

A) 40 B) 16 C) 24 D) 20
E) 30

Yechilishi: $Shar\ hajmi\ for-mulasidan: \frac{4}{3}\pi R^3 = \frac{32}{3}\pi =>$



$=> R = 2.\ AA_1 = 4;$

$S_\Delta = \frac{1}{2}a \cdot 2 => S_\Delta = a\ ;$

$S_{asos} = n \cdot a;\ Prizma\ hajmi\ formulasiga\ asosan$

$40 = S \cdot AA_1 =>$

$=> 40 = n \cdot a \cdot 4 => na = 10;$

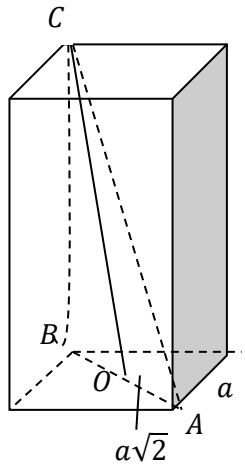
$S_{yon} = na \cdot AA_1 = 10 \cdot 4 = 40.$

Javobi: A.

60. Muntazam to’rtburchakli prizmaning hajmi 60 ga, yon sirti 120 ga teng. Prizma asosining simmitriya markazidan ustki asosining uchigacha bo’lgan masofasini toping.

A) $\sqrt{182}$ B) $\sqrt{215}$ C) $\sqrt{227}$ D) $\sqrt{239}$ E) $\sqrt{252}$

Yechilishi: $\begin{cases} V = a^2 \cdot BC \\ S_{yon} = P_{asos} \cdot BC \end{cases} =>$



$$=> \begin{cases} 60 = a^2 BC \\ 120 = 4a \cdot BC => \\ AB = a\sqrt{2} \end{cases}$$

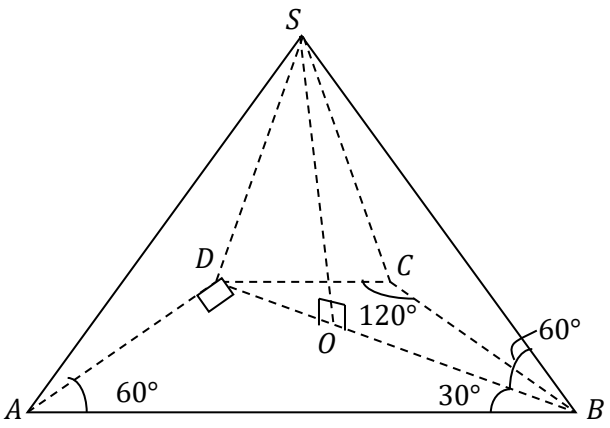
$$=> \begin{cases} BC = \frac{60}{a^2}; \\ 30 = a \cdot \frac{60}{a^2} => a = 2 \end{cases} =>$$

$$=> \begin{cases} BC = 15; \\ AB = 2\sqrt{2}; => \\ OB = \sqrt{2}. \end{cases}$$

$$=> OC^2 = BC^2 + OB^2 = 15^2 + \left(\sqrt{2}\right)^2 =$$

$$= 225 + 2 = 227 => OC = \sqrt{227}.$$ Javobi: C.

61. To’rtburchakli piramidaning barcha yon qirralari asos tekisligi bilan 60°li burchak tashkil qiladi. Uning asosi teng yonli trapetsiyadan iborat. Trapetsiyaning burchaklaridan biri 120° ga teng. Trapetsiyaning diagonallari uning o’tkir burchagining bissektrisalaridir. Piramidaning balandligi $4\sqrt{3}$ ga teng. Trapetsiyaning katta asosini toping.



A) $4\sqrt{3}$ B) 8 C) $8\sqrt{3}$

D) 12 E) $3\sqrt{6}$

Yechilishi:

$AO = BO = CO =$

$= DO = R.$

$\frac{4\sqrt{3}}{R} = tg60° => R = 4.$

$Ushbu\ aylana\ ABC\ to'g'riburchakli\ uchburchakka\ ham\ tashqi\ chizilganligi\ uchun\ AB = 8.$

$2 - usul: AOB\ teng\ yonli\ uchburchakka\ kosinuslar\ teoremasi\ qo'llaniladi:$

$AB^2 = AO^2 + BO^2 - 2 \cdot AO \cdot BO \cdot \cos 120° =$

$= 4^2 + 4^2 - 2 \cdot 4 \cdot 4 \cdot \left(-\frac{1}{2}\right) = 64.$ Javobi: B.

62. $x^8 = \frac{5x^4+1}{3}$ tenglamaning barcha haqiqiy ildizlari yig'indisini toping.

A) 0 B) 1 C) 2 D) 2,5 E) $aniqlab\ bo'lmaydi$

Yechilishi: $3x^8 - 5x^4 - 1 = 0;\ x^4 = y =>$

$=> 3y^2 - 5y - 1 = 0 => y_1 = \frac{5-\sqrt{37}}{6};\ y_2 = \frac{5+\sqrt{37}}{6} =>$

$=>\ x^4 \neq y_1 =>\ x^4 = y_2 => |x| = \sqrt[4]{\frac{5+\sqrt{37}}{6}} =>$

$=>\ x_1 + x_2 = 0.$ Javobi: A.

63. Ikki vektor yig'indisining uzunligi 20 ga, shu vektorlar ayirmasining uzunligi 12 ga teng. Shu vektorlarning skalyar ko'paytmasini toping.

A) 16 B) 48 C) 24 D) 64 E) 32

Yechilishi: $\begin{cases} \left|\vec{a} + \vec{b}\right| = 20 \\ \left|\vec{a} - \vec{b}\right| = 12 \end{cases} =>$

$$=> -\begin{matrix}\vec{a}^2+\vec{b}^2+2\vec{a}\vec{b}=400\\ \vec{a}^2+\vec{b}^2-2\vec{a}\vec{b}=144\end{matrix} => \vec{a}\vec{b}=64.$$ Javobi: D.

64. Rombning burchaklaridan biri boshqasidan uch marta katta, perimetri esa 20 ga teng. Rombning yuzini toping.

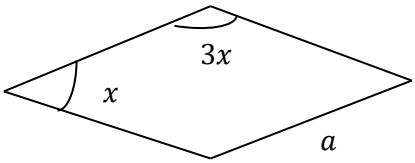
A) $12\sqrt{3}$ B) $12{,}5\sqrt{2}$ C) $10{,}5\sqrt{3}$

D) $8\sqrt{3}$ E) $7{,}5\sqrt{3}$

Yechilishi: $4x = 180^\circ => x = 45^\circ;$

$4a = 20 => a = 5.$

$S = 5^2 \sin 45^\circ = 12{,}5\sqrt{2}.$

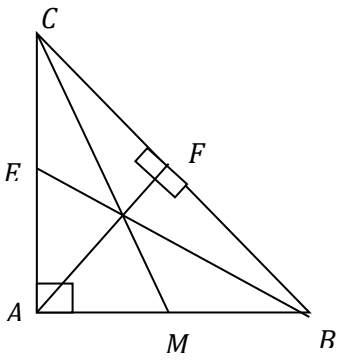


Javobi: B.

Qo'shimcha masala:

$ABC\ to'g'ri\ burchakli\ uch-buchak.\ AB = AC = 4.$

$AG, BE, CM\ lar\ medianalar.$



$S_{\Delta ABC} = \frac{1}{2}\cdot 4\cdot 4 = 8;$

$S_{\Delta ABE} = \frac{1}{2}\cdot 2\cdot 4 = 4;$

$S_{\Delta AMC} = \frac{1}{2}\cdot 2\cdot 4 = 4;$

$AF = BF = CF = 2\sqrt{2}; BC = 4\sqrt{2};$

$S_{\Delta AFB} = \frac{1}{2}\cdot 2\sqrt{2}\cdot 2\sqrt{2} = 4;$

$S_{\Delta AFC} = \frac{1}{2}\cdot 2\sqrt{2}\cdot 2\sqrt{2} = 4; AO = \frac{2}{3}\cdot 2\sqrt{2} = \frac{4\sqrt{2}}{3};$

$OF = \frac{1}{3}\cdot 2\sqrt{2} = \frac{2\sqrt{2}}{3};\ S_{\Delta BOC} = \frac{1}{2}\cdot 4\sqrt{2}\cdot\frac{2\sqrt{2}}{3} = \frac{8}{3};$

$S_{\Delta BOF} = S_{\Delta COG} = S_{\Delta AOM} = S_{\Delta AOE} = \frac{8}{3}:2 = \frac{4}{3};$

$S_{\Delta BOM} = S_{\Delta AFB} - S_{\Delta BOF} - S_{\Delta AOM} = 4 - \frac{4}{3} - \frac{4}{3} =$

$= 4 - \frac{8}{3} = \frac{4}{3}.$

Bulardan ko'rinadiki, uchburchakning 3 ta medianalari, 6 ta tengdosh uchburchaklar hosil qilar ekan.

11-axborotnoma

1. a parametrning qanday butun qiymatida $2x^2 + 6ax + a = 0$ tenglama ildizlari kvadratalarining yig'indisi 38 ga tengbo'ladi?

A) -2 B) 2 C) -3 D) -1 E) 4

Yechilishi: $2x^2 + 6ax + a = 0 =>$

$=> x_{1,2} = \frac{-6a \pm \sqrt{36a^2 - 8a}}{4};\ x_1^2 + x_2^2 = 9a^2 - a\ =>$

$=>\ 9a^2 - a = 38\ =>\ 9a^2 - a - 38 = 0\ =>$

$=> \begin{cases} a_1 = -2; \\ a_2 = 2,(1). \end{cases}$ Javobi: A.

2. p ning qanday qiymatlarida $x^2 + 2(p+1)x + 9p - 5 = 0$ tenglamaning ikkala ildizi manfiy va turli bo'ladi?

A) $\left(\frac{5}{9}; 1\right) \cup (6;\ \infty)$ B) $\left(\frac{5}{9}; 6\right)$ C) $\left(\frac{5}{9};\ \infty\right)$

D) $(6;\ \infty)$ E) $\left(\frac{5}{9}; 1\right)$

Yechilishi: $x^2 + 2(p+1)x + 9p - 5 = 0\ =>$

$$=> \begin{cases} D > 0 \\ b > 0 \\ c > 0 \end{cases} => \begin{cases} p^2 - 7p + 6 > 0 \\ 2(p+1) > 0 \\ 9p - 5 > 0 \end{cases} =>$$

$$=> \begin{cases} (-\infty; 1) \cup (6; \infty) \\ p > -1 \\ p > \frac{5}{9} \end{cases} => \left(\frac{5}{9}; 1\right) \cup (6; \infty).$$ Javobi: A.

3. Agar $\begin{cases} \frac{1}{\sqrt{x}} + \frac{1}{\sqrt{y}} = \frac{4}{3} \\ xy = 9 \end{cases}$ bo'lsa, $x + y$ ning qiymatini toping.

A) 10 B) 9 C) 8 D) 12 E) 11

Yechilishi: $\begin{cases}\frac{1}{\sqrt{x}}+\frac{1}{\sqrt{y}}=\frac{4}{3}\\ xy=9\end{cases} => 3\left(\sqrt{x}+\sqrt{y}\right)=4\cdot\sqrt{xy} =>$

$=> 9\left(x+y+2\sqrt{xy}\right)=16\cdot xy => 9(x+y+6)=$

$=16\cdot 9 => \ x+y=10.$ Javobi: A.

4. $\frac{x-1}{x}+\frac{x-2}{x}+\frac{x-3}{x}+\cdots+\frac{1}{x}=4$ tenglamaning ildizi 10 dan nechta kam?

A) 1 B) 2 C) 3 D) 4 E) 5

Yechilishi: $\frac{x-1}{x}+\frac{x-2}{x}+\frac{x-3}{x}+\cdots+\frac{1}{x}=4;$

1) $x\neq 0;\ \frac{1}{x}[(x-1)+(x-2)+(x-3)+\cdots+1]=4;$

$(x-1)+(x-2)+(x-3)+\cdots+1=4x => d=-1;$

$a_n=a_1+d(n-1) => \ 1=x-1+(-1)(n-1) =>$

$=> \ 1=x-1-n+1 => \ n=x-1;$

$S_n=\frac{a_1+a_n}{2}\cdot n => 4x=\frac{x-1+1}{2}\cdot(x-1) => \begin{cases}x=0\\ x=9\end{cases} =>$

$=> \ 10-9=1.$ Javobi: A.

5. $a\left(\frac{\sqrt{a}+\sqrt{b}}{2b\sqrt{a}}\right)^{-1}+b\left(\frac{\sqrt{a}+\sqrt{b}}{2a\sqrt{b}}\right)^{-1}$ ifodani soddalashtiring.

A) $2ab$ B) ab C) $4ab$ D) $\frac{1}{2}ab$ E) $\frac{1}{4}ab$

Yechilishi: $a\cdot\frac{2b\sqrt{a}}{\sqrt{a}+\sqrt{b}}+b\cdot\frac{2a\sqrt{b}}{\sqrt{a}+\sqrt{b}}=\frac{2ab}{\sqrt{a}+\sqrt{b}}\left(\sqrt{a}+\sqrt{b}\right)=$

$=2ab.$ Javobi: A.

6. Agar m va n sonlar $x^2+3mx-5n=0\ (m\cdot n\neq 0)$ tenglamaning ildizlari bo'lsa, $n-m$ ning qiymati nechaga teng bo'ladi?

A) 25 B) 24 C) 18 D) 12 E) 15

Yechilishi: $x^2 + 3mx - 5n = 0 \Rightarrow \begin{cases} m + n = -3m \\ m \cdot n = -5n \end{cases} = > \begin{cases} n = -4m \\ m = -5 \end{cases} \Rightarrow \begin{cases} n = 20 \\ m = -5 \end{cases} \Rightarrow n - m = 25.$

Javobi: A.

7. m va n natural sonlar. $\frac{6}{x} = \frac{1}{m} + \frac{1}{n}$ va $m + n = 18$ bo'lsa, x ning eng katta qiymatini toping.

A) 27 B) 24 C) 18 D) 30 E) 15

Yechilishi: $\frac{6}{x} = \frac{1}{m} + \frac{1}{n} \Rightarrow 6mn = (m + n)x \Rightarrow$

$\Rightarrow 6mn = 18x \Rightarrow x = \frac{mn}{3}; \quad m = n = 9 \Rightarrow x = 27.$

Javobi: A.

8. Agar sonli ketma-ketlikning umumiy hadi $a_n = \frac{3n-8}{n+2}$ formula bilan ifodalansa, bu ketma-ketlikning $\frac{4}{5}$ dan kichik nechta hadi bor?

A) 4 B) 3 C) 5 D) 6 E) 2

Yechilishi: $a_n = \frac{3n-8}{n+2} \Rightarrow a_1 = -\frac{5}{3}; \; a_2 = -\frac{2}{4} = -\frac{1}{2};$

$a_3 = \frac{1}{5}; \; a_4 = \frac{4}{6} = \frac{2}{3}; \; a_5 = \frac{7}{7} = 1.$ Javobi: A.

9. S_n arifmetik progressiyaning dastlabki n ta hadi yig'indisi bo'lsa, $S_5 - 3S_4 + 3S_3 - S_2$ ning qiymatini toping.

A) 0 B) $-2a_1$ C) $2a_1$ D) $3a_1$ E) $-3a_1$

Yechilishi: $S_5 - 3S_4 + 3S_3 - S_2 = (S_5 - S_4) -$

$-2(S_4 - S_3) + (S_3 - S_2) = 9a_5 - 2a_4 + a_3 = a_1 + 4d -$

$-2(a_1 + 3d) + a_1 + 2d = 0.$ Javobi: A.

10. a, b, c, d sonlar ko'rsatilgan tartibda geometrik progressiya tashkil etadi. $(a - c)^2 + (b - c)^2 + (b - d)^2 - (a - d)^2$ ni soddalashtiring.

A) 0 B) $2a$ C) $3b$ D) d E) $-2a$

Yechilishi: 1) $a, b, c, d \Rightarrow a; b = aq; c = aq^2; d = aq^3;$

2)$(a-c)^2 + (b-c)^2 + (b-d)^2 - (a-d)^2 = a^2 -$
$-2ac + c^2 + b^2 - 2bc + c^2 + b^2 - 2bd + d^2 - a^2 +$
$+2ad - d^2 = 2b^2 + 2c^2 - 2ac - 2bc - 2bd + 2ad =$
$= 2a^2q^2 + 2a^2q^4 - 2a^2q^2 - 2a^2q^3 - 2a^2q^4 +$
$+2a^2q^3 = 0.$ Javobi: A.

11. a, b, c lar musbat sonlar va $a^4 b^{\frac{1}{8}} = 16c^2$ bo'lsa, $4\log_2 a - \log_{\sqrt{2}} c + \log_4 \sqrt[4]{b}$ ning qiymatini toping.

A) 4 B) 2 C) 8 D) 6 E) 1

Yechilishi: 1)$a^4 b^{\frac{1}{8}} = 16c^2; \log_2 a^4 \sqrt[8]{b} = 4 + \log_2 c^2 \Rightarrow$
$\Rightarrow \log_2 \frac{a^4 \sqrt[8]{b}}{c^2} = 4;$

2) $4\log_2 a - \log_{\sqrt{2}} c + \log_4 \sqrt[4]{b} = \log_2 a^4 + \frac{1}{2}\log_2 \sqrt[4]{b} -$
$-2\log_2 c = \log_2 a^4 + \log_2 \sqrt[8]{b} - \log_2 c^2 = \log_2 \frac{a^4 \sqrt[8]{b}}{c^2} =$
$= 4.$ Javobi: A

12. Agar $\log_3 7 = a, \log_7 5 = b$ va $\log_5 4 = c$ bo'lsa, $\log_3 12$ ni toping.

A) $abc + 1$ B) $\frac{ab}{c} + 1$ C) $a + b + c$ D) $\frac{ac}{b} + 2$
E) $abc + 2$

Yechilishi: $\log_3 7 = a, \log_7 5 = b;\ \log_5 4 = c.$

1) $a = \log_3 7\,; b = \frac{\log_3 5}{\log_3 7} = \frac{\log_3 5}{a} \Rightarrow \log_3 5 = ab;$

$c = \frac{\log_3 4}{\log_3 5} = \frac{\log_3 4}{ab} \Rightarrow \log_3 4 = abc;$

2) $\log_3 12 = \log_3 3 + \log_3 4 = 1 + abc.$ Javobi: A.

13. $7^{\frac{2x^2-5x-9}{2}} = \left(\sqrt{2}\right)^{3\log_2 7}$ tenglamani yeching.

A) -1,5; 1 B) 1,5 C) -2,5; 4 D) 2,5 E) -1,5; 4

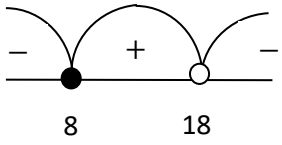
Yechilishi: $7^{\frac{2x^2-5x-9}{2}} = 2^{\log_2 7^{\frac{3}{2}}} \Rightarrow 2x^2 - 5x - 12 = 0 \Rightarrow x_{1,2} = \frac{5\pm11}{4} \Rightarrow x_1 = -\frac{3}{2};\ x_2 = 4.$

Javobi: E.

14. $\sqrt{\frac{8-x}{x-18}} > -1$ tengsizlikning butun sonlardan iborat yechimlari yig'indisini toping.

A) 125 B) 130 C) 143 D) 136 E) 124

Yechilishi: $\sqrt{\frac{8-x}{x-18}} > -1 \Rightarrow \frac{8-x}{x-18} \geq 0 \Rightarrow \begin{cases} x = 8; \\ x \neq 18. \end{cases}$



$[8; 18) \Rightarrow 8, 9, 10, \dots, 17 \Rightarrow \Rightarrow S_{10} = \frac{8+17}{2} \cdot 10 =$ 125. Javobi: A.

15. $y = \sin(\sin x)$ funksiyaning eng katta qiymatini toping.

A) $\sin 1$ B) 1 C) $\frac{1}{2}$ D) $\arcsin 1$ E) $\frac{\pi}{2}$

Yechilishi: $y = \sin(\sin x)$;

$y' = \cos(\sin x) \cdot \cos x \Rightarrow \begin{cases} \cos(\sin x) = 0 \\ \cos x = 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} \sin x \neq \frac{\pi}{2} + k\pi, k \in Z; \\ x = \frac{\pi}{2} + k\pi, k \in Z. \end{cases} \Rightarrow y = \sin\left(\sin\left(\frac{\pi}{2} + 2k\pi\right)\right) = \sin 1.$ Javobi: A.

