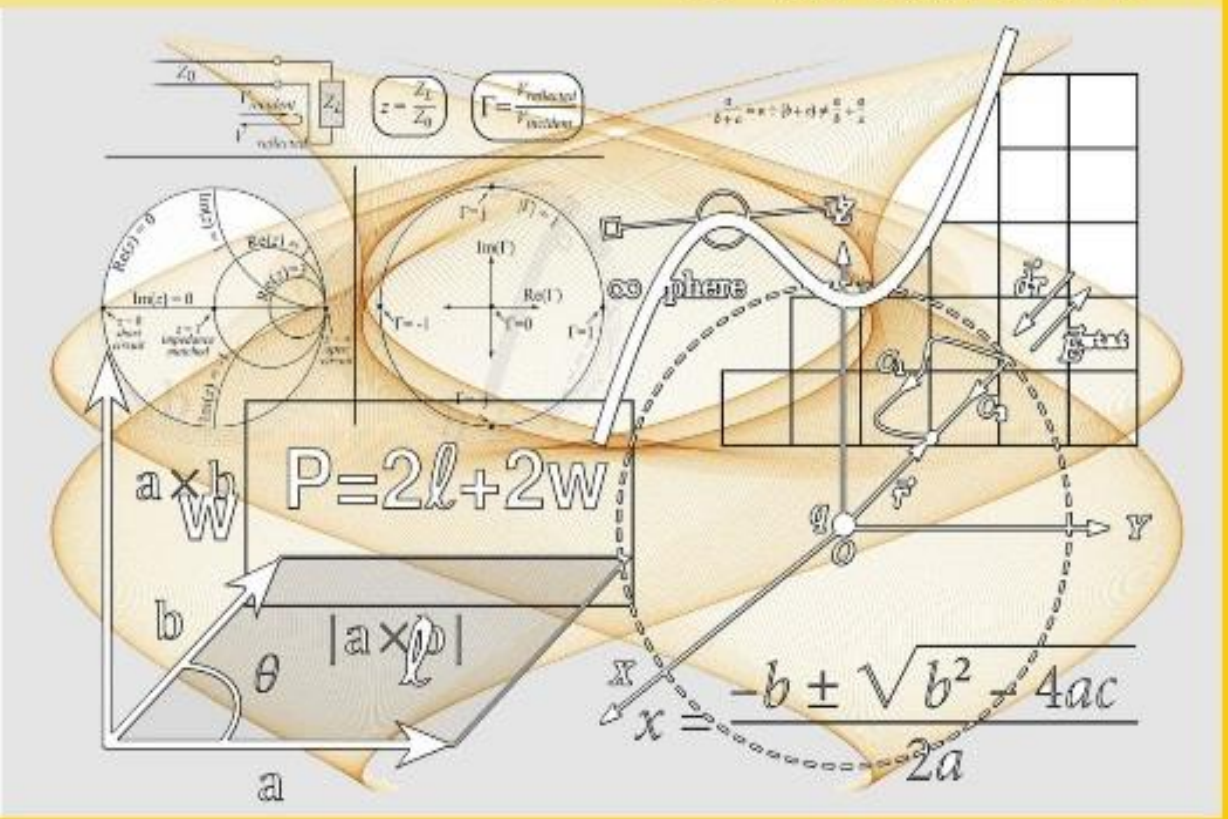
Pirnazar DAVRONOV

MATEMATIKADAN
MISOL VA MASALALAR YECHISH

3-KITOB



O‘ZBEKISTON RESPUBLIKASI MAKTABGACHA VA
MAKTAB TA’LIMI VAZIRLIGI

SAMARQAND VILOYATI PEDAGOGLARNI YANGI
METODIKALARGA O‘RGATISH MILLIY MARKAZI

Pirnazar DAVRONOV

MATEMATIKADAN
MISOL VA MASALALAR YECHISH

3-KITOB

“QAMAR MEDIA” NASHRIYOTI
TOSHKENT – 2024

UDK 51(076.1)
KBK 22.1я7
P 46

Pirnazar Davronov. Matematikadan misol va masalalar yechish. Metodik qo‘llanma. 3-kitob. – “Qamar media” nashriyoti. Toshkent – 2023-yil, 208 bet.

Taqrizchilar:

T.Ochilov – O‘zbekiston-Finlandiya pedagogika instituti “Aniq fanlar” kafedrasi dotsenti.

A.Qudratova – Samarqand viloyati pedagoglarni yangi metodikalarga o‘rgatish milliy markazi “Aniq va tabiiy fanlarni o‘qitish metodikasi” kafedrasi dotsenti;

B.Ro‘ziqulov – Samarqand viloyati Nurobod tumani Maktabgacha va maktab ta’limi bo‘limiga qarashli 21-umumiy o‘rta ta’lim maktabi matematika fani o‘qituvchisi.

Mazkur metodik qo‘llanmani yozishdan maqsad, 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 masalalarni yechishda biror qiyinchlikka duch kelishsa, biz yozgan kitoblarning foydasi tegsa, o‘zimizni qo‘yilgan maqsadimizga erishgan hisoblardik.

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 yurtlarda 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 viloyati pedagoglarni yangi metodikalarga o‘rgatish milliy 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 2018-2019-ikki 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‘qituvchilar 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 “yo‘q” 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 hamohang, 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.

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

Hazrat Shayx Muhammad Sodiq Muhammad Yusuf o‘gitlarida aytilishicha, muallimlik eng yuksak farz amali bo‘lib, ustozlar haqqiga avvalo Olloh, farishtalar, barcha osmon va yer 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‘rganish (rejasi)ning 7 bosqichini quyidagicha bayon qilgan: 1) 10 yoshgach madrasada Qur’oni karimni yod olingan; 2) qonun, ya’ni shariat ilmi; 3) hisob (matematika); 4) falsafa; 5) mantiq; 6) tib; 7) tabbiiy fanlarni o‘rganilgan. Ibn Sino matematika ilmini, ko‘mir sotib tirikchiligini o‘tkazadigan olimdan olgan.

Jahonda “Singapur Mo‘jizasi” 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 Respublikamiz Prizidenti 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 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.

Respublikamiz xalqaro baholash tashkilotlariga a’zo bo‘ldi. 4-sinf o‘quvchilarining matnni o‘qish va tushunsh darajasi baholash uchun PIRLS, 4- va 8-sinf o‘quvchilarining matematika va tabiiy yunalishdagi fanlardan o‘zlashtirish darajasini baholashda TIMSS, 15 yoshli ta’lim oluvchilarning o‘qish, matematika va tabiiy yunalishdagi fanlardan savodxonlik darajasini baholashda PISA, jahon miqyosida katta e’tibor qaratilayotgan STEAM (S – scitnce (tabiiy fanlar), T – technology (texnologiya), E – engineering (muxandislik san’ati), A – art (ijod), M – mathematics (matematika)) dasturi asosida amalga oshiriladigan bo‘ldi.

Ushbu tashkilotlarning barchasida matematik ta’limga aloxida e’tibor qaratilgan. Bunga hamohang tarzda, O‘zbekiston Respublikasi Prezidentining 2020-yil 7-maydagi “Matematika sohasidagi ta’lim sifatini oshirish va ilmiy-tadqiqotlarni rivojlantirish chora-tadbirlari to‘g‘risida” gi PQ-4708-son Qarori e’lon qilindi.

Biroq, 2022-yilda Respublikamiz oily o‘quv yurtlariga hujjat topshirgan 1 073 821 abituriyintlardan 51,2 foizi, ya‘ni 550 102 nafarining test natijalari o‘ta afsuslanarli, biz pedagoglar uchun esa uyat bo‘ldi. Ular ko‘rsatgan test natijalari 56,7 ballga ham yitmadi.

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, butun

musulmon olamining muallimi Imom Buxoriy (r.a): “Dunyoda ilmdan boshqa najot yuq va bo‘lmagay”,-deb aytgan bo‘lsa, Republikamiz rahbari “O‘qituvchi va murabbiylar biz uchun ibrat namunasi, barcha insoniy fazilatlar timsolidir”, - deb bizlarni ulug‘laydi.

Biz 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 fikrni 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.