16. $y = \frac{2}{5+|3x^2+x-2|} - 2$ funksiyaning eng katta qiymati nechaga teng?

A) -1,6 B) -1,2 C) -1,4 D) -0,8 E) -1,8

Yechilishi: *Kasr eng katta bo'lishi uchun uning maxraji eng kichik bo'lishi kerak.*

$y = \frac{2}{5+|3x^2+x-2|} - 2 = \frac{2}{5} - 2 = -\frac{8}{5} = -1{,}6$. Javobi: A.

17. Agar $f(x+2) = x^3 + 6x^2 + 12x + 8$ bo'lsa, $f\left(\sqrt{3}\right)$ ni toping.

A) $3\sqrt{3}$ B) $2\sqrt{3}$ C) $4\sqrt{3}$ D) 12 E) $3\sqrt{3}$

Yechilishi: $f(x+2) = (x+2)^3$; $x+2 = \sqrt{3} =>$

$=> x = \sqrt{3} - 2 => f\left(\sqrt{3}\right) = (\sqrt{3} - 2 + 2)^3 = 3\sqrt{3}$.

Javobi: A.

18. Agar $f'(x) = 12x^2 - 2x - 14$ va $f(2) = 5$ bo'lsa, $f(0)$ ni aniqlang.

A) 5 B) 6 C) 3 D) 0 E) -5

Yechilishi: $f(x) = 12\int x^2\,dx - 2\int x\,dx - 14\int dx =$

$= 4x^3 - x^2 - 14x + C => f(2) = 32 - 4 - 28 + C =>$

$=> C = 5 => f(0) = 5$. Javobi: A.

19. $(x+3)^2 + (y-5)^2 = 45$ aylananing $A(0;11)$ nuqtasiga o'tkazilgan urinmaning burchak koeffitsientini toping.

A) $-\frac{1}{2}$ B) -2 C) $\frac{1}{2}$ D) 2 E) $\frac{2}{3}$

Yechilishi: $(x+3)^2 + (y-5)^2 = 45$; $(y-5)^2 = 45 -$

$-(x+3)^2 =>$ $y = \sqrt{45-.(x+3)^2} + 5 =>$

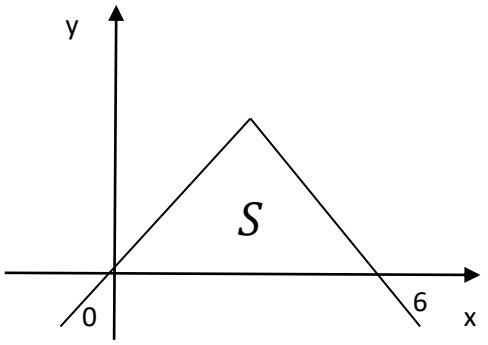
$=> y' = \frac{-2x-6}{2\sqrt{45-.(x+3)^2}}; => x = 0 => y'(0) = -\frac{6}{2\sqrt{36}} =$

$= -\frac{1}{2} => k = -\frac{1}{2}$. Javobi: A.

20. $y = 3 - |x-3|$ funksiya grafigi va Ox o'qi bilan chegaralangan figuraning yuzini toping.

A) 9 B) 8 C) 12

D) 6 E) 10



Yechilishi: 1) $\begin{cases} y = 3 - |x-3| \\ y = 0 \end{cases} \Rightarrow 3 -$

$-|x-3| = 0 \Rightarrow$

$\Rightarrow |x-3| = 3 \Rightarrow x - 3 =$

$= \pm 3 \Rightarrow \begin{cases} x - 3 = -3 \\ x - 3 = 3 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x = 0; \\ x = 6. \end{cases}$

2) $\begin{matrix} x - 3 \geq 0 \Rightarrow y = 3 - x + 3 \Rightarrow y = 6 - x \\ x - 3 < 0 \Rightarrow y = 3 + x - 3 \Rightarrow y = x \end{matrix} \Rightarrow$

$\Rightarrow 6 - x = x \Rightarrow x = 3 \Rightarrow y = 3.$ *Bundan*

$S_{\triangle} = \frac{1}{2} \cdot 6 \cdot 3 = 9.$ Javobi: A.

21. $\int_0^9 \sqrt[3]{x\sqrt{x}}\, dx$ ni hisoblang.

A) 18 B) 9 C) 27 D) $6\sqrt{3}$ E) $9\sqrt{3}$

Yechilishi: $\int_0^9 \sqrt[3]{x\sqrt{x}}\, dx = \int_0^9 x^{\frac{1}{2}}\, dx = \frac{x^{\frac{3}{2}}}{\frac{3}{2}} |_0^9 =$

$= \frac{2}{3} \cdot x\sqrt{x}|_0^9 = \frac{2}{3} \cdot 9 \cdot 3 = 18.$ Javobi: A.

22. α o'tkir burchak va $\sin^4 \alpha \cdot \cos^4 \alpha = \frac{1}{64}$ bo'lsa, α quyidagilarning qaysi biriga teng?

A) $\frac{\pi}{8}; \frac{3\pi}{8}$ B) $\frac{\pi}{8}; \frac{\pi}{4}$ C) $\frac{\pi}{16}$ D) $\frac{\pi}{6}; \frac{3\pi}{8}$ E) $\frac{\pi}{32}$

Yechilishi: $\sin^4 \alpha \cdot \cos^4 \alpha = \frac{1}{64} \Rightarrow$

$\sin \alpha \cos \alpha = \pm \frac{1}{2\sqrt{2}} \Rightarrow \sin 2\alpha = \pm \frac{\sqrt{2}}{2};$

$\begin{cases} 2\alpha = \frac{\pi}{4} + \pi k, k \in Z \\ 2\alpha = -\frac{\pi}{4} + \pi k, k \in Z \end{cases} \Rightarrow \begin{cases} \alpha = \frac{\pi}{8} + \frac{\pi k}{2}, k \in Z \\ \alpha = -\frac{\pi}{8} + \frac{\pi k}{2}, k \in Z \end{cases} \Rightarrow$

$$\Rightarrow \begin{cases} k = 0 \Rightarrow \alpha = \frac{\pi}{8}; \\ k = 1 \Rightarrow \alpha = \frac{3\pi}{8}. \end{cases}$$ Javobi: A.

23. Koordinata tekidligida $A(6;8)$ nuqtani koordinata boshi atrofida α burchakka burganda, $B(8;6)$ nuqtaga o'tdi. $\cos\alpha$ ning qiymatini toping.

A) $\frac{24}{25}$ B) $\frac{1}{12}$ C) $\frac{3}{8}$ D) $\frac{\sqrt{3}}{2}$ E) $\frac{1}{2}$

Yechilishi: $OA\ va\ OB\ to'g'richiziqlar\ tenglamalari\ tuziladi$:

$$\frac{x-0}{6-0} = \frac{y-0}{8-0} \Rightarrow y = \frac{4}{3}x;\ k_1 = \frac{4}{3};$$
$$\frac{x-0}{8-0} = \frac{y-0}{6-0} \Rightarrow y = \frac{3}{4}x;\ k_2 = \frac{3}{4};$$

$tg\alpha = \frac{k_2-k_1}{1+k_1k_2} = \frac{\frac{4}{3}-\frac{3}{4}}{1+\frac{3}{4}\cdot\frac{4}{3}} = \frac{7}{24}.$ $\alpha = arctg\frac{7}{24} \Rightarrow$

$\Rightarrow \cos\alpha = \frac{1}{\sqrt{1+\left(\frac{7}{24}\right)^2}} = \frac{24}{25}.$ Javobi: A.

24. $ctg\left(2\pi - 3\arcsin\frac{\sqrt{2}}{2}\right)$ ni hisoblang.

A) 1 B) $-\frac{\sqrt{3}}{2}$ C) $-\sqrt{3}$ D) $\sqrt{3}$ E) $\frac{1}{\sqrt{2}}$

Yechilishi: $\arcsin\frac{\sqrt{2}}{2} = \frac{\pi}{4};$

$ctg\left(2\pi - 3\arcsin\frac{\sqrt{2}}{2}\right) = -ctg\left(2\pi - \frac{3\pi}{4}\right) = -ctg\frac{3\pi}{4} =$

$= -(-1) = 1.$ Javobi: A.

25. Agar $\cos 29^\circ = a$ bo'lsa, $\sin 32^\circ$ ni a orqali ifodalang.

A) $2a^2 - 1$ B) $2a + 1$ C) $a - 1$ D) $1 - a^2$

E) $1 - 2a^2$

Yechilishi: $a = \cos 29^\circ;\ 1 + \sin\alpha = 2\cos^2\left(45° - \frac{\alpha}{2}\right) \Rightarrow$

$\Rightarrow 1 + \sin 32^\circ = 2\cos^2\left(45° - \frac{32^\circ}{2}\right) = 2a^2 \Rightarrow$

$\Rightarrow \sin 32^\circ = 2a^2 - 1$. Javobi: A.

26. Agar $tg\alpha = -2$ bo'lsa, $1 + 5\sin 2\alpha - 3\cos^{-1} 2\alpha$ ning qiymatini toping.

A) 2 B) 1 C) 4 D) -2 E) -1

Yechilishi: $tg\alpha = -2; 1 + 5\sin 2\alpha - 3\cos^{-1} 2\alpha =$

$= 1 + 5 \cdot \frac{2tg\alpha}{1+\text{tg}^2\,\alpha} - 3\frac{1+\text{tg}^2\,\alpha}{1-\text{tg}^2\,\alpha} = 1 + 5 \cdot \frac{-4}{1+4} - 3 \cdot \frac{1+4}{1-4} =$

$= 1 - 4 + 5 = 2$. Javobi: A.

27. α parametrning qanday qiymatlarida $\sin x \le \frac{3a-6}{a+1}$ tengsizlik yechimga ega emas?

A) $\left(-1; \frac{5}{4}\right)$ B) (-1; 0) C) (-1; 2) D) (-1; 5)

E) $(0; \infty)$

Yechilishi: $\sin x \le \frac{3a-6}{a+1} \Rightarrow \begin{cases} \sin x < -1 \\ \sin x > 1 \end{cases} \Rightarrow$

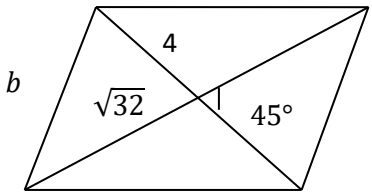
$\frac{3a-6}{a+1} < -1 \Rightarrow \frac{4a-5}{a+1} < 0 \Rightarrow \begin{cases} a < \frac{5}{4} \\ a > -1 \end{cases} \Rightarrow \left(-1; \frac{5}{4}\right)$.

Javobi: A.

28. Parallelogrammning diagonallari 4 va $\sqrt{32}$ ga teng. Ular 45° li burchak ostida kesishadi. Parallelogrammning katta balandligini toping.

A) 4 B) 2 C) $2\sqrt{2}$ D) $\sqrt{2}$ E) 3

Yechilishi:



$b^2 = \left(\frac{4}{2}\right)^2 + \left(\frac{\sqrt{32}}{2}\right)^2 -$

$-2 \cdot 2 \cdot \frac{\sqrt{32}}{2}\cos 45° = 4 + 8 -$

$2\sqrt{32} \cdot \frac{\sqrt{2}}{2} = 4 \Rightarrow b = 2;$

$S = \frac{1}{2} \cdot 4 \cdot \sqrt{32} \cdot \cos 45° = 2 \cdot \sqrt{32} \cdot \frac{\sqrt{2}}{2} = 8;$

$S = b \cdot h \Rightarrow h = \frac{8}{2} = 4.$ Javobi: A.

29. O'lchovlari 8 va 20 ga teng bo'lgan to'g'ri to'rtburchaklardan eng kamida nechtasini birlashtirib, kvadrat hosil qilish mumkin?

A) 10 B) 12 C) 6 D) 8 E) 15

Yechilishi: $a^2 = 8 \cdot 20 \cdot n \Rightarrow a^2 = 160 \cdot n \Rightarrow n = 10.$

Javobi: A.

30. Koordinatalar boshidan $5x + 12y = 60$ to'g'ri chiziqqacha bo'lgan masofani aniqlang.

A) $4\frac{8}{13}$ B) 5 C) $5\frac{3}{13}$ D) $4\frac{7}{13}$ E) 4,8

Yechilishi: $d = \left|\frac{5\cdot 0+12\cdot 0-60}{\sqrt{5^2+12^2}}\right| = \left|-\frac{60}{13}\right| = 4\frac{8}{13}.$

Javobi: A.

31. ABC uchburchakning A burchagi bissektrisasi BC tomoni uzunliklari 12 va 9 bo'lgan ikki kesmaga ajratadi. Agar $AC - AB = 4$ bo'lsa, ABC uchburchakning perimetrini toping.

A) 49 B) 52 C) 46 D) 50 E) 48

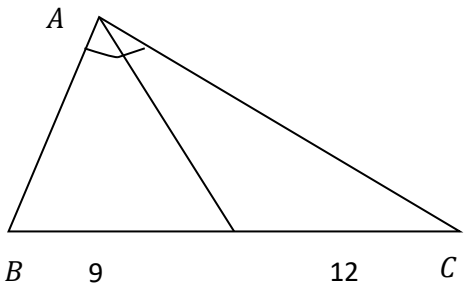
Yechilishi: $AC - AB = 4.$

$\frac{AB}{9} = \frac{AC}{12} \Rightarrow AB = \frac{3}{4}AC \Rightarrow$

$\Rightarrow AC - \frac{3\cdot AC}{4} = 4 \Rightarrow$

$\Rightarrow AC = 16 \Rightarrow\Rightarrow AB = 12.$

$P = 12 + 16 + 21 = 49.$



Javobi: A.

32. Uchburchakning tomonlari 5; 7 va 8 ga teng. Bu uchburchakka tashqi chizilgan doiraning yuzini toping.

A) $16\frac{1}{3}\pi$ B) $18\frac{2}{3}\pi$ C) 17π D) $15\frac{2}{3}\pi$ E) $15\frac{1}{3}\pi$

Yechilishi: $P = 10 \Rightarrow S = \sqrt{10 \cdot 5 \cdot 3 \cdot 2} = 10\sqrt{3};$

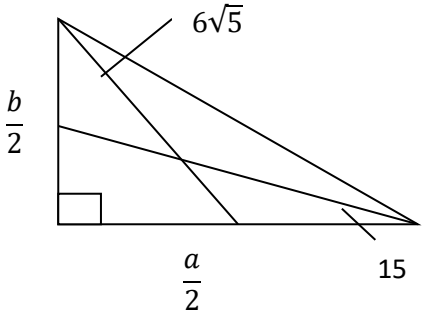
$R = \frac{40 \cdot 7}{40\sqrt{3}} = \frac{7}{\sqrt{3}}$; $S = \pi \cdot \frac{49}{3} = 16\frac{1}{3}\pi$. Javobi: A.

33. To'g'ri burchakli uchburchakda o'tkir burchaklarining medianalari uzunliklari 15 va $6\sqrt{5}$ ga teng. Gepotenuza uzunligini toping.

A) 18 B) 16 C) 20 D) 21 E) 19

Yechilishi:

$$\begin{cases} 15^2 = a^2 + \frac{b^2}{4} \\ \left(6\sqrt{5}\right)^2 = b^2 + \frac{a^2}{4} \end{cases} =>$$



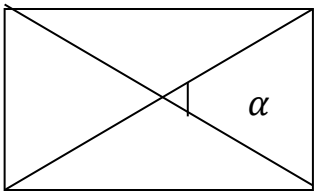
$$=> \begin{cases} a^2 = 192 \\ b^2 = 132 \end{cases} => c^2 = 324 =>$$

$=> c = 18.$ Javobi: A.

34. To'g'ri to'rtburchakning perimetri 32 ga, yuzasi esa 48 ga teng. Uning diagonallari orasidagi burchakning sinusini toping.

A) $\frac{3}{5}$ B) $\frac{3}{4}$ C) $\frac{2}{5}$ D) $\frac{4}{5}$ E) $\frac{2}{3}$

Yechilishi: $\begin{cases} a + b = 16 \\ a \cdot b = 48 \end{cases} =>$



$$=> \begin{cases} a = 16 - b \\ b^2 - 16b + 48 = 0 \end{cases} =>$$

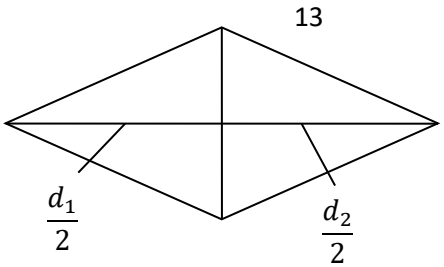
$$=> \begin{cases} a = 12 \\ b = 4 \end{cases} yoki \begin{cases} b = 12 \\ a = 4 \end{cases} =>$$

$=> d^2 = 12^2 + 4^2 = 160;$

$48 = \frac{1}{2}160 \cdot \sin\alpha => \sin\alpha = \frac{3}{5}.$

Javobi: A.

35. Rombning perimetri 52 ga, diagonallarining yig'indisi 34 ga teng. Rombning yuzini toping.



A) 30 B) 128 C) 32

D) 120 E) 24

Yechilishi: $4a = 52 \Rightarrow a = 13;\ \ d_1 + d_2 = 34 \Rightarrow$
$\Rightarrow d_2 = 34 - d_1;$

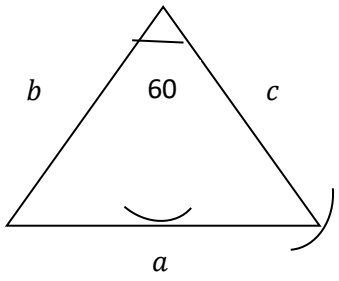
$d_1^2 + d_2^2 = 4 \cdot a^2 \Rightarrow d_1^2 + d_2^2 = 4 \cdot 13^2 \Rightarrow$
$\Rightarrow d_1^2 + d_2^2 = 676 \Rightarrow d_1^2 + (34 - d_1)^2 = 676 \Rightarrow$
$\Rightarrow \begin{cases} d_1 = 10 \\ d_2 = 24 \end{cases} \Rightarrow \ \ S = \frac{1}{2} \cdot 10 \cdot 24 = 120.$ Javobi: D.

36. Uchburchakning burchaklaridan biri 60°, unga tashqi chizilgan aylana radiusi $\frac{7}{\sqrt{3}}$ ga, ichki chizilgan aylana radiusi $\sqrt{3}$ ga teng. Uchburchakning yuzini toping.

A) $10\sqrt{3}$ B) $5\sqrt{3}$ C) $20\sqrt{3}$ D) $8\sqrt{3}$ E) $16\sqrt{3}$

Yechilishi:

1) $\frac{a}{\sin 60^\circ} = 2 \cdot \frac{7}{\sqrt{3}} \Rightarrow a = 7;$



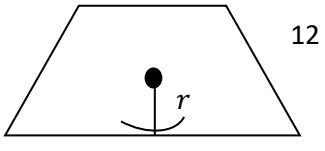
2) $a^2 = b^2 + c^2 - 2bc\cos 60^\circ \Rightarrow$
$b^2 + c^2 - bc = 49 \Rightarrow b^2 + c^2 = 49 + bc;$

3) $\frac{7}{\sqrt{3}} = \frac{7bc}{4S} \Rightarrow bc = \frac{4S}{\sqrt{3}};$

4) $\sqrt{3} = \frac{2S}{7+b+c} \Rightarrow b + c = \frac{2S}{\sqrt{3}} - 7 \Rightarrow b^2 + c^2 + 2bc =$
$= \frac{4S^2}{3} - \frac{28S}{\sqrt{3}} + 49 \Rightarrow 49 + bc + 2bc = \frac{4S^2}{3} - \frac{28S}{\sqrt{3}} +$
$+49 \Rightarrow 3 \cdot \frac{4S}{\sqrt{3}} = \frac{4S^2}{3} - \frac{28S}{\sqrt{3}} \Rightarrow S = 10\sqrt{3}.$ Javobi: A.

37. Yon tomoni 12 ga teng bo'lgan teng yonli trapetsiyaga radiusi 5 ga teng bo'lgan aylana ichki chizilgan. Trapetsiyaning yuzini toping.

A) 120 B) 240 C) 60 D) 180
E) 124



Yechilishi: $l = MN = 12; h = 2r = 10.$

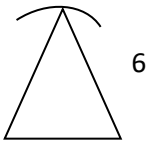
$S = MN \cdot 2r = 12 \cdot 10 = 120.$

Javobi: A.