Hamkasblarimning takliflariga asosan, o‘zim yechgan misol va masalalarimni o‘quv qo‘llanma shakliga nashr etishga kirishdim. Bunda, misol va masalalarning yechimlarini berishda, kitobxonni ko‘proq mustaqil izlanishga, mustaqil fkrlashga,

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. Boshqacha aytganda masalalarning yechimlarini berishda “Keys stadi” talablari e’tiborga olindi.

Masalalarni yechishga bunday yondashuv, ta’lim oluvchilarni bilim, ko‘nikma va malakani shakllantirish bilan birga, ularda kompetentli-faoliyatli bo‘lishlarini kuchaytiradi, o‘zluksiz ta’lim olish, ehtiyojlari va qobiliyatlarini rivojlantirish layoqatini hosil qiladi.

Kitob yozishning bosh maqsadi, insonlarning ma’naviy ehtiyojlarini qondirishga ko‘maklashish asosida jamiyat, mamlakat taraqqiyotiga hissa qo‘shishdan iborat.

“Matematikadan misol va masalalar yechish” nomli 3-kitob, 1999-yilda davlat test markazi tomonidan e’lon qilingan 10 ta axborotnomalarning 568 ta misol va masalalari, javoblar variantlari, yechimlar, to‘g‘ri javiblar, foydalanilgan adabiyotlar ro‘yxati hamda mundarijadan iborat.

Xulosa qilib aytganda, barchamiz birgalikda 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, jamiyat, davlat va oila oldida o‘zining mas’uliyatini chuqur anglaydigan, erkin fikrlovchi, faol, ilmni, axloqni, mehnatni va haqiqatni sevadigan, kamtar insonlarni o‘qitib tayyorlab beraylik

Pirnazar DAVRONOV

1999-YIL, 1-AXBOROTNOMA

1. $\frac{(16+81)\cdot\left(1+\frac{61}{36}\right):36}{\left[0{,}4+\frac{1}{0{,}(4)}\right]^2}\cdot 0{,}4$ ni hisoblang.

A) 0,4 B) 0,(4) C) 14,4 D) 36 E) $\frac{1}{36}$

Yechilishi: $\frac{(16+81)\cdot\left(1+\frac{61}{36}\right):36}{\left[0{,}4+\frac{1}{0{,}(4)}\right]^2}\cdot 0{,}4=\frac{97\cdot\frac{36+61}{36}\cdot\frac{1}{36}}{\left[\frac{4}{9}+\frac{1}{\frac{4}{9}}\right]^2}\cdot\frac{4}{10}=$

$\frac{\frac{97^2}{36^2}}{\left[\frac{4}{9}+\frac{9}{4}\right]^2}\cdot\frac{2}{5}=\frac{\frac{97^2}{36^2}}{\left[\frac{16+81}{36}\right]^2}\cdot\frac{2}{5}=\frac{2}{5}=0{,}4.$ Javobi: A.

2. $9^{20}-7^{20}$ ayirmaning oxirgi raqamini toping.

A) 0 B) 7 C) 1 D) 3 E) 2

Yechilishi: 1)9^{20} va 7^{20} larning takrorlanish sonlari topiladi;
2) daraja ko‘rsatkichlari takrorlanish soniga bo‘linadi;
3) ikkala holda ham qoldiq nol bo‘lganligi uchun takrorlanish sonlarining oxirgi raqamlari ayriladi. 1) $9;1 => 20:2=10;$
2) $7,9,3,1 => 20:4=5;$ 3) $9^{20}-7^{20}=\cdots 1-$
$-\cdots 1=0.$ Javobi: A.

3. $7+69+671+6673+66675$ ni 6 ga bo‘lishdagi qoldiqni toping.

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

Yechilishi: $7+69+671+6673+66675;$
Yig‘indini biror songa bo‘lgandagi qoldiq, qo‘shiluvchilarni shu songa bo‘lishdan chiqqan qoldiqlar yig‘indisini, yana shu songa bo‘lishdan chiqqan qoldiqqateng bo‘ladi.
$1+3+5+1+3=13 => 13 => 13:6=$ $qoldiq$ 1.
Javobi: A.

4. $0{,}8(0{,}2+1)(0{,}2^2+1)(0{,}2^4+1)(0{,}2^8+1)+(5^{-2})^8$ ni hisoblang.

A) 1 B) $0{,}2^{16}$ C) $2\cdot 0{,}2^{16}+1$ D) 2 E)

Yechilishi: $0{,}8(0{,}2+1)(0{,}2^2+1)(0{,}2^4+1)(0{,}2^8++1)+$
$+(5^{-2})^8=\frac{8}{10}\left(\frac{1}{5}+1\right)\left(\frac{1}{5^2}+1\right)\left(\frac{1}{5^4}+1\right)\left(\frac{1}{5^8}++1\right)+\frac{1}{5^{16}}=$
$=\left(1-\frac{1}{5}\right)\left(1+\frac{1}{5}\right)\left(1+\frac{1}{5^2}\right)\left(1+\frac{1}{5^4}\right)\left(1++\frac{1}{5^8}\right)+\frac{1}{5^{16}}=1-$
$-\frac{1}{5^{16}}+\frac{1}{5^{16}}=1.$ Javobi: A.

5. Institutdagi talabalarning 35% ini qizlar tashkil qiladi. Yigitlar qizlardan 252 taga ko‘p. Talabalarning umumiy sonini toping.

A) 840 B) 120 C) 420 D) 460 E) 416

Yechilishi: $x-jami;$ $0{,}35x-qizlar;$
$0{,}35x+252-yigitlar;$
$0{,}35x+0{,}35x+252=x\Rightarrow 0{,}7x+252=x\Rightarrow$
$\Rightarrow 0{,}3x=252\Rightarrow x=840.$ Javobi: A.

6. 520 sonini shunday ikki bo‘lakka bo‘lingki, ulardan birining 80% i ikkinchisining 24% ini tashkil qilsin. Bo‘laklarni kattasini toping.

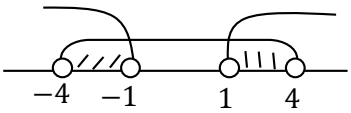
A) 400 B) 120 C) 420 D) 460 E) 416

Yechilishi: $\begin{cases}x+y=520\\0{,}8x=0{,}24y\end{cases}\Rightarrow\begin{cases}0{,}3y+y=520\\x=0{,}3y\end{cases}\Rightarrow$
$\Rightarrow\begin{cases}1{,}3y=520\\x=0{,}3y\end{cases}\Rightarrow\begin{cases}y=400;\\x=120.\end{cases}$ Javobi: A.

7. $1<|x|<4$ tengsizlikni yeching.

A) $(-\infty;-4)\cup(4;\infty)$ B) $(-4;-1)\cup(1;4)$
C) $(-\infty;-1)\cup(1;\infty)$ D) $(-1;1)$
E) $(-4;4)$

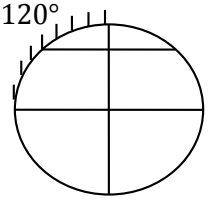
Yechilishi: $1<|x|<4\Rightarrow\Rightarrow\begin{cases}x>1;\\x<-1;\\-4<x<4.\end{cases}$

$(-4;-1) \cup (1;4)$. 

Javobi: B.

8. Agar $\sin\alpha = \frac{\sqrt{3}}{2}$ va $\frac{\pi}{2} < \alpha < \pi$ bo‘lsa, $\frac{|-1+\cos\alpha|+2\cos\alpha}{\left|\frac{tg\alpha}{\sqrt{3}}-0{,}5\right|}$ ni hisoblang.

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



Yechilishi: $\sin\alpha = \frac{\sqrt{3}}{2}$; $\frac{\pi}{2} < \alpha < \pi$;

$$\frac{|-1+\cos\alpha|+2\cos\alpha}{\left|\frac{tg\alpha}{\sqrt{3}}-0{,}5\right|} = \frac{|-1+\cos 120^\circ|+2\cos 120^\circ}{\left|\frac{tg120^\circ}{\sqrt{3}}-\frac{1}{2}\right|} =$$

$$= \frac{\left|-1-\frac{1}{2}\right|+2\left(-\frac{1}{2}\right)}{\left|\frac{-\sqrt{3}}{\sqrt{3}}-\frac{1}{2}\right|} = \frac{\frac{3}{2}-1}{\frac{3}{2}} = \frac{\frac{1}{2}}{\frac{3}{2}} = \frac{1}{2}\cdot\frac{2}{3} = \frac{1}{3}.$$ Javobi: A.

9. $\sqrt{11+6\sqrt{2}} + \sqrt{11-6\sqrt{2}}$ ni hisoblang.

A) 6 B) 22 C) $\sqrt{22}$ D) 6,012 E) 5,92

Yechilishi: $\sqrt{11+6\sqrt{2}} + \sqrt{11-6\sqrt{2}} =>$

$$=> \sqrt{11+\sqrt{72}} = \sqrt{\frac{11+\sqrt{121-72}}{2}} + \sqrt{\frac{11-7}{2}} = 3+\sqrt{2};$$

$$\sqrt{11-\sqrt{72}} = 3-\sqrt{2}; \quad \sqrt{11+\sqrt{72}} + \sqrt{11-\sqrt{72}} =$$

$$= 3+\sqrt{2}+3-\sqrt{2} = 6.$$ Javobi: A.

10. $\frac{p-q}{p^3\cdot q^2} - \frac{p+q}{p^2\cdot q^3}$ ni soddalashtiring.

A) $-\frac{p^2+q^2}{p^3q^3}$ B) $\frac{2pq-p^2-q^2}{p^3q^3}$ C) $-\frac{2}{p^3q^2}$

D) $-\frac{2}{p^3q+p^2q^2}$ E) 0

Yechilishi: $\frac{p-q}{p^3\cdot q^2} - \frac{p+q}{p^2\cdot q^3} = \frac{p^4q^4-p^3q^5-p^5q^3-p^4q^4}{p^6q^6} =$

$$= \frac{-p^3q^3(q^2+p^2)}{p^6q^6} = -\frac{p^2+q^2}{p^3q^3}.$$ Javobi: A.

11. $\frac{x^2-y^2}{2xy} : \frac{x+y}{2x}$ ni soddalashtiring.

A) $\frac{x-y}{y}$ B) $\frac{x-y}{y(1+y)}$ C) $\frac{(x-y)^2}{y(x+y)}$ D) $\frac{1}{y}$ E) $\frac{x}{y}$

Yechilishi: $\frac{x^2-y^2}{2xy} : \frac{x+y}{2x} = \frac{(x-y)(x+y)}{2xy} \cdot \frac{2x}{x+y} = \frac{x-y}{y}$.

Javobi: A.

12. $y = \frac{2x-3}{x(x+2)}$ funksiyaning aniqlanish sohasini toping.

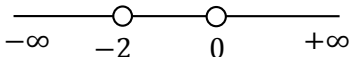
A) $(-\infty; -2) \cup (-2; 0) \cup (0; \infty)$ B) $(-\infty; 0) \cup (2; \infty)$

C) $(-\infty; -2) \cup (0; \infty)$ D) $(-\infty; 1{,}5) \cup (1{,}5; \infty)$

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

Yechilishi: $y = \frac{2x-3}{x(x+2)}$; $D(y) = ?$

$$\begin{cases} 2x-3=0 \\ x(x+2) \neq 0 \end{cases} => \begin{cases} x = \frac{3}{2} \\ x \neq 0 \\ x \neq -2 \end{cases}$$



$D(y) = (-\infty; -2) \cup (-2; 0) \cup (0; +\infty)$. Javobi: A.

13. $y = x|x|$ funksiya uchun qaysi xossa to‘g‘ri?

A) $toq\ funksiya$

B) $juft\ funksiya$

C) $kamayuvchi\ funksiya$

D) $juft\ funksiya\ ham\ emas, toq\ funksiya\ ham\ emas$

E) $Aniqlanish\ sohasi\ musbat\ sonlardan\ iborat$

Yechilishi: $y = x|x| => x = -x => y = -x|-x| = -x|x|$.

Javobi: A.

14. $f\left(\frac{ax-b}{bx-a}\right) = x^{50} + x^{49} + x^{48} + \cdots + x^2 + x + 1$ $(|a| \neq |b|)$ bo‘lsa, $f(1)$ ni hisoblang.

A) 1 B) 2 C) 51 D) 4 E) 5

Yechilishi: $f\left(\frac{ax-b}{bx-a}\right) = x^{50} + x^{49} + x^{48} + \cdots + x^2 + x + 1$ $(|a| \neq |b|)$; $f(1) = ?$

1) $\frac{ax-b}{bx-a}=1 \Rightarrow ax-b=bx-a \Rightarrow ax-bx=$
$=b-a \Rightarrow x(a-b)=b-a \Rightarrow x=\frac{b-a}{a-b} \Rightarrow$
$\Rightarrow \frac{-(a-b)}{a-b}=-1.$
2) $(-1)^{50}+(-1)^{49}+\cdots+(-1)^2+(-1)+1=1.$
Javobi: A.

15. $\left(\frac{1}{\sqrt{a}+\sqrt{b}}-\frac{\sqrt{a}+\sqrt{b}}{a-b}\right)\cdot\frac{a-2\sqrt{a}\sqrt{b}+b}{2\sqrt{b}}$ ni soddalashtiring.

A) $\frac{\sqrt{b}-\sqrt{a}}{\sqrt{a}+\sqrt{b}}$ B) $\frac{\sqrt{a}-\sqrt{b}}{\sqrt{a}+\sqrt{b}}$ C) $\frac{\sqrt{b}+\sqrt{a}}{\sqrt{a}-\sqrt{b}}$ D) $\frac{\sqrt{a}-\sqrt{b}}{a+b}$
E) $\frac{\sqrt{b}-\sqrt{a}}{a-b}$

Yechilishi: $\left(\frac{1}{\sqrt{a}+\sqrt{b}}-\frac{\sqrt{a}+\sqrt{b}}{a-b}\right)\cdot\frac{a-2\sqrt{a}\sqrt{b}+b}{2\sqrt{b}}=$
$=\left(\frac{1}{\sqrt{a}+\sqrt{b}}-\frac{\sqrt{a}+\sqrt{b}}{(\sqrt{a})^2-(\sqrt{b})^2}\right)\cdot\frac{(\sqrt{a})^2-2\sqrt{a}\sqrt{b}+(\sqrt{b})^2}{2\sqrt{b}}=$
$=\frac{\sqrt{a}-\sqrt{b}-\sqrt{a}-\sqrt{b}}{(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})}\cdot\frac{(\sqrt{a}-\sqrt{b})^2}{2\sqrt{b}}=\frac{-2\sqrt{b}}{\sqrt{a}+\sqrt{b}}\cdot\frac{\sqrt{a}-\sqrt{b}}{2\sqrt{b}}=\frac{\sqrt{b}-\sqrt{a}}{\sqrt{a}+\sqrt{b}}.$
Javobi: A.

16. $8(3^2+1)(3^4+1)(3^8+1)\ldots(3^{128}+1)x=3^{256}-1$ tenglamani yeching.

A) 1 B) $\frac{1}{8}$ C) $\frac{1}{2}$ D) -1 E) 2

Yechilishi: $8(3^2+1)(3^4+1)(3^8+1)\ldots(3^{128}+1)x=$
$=3^{256}-1 \Rightarrow (3^2-1)(3^2+1)(3^4+1)(3^8+1)\ldots$
$(3^{128}+1)x=3^{256}-1 \Rightarrow (3^4-1)(3^4+1)(3^8+1)$
$\ldots(3^{128}+1)x=3^{256}-1 \Rightarrow (3^8-1)(3^8+1)\ldots$
$\ldots(3^{128}-1)(3^{128}+1)x=3^{256}-1 \Rightarrow \cdots \Rightarrow$
$\Rightarrow (3^{128}+1)\cdot(3^{128}+1)x=3^{256}-1 \Rightarrow$
$\Rightarrow (3^{256}-1)x=3^{256}-1 \Rightarrow x=\frac{3^{256}-1}{3^{256}-1} \Rightarrow x=1.$
Javobi: A.

17. $\begin{cases} a^2x + 3y = 3 \\ 3x + y = 4 \end{cases}$ tenglamalar sistemasi a ning qanday qiymatlarida yechimga ega emas?