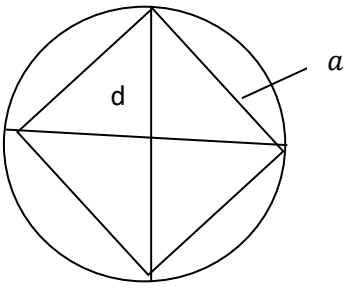
38. Aylanaga ichki chizilgan muntazam uchburchakning tomoni 6 ga teng. Shu aylanaga ichki chizilgan kvadratning yuzini toping.

A) 24 B) 18 C) 48 D) 36 E) 20

Yechilishi:



$\Rightarrow R = \frac{6\sqrt{3}}{3} = 2\sqrt{3};$



$d = 2R \Rightarrow a\sqrt{2} =$

$= 2 \cdot 2\sqrt{3} \Rightarrow a = 2\sqrt{6} \Rightarrow$

$\Rightarrow S = 24.$ Javobi: A.

39. To'g'ri burchakli uchburchakning katetlaridan biri 15 ga, ikkinchi katetining gepotenuzadagi proeksiyasi 16 ga teng. Bu uchburchakka ichki chizilgan aylananing radiusini toping.

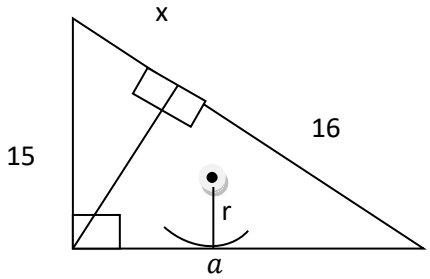
A) 5 B) 6 C) 7 D) 8 E) 4

Yechilishi: $15^2 = x(16 + x) \Rightarrow$

$x^2 + 16x - 225 = 0 \Rightarrow$

$x = 9 \Rightarrow a = 20 \Rightarrow r = 5.$

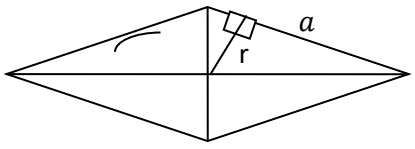
Javobi: A.



40. O'tkir burchagi 30° bo'lgan rombga doira ichki chizilgan. Shu doira yuzining romb yuziga nisbatini toping.

A) $\frac{\pi}{8}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{16}$ E) $\frac{\pi}{2}$

Yechilishi: $r = \frac{1}{2}a \sin 30° \Rightarrow$



$\Rightarrow r = \frac{1}{4}a;\ S_d = \frac{\pi a^2}{16};$

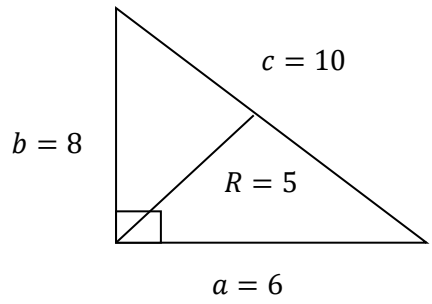
$S_r = a^2 \cdot \sin 30° = \frac{1}{2}a^2;\ \ S_d : S_r = \frac{\pi a^2}{16} : \frac{a^2}{2} = \frac{\pi}{8}.$

Javobi: A.

41. To’g’ri burchakli uchburchakning perimetri va yuzasi bir xil son, ya’ni 24 bilan ifodalanadi. Shu uchburchakka tashqi chizilgan doiraning yuzini toping.

A) 25π B) 36π C) 16π

D) 49π E) 18π



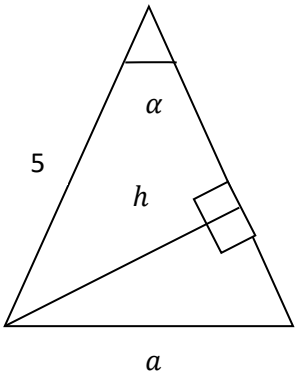
Yechilishi: $p = S_{\triangle} = 24;$

$c = 10 => R = 5 => S = 25\pi.$

Javobi: A.

42. Teng yonli uchburchakning yon tomoni 5 ga, uchidagi burchagining kosinusi $-\frac{7}{25}$ ga teng bo’lsa, uning yon tomoniga o’tkazilgan balandlikni aniqlang.

A) 4,8 B) 4,2 C) 5 D) 4,4 E) 4,6



Yechilishi: $\cos\alpha = -\frac{7}{25} =>$

$=> \alpha = \pm\left(\pi - \arccos\frac{7}{25}\right);$

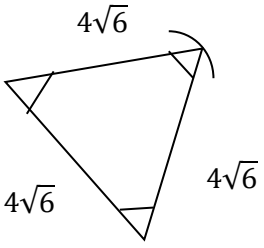
$h = 5 \cdot \sin\left(\pi - \arccos\frac{7}{25}\right) =$

$= 5\sin\arccos\frac{7}{25} = 5 \cdot \sqrt{1 - \frac{49}{625}} =$

$= 5 \cdot \frac{24}{25} = 4{,}8.$ Javobi: A.

43. Muntazam oltiburchakning tomoni $4\sqrt{6}$ ga teng. Shu ko’pburchakka tengdosh bo’lgan teng tomonli uchburchakning tomonini toping.

A) 24 B) 18 C) 12 D) 30 E) 16



Yechilishi: $6\alpha = 180(6-2) =>$

$=> \alpha = 120°; 6S_{\triangle} = 6 \cdot \frac{\left(4\sqrt{6}\right)^2\sqrt{3}}{4} =$

$= 6 \cdot \frac{16 \cdot 6\sqrt{3}}{4} = 144\sqrt{3};$

$144\sqrt{3} = \frac{a^2\sqrt{3}}{4} => a^2 = 144 \cdot 4 =>$

$=> a = 24.$ Javobi: A.

44. Tomonlari ayirmasi 4 ga teng bo'lgan arifmetik prograssiyani tashkil etuvchi ko'pburchakning perimetri 75 ga, eng katta tomoni 23 ga teng. Bu ko'pburchakning tomonlari soni nechta?

A) 5 B) 6 C) 7 D) 4 E) 3

Yechilishi: $a_1, a_1 + 4, \ldots, 23;\ 23 = a_1 + 4(n-1) =>$

$n = \frac{27 - a_1}{4};\ 75 = \frac{a_1 + 23}{2} \cdot \frac{27 - a_1}{2} => a_1^2 - 4a_1 -$

$-21 = 0 => a_1 = 7. => 23 = 7 + 4(n-1) => n = 5.$

Javobi: A.

45. Trapetsiyaning asoslari 8 va 12 ga, o'tkir burchaklaridan biri 30° ga teng. Yon tomonlari davom ettirilsa, to'g'ri burchak ostida kesishadi. Trapetsiyaning balandligini toping.

A) $\sqrt{3}$ B) $\sqrt{2}$ C) $2\sqrt{2}$ D) $2\sqrt{3}$ E) 3

Yechilishi: $\frac{x}{8} = \sin 30° => x = 4;$

$\frac{x+y}{12} = \sin 30° =>$

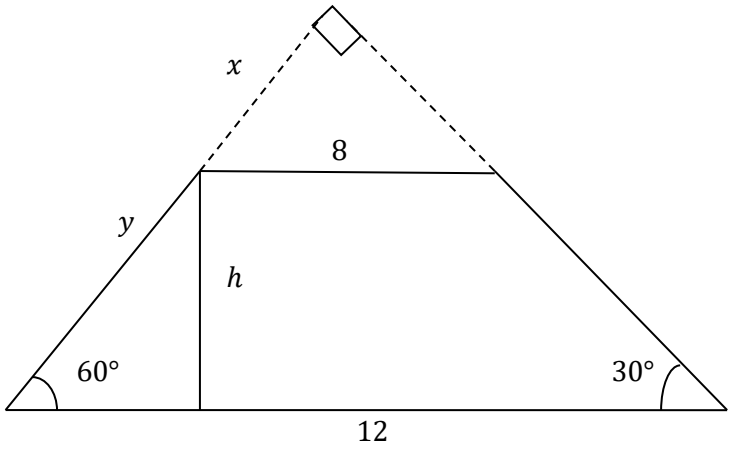
$=> x + y = 6 =>$

$=> y = 2 =>$

$=> \frac{h}{2} = \sin 60° =>$

$=> h = \sqrt{3}.$

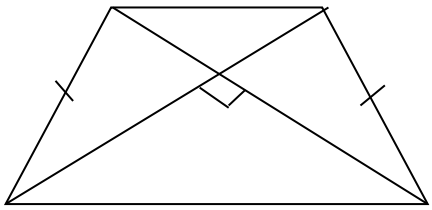
Javobi: A.



46. Teng yonli trapetsiyaning o'rta chizig'i 6 ga teng va diagonallari o'zaro perpendikulyar. Trapetsiyaning yuzini toping.

A) 36 B) 32 C) 49 D) 40 E) 25

Yechilishi:



$d \perp d \Rightarrow h^2 = MN^2;$

$$S = h^2 \Rightarrow \begin{cases} h^2 = 6^2 \Rightarrow h = 6. \\ S = 6^2 = 36. \end{cases}$$

Javobi: A.

47. Sferaning radiusi 60% uzaytirilsa, sfera sirtining yuzi necha foiz ko'payadi?

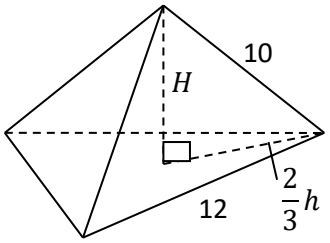
A) 156 B) 120 C) 150 D) 160 E) 144

Yechilishi: $S = 4\pi R^2; S_1 = 4\pi(1{,}6R)^2 = 4\pi R^2 \cdot 2{,}56 \Rightarrow$ $\Rightarrow 156\%$. Javobi: A.

48. Muntazam uchburchakli piramidaning yon qirrasi 10 ga, asosining tomoni 12 ga teng. Piramidaning balandligini toping.

A) $2\sqrt{13}$ B) $\sqrt{13}$ C) 2 D) $2\sqrt{7}$ E) $3\sqrt{13}$

Yechilishi: $h = \frac{12\sqrt{3}}{2} = 6\sqrt{3};$



$H^2 = 10^2 - \left(\frac{2}{3}h\right)^2 =$

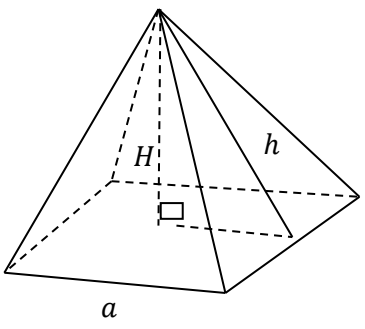
$= 100 - \frac{4}{9} \cdot 36 \cdot 3 = 52 = 4 \cdot 13 \Rightarrow$

$\Rightarrow H = 2\sqrt{3}$. Javobi: A.

49. Muntazam to'rtburchakli piramidaning hajmi 20 ga, balandligi esa 1 ga teng. Piramida apofemasi uzunligini toping.

A) 4 B) $4\sqrt{2}$ C) $3\sqrt{2}$

D) 6 E) 8



Yechilishi: $V = 30;\ H = 1.$

$V = \frac{1}{3}a^2 \cdot H => 20 \cdot 3 = a^2 =>$

$=> a = 2\sqrt{15};$

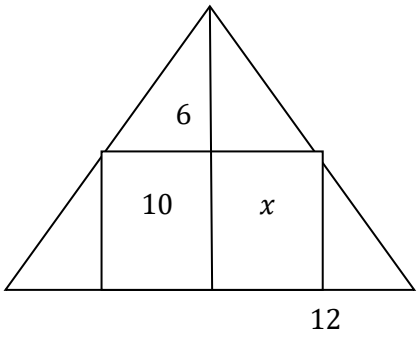
$h^2 = \left(\sqrt{15}\right)^2 + 1^2 = 16 => h = 4.$

Javobi: A.

50. Balandligi 16 ga, asosining radiusi 12 ga teng bo'lgan konusga balandligi 10 ga teng bo'lgan silindr ichki chizilgan. Silindr asosining radiusini toping.

A) 4,5 B) 4 C) 4,8

D) 4,2 E) 5



Yechilishi:

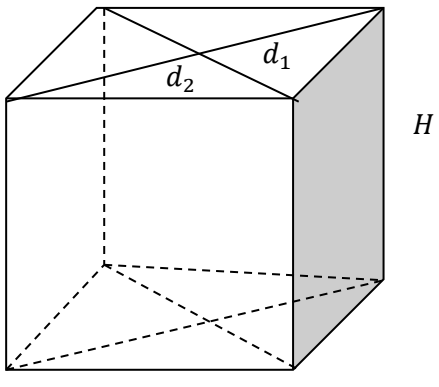
$\frac{16}{6} = \frac{24}{2x} => \frac{8}{3} = \frac{12}{x} => x = 4{,}5.$

Javobi: A.

51. To'g'ri parallelepipedning asosi yuzasi 30 ga teng bo'lgan rombdan iborat. Parallelepipedning diagonal kesimlaining yuzalari 96 va 40 ga teng bo'lsa, uning hajmini toping.

A) 240 B) 244 C) 320 D) 180 E) 232

Yechilishi:



$\frac{1}{2}d_1 d_2 = 30 => d_1 d_2 = 60;$

$\begin{cases} d_1 \cdot H = 40 \\ d_2 \cdot H = 96 \end{cases} =>$

$=> d_1 d_2 \cdot H^2 = 40 \cdot 96 =>$

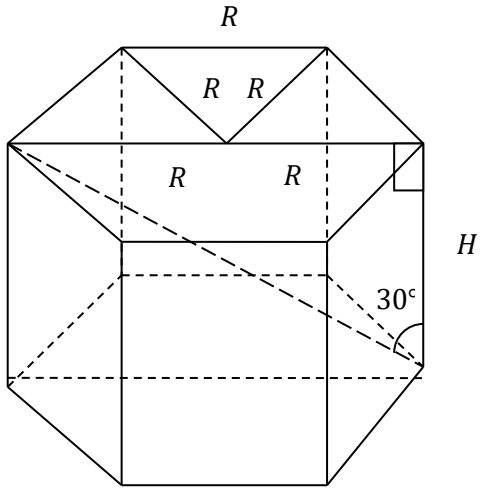
$=> 60 \cdot H^2 = 40 \cdot 96 =>$

$=> H = 8;\ V = 30 \cdot 8 = 240.$

Javobi: A.

52. Muntazam oltiburchakli prizmaning eng katta diagonali 8 ga teng va u yon qirrasi bilan 30° li burchak hosil qiladi. Prizmaning hajmini toping.

A) 72 B) 64 C) 76
D) 80 E) 84



Yechilishi:

$\frac{2R}{8} = \sin 30° => R = 2;$

$\frac{H}{8} = \cos 30° => H = 4\sqrt{3};$

$S_{asos} = 6S_{\triangle} = 6 \cdot \frac{2^2\sqrt{3}}{4} =$

$= 6\sqrt{3} => V = S_{asos} \cdot H =$

$= 6\sqrt{3} \cdot 4\sqrt{3} = 72.$

Javobi: A.

53. Muqovasiz kitobning bahosi muqovali kitobga qaraganda 300 so'mga arzon. 6 ta muqovasiz kitobning narxi 4 ta muqovali kitobning narxiga qaraganda 200 so'm arzon. Kitobning bahosi muqovasiz holda necha so'm bo'ladi?

A) 450 B) 500 C) 475 D) 800 E) 550

Yechilishi: $6x + 200 = 4(x + 300) => x = 500.$

Javobi: B.

54. $\left(6\frac{1}{2} - 8\frac{3}{4}\right) : \frac{1}{8} + 11\frac{3}{7}$ ni hisoblang.

A) $-7\frac{3}{7}$ B) $6\frac{3}{7}$ C) $-6\frac{4}{7}$ D) $-7\frac{5}{7}$ E) $-6\frac{5}{7}$

Yechilishi: $\left(\frac{13}{2} - \frac{35}{4}\right) \cdot 8 + \frac{80}{7} = -\frac{9}{4} \cdot 8 + \frac{80}{7} =$

$= -18 + \frac{80}{7} = -6\frac{4}{7}.$ Javobi: C.

55. $12\frac{1}{2} : 2\frac{1}{2} = 16\frac{2}{3} : y$ tenglamani yeching.

A) $3\frac{1}{3}$ B) $3\frac{2}{3}$ C) $3\frac{1}{6}$ D) $3\frac{5}{6}$ E) $3\frac{1}{9}$

Yechilishi: $\frac{25}{2}\cdot\frac{2}{5}=\frac{50}{3}\cdot\frac{1}{y} \Rightarrow 5\cdot 3\cdot y=50 \Rightarrow$

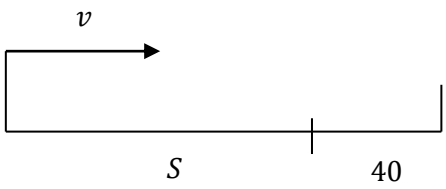
$\Rightarrow y=3\frac{1}{3}$. Javobi: A.

56. Mototsiklchi mo'ljaldagi tezlikni 15 km/soatga oshirib, 6 soatda 7 soatda bosib o'tishi kerak bo'lgan masofaga qaraganda 40 km ko'p yo'lni bosib o'tdi. Mototsiklchining mo'ljaldagi tezligini toping (km/soat).

A) 60 B) 45 C) 55 D) 50 E) 40

Yechilishi:

$$\begin{cases} S=7v \\ S+40=6(v+15) \end{cases} \Rightarrow$$



$$\begin{array}{r} S=7v \\ -\ S=6v+50 \\ \hline o=v-50 \\ v=50 \end{array}$$

Javobi: D.

57. $12\cdot\left(1\frac{3}{4}x+\frac{5}{8}\right)=-6\frac{1}{2}$ tenglamani yeching.

A) $-\frac{1}{3}$ B) $-\frac{2}{3}$ C) $\frac{2}{3}$ D) $-\frac{13}{21}$ E) $\frac{3}{4}$

Yechilishi:

$12\cdot\left(\frac{7x}{4}+\frac{5}{8}\right)=-\frac{13}{2} \Rightarrow \frac{7x}{4}=-\frac{13}{2}:12-\frac{5}{8} \Rightarrow$

$\Rightarrow 7x=-\frac{13}{24}\cdot 4-\frac{5}{8}\cdot 4 \Rightarrow 7x=-\frac{13}{6}-\frac{5}{2} \Rightarrow$

$\Rightarrow 7x=-\frac{28}{6} \Rightarrow x=-\frac{2}{3}$. Javobi: B.

58. $10-2\frac{1}{2}:3\frac{3}{4}+\left(2\frac{1}{2}-1\frac{1}{3}\right)\cdot 6$ ni hisoblang.

A) $16\frac{2}{3}$ B) $17\frac{1}{3}$ C) $15\frac{2}{3}$ D) $16\frac{1}{3}$ E) 17

Yechilishi: $10-\frac{5}{2}\cdot\frac{4}{15}+\left(\frac{5}{2}-\frac{4}{3}\right)\cdot 6=10-\frac{2}{3}+\frac{15-8}{6}\cdot 6=$

$=17-\frac{2}{3}=\frac{49}{3}=16\frac{1}{3}$. Javobi: D.

59. Traktorchilar maydonni uch kunda haydab bo'lishdi. Birinchi kuni ular maydonning $\frac{3}{7}$ qismini, ikkinchi kuni butun yer maydonining 40% ini, uchinchi kuni qolgan 72 ga maydonni haydashgan bo'lsa, maydonning yuzi necha gektar bo'ladi?

A) 420 B) 450 C) 500 D) 350 E) 520

Yechilishi: $\frac{3}{7}x + 0{,}4x + 72 = x \Rightarrow$

$\Rightarrow 3x + 2{,}8x + 504 = 7x \Rightarrow 1{,}2x = 504 \Rightarrow x = 420.$

Javobi: A.

60. Birinchi son ikkinchi sondan 2,5 ga ortiq. Birinchi sonning $\frac{1}{5}$ qismi ikkinchi sonning $\frac{4}{5}$ qismiga teng. Shu sonlarning yig'indisini toping.