A) ± 3 B) ± 1 C) $\pm\sqrt{3}$ D) 0 E) $\emptyset$

Yechilishi: $\begin{cases} a^2x + 3y = 3 \\ 3x + y = 4 \mid \cdot 3 \end{cases} \Rightarrow -\dfrac{\begin{array}{r} a^2x + 3y = 3 \\ 9x + 3y = 12 \end{array}}{a^2x - 9x = -9} \Rightarrow$

$\Rightarrow x(a^2 - 9) = -9 \Rightarrow x = -\frac{9}{a^2-9} \Rightarrow a = \pm 3.$

Javobi: A.

18. $x^2 + px - 35 = 0$ tenglamaning ildizlaridan biri 7 ga teng. Ikkinchi ildizning va p ning qiymatini toping.

A) -5; -2 B) -5; 2 C) 5; 2 D) 5; -2 E) 5; 1

Yechilishi: $x^2 + px - 35 = 0;\ p = p; q = -35;\ x_1 = 7;$

$\begin{cases} 7 + x_2 = -p \\ 7 \cdot x_2 = -35 \end{cases} \Rightarrow \begin{cases} 7 - 5 = -p \\ x_2 = -5 \end{cases} \Rightarrow \begin{cases} p = -2; \\ x_2 = -5. \end{cases}$

Javobi: A.

19. $\begin{cases} y - x^3 = 0 \\ y = 16x \end{cases}$ tenglamalar sistemasini yeching.

A) $(0; 0), (4; 64), (-4; -64)$ B) $(0; 0), (8; 2), (27; 3)$

C) $\emptyset$ D) $(8; 1), (24; 2), (48; 3)$

E) $(16; 1), (16; 2), (48; 3)$

Yechilishi: $\begin{cases} y - x^3 = 0 \\ y = 16x \end{cases} \Rightarrow \begin{cases} 16x - x^3 = 0 \\ y = 16x \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x(16 - x^2) = 0 \\ y = 16x \end{cases} \Rightarrow \begin{cases} x = 0 \\ x^2 = 16 \\ y = 16x \end{cases} \Rightarrow \begin{cases} x = 0 \\ x = \pm 4 \\ y = 16x \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x_1 = 0 \\ x_2 = -4 \\ x_3 = 4 \\ y = 16x \end{cases} \Rightarrow \begin{cases} x_1 = 0 \Rightarrow y_1 = 0 \\ x_2 = -4 \Rightarrow y_2 = -64 \Rightarrow \\ x_3 = 4 \Rightarrow y_3 = 64 \end{cases}$

$$=> \begin{cases} A(x_1; y_1) = A(0;0) \\ B(x_2; y_2) => B(-4;-64) \\ C(x_3; y_3) => C(4;64) \end{cases}$$ Javobi: A.

20. $\frac{1}{x} > x$ tengsizlikni yeching.

A) $(-\infty;-1) \cup (0;1)$ B) $[0;1)$ C) $(-1;1)$

D) $\emptyset$ E) $(-\infty;1)$

Yechilishi: $\frac{1}{x} > x => 1)\ x \neq 0$

$2)\ x > 0 => 1 > x^2 => |x| < 1 => -1 < x < 1;$

$3)\ x < 0 => 1 < x^2 => |x| > 1 => \begin{cases} x > 1; \\ x < -1; \end{cases}$

$1), 2)\ va\ 3)\ dan\ (-\infty;-1) \cup (0;1).$ Javobi: A.

21. Quyidagi tengsizliklardan qaysilari o‘zaro teng kuchli?

1) $\frac{x-3}{x+1} \geq 0$; 2) $\frac{x-3}{x^2+1} \geq 0$; 3) $\frac{x-3}{x^2} \geq 0$; 4) $x - 3 \geq 0$.

A) 2; 3; 4 B) 1; 2; 4 C) 1; 4 D) $hammasi$ E) 2; 3

Yechilishi: 1) $\frac{x-3}{x+1} \geq 0 => \begin{cases} x = 3; \\ x \neq -1. \end{cases}$ Javobi: A.

22. Arifmetik progressiyada $a_{20} = 0$ va $a_{21} = -41$ bo‘lsa, a_1 ni toping.

A) 779 B) -779 C) 41 D) -41 E) -820

Yechilishi: $\begin{cases} a_{20} = 0 \\ a_{21} = -41 \end{cases} => \begin{array}{r} a_1 + 19d = 0 \\ -\ a_1 + 20d = -41 \\ \hline -d = 41 => d = -41 \end{array} =>$

$=> a_1 = -19d = -19 \cdot (-41) = 779.$ Javobi: A.

23. $\sqrt{5}, 1, \frac{1}{\sqrt{5}}, \ldots$ geometrik progressiyaning yig‘indisini toping.

A) $\frac{5}{\sqrt{5}-1}$ B) $\frac{6\sqrt{5}+5}{5}$ C) $\frac{\sqrt{5}-1}{\sqrt{5}}$ D) 4,16 E) 4,5

Yechilishi: $\sqrt{5}, 1, \frac{1}{\sqrt{5}}, \ldots, cheksiz\ kamayuvchi.$

$b_1 = \sqrt{5};\ q = \frac{1}{\sqrt{5}} => S = \frac{\sqrt{5}}{1-\frac{1}{\sqrt{5}}} = \frac{\sqrt{5}}{\frac{\sqrt{5}-1}{\sqrt{5}}} = \frac{5}{\sqrt{5}-1}.$

Javobi: A.

24. $y = 2 - \cos 2x.$ $y' = ?$

A) $2\sin 2x$ B) $\sin 2x$ C) $4\cos 2x$

D) $-\sin 2x$ E) $-2\sin 2x$

Yechilishi: $y = 2 - \cos 2x \Rightarrow y' = 2\sin 2x.$

Javobi: A.

25. $y_1 = \cos^2 3x$, $y_2 = -\sin^2 3x$ va $y_3 = 2\sin 6x$ funksiyalardan qaysilarining hosilalari teng?

A) $y_1; y_2$ B) $y_1; y_3$ C) $y_2; y_3$ D) $y_1; y_2; y_3$

E) $hosilasi\ tenglari\ yo'q$

Yechilishi: $\begin{cases} y_1 = \cos^2 3x \\ y_2 = -\sin^2 3x \Rightarrow \\ y_3 = 2\sin 6x \end{cases}$

$\Rightarrow \begin{cases} y_1' = -6\cos 3x \sin 3x; \\ y_2' = -6\sin 3x \cos 3x; \\ y_3' = 12\cos 6x. \end{cases}$ Javobi: A.

26. $f(x) = \frac{1}{x^2} - \cos x$ funksiyaning boshlang‘ich funksiyasini toping.

A) $-\frac{1}{x} - \sin x + C$ B) $-\frac{1}{x^3} - \sin x + C$

C) $\frac{1}{x^2} - \sin x + C$ D) $\frac{1}{x} + \sin x + C$

E) $-\frac{1}{x^2} + \sin x + C$

Yechilishi: $f(x) = \frac{1}{x^2} - \cos x = x^{-2} - \cos x;$

$F(x) = \int x^{-2}dx - \int \cos x\, dx = \frac{x^{-2+1}}{-2+1} - \sin x + C =$

$= -\frac{1}{x} - \sin x + C.$ Javobi: A.

27. $\int_0^2 x^3\, dx$ ni hisoblang.

A) 4 B) -4 C) $\frac{16}{3}$ D) 2 E) $\frac{8}{3}$

Yechilishi: $\int_0^2 x^3 dx = \frac{1}{4}x^4|_0^2 = \frac{1}{4}[2^4 - 0^4] = 4.$

Javobi: A.

28. $\left(\frac{1}{\sqrt{2}-1}\right)^{\frac{\log_6 \log_6(\sqrt{2}+1)}{\log_6(\sqrt{2}+1)}}$ ni soddalashtiring.

A) $\log_6(\sqrt{2}+1)$ B) $\log_6(\sqrt{2}-1)$ C) $\frac{1}{\sqrt{2}-1}$

D) $\sqrt{2}+1$ E) 1

Yechilishi: $\left(\frac{1}{\sqrt{2}-1}\right)^{\frac{\log_6 \log_6(\sqrt{2}+1)}{\log_6(\sqrt{2}+1)}} =$

$= \left[\frac{1\cdot(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)}\right]^{\frac{\log_6 \log_6(\sqrt{2}+1)}{\log_6(\sqrt{2}+1)}} =$

$= (\sqrt{2}+1)^{\log_{(\sqrt{2}+1)} \log_6(\sqrt{2}+1)} = \log_6(\sqrt{2}+1).$ Javobi: A.

29. $4^{x-4} = 0{,}5$ tenglamani yeching.

A) 3,5 B) 4,5 C) -4,5 D) -3,5 E) $\emptyset$

Yechilishi: $4^{x-4} = 0{,}5 \Rightarrow 2^{2(x-4)} = 2^{-1} \Rightarrow$

$\Rightarrow 2x - 8 = -1 \Rightarrow x = 3{,}5.$ Javobi: A.

30. $\left(\sqrt{6}\right)^{x} \leq \frac{1}{36}$ tengsizlikni yeching.

A) $(-\infty; -4]$ B) $[-4; \infty)$ C) $[-4; 4]$ D) $\emptyset$

E) $(-\infty; 6]$

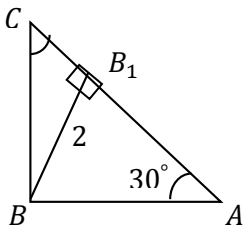
Yechilishi: $\left(\sqrt{6}\right)^{x} \leq \frac{1}{36} \Rightarrow \sqrt{6^x} \leq \frac{1}{6^2} \Rightarrow 6^{\frac{x}{2}} \leq 6^{-2};$

1) $x < 0 \Rightarrow \frac{x}{2} \leq -2 \Rightarrow x \leq -4 \Rightarrow (-\infty; -4].$

Javobi: A.

31. $\triangle ABC$ va $\angle B = 90°, \angle C = 60°$. BB_1 balandlik 2 ga teng. AB ni toping.

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



Yechilishi: $AB = 4.$

Javobi: A.

32. Aylananing O markazi to‘g‘ri burchakli ABC uchburchakning AC gepotenuzasida yotadi. Uchburchakning katetlari aylanaga urinadi. Agar OC kesmaning uzunligi 4 ga,

C nuqtadan CB katetning aylana bilan urinish nuqtasigacha bo‘lgan masofa 3 ga teng bo‘lsa, CB ni toping.

A) $3+\sqrt{7}$ B) 7 C) 8 D) 6 E) $4+\sqrt{7}$

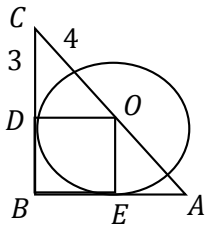
Yechilishi: $DO^2 = 4^2 - 3^2 = 7 \Rightarrow$

$\Rightarrow DO = \sqrt{7};$

$DO = OE = \sqrt{7} \Rightarrow$

$\Rightarrow CB = CD + DB = 3 + \sqrt{7}.$

Javobi: A.



33. $ABCD$ parallelogrammning perimetri 10 ga teng. ABD uchburchakning perimetri 8 ga teng. BD diagonalning uzunligini toping.

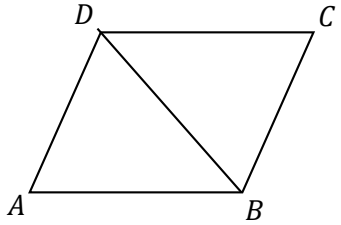
A) 3 B) 4 C) 2 D) 3,5 E) 2,5

Yechilishi:

$$\begin{cases} AB + BC + CD + AD = 10 \\ AB + DB + AD = 8 \\ AD = BC \end{cases} \Rightarrow$$

$\Rightarrow 10 = 2(AB + AD) \Rightarrow AB + AD = 5 \Rightarrow$

$\Rightarrow BD + 5 = 8 \Rightarrow DB = 3.$ Javobi: A.



34. Trapetsiyaning yon tomoni uchta teng qismga bo‘lingan, bo‘linish nuqtalaridan ikkinchi yon tomoniga asosga parallel kesmalar o‘tkazilgan. Trapetsiyaning asoslari 2 va 5 ga teng bo‘lsa, bu kesmalarning uzunliklarini toping.

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

Yechilishi: 1) $AB = \frac{2+CD}{2} \Rightarrow$

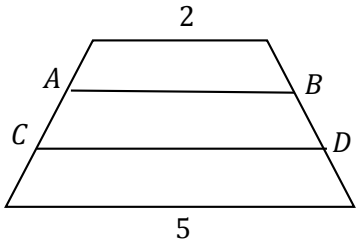
$\Rightarrow CD = 2AB - 2;$

2) $CD = \frac{AB+5}{2} = AB = 2CD - 5;$

3) $AB = 2 \cdot (2AB - 2) - 5 \Rightarrow$

$\Rightarrow AB = 4AB - 4 - 5 \Rightarrow 3AB = 9 \Rightarrow AB = 3;$

4) $CD = 2 \cdot AB - 2 = 2 \cdot 3 - 2 = 4.$ Javobi: A.



35. $M_1(1;\ 2), M_2(3;4), M_3(-4;3), M_4(0;5)$ va $M_5(5;-1)$ nuqtalardan qaysi birlari $x^2+y^2=25$ tenglama bilan berilgan aylanada yotadi?

A) M_1, M_3, M_4 B) M_1 C) M_5 D) M_1, M_5
E) $hammasi$

Yechilishi: $M_1(1;2) => 1^2+2^2=25 =>$
$5 \neq 25\ yotmaydi;$
$M_2 => 3^2+4^2=25 => 25=25\ yotadi.$ Javobi: A.

36. Agar $\vec{a}=(-6;8)$ vektor berilgan bo‘lib, $|\lambda\vec{a}|=5$ bo‘lsa, λ ni toping.

A) $\pm\frac{1}{2}$ B) $-\frac{5}{6}$ C) $\frac{5}{8}$ D) $\pm\frac{5}{14}$ E) $\frac{1}{20}$

Yechilishi: $\vec{a}=\{-6;8\};\ |\lambda\vec{a}|=5 =>$
$=> |\lambda\{-6;8\}|=5 => |\{-\lambda 6; 8\lambda\}|=5 =>$
$=> \sqrt{36\lambda^2+64\lambda^2}=5 => |10\lambda|=5 =>$
$=> 10\lambda=\pm 5 => \lambda=\pm\frac{1}{2}.$ Javobi: A.

37. Muntazam ko‘pburchakning tashqi burchagi $36°$ ga teng. Uning nechta tomoni bor?

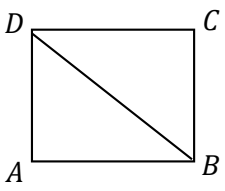
A) 10 B) 6 C) 8 D) 12 E) 9

Yechilishi: $360°:36°=10.$ Javobi: A.

38. Doiraning yuzi unga ichki chizilgan kvadratning yuzidan necha marta katta?

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

Yechilishi: $AB=a => AC=a\sqrt{2} =>$
$=> R=\frac{a\sqrt{2}}{2};$
$S_{kv}=a^2;$
$S_d=\pi R^2=\frac{1}{2}\pi a^2=\frac{\pi}{2}\cdot a^2.$



Javobi: A.

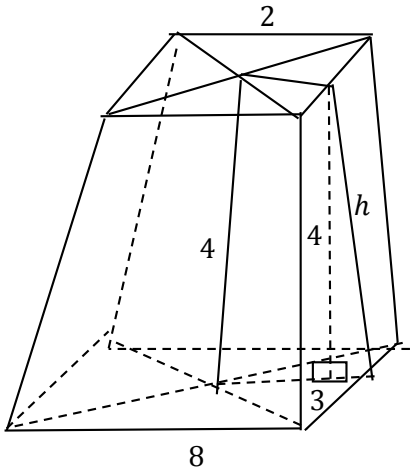
39. Silindr asosining radiusi ikki marta orttirilsa, uning hajmi necha marta ortadi?

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

Yechilishi: $V_1 = \pi R^2 H;\ \ V_2 = \pi(2R)^2 H = 4\pi R^2 H.$
Javobi: A.

40. To‘rtburchakli muntazam kesik piramida asoslarining tomonlari 8 va 2 ga, balandligi 4 ga teng. Uning to‘la sirtini toping.

A) 168 B) 169 C) 168,1
D) 170 E) 171



Yechilishi: $S_T = S_{yon} + S_1 + S_2;$
$h^2 = 4^2 + 3^2 =$
$= 16 + 9 = 25 => h = 5;$
$S_{yon} = 4 \cdot \frac{a+b}{2} \cdot h =$
$= 2 \cdot (2 + 8) \cdot 5 = 100;$
$S_T = 100 + 64 + 4 = 168.$
Javobi: A.