A) 4 B) 6 C) $6\frac{1}{3}$ D) $5\frac{1}{6}$ E) $4\frac{1}{6}$

Yechilishi: $\begin{cases} x = y + 2{,}5 \\ \frac{1}{5}x = \frac{4}{5}y \end{cases} \Rightarrow \begin{cases} 4y = y + 2{,}5 \\ x = 4y \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 3y = 2{,}5 \\ x = 4y \end{cases} \Rightarrow \begin{cases} y = \frac{2{,}5}{3} \\ x = 4 \cdot \frac{2{,}5}{3} \end{cases} \Rightarrow x + y =$

$= \frac{10}{3} + \frac{2{,}5}{3} = \frac{12{,}5}{3} = \frac{125}{30} = \frac{25}{6} = 4\frac{1}{6}.$ Javobi: E.

61. $\frac{0{,}6^2 - 0{,}6 \cdot 0{,}2 + 0{,}1^2}{1{,}5 - 1{,}5^2}$ ni hisoblang.

A) -0,5 B) $-\frac{1}{3}$ C) -3 D) $-1\frac{2}{3}$ E) -2,5

Yechilishi: $\frac{0{,}6^2 - 0{,}6 \cdot 0{,}2 + 0{,}1^2}{1{,}5 - 1{,}5^2} = \frac{0{,}6(0{,}6 - 0{,}1) + 0{,}1^2}{1{,}5(1 - 1{,}5)} =$

$= \frac{0{,}6 \cdot 0{,}4 + 0{,}01}{1{,}5 \cdot (-0{,}5)} = -\frac{0{,}25}{-1{,}5 \cdot 0{,}5} = -\frac{25}{15 \cdot 5} = -\frac{1}{3}.$ Javobi: B.

62. $1{,}2 \cdot (0{,}5 - 5x) + 4{,}2 = 3 \cdot (4 - 2{,}1x)$ tenglamaning ildizi -10 dan qancha ortiq?

A) 14 B) 24 C) 34 D) 28 E) 12,4

Yechilishi: $\frac{12}{10}\cdot\left(\frac{1}{2}-5x\right)+\frac{42}{10}=3\cdot\left(4-\frac{21}{10}x\right)=>$

$=>\frac{6}{5}\cdot\frac{1-10x}{2}+\frac{21}{5}=3\cdot\frac{40-21x}{10}=>\frac{24-30x}{5}=\frac{120-63x}{10}=>$

$=>48-60x=120-63x=>3x=72=>x=24.$

Javobi: B.

63. $\frac{x^3-8}{x-2}=6x+1$ tenglamaning ildizlari yig'indisini toping.

A) 6 B) 4 C) -4 D) 3 E) -2

Yechilishi: $\frac{x^3-8}{x-2}=6x+1=>\frac{(x-2)(x^2+2x+4)}{x-2}=$

$=6x+1;\ x\neq 2;\ x^2-4x+3=0=>\begin{cases}x_1=1;\\x_2=3.\end{cases}=>$

$=>\ x_1+x_2=4.$ Javobi: B.

64. $\frac{2x-7}{6}+\frac{7x-2}{3}<3-\frac{1-x}{2}$ tengsizlikning butun sonlardan iborat yechimlaridan eng kattasini ko'rsating.

A) 2 B) -1 C) 1 D) 0 E) -2

Yechilishi: $\frac{2x-7}{6}+\frac{7x-2}{3}-3+\frac{1-x}{2}<0=>$

$=>2x-7+14x-4-18+3-3x<0=>$

$=>13x<26=>x<2\ =>x=1.$ Javobi: C.

65. Agar $\begin{cases}\frac{x+3y+1}{y}-\frac{y-x+3}{2(x-2)}=2,\\ y-x=1\end{cases}$ bo'lsa, $x\cdot y$ ning qiymatini toping.

A) 15 B) -6 C) -8 D) 6 E) 12

Yechilishi: $\begin{cases}\frac{x+3y+1}{y}-\frac{y-x+3}{2(x-2)}=2;\\ y-x=1=>y=x+1;\end{cases}\ y\neq 0;x\neq 2;$

$\frac{x+3x+3+1}{x+1}-\frac{x+1-x+3}{2(x-2)}=2=>x=3=>y=4;xy=12.$

Javobi: E.

66. $\begin{cases}(x+2)(2-x)<(x+3)(4-x)\\ \frac{3+x}{4}+\frac{1-2x}{6}\geq 1\end{cases}$ tengsizliklar sistemasining butun sonlardan iborat yechimlari nechta?

A) 7 B) 8 C) 6 D) 9 E) 12

Yechilishi: $\begin{cases}(x+2)(2-x)<(x+3)(4-x)\\ \frac{3+x}{4}+\frac{1-2x}{6}\geq 1\end{cases} =>$

$=> \begin{cases}-x^2+4<x-x^2+12 => x>-8\\ 9+3x+2-4x\geq 12 => x\leq -1\end{cases} => (-8;-1].$

Javobi: A.

67. $x^2+x+a=0$ tenglamaning x_1 va x_2 ildizlari orasida $\frac{1}{x_1}+\frac{1}{x_2}=\frac{1}{2}$ munosabat o'rinli. a ning qiymatini toping.

A) -2,5 B) -2 C) -1 D) -1,5 E) -0,5

Yechilishi: $x^2+x+a=0 => \begin{cases}x_1+x_2=-1\\ x_1\cdot x_2=a\end{cases};$

$\frac{1}{x_1}+\frac{1}{x_2}=\frac{1}{2} => 2(x_1+x_2)=x_1\cdot x_2 => a=-2.$

Javobi: B.

68. $\frac{(2|x|-3)^2-|x|-6}{4x+1}=0$ tenglama ildizlarining ko'paytmasini toping.

A) $\frac{3}{4}$ B) $-\frac{5}{4}$ C) $-\frac{9}{4}$ D) $-\frac{9}{16}$ E) $\frac{9}{16}$

Yechilishi: $\frac{(2|x|-3)^2-|x|-6}{4x+1}=0 => x\neq -\frac{1}{4};$

$4x^2-12|x|+9-|x|-6=0 =>$

$\begin{cases}4x^2-13|x|+3=0;\\ x\neq -\frac{1}{4}.\end{cases} => \begin{cases}4x^2-13x+3=0\\ 4x^2+13x+3=0\end{cases} =>$

$$\Rightarrow \begin{cases} x_1 = \frac{1}{4};\ x_2 = 3; \\ x_3 = -3;\ x_4 \neq -\frac{1}{4}. \end{cases} \Rightarrow x_1 \cdot x_2 \cdot x_3 =$$

$= \frac{1}{4} \cdot (-3) \cdot 3 = -\frac{9}{4}.$ Javobi: C.

69. $y = -3x^2 + bx + c$ parabolaning uchi $M(-4; 3)$ nuqtada yotadi. $b + c$ ning qiymatini toping.

A) -72 B) -55 C) -57 D) -48 E) -69

Yechilishi: $y = -3x^2 + bx + c;\ \ M(-4; 3); a = -3;$

$x = -\frac{b}{2a} \Rightarrow\ -4 = -\frac{b}{2(-3)} \Rightarrow b = -24;$

$3 = -\frac{(-24)^2 - 4\cdot(-3)\cdot C}{4\cdot(-3)} \Rightarrow 36 = 576 + 12c \Rightarrow c = -45;$

$b + c = -24 - 45 = -69.$ Javobi: E.

70. $|3x - 1| = |5 - x|$ tenglamaning ildizlari ko'paytmasini toping.

A) -3 B) 1,5 C) 3 D) 2 E) -2

Yechilishi: $|3x - 1| = |5 - x|$

$$3x - 1 \geq 0 \Rightarrow \begin{cases} 3x - 1 = |5 - x| \\ -3x + 1 = |5 - x| \end{cases};$$

$$5 - x \geq 0 \Rightarrow \begin{cases} 3x - 1 = 5 - x \\ -3x + 1 = 5 - x \end{cases} \Rightarrow \begin{cases} 4x = 6 \\ 2x = -4 \end{cases} \Rightarrow$$

$$5 - x < 0 \Rightarrow \begin{cases} 3x - 1 = -5 + x \\ -3x + 1 = -5 + x \end{cases}$$

$$\Rightarrow \begin{cases} x_1 = \frac{3}{2}; \\ x_2 = -2. \end{cases} \Rightarrow x_1 \cdot x_2 = -3.$$ Javobi: A.

71. $\frac{5a}{3(4-a)} + \frac{a+4}{8-3a} \cdot \left(\frac{a-1}{a+4} - \frac{a-3}{a-4}\right)$ ifodaning $a = -0{,}2$ bo'lgandagi qiymatini hisoblang.

A) $-\frac{7}{9}$ B) 0 C) $-\frac{5}{9}$ D) $\frac{2}{3}$ E) $-\frac{1}{18}$

Yechilishi: $\frac{5a}{3(4-a)}+\frac{a+4}{8-3a}\cdot\frac{(a-1)(a-4)-(a-3)(a+4)}{(a+4)(a-4)}=$

$=\frac{5a}{3(4-a)}+\frac{a^2-4a-a+4-a^2-4a+3a+12}{(8-3a)(a-4)}=\frac{5a}{3(4-a)}+$

$+\frac{16-6a}{(8-3a)(a-4)}=\frac{5a}{3(4-a)}-\frac{2}{4-a}=\frac{5a-6}{3(4-a)}=\frac{5(-0,2)-6}{3(4+0,2)}=$

$=-\frac{7}{12,6}=\frac{7}{\frac{126}{10}}=-\frac{5}{9}.$ Javobi: C.

72. a ning qanday qiymatida $|2-3x-x^2|=5a$ tenglama uchta turli haqiqiy ildizga ega bo'ladi?

A) 1 B) 0,75 C) 0,85 D) 1,25 E) 0,5

Yechilishi: $|2-3x-x^2|=5a \Rightarrow$

$\begin{cases}2-3x-x^2=5a\\x^2+3x-2=5a\end{cases}\Rightarrow$

$\Rightarrow \begin{cases}x^2+3x-2+5a=0\\x^2+3x-2-5a=0\end{cases}\Rightarrow D=b^2-4ac=$

$=3^2+4\cdot(2-5a)\geq 0 \Rightarrow 20a\leq 17 \Rightarrow a\leq 0{,}85.$

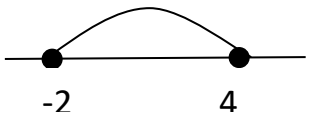
Javobi: C.

73. $\sqrt{8+2x-x^2}>6-3x$ tengsizlikning butun sonlardan iborat yechimlari nechta?

A) 2 B) 3 C) 4 D) 5 E) 1

Yechilishi: $\sqrt{8+2x-x^2}>6-3x.$

1) $x^2-2x-8\leq 0 \Rightarrow \begin{cases}x_1=-2\\x_2=4\end{cases}$



$yoki\ [-2;4].$

2) $8+2x-x^2>36-36x+9x^2 \Rightarrow$

$\Rightarrow 10x^2-38x+28<0 \Rightarrow 5x^2-19x+14<0;$

$x_{1,2}=\frac{19\pm\sqrt{361-4\cdot5\cdot14}}{2\cdot5}=\frac{19\pm\sqrt{81}}{10}\Rightarrow x_1=\frac{19-9}{10}=1;$

$x_2 = \frac{19+9}{10} = 2{,}8. => (1; 2{,}8).\ Demak, x = 2; 3; 4.$

Javobi: B.

74. $\sqrt{17 - 12\sqrt{2}} \cdot \left(6 + 4\sqrt{2}\right)$ ning qiymatini hisoblang.

A) $\sqrt{2}$ B) $-\sqrt{2}$ C) $\sqrt{3+\sqrt{8}}$ D) 2 E) $\sqrt{3-\sqrt{8}}$

Yechilishi: $\sqrt{17 - 12\sqrt{2}} \cdot \left(6 + 4\sqrt{2}\right) =$

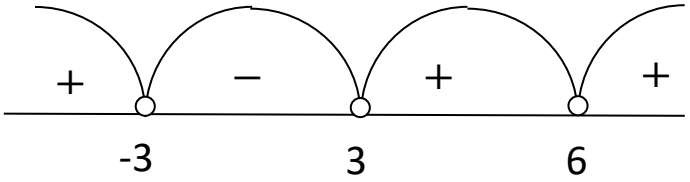
$= \sqrt{17 - \sqrt{288}} \cdot \left(6 + 4\sqrt{2}\right) = \left(3 - 2\sqrt{2}\right) \cdot 2\left(3 + 2\sqrt{2}\right) = 2(9 - 8) = 2.$ Javobi: D.

75. $\frac{(x+4)^2-8x-25}{(x-6)^2} > 0$ tengsizlikning butun sonlardan iborat yechimlaridan nechtasi [-5; 6] kesmada joylashgan?

A) 2 B) 3 C) 4 D) 5 E) 6

Yechilishi: $\begin{cases} \frac{(x+4)^2-8x-25}{(x-6)^2} > 0 \\ x \neq 6 \end{cases} => \frac{(x-3)(x+3)}{(x-6)^2} > 0 =>$

$=> \begin{cases} x^2 > 9 \\ x \neq 6 \end{cases} => \begin{cases} |x| > 3 \\ x \neq 6 \end{cases} => \begin{cases} x > 3; \\ x < -3; \\ x \neq 6. \end{cases}$



$x = -5; -4; 4; 5.$

Javobi: C.

76. $\frac{\sqrt{2-x}}{\sqrt{3+x}} = \frac{2-x}{3+x}$ tenglama ildizlarining o'rta arifmetigini toping.

A) 1 B) 0,75 C) 1,5 D) $\frac{1}{3}$ E) -1

Yechilishi: $\begin{cases} \frac{\sqrt{2-x}}{\sqrt{3+x}} = \frac{2-x}{3+x} \\ x > -3 \end{cases} => \frac{2-x}{3+x} = \frac{(2-x)^2}{(3+x)^2} =>$

$=> (2 - x)(3 + x)^2 - (2 - x)^2(3 + x) = 0 =>$

$$=> (2-x)(3+x)(3+x-2+x)=0 =>$$

$$=> \begin{cases} x_1 = 2 \\ x \neq -3 \\ x_2 = -\frac{1}{2} \end{cases} => \frac{x_1+x_2}{2} = \frac{1}{2}\left(2-\frac{1}{2}\right) = \frac{3}{4} = 0{,}75.$$

Javobi: B.

77. $\frac{\sqrt{x+4\sqrt{x-4}}-2}{\sqrt{x-4\sqrt{x-4}}+2}$ $(x \geq 8)$ ni soddalashtiring.

A) 1 B) -1 C) 0,5 D) 0,25 E) 2

Yechilishi: $\frac{\sqrt{x+4\sqrt{x-4}}-2}{\sqrt{x-4\sqrt{x-4}}+2} = \frac{\sqrt{\left(\sqrt{x-4}+2\right)^2}-2}{\sqrt{\left(\sqrt{x-4}-2\right)^2}+2} = \frac{\sqrt{x-4}+2-2}{\sqrt{x-4}-2+2} = 1.$

Javobi: A.

78. k ning qanday qiymatlarida $(2x-k)\cdot \log_2 x = 0$ tenglama bitta ildizga ega?

A) $0 < k \leq 1$ B) $k > 2$ C) $k = 1$

D) $1 \leq k < 2$ E) $k \leq 0;\ k = 2$

Yechilishi: $(2x-k)\cdot \log_2 x = 0 => \begin{cases} x > 0 \\ 2x-k=0 => \\ \log_2 x = 0 \end{cases}$

$\begin{cases} x > 0; \\ k = 2; \\ x = 1. \end{cases}$ $Demak, tenglama\ x = 1\ bitta\ ildizdan\ boshqa\ ildizga\ ega\ bo'lmasligi\ uchun\ x \leq 0\ bo'lishi\ kerak\ Bundan, k \leq 0\ bo'ladi.$ Javobi: E.

79. $y_1 = x-2,\ y_2 = \sqrt{(x-2)^2},\ y_3 = \left(\sqrt{x-2}\right)^2$ funksiyalarga nisbatan quyidagi mulohazalarning qaysi biri to'g'ri?

A) $uchala\ funksiyaning\ grafigi\ bir\ xil$

B) $birincha\ va\ ikkinchi\ funksiyaning\ grafigi\ ustma-ust\ tushadi$

C) $birinchi\ va\ uchinchi\ funksiyaning\ grafigi\ ustma-ust\ tushadi$

D) *ikkincha va uchinchi funksiyalar grafigi ustma – ust tushadi*

E) *uchala funksiyaning grafiklari turlicha*

Yechilishi: $y_1 = x - 2,\ y_2 = \sqrt{(x-2)^2} = |x-2|;$

$y_3 = \left(\sqrt{x-2}\right)^2 = |x-2|.$ Javobi: D.

80. $y = \sin^4 2x + \cos^4 2x$ funksiyaning eng katta qiymatini ko'rsating.

A) 2 B) 1,5 C) 1 D) 0,5 E) 0,75

Yechilishi: $y = \sin^4 2x + \cos^4 2x = 1 - \frac{1}{2}(\sin 4x)^2 = 1.$ Javobi: C.

81. Agar $\sin 2\alpha = -\frac{1}{3}$ bo'lsa, $\sin^2\left(\frac{\pi}{4} - \alpha\right)$ ning qiymatini toping.

A) $\frac{1}{3}$ B) $-\frac{2}{3}$ C) $\frac{2}{3}$ D) $\frac{4}{3}$ E) $-\frac{1}{3}$

Yechilishi: $\sin 2\alpha = -\frac{1}{3};\ \sin^2\left(\frac{\pi}{4} - \alpha\right) = \left(\frac{\cos\alpha - \sin\alpha}{\sqrt{2}}\right)^2 = \frac{1-\sin 2\alpha}{2} == \left(1 + \frac{1}{3}\right)\cdot\frac{1}{2} = \frac{2}{3}.$ Javobi: C.

82. $3^{\sqrt{\log_3 2}} - 2^{\sqrt{\log_2 3}} - 1$ ni hisoblang.

A) 0 B) 1 C) 2 D) -1 E) -2

Yechilishi: *Dastlabki ikki hadning bir – biriga teng – ligini isbotlash uchun, ularni alohida – alohida 2 asosga ko'ra logarifmlaymiz.*

1) $\log_2 3^{\sqrt{\log_3 2}} = \sqrt{\log_3 2}\cdot\log_2 3 =$

$= \sqrt{\log_3 2\cdot\log_2 3\cdot\log_2 3} = \sqrt{\log_3 2\cdot\frac{1}{\log_3 2}\cdot\log_2 3} =$

$= \sqrt{\log_2 3};$

2) $\log_2 2^{\sqrt{\log_2 3}} = \sqrt{\log_2 3}.$ *Bundan*: $3^{\sqrt{\log_3 2}} -$

$-2^{\sqrt{\log_2 3}} - 1 = -1.$ Javobi: D.

83. $\sin\left(300 \arcsin\left(-\frac{\sqrt{2}}{2}\right)\right)$ ni hisoblang.

A) 1 B) -1 C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) 0

Yechilishi:

$\text{Sin}\left(300 \arcsin\left(-\frac{\sqrt{2}}{2}\right)\right) =$

$= \sin\left(300 \cdot \frac{3\pi}{4}\right) = \sin 225\pi = 0.$ Javobi: E.

12-axborotnoma

1. $2x^2 - 7x + c = 0$ tenglamanng idizlaridan biri 0,5 ga teng. Shu tinglamaning ikkinchi ildizini toping.

A) 4 B) 3 C) 0 D) 6,5 E) 5,5

Yechilishi: $2x^2 - 7x + c = 0 \Rightarrow 2 \cdot \frac{1}{4} - \frac{7}{2} + c = 0 \Rightarrow$

$c = 3 \Rightarrow x^2 - 3{,}5x + 1{,}5 = 0 \Rightarrow \frac{1}{2} \cdot x_2 = 1{,}5 \Rightarrow$

$\Rightarrow x_2 = 3.$ Javobi: B.

2. $3x^4 - 5x^2 + 2 = 0$ tenglamaning eng kichik va eng katta ildizlari ayirmasini toping.

A) 2 B) $\frac{2\sqrt{6}}{3}$ C) $-\frac{2\sqrt{6}}{3}$ D) -2 E) $\frac{5}{3}$

Yechilishi: $3(x^2)^2 - 5x^2 + 2 = 0 \Rightarrow$

$\Rightarrow \begin{cases} x^2 = y \\ 3y^2 - 5y + 2 = 0 \end{cases} \Rightarrow \begin{cases} x_1 = \frac{2}{3}; \ x_1 = -\sqrt{\frac{2}{3}}; \\ x_2 = 1 \end{cases}$

$x_2 = \sqrt{\frac{2}{3}}; \ x_3 = -1; \ x_4 = 1 \Rightarrow x_3 - x_4 = -2.$ Javobi: D.