41. $tg\alpha \cdot ctg(\pi + \alpha) + \text{ctg}^2\,\alpha$ ni soddalashtiring.

A) $\frac{1}{\sin^2\alpha}$ B) $\frac{1}{\cos^2\alpha}$ C) $tg\alpha$ D) $\text{tg}^2\,\alpha$ E) 1

Yechilishi: $tg\alpha \cdot ctg(\pi + \alpha) + \text{ctg}^2\,\alpha =$
$= tg\alpha \cdot ctg\alpha + \text{ctg}^2\,\alpha = 1 + \frac{\cos^2\alpha}{\sin^2\alpha} = \frac{1}{\sin^2\alpha}.$
Javobi: A.

42. Quyidagi tengliklardan qaysi biri noto‘g‘ri?

A) $\cos\left(\frac{\pi}{4} - \alpha\right) = \frac{\sqrt{2}}{2}(\cos\alpha - \sin\alpha)$

B) $\sin\left(\frac{\pi}{2} + \alpha\right) = \cos\alpha$

C) $\cos(\alpha - 30°) = \frac{\sqrt{3}}{2}\cos\alpha + \frac{1}{2}\sin\alpha$

D) $tg\left(\frac{\pi}{4} + \alpha\right) = \frac{1+tg\alpha}{1-tg\alpha}$ E) $\cos 75° = \frac{\sqrt{2}(\sqrt{3}-1)}{4}$

Yechilishi: $\cos\left(\frac{\pi}{4} - \alpha\right) = \frac{\sqrt{2}}{2}(\cos\alpha - \sin\alpha) =>$
$=> \cos\frac{\pi}{4}\cos\alpha + \sin\frac{\pi}{4}\sin\alpha = \frac{\sqrt{2}}{2}(\cos\alpha + \sin\alpha).$
Javobi: A.

43. $2\sin x \geq \sqrt{2}$ tengsizlikni yeching.

A) $\frac{\pi}{4}+2\pi n \leq x \leq \frac{3\pi}{4}+2\pi n, n \in Z$

B) $-\frac{5\pi}{4}+2\pi n \leq x \leq \frac{\pi}{4}+2\pi n, n \in Z$

C) $\frac{\pi}{4}+2\pi n \leq x < \frac{3\pi}{4}+2\pi n, n \in Z$

D) $\frac{\pi}{4}+\pi n \leq x \leq \frac{3\pi}{4}+\pi n, n \in Z$

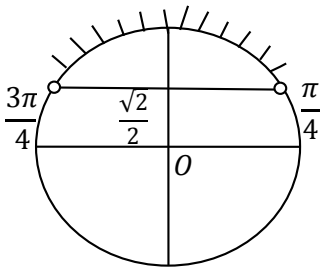
E) $-\frac{5\pi}{4}+\pi n \leq x \leq \frac{\pi}{4}+\pi n, n \in Z$

Yechilishi: $2\sin x \geq \sqrt{2} => \sin x \geq \frac{\sqrt{2}}{2}$;

$\frac{\pi}{2}+\frac{\pi}{4}=\frac{3\pi}{4}$.

$\frac{\pi}{4} \leq x \leq \frac{3\pi}{4} =>$

$=> \frac{\pi}{4}+2\pi n \leq x \leq \frac{3\pi}{4}+2\pi n.$



Javobi: A.

44. $ctg(x+1)\cdot tg(2x-3)=1$ tenglamaning $(\pi;2\pi)$ oraliqdagi yechimini toping.

A) 4 B) 2 C) 3 D) 5 E) $\frac{\pi}{2}+\pi k, k \in Z$

Yechilishi: $ctg(x+1)\cdot tg(2x-3)=1.$

$tg(2x-3)=\frac{1}{ctg(x+1)} =>$

$=> tg(2x-3)=tg(x+1) => 2x-3=x+1 =>$

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

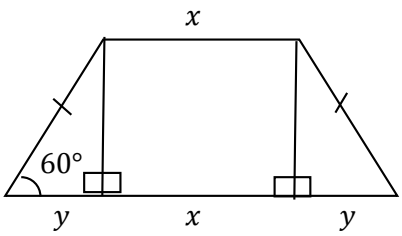
45. Teng yonli trapetsiyaning katta asosi 2,7 ga, yon tomoni 1 ga, ular orasidagi burchak 60º ga teng. Uning kichik asosini toping.

A) 1,7 B) 2,35 C) 1,35 D) $2,7-\sqrt{3}$ E) $2,7-\frac{\sqrt{3}}{2}$

Yechilishi: $x+2y=2,7 =>$

$=> x=2,7-2y.$

$1)\frac{y}{1}=\cos 60° => y=\frac{1}{2};$



2) $x = 2{,}7 - 2 \cdot \frac{1}{2} = 1{,}7$. Javobi: A.

46. $x + y = 1$ tenglama bilan berilgan to‘g‘ri chiziqqa parallel to‘g‘ri chiziqni toping.

A) $2x + 2y + 3 = 0$ B) $y = x - 1$ C) $x - y = 2$

D) $y = x + 1$ E) $y = -\frac{1}{2}x + 1$

Yechilishi: $x + y = 1$; $\frac{A_1}{A_2} = \frac{B_1}{B_2}$;

$2x + 2y + 3 = 0 \Rightarrow \frac{1}{2} = \frac{1}{2}$. Javobi: A.

47. $2y = 2x + 3$ to‘g‘ri chiziqning OX o‘qi bilan hosil qilgan burchagini toping.

A) 45° B) 30° C) 60° D) 75° E) 135°

Yechilishi: $2y = 2x + 3 \Rightarrow y = x + \frac{3}{2} \Rightarrow k = 1 \Rightarrow$

$k = tg\alpha \Rightarrow tg\alpha = 1 \Rightarrow \alpha = 45°$. Javobi: A.

48. $\vec{a}(2; -4)$, $\vec{b}(1; 2), \vec{c}(1; -2)$ va $\vec{d}(-2; -4)$ vektorlardan qaysilari kollinear vektorlar?

A) $\vec{a}, \vec{c}$; $\vec{b}, \vec{d}$ B) $\vec{b}, \vec{c}$ C) $\vec{a}, \vec{d}$ D) $\vec{a}, \vec{b}$

E) $kollinearlari\ yo'q$

Yechilishi: $\vec{a} = \{2; -4\}$; $\vec{b} = \{1; 2\}$; $\vec{c} = \{1; -2\}$;

$\vec{d} = \{-2; -4\}$; 1) $\vec{a} = 2\vec{c}$; 2) $\vec{b} = -2\vec{d}$.

Javobi: A.

49. Shaklda berilganlarga ko‘ra $ADEC$ to‘rtburchakning yuzini toping.

A) 10 B) 6 C) 12 D) 8 E) 7

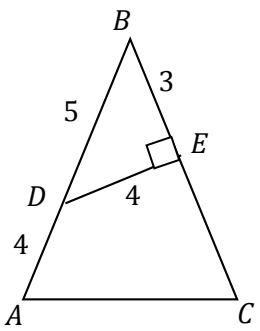
Yechilishi: $\angle B = \alpha$; $\sin\alpha = \frac{4}{5}$;

$S_{\triangle ABC} = \frac{1}{2} \cdot a \cdot b \cdot \sin\alpha =$

$= \frac{1}{2} \cdot 9 \cdot 5 \cdot \frac{4}{5} = 18$.

$S_{\triangle DEB} = 6$; $S_{\square} = 18 - 6 = 12$.

Javobi: C.



50. $x = \sin 60°, y = \cos(-60°)$ va $z = ctg\frac{31\pi}{6}$ sonlarni kamayish tartibida yozing.

A) $z > x > y$ B) $x > y > z$ C) $y > z > x$

D) $z > y > x$ E) $y > x > z$

Yechilishi:

$$\begin{cases} x = \sin 60° = \frac{\sqrt{3}}{2} \\ y = \cos(-600°) = \cos 600° = \cos(4\pi - 120°) = \\ = \cos 120° = -\frac{1}{2}. \\ z = ctg\frac{31\pi}{6} = ctg930° = ctg(5\pi + 30°) = \\ = ctg30° = \sqrt{3}. \end{cases}$$

$z > x > y$. Javobi: A.