3. $a + b = 18; \ a^2 + b^2 = 170; \quad ab = ?$

A) 45 B) 72 C) 77 D) 80 E) 84

Yechilishi: $\begin{cases} a + b = 18 \\ a^2 + b^2 = 170 \end{cases} \Rightarrow 170 + 2ab = 324 \Rightarrow$

$\Rightarrow ab = 77.$ Javobi: C.

4. $x^4 - 7a^2x^2 - 9a^4 = 0 \ (a \neq 0)$ tenglamaning haqiqiy ildizlari nechta?

A) $a\ ga\ bog'liq$ B) $ildizlari\ yo'q$ C) 1 ta

D) 2 ta E) 4 ta

Yechilishi: $x^4 - 7a^2x^2 - 9a^4 = 0 \ \ (a \neq 0).\ x^2 = y =>$

$=> y^2 - 7a^2y - 9a^4 = 0 => y_{1,2} = \frac{7a^2}{2} \pm$

$\pm\sqrt{\frac{49a^4}{4} + 9a^4} = \frac{7a^2}{2} \pm \frac{\sqrt{85}\cdot a^2}{2} = \frac{a^2}{2}\left(7 \pm \sqrt{85}\right) =>$

$$=> \begin{cases} x^2 = \frac{a^2}{2}\left(7 + \sqrt{85}\right) => \ x_{1,2} = \pm\sqrt{\frac{a^2}{2}\left(7 + \sqrt{85}\right)}; \\ x^2 \neq \frac{a^2}{2}\left(7 - \sqrt{85}\right) < 0. \end{cases}$$

Javobi: D.

5. Ikki sonning ko'paytmasi ularning yig'indisidan 29 ga ayirmasidan 41 ga ortiq. Shu ikki sondan birini toping.

A) 7 B) 8 C) 9 D) 10

E) $To'g'ri\ javob\ keltirilmagan$

Yechilishi: $\begin{matrix} x \cdot y = x + y + 29 \\ x \cdot y = x - y + 41 \end{matrix} => 0 = 2y - 12 \ =>$

$=> y = 6; x = 7.$ Javobi: A.

6. Ikki sonning ayirmasi $\sqrt{7}$ ga teng. Ko'paytmasi esa 4,5 ga teng. Shu ikki sonning yig'indisini toping.

A) ± 4 B) 5 C) ± 5 D) $\sqrt{11}$ E) $\pm\sqrt{15}$

Yechilishi: $\begin{cases} x - y = \sqrt{7} \\ x \cdot y = 4{,}5 \end{cases} => \begin{cases} y = x - \sqrt{7} \\ x^2 - \sqrt{7}x - 4{,}5 = 0 \end{cases} =>$

$$=> \begin{cases} x_1 = \frac{\sqrt{7}-5}{2} \\ x_2 = \frac{\sqrt{7}+5}{2} \end{cases};\ y_1 = \frac{\sqrt{7}-5}{2} - \sqrt{7} = -\frac{\sqrt{7}+5}{2};$$

$y_2 = \frac{\sqrt{7}+5}{2} - \sqrt{7} = -\frac{\sqrt{7}-5}{2}; x_1 + y_1 = \frac{\sqrt{7}-5}{2} - \frac{\sqrt{7}+5}{2} = -5;$

$x_2 + y_2 = \frac{\sqrt{7}+5}{2} - \frac{\sqrt{7}-5}{2} = 5.$ Javobi: C.

7. k parametrning qanday qiymatlarida $\begin{cases} kx - 3y = 6 \\ 2x - y = 2 \end{cases}$ tenglamalar sistemasi yechimga ega emas?

A) $bunday\ qiymatlari\ yo'q$ B) 2 C) 3 D) 6 E) 1

Yechilishi: $\frac{k}{2} = \frac{-3}{-1} => k = 6.$ Javobi: D.

8. n soni 10; 12 va m sonlarining o'rta arifmetigidan 1,5 marta ko'p. m ni n orqali ifodalang.

A) $2n - 22$ B) $\frac{2}{3}n - 22$ C) $4n - 22$

D) $\frac{3}{2}n - 12$ E) $ifodalab\ bo'lmaydi$

Yechilishi: $\frac{10+12+m}{3} \cdot 1{,}5 = n => m = 2n - 22.$

Javobi: A.

9. Suv bilan to'ldirlgan idishning og'rligi 7 kg, yarmigacha to'latilganda esa 3 kg 750 g. Idish to'ldirilgandagi suvning og'irligini (kg) aniqlang.

A) 5 B) 5,5 C) 6 D) 6,5 E) 5,75

Yechilishi: $-\begin{cases} i + c = 7000 \\ i + \frac{c}{2} = 3750 \end{cases} => \frac{c}{2} = 3250 => c = 6{,}5.$

Javobi: D.

10. Sexda tokarlar, slesarlar va frezerovshiklar ishlamoqda. Sexda ishlayotgan slesarlarning soni tokarlar soniga teng, frezerovshiklarning sonidan esa ikki marta ko'p. Sexda ishlayotgan barcha ishchilarning soni quyidagi sonlardan qaysi biriga teng bo'la olishi mumkin?

A) 32 B) 28 C) 25 D) 24 E) 42

Yechilishi: $2x + 2x + x = 5x = 25.\ x = 5.$

Javobi: C.

11. y minutda x (mm) yomg'ir yog'adi. 2,5 soatda necha mm yomg'ir yog'adi?

A) $\frac{x}{150y}$ B) $\frac{xy}{150}$ C) $\frac{150x}{y}$ D) $\frac{150y}{x}$ E) $\frac{150}{xy}$

Yechilishi: $\frac{1}{y}\cdot x;\ 2{,}5c = 2{,}5\cdot 60\,\text{min} = 150min => \frac{150x}{y}$.

Javobi: C.

12. A aralashmaning bir kilogrammi 1000 so'm, B aralashmaning bir kilogrammi esa 2000 so'm turadi. B va A aralashmadan 3:1 nisbatda tayyorlangan 1 kg aralashma necha so'm turadi?

A) 1500 B) 1750 C) 1650 D) 1800 E) 1850

Yechilishi: $3x + x = 1 => x = \frac{1}{4}$;

$\frac{1}{4}A + \frac{3}{4}B = \frac{1}{4}\cdot 1000 + \frac{3}{3}\cdot 2000 = 250 + 1500 = 1750.$

Javobi: B.

13. Ikki to'rt xonali sonning ayirmasi eng kami bilan nechaga teng bo'ladi?

A) -8999 B) -9000 C) -8998 D) -19998 E) -19999

Yechilishi: $-9999 - 9999 = -19998.$ Javobi: D.

14. a parametrning qanday qiymatida $3x + ay - 13 = 0$ va $2x - 3y + 5 = 0$ to'g'ri chiziqlarning kesishish nuqatasi birinchi koordinat choragining bissektrisasida yotadi?

A) 0,6 B) -0,8 C) 0,4 D) -0,6 E) -0,4

Yechilishi: $\begin{cases} 3x + ay - 13 = 0 \\ 2x - 3y + 5 = 0 \\ x = y \end{cases} =>$

$\begin{cases} 3x + ax - 13 = 0 \\ 2x - 3x + 5 = 0 \\ x = y \end{cases} =>$

$=> \begin{cases} a = -0{,}4 \\ x = 5 \\ y = 5 \end{cases}$ Javobi: E.

15. $\sqrt{(x-7)^2} + \sqrt[3]{(5-x)^3} = 8$ tenglamaning ildizi nechta?

A) $ildizi\ yo'q$ B) 1 C) 2 D) 3 E) $cheksiz\ ko'p$

Yechilishi: $\sqrt{(x-7)^2} + \sqrt[3]{(5-x)^3} = 8 \Rightarrow$

$\Rightarrow |x-7| + 5 - x = 8 \Rightarrow |x-7| = x + 3 \Rightarrow$

$\Rightarrow \begin{cases} x - 7 \neq x + 3 \\ -x + 7 = x + 3 \end{cases} \Rightarrow x = 2.$ Javobi: B.

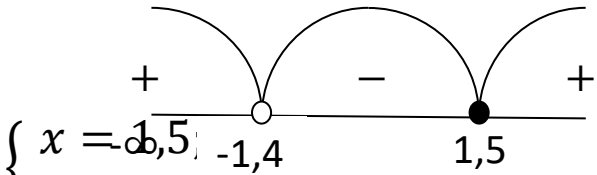
16. $\sqrt{\frac{2x-3}{5x+7}} \geq -2$ tengsizlikni yeching.

A) $(-\infty - 1{,}2] \cup [2{,}5; \infty)$ B) $(-\infty; -1{,}4] \cup [1{,}5; \infty)$

C) $[1{,}5; 4]$ D) $(-\infty; -1{,}4) \cup [1{,}5; \infty)$

E) $(-\infty; 1{,}4) \cup [2{,}5; \infty)$

Yechilishi: $\sqrt{\frac{2x-3}{5x+7}} \geq -2 \Rightarrow \begin{cases} 2x - 3 = 0 \\ 5x + 7 \neq 0 \end{cases} \Rightarrow$



$\begin{cases} x = 1{,}5 \\ x \neq -1{,}4. \end{cases}$

$(-\infty; -1{,}4) \cup [1{,}5; \infty).$

Javobi: D.

17. Agar $\sqrt[4]{x} - 4\sqrt[8]{x} = 5$ bo'lsa, $\frac{100}{\sqrt{x}}$ ning qiymatini toping.

A) 0,4 B) 0,24 C) 0,16 D) 0,25 E) 0,36

Yechilishi: $\sqrt[4]{x} - 4\sqrt[8]{x} = 5 \Rightarrow \sqrt[8]{x} = y \Rightarrow y^2 - 4y -$

$$-5 = 0 => \begin{cases} \sqrt[8]{x} \neq -1 \\ \sqrt[8]{x} = 5 \end{cases} => x = 5^8 => \frac{100}{\sqrt{5^8}} = 0{,}16.$$

Javobi: C.

18. $x^{-4} + y^{-4} = 162$ va $x^{-3} + y^{-3} = 0$ shartlarni qanoatlantiradigan (x;y) nuqtalar orasidagi kesmaning uzunligini aniqlang.

A) $\frac{3\sqrt{2}}{4}$ B) $\frac{2\sqrt{3}}{3}$ C) $\frac{3\sqrt{2}}{8}$ D) $\frac{2\sqrt{3}}{5}$ E) $\frac{2\sqrt{2}}{3}$

Yechilishi: $\begin{cases} x^{-4} + y^{-4} = 162 \\ x^{-3} + y^{-3} = 0 \end{cases} => \begin{cases} \frac{1}{x^4} + \frac{1}{y^4} = 162 \\ \frac{1}{x^3} + \frac{1}{y^3} = 0 \end{cases}$

$$x \neq 0; y \neq 0 => \begin{cases} x^4 + y^4 = 162x^4y^4 \\ x^3 + y^3 = 0 \end{cases} =>$$

$$=> \begin{cases} (-y)^4 + y^4 = 162(-y)^4y^4 \\ x^3 = -y^3 => x = -y \end{cases} => 162y^8 = 2y^4 =>$$

$$=> \begin{cases} y^4 \neq 0 \\ y^4 = \frac{1}{81} \end{cases} => y_{1,2} = \pm\frac{1}{3} => x_{1,2} = \pm\frac{1}{3};$$

$$A\left(-\frac{1}{3}; \frac{1}{3}\right); B\left(\frac{1}{3}; -\frac{1}{3}\right);$$

$$\left|\overrightarrow{AB}\right| = \sqrt{\left[\frac{1}{3} - \left(-\frac{1}{3}\right)\right]^2 + \left[-\frac{1}{3} - \frac{1}{3}\right]^2} = \sqrt{2 \cdot \frac{4}{9}} = \frac{2\sqrt{2}}{3}.$$

Javobi: E.

19. $\left(\cos\frac{5\pi}{3}\right)^{5x-3} = \sqrt{8}$ tenglamani yeching.

A) 0,2 B) 0,3 C) 0,4 D) 0,6 E) 0,8

Yechilishi: $\left(\cos\frac{5\pi}{3}\right)^{5x-3} = \sqrt{8} => \left(\frac{1}{2}\right)^{5x-3} = 2^{\frac{3}{2}} =>$

$$=> 2^{3-5x} = 2^{1,5} => 5x = 3 - 1{,}5 => x = \frac{1{,}5}{5} = 0{,}3.$$

Javobi: B.

20. Agar $f(x) = \ln x$ bo'lsa, $f'(x) \le x$, tengsizlikni yeching.

A) $[-1;0) \cup [1;\infty)$ B) $(-1;0) \cup [1;\infty)$

C) $(-\infty;-1] \cup [1;\infty)$ D) $[1;\infty)$ E) (0;1]

Yechilishi: $\begin{cases} f(x) = \ln x \\ x > 0 \end{cases} => \frac{1}{x} \le x => x^2 \ge 1 =>$

$=> |x| \ge 1 => \begin{cases} x \ge 1; \\ x \le -1. \end{cases}$ Javobi: D.

21. $(x+2) \cdot (x^2+10x+25) \cdot \sqrt{49-x^2} \ge 0$ tengsizlikni qanoatlantiruvchi barcha butun sonlarning yig'indisini toping.

A) 25 B) 13 C) 20 D) 28 E) 21

Yechilishi: $(x+2) \cdot (x^2+10x+25) \cdot \sqrt{49-x^2} \ge 0 =>$

$=> (x+2)(x+5)^2\sqrt{49-x^2} \ge 0 => \begin{cases} (x+5)^2 \ge 0; \\ 49-x^2 \ge 0; \\ x+2 \ge 0. \end{cases}$

$=> \begin{cases} x^2 \le 49 \\ x \ge -2 \end{cases} => \begin{cases} |x| \le 7 \\ x \ge -2 \end{cases} => \begin{cases} -7 \le x \le 7 \\ x \ge -2 \end{cases} =>$

$=> -2 \le x \le 7 => 3+4+5+6+7 = 25.$ Javobi: A.

22. $f(x) = \frac{\sqrt{9-x^2}}{5^{x-2}-1}$ funksiyaning aniqlanish sohasini toping.

A) (2;3] B) $[-3;2) \cup (2;3]$ C) $[-3;3]$

D) $[-3;2)$ E) $[-3;-2) \cup (-2;2) \cup (2;3]$

Yechilishi: $f(x) = \frac{\sqrt{9-x^2}}{5^{x-2}-1} => \begin{cases} 9-x^2 \ge 0 \\ 5^{x-2}-1 \ne 0 \end{cases} =>$

$=> \begin{cases} x^2 \le 9 \\ x \ne 2 \end{cases} => \begin{cases} -3 \le x \le 3; \\ x \ne 2. \end{cases}$ Javobi: B.

23. $y = 1 - 6\sin 2x + 8\cos 2x$ funksiyaning eng katta qiymatini toping.

A) 15 B) 14 C) 13 D) 12 E) 11

Yechilishi: $y = 1 - 6\sin 2x + 8\cos 2x =>$

$=> y' = -12\cos 2x - 16\sin 2x => -12\cos 2x =$

$= 16sin2x => tg2x = -\frac{3}{4} => 2x = -arctg\frac{3}{4} =>$

$y = 1 - 6\sin arctg\frac{3}{4} + 8\cos arctg\frac{3}{4} = 11.$

Javobi: E.

24. $\log_3(x-2)^2 \le 4$ tengsizlik nechta butun sonda o'rinli bo'ladi?

A) 9 B) 10 C) 19 D) 18 E) $cheksiz\ ko'p$

Yechilishi: $\log_3(x-2)^2 \le 4 => \log_3(x-2) \le 2 =>$

$=> \begin{cases} x-2>0 \\ x-2 \le 9 \end{cases} => \begin{cases} x>2 \\ x \le 11 \end{cases} => 3,4,\dots,11.$

Javobi: A.

25. $1 + \frac{\sin^4\alpha + \sin^2\alpha \cdot \cos^2\alpha}{\cos^2\alpha}$ ni soddalashtiring.

A) $\mathrm{tg}^2\alpha$ B) $1+\mathrm{tg}^2\alpha$ C) $\mathrm{ctg}^2\alpha$

D) $1+\mathrm{ctg}^2\alpha$ E) $\mathrm{tg}^2\alpha + \mathrm{ctg}^2\alpha$

Yechilishi: $1 + \frac{\sin^4\alpha + \sin^2\alpha \cdot \cos^2\alpha}{\cos^2\alpha} = 1 + \frac{\sin^2\alpha \cdot 1}{\cos^2\alpha} =$

$= 1 + \mathrm{tg}^2\alpha.$ Javobi: B.

26. $y = |x-1| + |x-3|$ funksiyaning eng kichik qiymatini toping.

A) 3 B) 4 C) 2 D) 1 E) 0

Yechilishi: $y = |x-1| + |x-3|;$

$Modul\ qatnashgan\ funksiya, o'zining\ eng\ kichik\ qiymatiga, modul\ ichidagi\ ifoda\ nolga\ teng\ bo'l - ganda\ erishadi.$

$\begin{cases} x-1=0 \\ x-3=0 \end{cases} => \begin{cases} y = |1-1| + |1-3| = 2; \\ y = |3-1| + |3-3| = 2. \end{cases}$ Javobi: C.

27. $y = \frac{8\sin x - 15\cos x + 3}{4}$ funksiyaning eng katta qiymatini toping.

A) 6,5 B) 7,5 C) 5 D) 6 E) 7

Yechilishi: $-\sqrt{a^2+b^2} \le a\cos x + b\sin x \le \sqrt{a^2+b^2}$

$formulaga\ asosan: \sqrt{8^2+(-15)^2} = 17;$

$y = \frac{8\sin x - 15\cos x + 3}{4} = \frac{17\left(\frac{8}{17}\sin x - \frac{15}{17}\cos x\right)+3}{4} = \frac{17\sin(x-\varphi)}{4};$

$-1 \le \sin(x-\varphi) \le 1. U\ holda\ y_{max} = \frac{17\cdot 1+3}{4} = 5.$

Javobi: C.

28. $\int_0^4 \frac{dx}{0{,}5x+1}$ ni hisoblang.

A) 2 B) ln 16 C) ln 9 D) ln 12 E) ln 18

Yechilishi: $\int_0^4 \frac{dx}{0{,}5x+1} = 2\int_0^4 \frac{d\left(\frac{1}{2}x+1\right)}{\frac{1}{2}x+1} =$

$= 2\cdot \ln\left(\frac{1}{2}x+1\right)|_0^4 = 2\left[\ln\left(\frac{1}{2}\cdot 4+1\right) - \ln\left(\frac{1}{2}\cdot 0 + \right.\right.$

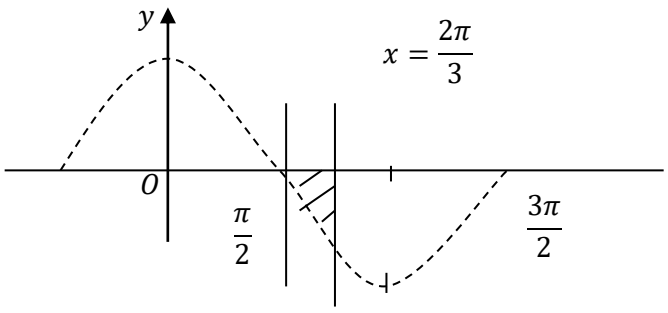
$\left.\left. +1\right)\right] = \ln 9.$ Javobi: C.

29. $y = |\cos x|; y = 0;\ x = \frac{\pi}{2}$ va $x = \frac{2\pi}{3}$ chiziqlar bilan chegaralangan sohaning yuzini toping.

A) 1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}-1}{2}$ D) $\frac{2-\sqrt{3}}{2}$ E) $\frac{2\sqrt{3}-3}{2}$

Yechilishi: $y = |\cos x|;$

$y = 0;\ x = \frac{\pi}{2};\ x = \frac{2\pi}{3}.$



$S = -\int_{90^\circ}^{120^\circ} \cos x\, dx$

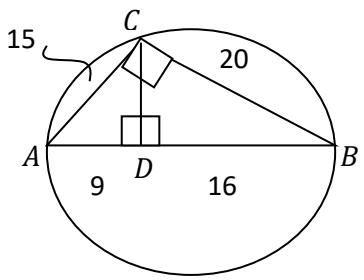
$= -\sin x\,|_{90^\circ}^{120^\circ} =$

$= -[\sin 120^\circ -$

$-\sin 90^\circ] = \frac{2-\sqrt{3}}{2}.$

Javobi: D

30. Uchburchakning tomonlaridan biri unga tashqi chizilgan aylananing



diametridan iborat. Uchburchakning eng kichik balandligi qarama-qarshi tomonni uzunliklari 9 va 16 ga teng kesmalarga ajratadi. Shu uchburchakning eng kichik tomoni uzunligini toping.

A) 20 B) 15 C) 10 D) 12 E) 18

Yechilishi:

1) $Misr\ uchburchagiga$
$asosan\ AC = 15.$

2) $CD^2 = 9 \cdot 16 => CD = 12;$

$AC^2 = 12^2 + 9^2 = 2{,}25; AC = 15.$

Javobi: B.

31. Parallelogrammning diagonali $8\sqrt{2}$ ga teng. Shu parallelogrammga ichki va tashqi aylanalar chizish mumkin bo'lsa, parallelogrammning yuzini toping.

A) $berilganlar\ yetarli\ emas$ B) 32 C) 64

D) 128 E) 2156

Yechilishi: $d = 8\sqrt{2} => a = 8.\ S = 64.$ Javobi: C.

32. $3x + 4y + 7 = 0$ va $3x + y - 5 = 0$ to'g'ri chiziqlarning kesishish nuqtasi koordinata boshidan qanday masofada joylashgan?

A) 5 B) 6 C) 8 D) $8\sqrt{2}$ E) 10

Yechilishi: $-\begin{matrix}3x + 4y + 7 = 0 \\ 3x + y - 5 = 0\end{matrix} => \begin{cases} x = 3 \\ y = -4 \end{cases} =>$

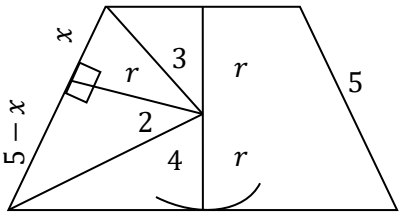
$=> A(3; -4);\ \left|\overrightarrow{OA}\right| = \sqrt{3^2 + (-4)^2} = 5.$ Javobi: A.

33. Teng yonli trapetsiyaga ichki chizilgan aylananing markazi ustki asosining uchidan 3 ga, pastki asosining uchidan 4

ga teng masofada joylashgan. Shu trapetsiyaga ichki chizlgan doiraning yuzini toping.

A) $2{,}56\pi$ B) $4{,}84\pi$ C) $3{,}24\pi$ D) $6{,}76\pi$ E) $5{,}76\pi$

Yechilishi:



$Misr\ uchurchagiga\ asosan,$

$yon\ tomon\ 5\ ga\ teng.$

$\begin{cases} r^2 = 3^2 - x^2 \\ r^2 = 4^2 - (5-x)^2 \end{cases} => 9 - x^2 = 16 - (5-x)^2 =>$

$=> x = 1{,}8 => r^2 = 9 - 1{,}8^2 = 5{,}76 => r = 2{,}4;$

$S = \pi r^2 = 5{,}76\pi.$ Javobi: E.

34. Diagonali 10 ga, o'tkir burchagi 45° ga teng bo'lgan parallelogrammning yuzi nimaga teng?

A) $berilganlar\ yetarli\ emas$ B) 50 C) $25\sqrt{2}$

D) $50\sqrt{2}$ E) 40

Yechilishi: $Masala\ shartida\ berilgan\ ma'lumotlar\ yetarli\ emas.$

Javobi: A.

35. ABCD kvadratning tashqarisida muntazam AFB uchburchak yasalgan. Agar kvadratning tomoni $\sqrt{6}$ ga teng bo'lsa, FC kesmaning uzunligini toping.

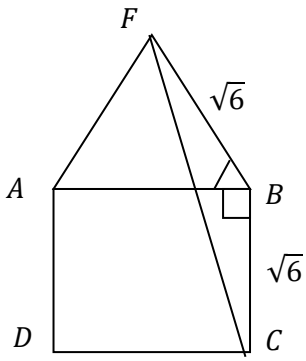
A) $2\sqrt{6}$ B) $3\sqrt{3}$ C) $6\sqrt{2}$ D) $3\sqrt{2}$ E) $3+\sqrt{3}$

Yechilishi: $FC^2 = \left(\sqrt{6}\right)^2 + \left(\sqrt{6}\right)^2 - 2\sqrt{6}\cdot\sqrt{6}\cos 150° =$

$= 6 + 6 - 12\cdot\left(-\frac{\sqrt{3}}{2}\right) = 12 + 6\sqrt{3} =>$

$=> FC = \sqrt{12 + 6\sqrt{3}} =$

$= \sqrt{12 + \sqrt{108}} = \sqrt{\frac{12+\sqrt{144-108}}{2}} +$



$+\sqrt{\frac{12-\sqrt{144-108}}{2}} = 3+\sqrt{3}.$

Javobi: E.

36. Tomonining uzunligi 1 ga teng muntazam sakkizburchakka ichki chizilgan doiraning yuzini toping.

A) $\pi\frac{2\sqrt{3}+1}{4}$ B) $\pi\frac{3+2\sqrt{2}}{4}$ C) $\pi\frac{6+4\sqrt{2}}{9}$

D) $\pi\frac{3+2\sqrt{2}}{16}$ E) $\pi\frac{2+3\sqrt{3}}{2}$

Yechilishi: $8\alpha = 180(8-2) => 8\alpha = 1080 =>$

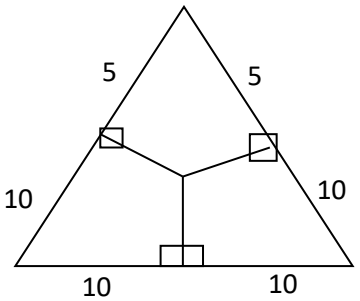
$=> \alpha = 135°;\quad r = \frac{1}{2tg\frac{180}{8}} = \frac{1}{2tg\ 22{,}5°} = \frac{1}{2\cdot\frac{\sqrt{2}}{2+\sqrt{2}}} =$

$= \frac{2+\sqrt{2}}{2\sqrt{2}};\ S = \pi r^2 = \pi\cdot\frac{3+2\sqrt{2}}{4}.$ Javobi: B.

37. ABC uchburchakka (AB=BC=15) ichki chizilgan aylana uning yon tomonlariga B uchidan boshlab hisoblaganda 5 ga teng masofada urinadi. Uchburchakning yuzini toping.

A) $50\sqrt{2}$ B) $25\sqrt{2}$ C) $50\sqrt{5}$

D) $20\sqrt{5}$ E) $50\sqrt{3}$



Yechilishi:

$h^2 = 15^2 - 10^2 =>$

$=>\ h = 5\sqrt{5};\ S_{\triangle} = \frac{1}{2}\cdot 20\cdot 5\sqrt{5} =$

$= 50\sqrt{5}.$ Javobi: C.

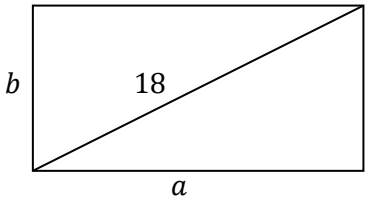
38. Diagonali 18 ga teng bo'lgan to'g'ri to'rtburchakning yuzi eng ko'pi bilan nechaga teng bo'lishi mumkin?

A) $aniqlab\ bo'lmaydi$ B) 180 C) 162

D) 174 E) 167

Yechilishi: $a^2 + b^2 = 18^2 =>$

$=> a^2 = 324 - b^2 =>$



$=> a = \sqrt{324 - b^2}$; $S = a \cdot b = \sqrt{324 - b^2} \cdot b = \sqrt{324b^2 - b^4}$;

$S' = \frac{b(648-4b^2)}{2b\sqrt{324-b^2}} => 4b^2 = 648 =>$

$=> b = 9\sqrt{2} =>$ $a = \sqrt{324 - 162} = \sqrt{162} =$

$= \sqrt{81 \cdot 2} = 9\sqrt{2}$; $S = \left(9\sqrt{2}\right)^2 = 162.$ Javobi: C.

39. Uchlari M(-3;3;1); N(3;-5;1) va E(-4;-1;-2) nuqtalarda bo'lgan uchburchakning MN tomoni va EF medianasi orasidagi burchakni toping.

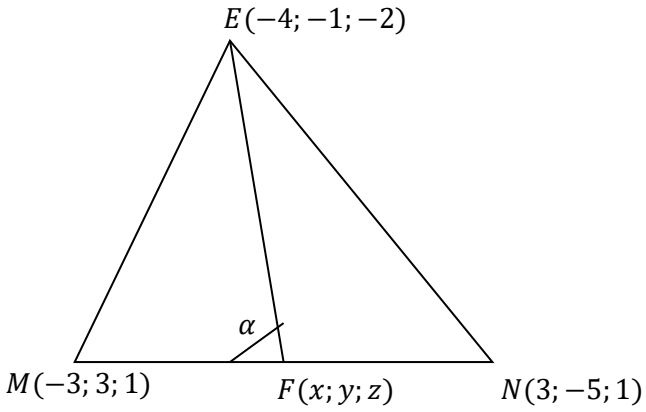
A) 45° B) arccos 0,64 C) 60°

D) arccos 0,48 E) arccos 0,75

Yechilishi:

$$\begin{cases} x = \frac{3 + (-3)}{2} = 0 \\ y = -1 \\ z = 1 \end{cases} =>$$

$=> F(0; -1; 1).$



$\overrightarrow{FE} = \{-4; 0; -3\} => \left|\overrightarrow{FE}\right| = 5;$

$\overrightarrow{FM} = \{-3; -4; 0\} => \left|\overrightarrow{FM}\right| = 5;$

$\text{Cos}\,\alpha = \frac{-4\cdot(-3)+0\cdot4-3\cdot0}{5\cdot5} = \frac{12}{25} = -0{,}48 =>$

$=> \alpha = \arccos 0{,}48.$ Javobi: D.

40. Muntazam piramidaning yon sirti to'la sirtining 80% ini tashkil etadi. Piramidaning yon yoqlari va asos tekisligi orasidagi burchakni toping.

A) 60° B) $\arccos\frac{1}{4}$ C) $\arccos\frac{1}{5}$ D) $\arccos\frac{2}{3}$ E) 45°

Yechilishi: $S_{yon} = 0{,}8S_T \Rightarrow$

$\Rightarrow S_{yon} = 0{,}8(S_{yon} + S_{asos}) \Rightarrow$

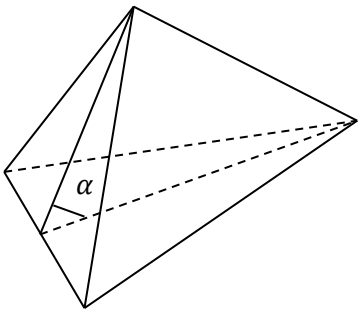
$\Rightarrow 0{,}8S_{asos} = S_{yon} - 0{,}8S_{yon} \Rightarrow$

$\Rightarrow 0{,}8S_{asos} = 0{,}2S_{yon} \Rightarrow$

$\Rightarrow S_{asos} = \frac{1}{4}S_{yon}; \Rightarrow$

$\Rightarrow \frac{1}{4}S_{yon} = S_{yon} \cdot \cos\alpha \Rightarrow$

$\Rightarrow \alpha = arc\cos\frac{1}{4}$. Javobi: B.



41. To'g'ri burchakli parallelepipedning bir uchidan chiquvchi uchta qirralarining o'rtalari orqali o'tkazilgan tekislik undan hajmi 6 ga teng bo'lgan piramida kesib ajratadi. Parallelepipedning hajmini toping.

A) 120 B) 144 C) 180

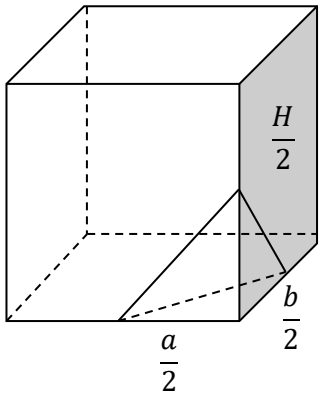
D) 288 E) 276

Yechilishi: $S_\Delta = \frac{1}{2} \cdot \frac{a}{2} \cdot \frac{b}{2} = \frac{1}{8}a \cdot b;$

$V = \frac{1}{3} \cdot S_{asos} \cdot \frac{H}{2} \Rightarrow 6 = \frac{1}{3} \cdot \frac{1}{8}ab \cdot \frac{H}{2} \Rightarrow$

$\Rightarrow abH = 6 \cdot 24 \cdot 2;\ V = ab \cdot H =$

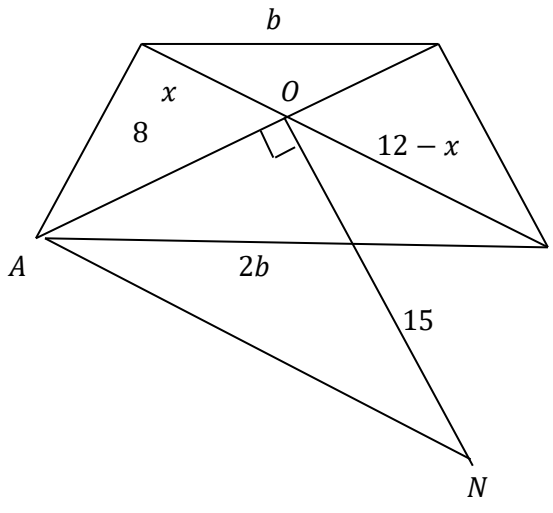
$= 144 \cdot 2 = 288.$ Javobi: D.



42. Teng yonli trapetsiya diagonallarining kesishgan nuqtasi O dan uzunligi 15 ga teng ON perpendikulyar tushirildi. Trapetsiyaning dagonali 12 ga teng va kichik asosi katta asosidan ikki marta qisqa. N nuqta trapetsiya katta asosining uchidan qanday masofada joylashgan?

A) 17 B) 18 C) 20

D) 21 E) 24



Yechilishi: $\frac{2b}{b} = \frac{12-x}{x} \Rightarrow$

$\Rightarrow 2x = 12 - x \Rightarrow$

$\Rightarrow x = 4.\ \ OA = 8.$

$AN^2 = ON^2 + OA^2 =$

$= 15^2 + 8^2 = 289 \Rightarrow$

$\Rightarrow AN = 17.$

Javobi: A.

43. Muntazam uchburchakning yuzi $9\sqrt{3}$ ga teng. Shu uchburchakdan eng katta yuzaga ega bo'lgan kvadrat qirqib olingan. Shu kvadratning perimetrini toping.

A) $18\sqrt{3} - 12$ B) $24 - 12\sqrt{3}$ C) $64\sqrt{3} - 96$

D) $54 - 16\sqrt{3}$ E) $48\sqrt{3} - 72$

Yechilishi:

1) $9\sqrt{3} = \frac{a_1^2\sqrt{3}}{4} \Rightarrow\ a_1 = 6;$

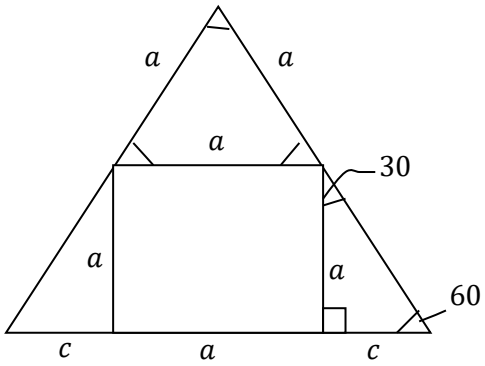
2) $a + 2c = 6\ \ \frac{a}{c} = tg60° \Rightarrow$

$\Rightarrow a = c \cdot \sqrt{3} \Rightarrow c = \frac{a}{\sqrt{3}} \Rightarrow$

$\Rightarrow a + 2 \cdot \frac{a}{\sqrt{3}} = 6 \Rightarrow$

$\Rightarrow a = \frac{6\sqrt{3}}{2+\sqrt{3}} \Rightarrow 4a = \frac{24\sqrt{3}}{2+\sqrt{3}} =$

$= \frac{24\sqrt{3}(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})} = 48\sqrt{3} - 72.$

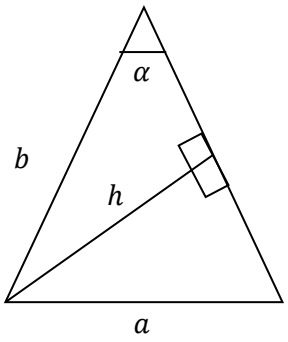


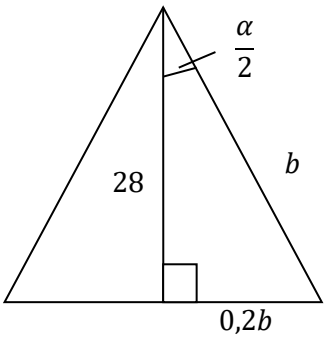
Javobi: E.

44. Teng yonli uchburchak asosining uzunligi yon tomoni uzunligining 40% iga teng. Asosga tushirilgan balandligi 28 ga teng. Shu uchburchakning yon tomoniga tushirilgan balandligini toping.

A) 13,8 B) 15,4 C) 11,2 D) 10,6 E) 12,2

Yechilishi:





$a = 0{,}4b; \quad b^2 = 784 + 0{,}04b^2 \Rightarrow 0{,}96b^2 = 784;$

$b = \sqrt{\frac{2450}{3}}; \quad \frac{0{,}2b}{b} = \sin\frac{\alpha}{2} \Rightarrow \frac{1}{2}(1 - \cos\alpha) = 0{,}2^2 \Rightarrow$

$\Rightarrow \cos\alpha = 0{,}92 \Rightarrow \cos\alpha = \frac{23}{25} \Rightarrow \alpha = arc\cos\frac{23}{25};$

$\frac{h}{b} = \sin\alpha \Rightarrow h = b \cdot \sin\alpha = \sqrt{\frac{2450}{3}} \cdot \sin arc\cos\frac{23}{25} =$

$= \sqrt{\frac{2450}{3}} \cdot \sqrt{1 - \left(\frac{23}{25}\right)^2} = \sqrt{\frac{2450}{3} \cdot \frac{96}{625}} = 11{,}2.$

Javobi: C.

45. Teng yonli uchburchakning uchidan asosiga tushirilgan balandligi 26 ga teng. Asosining uzunligi yon tomoni uzunligining 60% iga teng. Shu uchburchak bissektrisalarining kesishgan nuqtasi uning uchidan qanday masofada joylashgan?

A) 15,6 B) 20 C) 18 D) 16,4 E) 17,6

Yechilishi:

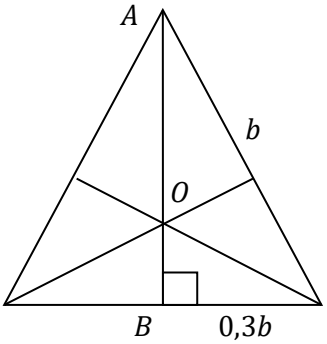
$AO : OB = \frac{b+b}{0{,}6b} \Rightarrow \frac{2b}{0{,}6b} = \frac{20}{6} = \frac{10}{3};$

$OB = \frac{3 \cdot AO}{10}; \quad AO + OB = 26 \Rightarrow$

$\Rightarrow OB = 26 - OA;$

$\frac{3 \cdot AO}{10} = 26 - OA \Rightarrow 3 \cdot AO = 26 \cdot 10 -$

$-10 \cdot AO \quad 13 \cdot AO = 26 \cdot 10 \Rightarrow$



$\Rightarrow AO = 20.$ Javobi: B.

46. Mehnat unumdorligi bir xil bo'lgan 9 kishi ma'lum hajmdagi ishni 15 kunda tugatishdi. 12 kishi o'shancha mehnat unumdorligi bilan ishlasa, o'sha hajmdagi ishni necha kunda tugatishi mumkin?

A) 20 B) $18\frac{1}{2}$ C) $14\frac{1}{4}$ D) $13\frac{3}{4}$ E) $11\frac{1}{4}$

Yechilishi: $9 \cdot 15 = 12 \cdot x \Rightarrow x = 11\frac{1}{4}$. Javobi: E.

47. Natural sonlardan iborat ketma-ketlikning ikkkinchi hadidan boshlab har bir hadi o'zidan oldingi handing kvadratidan 5 ning ayrilganiga teng. Agar shu ketma-ketlikning uchinchi hadi 116 ga teng bo'lsa, uning birinchi hadi nechaga teng?