1999-YIL, 2-AXBOROTNOMA

1. $\frac{7{,}4+\frac{13}{17}\cdot 0{,}15\cdot 1\frac{4}{13}\cdot 6\frac{2}{3}}{0{,}2\cdot 5-0{,}16}$ ni hisoblang.

A) 10 B) 8 C) 12 D) 6 E) 11

Yechilishi: $\frac{7{,}4+\frac{13}{17}\cdot 0{,}15\cdot 1\frac{4}{13}\cdot 6\frac{2}{3}}{0{,}2\cdot 5-0{,}16}=\frac{7{,}4+\frac{13}{17}\cdot\frac{3}{20}\cdot\frac{17}{13}\cdot\frac{20}{3}}{1-0{,}16}=\frac{8{,}4}{0{,}84}=$

$=\frac{840}{84}=10.$ Javobi: A.

2. 821 ga qanday eng kichik musbat sonni qo‘shganda, yig‘indi 6 ga qoldiqsiz bo‘linadi?

A) 4 B) 1 C) 5 D) 7 E) 9

Yechilishi: $821 => 8+2+1=11.$ Javobi: B.

3. $3p-3\in N$ son $1;2;3;6;9$ va 18 ga qoldiqsiz bo‘linadi. p ning eng kichik natural qiymatini toping.

A) 14 B) 21 C) 7 D) 5 E) 24

Yechilishi: $3p-3=3(p-1) => p=7.$

Javobi: C.

4. $24;18$ va 30 sonlari eng kichik umumiy karralisining eng katta umumiy bo‘luvchisiga nisbatini toping.

A) 90 B) 72 C) 48 D) 30 E) 60

Yechilishi:

$K(24;18;30)=2^3\cdot 3^2\cdot 5=360;$

$D(24;18;30)=2\cdot 3=6;\ \frac{K}{D}=\frac{360}{6}=60.$ Javobi: E.

5. To‘rtta sonning yig‘indisi 128 ga teng. Agar birinchi va ikkinchi sonning nisbati $2:3$ kabi, ikkinchi va uchinchi sonning nisbati $3:5$ kabi va uchinchi va to‘rtinchi sonning

nisbati 5: 6 kabi bo‘lsa, birinchi va to‘rtinchi sonning yig‘indisini toping.

A) 60 B) 62 C) 66 D) 68 E) 64

Yechilishi:

$$\begin{cases} x+y+z+t=128 \\ \frac{x}{y}=\frac{2}{3} => x=\frac{2}{3}y \\ \frac{y}{z}=\frac{3}{5} => y=\frac{3}{5}z \\ \frac{z}{t}=\frac{5}{6} => z=\frac{5}{6}t \end{cases} => \begin{cases} x+y+z+t=128 \\ x=\frac{2}{3}\cdot\frac{1}{2}\cdot t=\frac{1}{3}t \\ y=\frac{3}{5}\cdot\frac{5}{6}t=\frac{1}{2}t \\ z=\frac{5}{6}t \end{cases} =>$$

$$=> \frac{1}{3}t+\frac{1}{2}t+\frac{5}{6}t+t=128 => 16t=128\cdot 6 =>$$

$$=> t=48. \qquad x+t=\frac{1}{3}\cdot 48+48=64.$$

Javobi: E.

6. It o‘zidan 30 m masofada turgan tulkini quva boshladi. It har sakraganda 2 m, tulki esa 1m masofani o‘tadi. Agar it 2 marta sakraganda, tulki 3 marta sakrasa, it qancha (m) masofada tulkini quvib yetadi?

A) 110 B) 120 C) 116 D) 124 E) 130

Yechilishi: $S_i=v_i\cdot t=4t$

$S_t=v_t\cdot t=3t$

$S_i=S_t+30$

$4t=3t+30 => t=30 => S_i=4\cdot 30=120.$

Javobi: B.

7. Hovuzga 2 ta quvur o‘tkazilgan. Birinchi quvur bo‘sh hovuzni 10 soatda to‘ldiradi, ikkinchisi esa to‘la hovuzni 15 soatda bo‘shatadi. Hovuz bo‘sh bo‘lgan vaqtda ikkala quvur birdaniga ochilsa, hovuz necha soatdan keyin to‘ladi?

A) 25 B) 28 C) 30 D) 32 E) 24

Yechilishi: $\left(\frac{1}{10}-\frac{1}{15}\right)\cdot x=1 \Rightarrow \frac{3-2}{30}x=1 \Rightarrow x=30.$

Javobi: C.

8. Ikki xonali sonning raqamlari yig‘indisi 6 ga teng. Agar bu songa 18 qo‘shilsa, berilgan sonning raqamlari o‘rinlarini almashtirib yozishdan hosil bo‘lgan songa teng son hosil bo‘ladi. Berilgan sonni toping.

A) 15 B) 60 C) 51 D) 24 E) 33

Yechilishi: $\begin{matrix} xy+18=yx \\ x+y=6 \end{matrix} \Rightarrow$

$\Rightarrow \begin{cases} 10x+y+18=10y+x \\ x=6-y \end{cases} \Rightarrow \begin{cases} 9x+18=9y \\ x=6-y \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 9(x+2)=9y \\ x=6-y \end{cases} \Rightarrow \begin{cases} x+2=y \\ x=6-y \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 6-y+2=y \\ x=6-y \end{cases} \Rightarrow \begin{cases} 2y=8 \\ x=6-y \end{cases} \Rightarrow \begin{cases} y=4 \\ x=2 \end{cases} \Rightarrow$

$\Rightarrow xy=24.$ Javobi: D.

9. α va β irratsional sonlar $(\alpha \neq \beta)$, $\alpha+\beta$- ratsional son. Quyidagilardan qaysi biri ratsional son?

A) $\alpha-2\beta$ B) $\alpha^2+2\alpha\beta+\beta^2$ C) $\frac{\alpha-2\beta}{2}$

D) $2\alpha+\beta$ E) $\alpha-3\beta$

Yechilishi: $(\alpha+\beta)^2=\alpha^2+2\alpha\beta+\beta^2.$ Javobi: B.

10. Ikki natural son kvadratlarining o‘rta arifmetigi 10 ga, o‘rta geometrigi esa 8 ga teng. Shu sonlarning yig‘indisini toping.

A) 4 B) 12 C) 9 D) 6 E) 7

Yechilishi: $\begin{cases} \frac{x^2+y^2}{2} = 10 \\ \sqrt{(xy)^2} = 8 \end{cases} =>$

$$=> + \begin{matrix} x^2+y^2 = 20 \\ xy = 8/2 \\ \hline x^2+2xy+y^2 = 36 \end{matrix} => (x+y)^2 = 36 =>$$

$=> x+y = 6.$ Javobi: D.

11. Agar $a = 8$ va $b = 2$ bo‘lsa, $\frac{a^{\frac{3}{2}}-b^{\frac{3}{2}}}{a^{\frac{1}{2}}-b^{\frac{1}{2}}} - \frac{a^{\frac{3}{2}}+b^{\frac{3}{2}}}{a^{\frac{1}{2}}+b^{\frac{1}{2}}}$ ning qiymati nechaga teng bo‘ladi?

A) 10 B) 6 C) 8 D) 12 E) 4

Yechilishi: $a = 8;\ b = 2;$ $\frac{\sqrt{a^3}-\sqrt{b^3}}{\sqrt{a}-\sqrt{b}} - \frac{\sqrt{a^3}+\sqrt{b^3}}{\sqrt{a}+\sqrt{b}} =$

$$= \frac{a^2+\sqrt{a^3b}-\sqrt{ab^3}-b^2-a^2+\sqrt{a^3b}-\sqrt{ab^3}+b^2}{a-b} =$$

$$= \frac{2\sqrt{a^3b}-2\sqrt{ab^3}}{a-b} = \frac{2\sqrt{ab}(a-b)}{a-b} = 8.$$ Javobi: C.

12. $\sqrt{3\sqrt[3]{18}} \cdot \sqrt[6]{96}$ ni hisoblang.

A) 6 B) 18 C) 9 D) 10 E) 4

Yechilishi: $\sqrt{3\sqrt[3]{18}} \cdot \sqrt[6]{96} = \sqrt[6]{27 \cdot 18 \cdot 96} =$

$$= \sqrt[6]{3^3 \cdot 2 \cdot 3^2 \cdot 3 \cdot 2^5} = \sqrt[6]{3^6 \cdot 2^6} = 3 \cdot 2 = 6.$$

Javobi: A.