A) 3 B) 4 C) 5 D) 7 E) 8

Yechilishi: $a_1,\ a_1^2 - 5,\ (a_1^2 - 5)^2 - 5 = 116 \Rightarrow$

$a_1^4 - 10a_1^2 + 25 - 5 = 116 \Rightarrow a_1^4 - 10a_1^2 - 96 = 0 \Rightarrow$

$\Rightarrow a_1^2 = y \Rightarrow y^2 - 10y - 96 = 0 \Rightarrow \begin{cases} y_1 = 16 \\ y_2 = -6 \end{cases} \Rightarrow$

$\Rightarrow\ a_1^2 = 16\ \Rightarrow a_1 = 4.$ Javobi: B.

48. 720 ning 50% i 24 ning 500% idan necha foiz ko'p?

A) 100 B) 200 C) 300 D) 320 E) 400

Yechilishi: $\begin{matrix} 720 \cdot 0{,}5 = 360 \\ 24 \cdot 5 = 120 \end{matrix} \Rightarrow \begin{matrix} 360 - x\% \\ 120 - 100\% \end{matrix}$ $x = \frac{360 \cdot 100}{120} = 300\% \Rightarrow 300 - 100 = 200.$ Javobi: B.

49. Mahsulotning bahosi 30% ga oshirildi. Ma'lumvaqtdan keyin 20% ga arzonlashtirildi, shundan so'ng uning narxi 7800 so'm bo'ldi. Mahsulotning dastlabki bahosi necha so'm bo'lgan?

A) 6500 B) 6820 C) 7500 D) 9300 E) 8400

Yechilishi: $(1{,}3 \cdot a) \cdot 0{,}8 = 7800 \Rightarrow a = 7500.$

Javobi: C.

50. A soning 25% i B sonining 15%iga teng bo'lsa, A soni B sonining necha fozini tashkil etadi?

A) 8,75 B) 87,5 C) 60 D) 40 E) 18,75

Yechilishi: $0{,}25 \cdot A = 0{,}15 \cdot B \Rightarrow A = \frac{0{,}15 \cdot B}{0{,}25} = \frac{3}{5}B;$

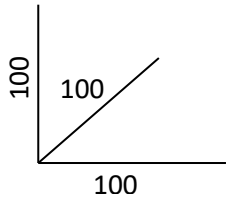
$$\begin{matrix} B - 100\% \\ A - x\% \end{matrix} \Rightarrow Bx = 100 \cdot \frac{3}{5}B \Rightarrow x = 60\%.$$

Javobi: C.

51. Qirrasi 1m bo'lgan kub qirrasi 1sm bo'lgan kvadratga ajratildi va ular har bir qatorga yig'ildi. Hosil bo'lgan qatorning uzunligini toping.

A) $10m$ B) $100sm$ C) $10km$ D) $500m$ E) $1km$

Yechilishi:



$100^3 = 1000000 = 10km.$ Javobi: C.

52. Oltita o'quvchining o'rtacha bo'yi 120 sm, shulardan bir o'quvchining bo'yi 105 sm. Qolgan besh o'quvchining o'rtacha bo'yi qanchaga teng?

A) 122 B) 123 C) 121 D) 124 E) 125

Yechilishi: $\frac{a_1+a_2+\cdots+a_6}{6} = 120 \Rightarrow$

$a_1 + a_2 + \cdots + a_6 = 120 \cdot 6 \Rightarrow a_2 + \cdots + a_6 = 120 \cdot$

$\cdot 6 - 105 \Rightarrow a_2 + \cdots + a_6 = 615 \Rightarrow \frac{a_2+\cdots+a_6}{5} = 123.$

Javobi: B.

53. Ko'p qavatli uyda yashovchi aholining $\frac{1}{6}$ qismi shaxmat o'ynashni, $\frac{1}{4}$ qismi esa narda o'ynashni biladi. Shu uyda yashovchi aholining $\frac{2}{3}$ qismi hech qanday o'yin o'ynashni

bilmaydi. Aholining qanday qismi ham shaxmat, ham narda o'ynashni biladi?

A) $\frac{1}{12}$ B) $\frac{1}{6}$ C) $\frac{2}{5}$

D) $\frac{1}{12}\ dan\ \frac{1}{6}\ qismigacha$ E) $\frac{1}{6} dan\ \frac{1}{4}\ qismigacha$

Yechilishi:

$Tilga\ oid\ formuladan\ foydalanish\ mumkin.$

$x - jami\ aholi\ soni;$

$y - ikkala\ o'yinni\ biladiganlar\ soni;\ U\ holda$

$x = \frac{1}{6}x + \frac{1}{4}x + \frac{2}{3}x - y => y = \frac{13}{12}x - x = \frac{1}{12}x.$

Javobi: A.

54. 30 ta turistdan 20 tasi ingliz tilini, 15 tasi fransuz tilini bilishadi. Shu turistlardan nechtasi ikkala tilni ham biladi?

A) 5 B) 10 C) 15

D) 5 $tadan$ 10 $tagacha$ E) 5 $tadan$ 15 $tagacha$

Yechilishi: $Tilga\ oid\ formulaga\ asosan$:

$30 = 20 + 15 - x => x = 35 - 30 = 5.$ Javobi: A.

55. $e^x + 7e^{-x} = 8$ tenglamaning ildizlari yig'indisini toping.

A) 8 B) $\ln 7e$ C) $\ln 7$ D) $\ln 8$ E) $\ln 56$

Yechilishi: $e^x + 7e^{-x} = 8 => (e^x)^2 - 8e^x + 7 = 0 =>$

$=> e^x = y => y^2 - 8y + 7 = 0 => \begin{cases} y_1 = 1 \\ y_2 = 7 \end{cases} =>$

$=> \begin{cases} e^x = 1 \\ e^x = 7 \end{cases} => \begin{cases} x \ln e = \ln 1 \\ x \ln e = \ln 7 \end{cases} => \begin{cases} x_1 = 0; \\ x_2 = \ln 7\,. \end{cases}$

Javobi: C.

56. $x^2 7^x + 1 > 7^x + x$ tengsizlikni yeching.

A) $(1;\infty)$ B) $(-1;0)$ C) $(-1;1)$

D) $(-\infty;0) \cup (1;\infty)$ E) $(-1;1) \cup (1;\infty)$

Yechilishi:

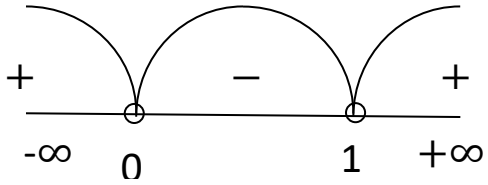
$x^2 \cdot 7^x + 1 > 7^x + x \quad x^2 \cdot 7^x - 7^x - x + 1 > 0 =>$

$=> 7^x(x^2 - 1) - (x - 1) > 0 =>$

$7^x(x-1)(x+1) - (x-1) > 0 =>$

$=> (x-1)[7^x(x+$

$+1) - 1] > 0 =>$



$$=> \begin{cases} x - 1 = 0 \\ 7^x(x+1) = 1 \end{cases} =>$$

$$=> \begin{cases} x - 1 = 0 \\ 7^x = 1 \\ x + 1 = 1 \end{cases} => x = 1; x = 0. \ (-\infty; 0) \cup (1; \infty).$$

Javobi: D.

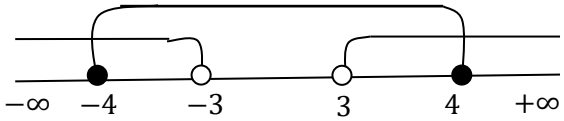
57. $e^{\ln(3x^2-27)} \leq 21$ tengsizlik nechta butun sonda o'rinli bo'ladi?

A) 8 B) 9 C) 6 D) 4 E) 2

Yechilishi: $e^{\ln(3x^2-27)} \leq 21 => \begin{cases} 3x^2 - 27 > 0 \\ 3x^2 - 27 \leq 21 \end{cases} => =$

$$> \begin{cases} 3x^2 > 27 \\ 3x^2 \leq 48 \end{cases} => \begin{cases} x^2 > 9 \\ x^2 \leq 16 \end{cases} => \begin{cases} |x| > 3 \\ |x| \leq 4 \end{cases} =>$$

$$\begin{cases} x > 3; \\ x < -3; \\ -4 \leq x \leq 4. \end{cases} =>$$



$[-4; -3) \cup (3; 4] =>$

$=> x = -4; 4.$

Javobi: E.

58. $5^{\sqrt{\log_5 a}} - a^{\sqrt{\log_a 5}} (a > 1)$ ni soddalashtiring.

A) a B) a^2 C) $5a$ D) 1 E) 0

Yechilishi: *Har bir had alohida – alohida a asosga ko'ra logarifmlanadi*: $x = 5^{\sqrt{\log_5 a}} =>$

$\log_a x = \sqrt{\log_5 a} \cdot \log_a 5 = \sqrt{\log_5 a \cdot \log_a 5 \cdot \log_a 5} =$

$$= \sqrt{\log_5 a \cdot \frac{1}{\log_5 a} \cdot \log_a 5} = \sqrt{\log_a 5} => x = a^{\sqrt{\log_a 5}};$$

$y = a^{\sqrt{\log_a 5}} => \log_a y = \sqrt{\log_a 5} \cdot \log_a a =$

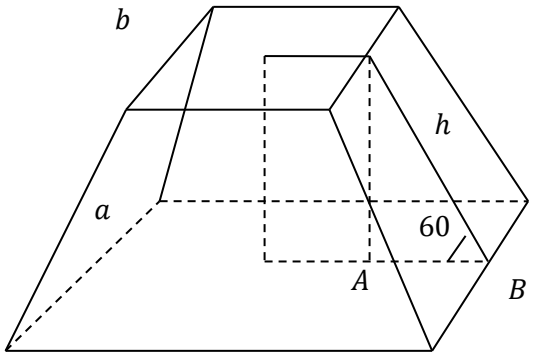
$=> \sqrt{\log_a 5} => y = a^{\sqrt{\log_a 5}}. Demak,$

$5^{\sqrt{\log_5 a}} - a^{\sqrt{\log_a 5}} = 0.$ Javobi: E.

59. Muntazam kesik piramida ustki asosining yuzi ostki asosining yuzidan uch marta kam. Piramidaning barcha yon yoqlari ostki asosiga 60° burchak ostida og'ishgan. Piramida ostki asosining yuzi piramida yon sirtining necha foizini tashkil etadi?

A) 60 B) 50 C) 40

D) 80 E) 75



Yechilishi: $S_1 = b^2; S_2 = 3S_1;$

$S_2 = a^2 => a^2 = 3b^2 =>$

$=> a = \sqrt{3} \cdot b;$

$AB = \frac{a}{2} - \frac{b}{2} = \frac{a-b}{2};$

$\frac{a-b}{2} : h = \cos 60° =>$

$=> h = a - b;$

$S_{yon} = \frac{4(a+b)}{2} \cdot h = 2(a+b)(a-b) =>$

$=> S_{yon} = 2(a^2 - b^2);\ S_{yon} = 2[3b^2 - b^2] = 4b^2;$

$4b^2 - 100\%$
$3b^2 - \quad x\%$ $=> x = 75\%.$ Javobi: E.

60. $\sin^3 x + \cos^2 x + \sin^2 x = 2$ tenglama $[-2\pi; 2\pi]$ kesmada nechta ildizga ega?

A) $ildizi\ yo'q$ B) 1 ta C) 2 ta D) 3 ta E) 4 ta

Yechilishi: $\sin^3 x + \cos^2 x + \sin^2 x = 2 =>$

$\Rightarrow \sin^3 x = 1 \Rightarrow \sin x = 1 \Rightarrow x = \frac{\pi}{2} + 2\pi k; k \in Z.$

$k = 0 \Rightarrow x = \frac{\pi}{2}$. Javobi: B.

61. a parametrning qanday qiymatlarida $\sin^6 x + \cos^6 x = a$ tenglama yechimga ega?

A) $[0; 1]$ B) $[0{,}5; 1]$ C) $[0{,}25; 0{,}5]$

D) $[0{,}25; 1]$ E) $[0{,}25; 0{,}75]$

Yechilishi: $\sin^6 x + \cos^6 x = a \Rightarrow 1 - \frac{3}{4}\sin^2 2x = a \Rightarrow$

$\Rightarrow -a + 1 = \frac{3}{4}\sin^2 2x \Rightarrow \sin^2 2x = \frac{-4a+4}{3} \Rightarrow$

$\Rightarrow 0 \le \sin^2 2x \le 1 \Rightarrow 0 \le \frac{-4a+4}{3} \le 1 \Rightarrow$

$\Rightarrow 0 \le -4a + 4 \le 3 \Rightarrow -4 \le -4a \le -1 \Rightarrow$

$\Rightarrow 1 \ge a \ge 0{,}25;$ $[0{,}25;\ 1]$. Javobi: D.

62. $(-2x^2 + 5x - 7) \cdot (3\,\mathrm{tg}^2 x - 1) \ge 0$ tengsizlikni yeching.

A) $yechimga\ ega\ emas$

B) $\left[-\frac{\pi}{6} + \pi n; \frac{\pi}{2} + \pi n\right), n \in Z$

C) $\left(-\frac{\pi}{2} + \pi n; \frac{\pi}{6} + \pi n\right], n \in Z$

D) $\left[-\frac{\pi}{6} + \pi n; \frac{\pi}{6} + \pi n\right], n \in Z$ E) $(-\infty; \infty)$

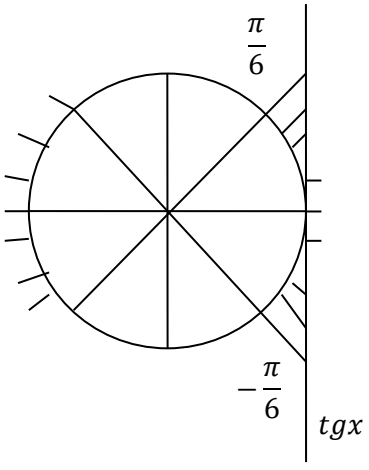
Yechilishi: $(-2x^2 + 5x - 7) \cdot (3tg^2x - 1) \ge 0$

$(2x^2 - 5x + 7) \cdot (3tg^2x - 1) \le 0 \Rightarrow$

$$\Rightarrow \begin{cases} D < 0 \\ 2x^2 - 5x + 7 > 0 \\ tg^2 x \le \frac{1}{3} \end{cases} \Rightarrow$$

$\Rightarrow |tgx| \le \frac{\sqrt{3}}{3} \Rightarrow$

$\Rightarrow -\frac{\sqrt{3}}{3} \le tgx \le \frac{\sqrt{3}}{3} \Rightarrow$



$=> \left[-\frac{\pi}{6}+\pi n;\ \frac{\pi}{6}+\pi n\right] \quad n \in Z.$

Javobi: D.

63. 10; 15; 20; …arifmetik progressiyaning dastlabki nechta hadining yig'indisi 2475 ga teng bo'ladi?

A) 40 B) 25 C) 30 D) 35 E) 33

Yechilishi: $2475 = \frac{10+[10+5(n-1)]}{2} \cdot n =>$

$2475 \cdot 2 = (20 + 5 \cdot n - 5)n => 2475 \cdot 2 =$

$= 15 \cdot n + 5n^2 => 495 \cdot 2 = n^2 + 3n => n^2 + 3n -$

$-990 = 0 => n = 30.$ Javobi: C.

64. Dastlabki n ta hadining yig'indisi $S_n = 2n^2 - 3n$ formula bo'yicha hisoblanadigan arifmetik progressiyaning ayirmasini toping.

A) 5 B) -3 C) 3 D) 2 E) 4

Yechilishi: $a_2 = S_2 - S_1 = 2 - (-1) = 3;$

$a_3 = S_3 - S_2 = 9 - 2 = 7;$ Javobi: E.

$d = a_3 - a_2 = 4.$

65. Cheksiz kamayuvchi geometrik progressiyaning hadlari yig'indisi 1,6 ga, ikkinchi hadi -0,5 ga teng. Shu progressiyaning uchinchi hadini toping.

A) $\frac{1}{8}$ B) $-\frac{1}{4}$ C) $-\frac{1}{8}$ D) $\frac{5}{8}$ E) $\frac{1}{4}$

Yechilishi: $S = 1{,}6;\ |q| < 1;\ b_2 = b_1 \cdot q =>$

$-0{,}5 = b_1 \cdot q =>\ b_1 = -\frac{0{,}5}{q};\ 1{,}6 = \frac{-0{,}5}{q} : (1-q);$

$1{,}6 \cdot q(1-q) = -0{,}5 => 1{,}6q^2 - 1{,}6q - 0{,}5 = 0 =>$

$\begin{cases} q_1 = \frac{5}{4} > 1; \\ q_2 = -\frac{1}{4}. \end{cases}$ $b_3 = b_2 \cdot q =>\ b_3 = (-0{,}5) \cdot \left(-\frac{1}{4}\right) = \frac{1}{8}.$

Javobi: A.

66. O'suvchi geometrik progressiyaning birinchi hadi 3 ga, yettinchi va to'rtinchi hadlarining ayirmasi 168 ga teng. Shu progressiyaning maxrajini toping.

A) 3 B) $\frac{3}{2}$ C) $\sqrt{7}$ D) $2\sqrt{2}$ E) 2

Yechilishi: $b_1 = 3; b_7 - b_4 = 168 \Rightarrow$

$b_1q^6 - b_1q^3 = 168 \Rightarrow q^6 - q^3 - 56 = 0;\ q^3 = y \Rightarrow$

$\Rightarrow y^2 - y - 56 = 0 \Rightarrow \begin{cases} y_1 = 7 \\ y_2 = 8 \end{cases} \Rightarrow q^3 = 8 \Rightarrow q = 2.$

Javobi: E.

67. $x^2 = |5x - 6|$ tenglamaning nechta ildizi bor?

A) 0 B) 1 C) 2 D) 3 E) 4

Yechilishi: $x^2 = |5x - 6| \Rightarrow \begin{cases} x^2 + 5x - 6 = 0 \\ x^2 - 5x + 6 = 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x_1 = -6; \\ x_2 = 1; \\ x_3 = 2; \\ x_4 = 3. \end{cases}$ Javobi: E.

68. m ning $(m-2)x^2 - 2mx + 2m - 3 = 0$ tenglama bitta ildizga ega bo'ladigan qiymatlarining o'rta arifmetigini toping.

A) 4 B) 5 C) 4,5 D) 3,5 E) 3

Yechilishi: $(m-2)x^2 - 2mx + 2m - 3 = 0 \Rightarrow$

$\Rightarrow D = 0 \Rightarrow (-2m)^2 - 4(m-2)(2m-3) = 0 \Rightarrow$

$\Rightarrow m^2 - 7m + 6 = 0 \Rightarrow\ m_1 = 1;\ \ m_2 = 6 \Rightarrow 3{,}5.$

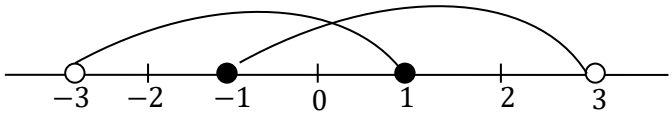
Javobi: D.

69. $x^2 - 2|x| < 3$ tengsizlikning butun sonlardan iborat yechimlari nechta?

A) 7 B) 6 C) 5 D) 4 E) 3

Yechilishi: $x^2 - 2|x| < 3 \Rightarrow \begin{cases} x^2 - 2x - 3 < 0 \\ x^2 + 2x - 3 < 0 \end{cases} \Rightarrow$

$$=> \begin{cases} x_1 = -1; \\ x_2 = 3; \\ x_3 = -3; \\ x_4 = 1. \end{cases}$$



$$x = -2;\ -1; 0; 1; 2.$$

Javobi: C.

70. Agar $f(x) = x^4 - 2x^2 + 1$ bo'lsa, $f(1+a) - f(1-a)$ nimaga teng?

A) $8a^3$ B) $4a^2 + 2a$ C) $a^3 + 8$

D) $a^4 + 4a^3$ E) 4

Yechilishi: $f(x) = x^4 - 2x^2 + 1 = (x^2 - 1)^2$;

$f(1+a) = [(1+a)^2 - 1]^2 = (1 + 2a + a^2 - 1)^2 =$

$= (a^2 + 2a)^2 = a^4 + 4a^3 + 4a^2$;

$f(1-a) = [(1-a)^2 - 1]^2 = (1 - 2a + a^2 - 1)^2 =$

$= (a^2 - 2a)^2 = a^4 - 4a^3 + 4a^2$; $f(1+a) -$

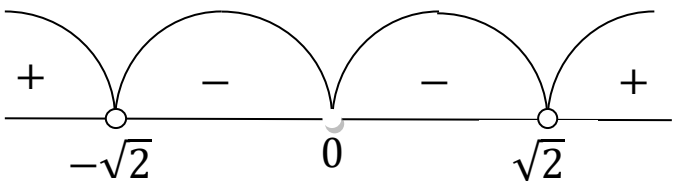
$-f(1-a) = 8a^3$. Javobi: A.

71. $f(x) = 0{,}6x^5 - 2x^3 - 1$ funksiyaning maksimum nuqtasini toping.

A) 0 B) 1 C) $\sqrt{2}$ D) $-\sqrt{2}$ E) -1

Yechilishi: $f(x) = 0{,}6 \cdot x^5 - 2x^3 - 1$;

$$f'(x) = 3x^4 - 6x^2 => x^2(3x^2 - 6) = 0 => \begin{cases} x = 0; \\ x = \pm\sqrt{2}. \end{cases}$$



Hosila $x = -\sqrt{2}$ kritik nuqtadan o'tishda ishorasini "+" dan "−" ga o'zgartiradi. Demak, $x = -\sqrt{2}$ maksimum nuqta. Javobi: D.

72. $f(x)=\frac{\ln 2x}{x}$. $f'(1)-?$

A) $1-\ln 2$ B) $\ln 2-1$ C) $\ln 2$ D) $\frac{2}{e^2}$ E) $\frac{\ln 2}{e^2}$

Yechilishi: $f'(x)=\frac{(\ln 2x)'\cdot x-\ln 2x\cdot(x)'}{x^2}=\frac{\frac{2}{2x}\cdot x-\ln 2x}{x^2}=>$

$=> f'(1)=1-\ln 2.$ Javobi: A.

73. Agar $f(x)=x^3+5x^2+4x+2$ bo'lsa, $f'(x)=f(1)$ tenglamaning eng kichik ildizini toping.

A) -6 B) $-\frac{1}{3}$ C) -2 D) -4 E) $-\frac{2}{3}$

Yechilishi: $f(1)=1+5+4+2=12;$

$f'(x)=3x^2+10x+4=>3x^2+10x-8=0\ =>$

$=>\begin{cases}x_1=-4;\\ x_2=\frac{2}{3}.\end{cases}$

Javobi: D.

74. $(4\cdot 2^x+2\cdot 2^{-x}-9)\cdot\sqrt{x+1}=0$ tenglama ildizlari yig'indisini toping.

A) 0 B) -3 C) -2 D) -1 E) 4

Yechilishi: $(4\cdot 2^x+2\cdot 2^{-x}-9)\sqrt{x+1}=0;$

$\begin{cases}4\cdot 2^x+2\cdot 2^{-x}-9=0\\ x+1\geq 0\end{cases}=>\begin{cases}4\cdot 2^x+\frac{2}{2^x}-9=0\\ x\geq -1\end{cases}=>$

$=> 2^x=y=>\ 4y^2-9y+2=0\ =>\begin{cases}y_1=\frac{1}{4}\\ y_2=2\end{cases}=>$

$=>\begin{cases}2^x=2^{-2}\\ 2^x=2\\ x\geq -1\end{cases}=>\begin{cases}x=-2\\ x=1\\ x\geq -1\end{cases}=>\begin{cases}x_1=1\\ x_2=-1\end{cases}=>$

$x_1+x_2=0.$ Javobi: A.

75. Agar $tg\alpha=3$ bo'lsa, $\sin 2\alpha-\cos 2\alpha$ ning qiymatini toping.

A) -0,2 B) 0,8 C) 1,2 D) 1,4 E) 1,6

Yechilishi: $tg\alpha = 3;\ \sin 2\alpha - \cos 2\alpha =$

$= \frac{2tg\alpha}{1+tg^2\alpha} - \frac{1-tg^2\alpha}{1+tg^2\alpha} = 1{,}4.$ Javobi: D.

76. $3^{log_3^2 x} + x^{\log_3 x} = 162$ tenglamaning ildizlari ko'paytmasini toping.

A) 9 B) 3 C) 1 D) $\frac{1}{3}$ E) $\frac{2}{9}$

Yechilishi: $3^{\log \frac{2}{3} x} + x^{\log_3 x} = 162;\ x > 0; x \neq 1.$

$\left(3^{\log_3 x}\right)^{\log_3 x} + x^{\log_3 x} = 162;\ x^{\log_3 x} + x^{\log_3 x} = 162;$

$2 \cdot x^{\log_3 x} = 162 => \log_3 x \log_3 x = \log_3 81 =>$

$=> \log \frac{2}{3} x = 4 \log_3 3 => \log_3 x = \pm 2 => \begin{cases} x_1 = \frac{1}{9} \\ x_2 = 9 \end{cases} =>$

$=> x_1 \cdot x_2 = 1.$ Javobi: C.

77. $\left(\left(\text{tg}^2 \frac{7\pi}{24} - \text{tg}^2 \frac{\pi}{24}\right) : \left(1 - \text{tg}^2 \frac{7\pi}{24} \cdot \text{tg}^2 \frac{\pi}{24}\right)\right)^2$ ni hisoblang.

A) $\frac{1}{9}$ B) 3 C) 1 D) $\frac{1}{3}$ E) $\frac{2}{9}$

Yechilishi: $\left[\left(tg^2 \frac{7\pi}{24} - tg^2 \frac{\pi}{24}\right) : \left(1 - tg^2 \frac{7\pi}{24} \cdot tg^2 \frac{\pi}{24}\right)\right]^2 =$

$= \left[\begin{array}{c} \left(tg \frac{7\pi}{24} - tg \frac{\pi}{24}\right)\left(tg \frac{7\pi}{24} + tg \frac{\pi}{24}\right) : \\ : \left(1 - tg^2 \frac{7\pi}{24} \cdot tg^2 \frac{\pi}{24}\right) \end{array}\right]^2 =$

$= \left[\frac{tg\left(\frac{7\pi}{24}+\frac{\pi}{24}\right)\cdot\left(1-tg\frac{7\pi}{24}\cdot tg\frac{\pi}{24}\right)\cdot tg\left(\frac{7\pi}{24}-\frac{\pi}{24}\right)\left(1+tg\frac{7\pi}{24}\cdot tg\frac{\pi}{24}\right)}{1-tg^2\frac{7\pi}{24}\,tg^2\frac{\pi}{24}}\right]^2 =$

$= \left[tg \frac{8\pi}{24} \cdot tg \frac{6\pi}{24}\right]^2 = \left[\sqrt{3} \cdot 1\right]^2 = 3.$ Javobi: B.

78. $\cos^2\left(\frac{\pi}{8} + x\right) + \cos^2\left(\frac{\pi}{8} - x\right) = \frac{3}{2}$ $(x \in [-\pi; 2\pi])$ tenglamaning ildizlari yig'indisini toping.

A) 0 B) $\frac{5\pi}{4}$ C) $\frac{13\pi}{8}$ D) 3π E) $\frac{3\pi}{2}$

Yechilishi: $\cos^2\left(\frac{\pi}{8}+x\right)+\cos^2\left(\frac{\pi}{8}-x\right)=\frac{3}{2}[-\pi;2\pi]$.

$\frac{1}{2}\left(1+\cos\left(\frac{\pi}{4}+2x\right)\right)+\frac{1}{2}\left(1+\cos\left(\frac{\pi}{4}-2x\right)\right)=\frac{3}{2}$;

$\cos\left(\frac{\pi}{4}+2x\right)+\cos\left(\frac{\pi}{4}-2x\right)=1;\ 2\cdot\cos\frac{1}{2}\left(\frac{\pi}{4}+2x+\right.$

$\left.+\frac{\pi}{4}-2x\right)\cdot\cos\frac{1}{2}\left(\frac{\pi}{4}+2x-\frac{\pi}{4}+2x\right)=1;$

$2\cdot\cos\frac{\pi}{4}\cos 2x=1 \Rightarrow 2\cdot\frac{\sqrt{2}}{2}\cos 2x=1 \Rightarrow$

$\Rightarrow \cos 2x=\frac{\sqrt{2}}{2} \Rightarrow 2x=\pm\frac{\pi}{4}+2k\pi; k\in Z \Rightarrow$

$\Rightarrow x=\pm\frac{\pi}{8}+k\pi \Rightarrow \begin{cases} x=-\frac{\pi}{8}+k\pi; \\ x=\frac{\pi}{8}+k\pi. \end{cases}$

$k=-1 \Rightarrow \begin{cases} x=-\frac{9\pi}{8}; \\ x=-\frac{7\pi}{8}. \end{cases}$ $k=0 \Rightarrow \begin{cases} x=-\frac{\pi}{8}; \\ x=\frac{\pi}{8}. \end{cases}$

$k=1 \Rightarrow \begin{cases} x=\frac{7\pi}{8}; \\ x=\frac{9\pi}{8}. \end{cases}$ $k=2 \Rightarrow \begin{cases} x=\frac{15\pi}{8}; \\ x=-\frac{15\pi}{8}. \end{cases}$

$-\frac{7\pi}{8}-\frac{\pi}{8}+\frac{\pi}{8}+\frac{7\pi}{8}+\frac{9\pi}{8}+\frac{15\pi}{8}=3\pi.$ Javobi: D.

79. Agar $|\vec{a}|=2$ va $|\vec{b}|=4$ hamda $\vec{a}$ va $\vec{b}$ vektorlar orasidagi burchak 135° ga teng bo'lsa, $|\vec{a}-2\vec{b}|$ ning qiymatini toping.

A) $2\sqrt{10}$ B) $4\sqrt{2}$ C) $15\sqrt{2}$

D) $\sqrt{15+4\sqrt{2}}$ E) $2\sqrt{17-4\sqrt{2}}$

Yechilishi: $\vec{a}\,\hat{;}\,\vec{b}=135°$;

$|\vec{a}+2\vec{b}|^2=|\vec{a}|^2+4\vec{a}\vec{b}+4|\vec{b}|^2=$

$=2^2+4\cdot|\vec{a}||\vec{b}|\cdot\cos(\vec{a}\,\hat{\cdot}\,\vec{b})+4\cdot4^2=$

$= 4 + 4 \cdot 2 \cdot 4 \cdot \cos 135° + 4 \cdot 16 = 68 + 32 \cdot \left(-\frac{\sqrt{2}}{2}\right) =$

$= 68 - 16\sqrt{2} => \left|\vec{a} + 2\vec{b}\right| = \sqrt{68 - \sqrt{512}} =$

$= 2\sqrt{17 - 4\sqrt{2}}$. Javobi: E.

80. Parallelogrammning uchta ketma-ket $A(-3; -2; 0)$, $B(3; -3; 1)$ va $C(5; 0; 2)$ uchlari berilgan. $\overrightarrow{AC}$ va $\overrightarrow{BD}$ vektorlar orasidagi burchakni toping.

A) 60° B) 150° C) 135° D) 120° E) 90°

Yechilishi: $\begin{cases} x = \frac{-3+5}{2} = 1; \\ y = \frac{-2+0}{2} = -1; \\ z = 1. \end{cases}$ $O(x; y; z) = O(1; -1; 1).$

$\overrightarrow{OB} = \{3 - 1; -3 - (-1); 1 - 1\} = \{2; -2; 0\} =>$

$=> \left|\overrightarrow{OB}\right| = \sqrt{8};\ \overrightarrow{OC} =$

$\{5 - 1; 0 - (-1); 2 - 1\} =$

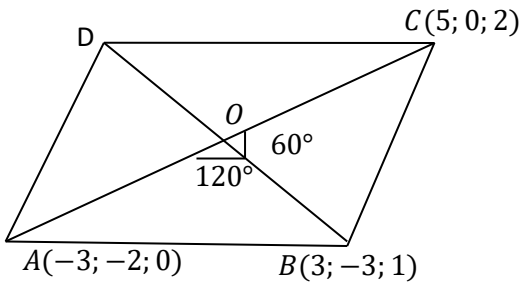
$= \{4; 1; 1\} => \left|\overrightarrow{OC}\right| = \sqrt{18};$

$\cos(\overrightarrow{OB}\ \hat{;}\ \overrightarrow{OC}) =$

$= \frac{\{2;-2;0\}\cdot\{4;1;1\}}{\sqrt{8}\cdot\sqrt{18}} = \frac{8-2+0}{2\sqrt{2}\cdot 3\sqrt{2}} =$

$= \frac{6}{12} = \frac{1}{2} => \left(\overrightarrow{OB}\ \hat{;}\ \overrightarrow{OC}\right) =$

$= 60° => \left(\overrightarrow{OA}\ \hat{;}\ \overrightarrow{OB}\right) = 120°.$



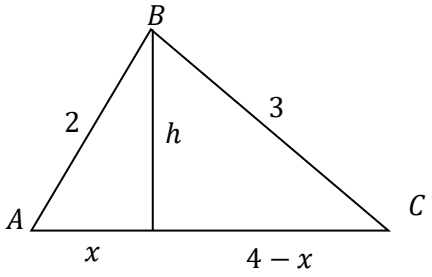
Javobi: D.

81. ABC uchburchakda $AB = 2, BC = 3$ va $AC = 4$ bo'lsa, C burchakning sinusini toping.

A) $\frac{\sqrt{13}}{8}$ B) $\frac{\sqrt{15}}{8}$ C) $\frac{\sqrt{14}}{8}$ D) $\frac{\sqrt{19}}{8}$ E) $\frac{\sqrt{17}}{8}$

Yechilishi: $\begin{cases} h^2 = 4 - x^2; \\ h^2 = 9 - (4 - x)^2 \end{cases} =>$

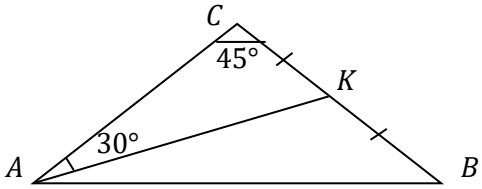
$\Rightarrow 4 - x^2 = 9 - 16 +$
$+8x - x^2 \Rightarrow 8x = 11 \Rightarrow$
$\Rightarrow x = \frac{11}{8} \Rightarrow h^2 = 4 -$
$-\left(\frac{11}{8}\right)^2 = 4 - \frac{121}{64} = \frac{135}{64} \Rightarrow$
$h = \frac{\sqrt{135}}{8}$. $\sin\angle C = h : BC =$
$= \frac{3\sqrt{15}}{8} : 3 = \frac{\sqrt{15}}{8}$. Javobi: B.



82. ABC uchburchakning AK medianasi AC tomoni bilan 30° burchak tashkil qiladi. Agar $AK = \frac{13\sqrt{2}}{4}$ va $\angle BCA = 45°$ bo'lsa, BC tomonning uzunligini toping.

A) $4\sqrt{3}$ B) $5\sqrt{2}$ C) 5,5
D) $\frac{11\sqrt{2}}{3}$ E) 6,5

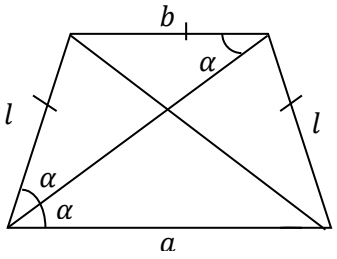
Yechilishi: $\frac{CK}{\sin 30°} = \frac{AK}{\sin 45°} \Rightarrow$
$\Rightarrow \frac{CK}{\frac{1}{2}} = \frac{13\sqrt{2}}{4} : \frac{\sqrt{2}}{2} \Rightarrow BC = 2 \cdot$
$CK = 6{,}5$. Javobi: E.



83. Trapetsiyaning diagonallari uning katta asosidagi burchaklarini teng ikkiga bo'ladi. Trapetsiyaning o'rta chizig'i 11,7 ga, perimetri esa 36 ga teng. Trapetsiyaning katta tomonining uzunligini toping.

A) 18 B) 17,6 C) 17,1
D) 16,3 E) 16,8

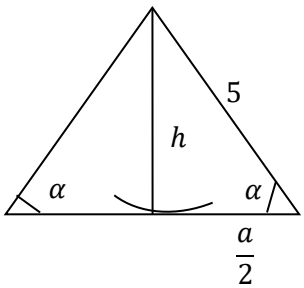
Yechilishi:



Ichki almashinuvchi burchaklarning tengligi va uchbur − chakda teng burchaklarqarshisida teng tomonlaryotishidan, trapetsiyaningteng yonli va yonining kichik asosga tengligi kelib chiqadi.

$a + b = 23{,}4 \Rightarrow 36 = a + b + 2l \Rightarrow l = 6{,}3 \Rightarrow$
$\Rightarrow b = l \Rightarrow a + b = 23{,}4 \Rightarrow a = 17{,}1$. Javobi: C.

84. Teng yonli uchburchakning yon tomoni 5 ga, asosidagi burchakning kosinusi 0,6 ga teng. Shu uchburchakka ichki chizilgan aylananing radiusini toping.



A) 3 B) 1,5 C) $\sqrt{2}$ D) 1,2 E) 2,4

Yechilishi: $\cos\alpha = 0{,}6; S_{\triangle} = \frac{1}{2}\cdot 6\cdot 4 =$ 12;

$$\frac{a}{2} : 5 = \cos\alpha \Rightarrow a = 10\cdot 0{,}6 = 6 \Rightarrow$$

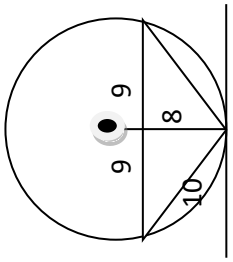
$$\Rightarrow h = 4; S_{\triangle} = \frac{1}{2}\cdot 6\cdot 4 = 12;$$

$$r = \frac{2S}{a+b+c} = \frac{24}{16} = \frac{3}{2} = 1{,}5.$$

Javobi: B.

85. Aylana vatarining uzunligi 10 ga teng. Shu vatarning bir uchidan ayalanaga urinma, ikkinchi uchidan esa, urinmaga parallel qilib kesuvchi o'tkazilgan. Agar shu kesuvchining aylana ichidagi kesmasining uzunligi 12 ga teng bo'lsa, aylananing radiusini toping.

A) 6,75 B) 8 C) 6,5 D) 6,25 E) 7,5



Yechilishi: $S_{\triangle} = \frac{1}{2}\cdot 12\cdot 8 = 48;$

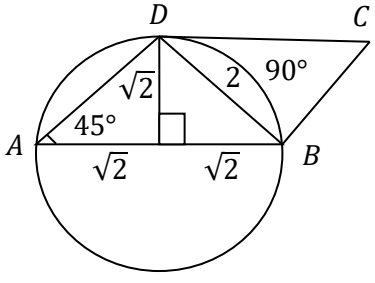
$$R = \frac{abc}{4S} = \frac{10\cdot 10\cdot 12}{4\cdot 48} = 6{,}25.$$

Javobi: D.

86. $ABCD$ parallelogrammning BD diagonali 2 ga, C burchagi 45° ga teng. CD tomoni D nuqtada ABD uchburchakka tashqi chizilgan aylanaga urinadi. Parallelogrammning yuzini toping.

A) 4 B) $4\sqrt{2}$ C) $8\sqrt{2}$ D) $3\sqrt{2}$ E) $\frac{7\sqrt{2}}{2}$

Yechilishi:



$$S_{\triangle} = \frac{1}{2}\cdot 2\sqrt{2}\cdot\sqrt{2} = 2;$$

$S_{\square} = 2S_{\triangle} = 4$. Javobi: A.

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MATEMATIKADAN
MISOL VA MASALALAR YECHISH

“QAMAR MEDIA” NASHRIYOTI

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ISBN 978-9943-7049-3-0

“Qamar media” nashriyoti, Toshkent shahar, Mirobod tumani
Qo‘yliq mavze-4, 3-uy, 26-xonadon. tel.: +99894-672-71-11

Terishga berildi: 21.04.2021-yil. Bosishga ruxsat etildi: 05.05.2021-yil.
Bichimi 60x84 $^{1/16}$, “Times New Roman” garniturasi. Bosma tabog‘i 20
Adadi 100 nusxa. Buyurtma № 2021/12
Bahosi kelishilgan narxda
Noshirlik litsenziyasi: № 18-4178

Samarqand viloyat xalq ta’limi xodimlarini qayta tayyorlash va ularning malakasini oshirish hududiy markazi bosmaxonasida chop etildi

ISBN 978-9943-7049-3-0