13. $\sqrt{9+\sqrt{65}} \cdot \sqrt{9-\sqrt{65}}$ 14 dan qanchaga kam?

A) 8 B) 9 C) 10 D) 11 E) 12

Yechilishi: $\sqrt{9+\sqrt{65}} \cdot \sqrt{9-\sqrt{65}} =$

$$= \left(\sqrt{\frac{9+4}{2}} + \sqrt{\frac{9-4}{2}}\right)\left(\sqrt{\frac{13}{2}} - \sqrt{\frac{5}{2}}\right) = \frac{13}{2} - \frac{5}{2} = 4.$$

$14 - 4 = 10.$ Javobi: C.

14. $(x-2)^2-4|x-2|+3=0$ tenglamaning ildizlari ko‘paytmasini toping.

A) 3 B) 15 C) -3 D) -15 E) -9

Yechilishi: $(x-2)^2-4|x-2|+3=0;$

1) $x-2>0 \Rightarrow x^2-4x+4-4x+8+3=0 \Rightarrow$

$\Rightarrow x^2-8x+15=0 \Rightarrow \begin{cases} x_1=3 \\ x_2=5 \end{cases} \Rightarrow x_1\cdot x_2=15.$

2) $x-2<0 \Rightarrow x^2-4x+4+4x-8+3=0 \Rightarrow$

$\Rightarrow x^2-1=0 \Rightarrow x^2=1 \Rightarrow x_{3,4}=\pm 1 \Rightarrow$

$\Rightarrow x_3\cdot x_4=1\cdot(-1)=-1.$

$x_1\cdot x_2\cdot x_3\cdot x_4=3\cdot 5\cdot(-1)\cdot 1=-15.$ Javobi: D.

15. $x^4=3x^2-2x$ tenglamaning eng katta va eng kichik ildizlari yig‘indisini toping.

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

Yechilishi: $x^4-3x^2+2x=0 \Rightarrow$

$\Rightarrow x^4-2x^2+1-x^2+2x-1=0 \Rightarrow$

$\Rightarrow x^4-2x^2+1-(x^2-2x+1)=0 \Rightarrow$

$\Rightarrow (x^2-1)^2-(x-1)^2=0 \Rightarrow$

$\Rightarrow [(x-1)(x+1)]^2-(x-1)^2=0 \Rightarrow$

$\Rightarrow (x-1)^2(x+1)^2-(x-1)^2=0 \Rightarrow$

$\Rightarrow (x-1)^2[(x+1)^2-1] \Rightarrow \begin{cases} (x-1)^2=0 \\ (x+1)^2-1=0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x-1=0 \\ x+1=\pm 1 \end{cases} \Rightarrow \begin{cases} x=1; \\ x=0; \\ x=-2. \end{cases}$ Javobi: D.

16. x_1 va x_2 $x^2-px+p-1=0$ tenglamaning ildizlari. p ning qanday qiymatida $x_1^2+x_2^2$ yig‘indi eng kichik qiymatni qabul qiladi?

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

Yechilishi: $x^2 - px + p - 1 = 0 =>$

$=> p = -p; q = p - 1.$

$\begin{cases} x_1 + x_2 = p \\ x_1 \cdot x_2 = p - 1 \end{cases} => \begin{cases} x_1^2 + x_2^2 + 2x_1x_2 = p^2 \\ x_1x_2 = p - 1 \end{cases} =>$

$=> x_1^2 + x_2^2 + 2(p-1) = p^2 =>$

$=> x_1^2 + x_2^2 = p^2 - 2p + 2 => p^2 - 2p + 1 + 1 =$

$=> (p-1)^2 + 1.$ Javobi: C.

17. a ning qanday qiymatida $\begin{cases} 2x + ay = 2 \\ ax + 2y = 3 \end{cases}$ tenglamalar sistemasi yechi,ga ega bo‘lmaydi?

A) 3 B) ± 3 C) 4 D) ± 2 E) -4

Yechilishi: $\begin{cases} 2x + ay = 2/a \\ ax + 2y = 3/2 \end{cases} =>$

$$=> -\begin{array}{r} 2ax + a^2y = 2a \\ 2ax + 4y = 6 \\ \hline a^2y - 4y = 2a - 6 \end{array} => (a^2 - 4)y = 2a - 6 =>$$

$=> y = \frac{2a-6}{a^2-4} => a = \pm 2.$ Javobi: D.

18. k ning qanday eng katta butun qiymatida $kz^2 + 2(k-12)z + 2 = 0$ tenglama yechimga ega bo‘lmaydi?

A) 16 B) 18 C) 20 D) 17 E) 21

Yechilishi: $kz^2 + 2(k-12)z + 2 = 0;$

$D < 0 => [2(k-12)]^2 - 4k \cdot 2 < 0 =>$

$=> 4(k-12)^2 - 8k < 0 => (k-12)^2 - 2k < 0 =>$

$=> k^2 - 24k + 144 - 2k < 0 =>$

$k^2 - 26k + 144 < 0 =>$

$k_{1,2} = 13 \pm \sqrt{169 - 144} = 13 \pm 5 => \begin{cases} k_1 = 8 \\ k_2 = 18 \end{cases} =>$

$=> k \in (8; 18) => k = 17.$ Javobi: D.

19. $\sqrt{x^2 - 3x + 5} + x^2 = 3x + 7$ tenglamaning ildizlari yig‘indisini toping.

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

Javobi: D.

Yechilishi: $\sqrt{x^2 - 3x + 5} + x^2 = 3x + 7;$

1) $\sqrt{x^2 - 3x + 5} + x^2 - 3x + 5 = 12;$

$\sqrt{x^2 - 3x + 5} = z;\ z^2 + z - 12 = 0 =>$

$=> z_{1,2} = -\frac{1}{2} \pm \sqrt{\frac{1}{4} + 12} = -\frac{1}{2} \pm \frac{7}{2} => \begin{cases} z_1 = -4; \\ z_2 = 3. \end{cases}$

2) $\sqrt{x^2 - 3x + 5} \neq -4;$

3) $\sqrt{x^2 - 3x + 5} = 3 => x^2 - 3x - 4 = 0 =>$

$=> x_{1,2} = \frac{3}{2} \pm \sqrt{\frac{9}{4} + 4} = \frac{3}{2} \pm \frac{5}{2} => \begin{cases} x_1 = -1 \\ x_2 = 4 \end{cases} =>$

$=> x_1 + x_2 = -1 + 4 = 3.$ Javobi: C.

20. $\sqrt{x^2 - 6x + 9} < 3$ tengsizlik nechta butun yechimga ega?

A) 4 B) 6 C) 7 D) 8 E) 5

Yechilishi: $\sqrt{x^2 - 6x + 9} < 3 =>$

$=> \begin{cases} x^2 - 6x + 9 \geq 0 \\ x^2 - 6x + 9 < 9 \end{cases} => \begin{cases} x \neq 3 \\ x^2 - 6x < 0 \end{cases} =>$

$=> x(x - 6) < 0 => (0; 6).$ U holda $x = 1,2,4,5.$

Javobi: A.

21. $(x - a)(x - b) \leq 0$ tengsizlikning yechimlaer to‘plami [2; 6] oraliqdan iborat. ab ning qiymatini toping.

A) 10 B) 11 C) 13 D) 12 E) 8

Yechilishi: $(x-a)(x-b) \le 0 \Rightarrow \begin{cases} x=a \\ x=b \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} a=2 \\ b=6 \end{cases} \Rightarrow a \cdot b = 12.$ Javobi: D.

22. $y = x^2$ va $y = |x|$ funksiyalar grafiklarining OX o‘qida yotmaydigan kesishish nuqtalari orasidagi masofani toping.

A) 2 B) 2,5 C) 2,3 D) 1,5 E) 1,8

Yechilishi: $y = x^2;\ \ y = |x|.$

$A(1;1), \qquad B(-1;1).$

$|AB| = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} =$

$= \sqrt{(-1-1)^2+(1-1)^2} = 2.$ Javobi: A.

23. Arifmetik progressiyaning hadlari 19 ta. Uning o‘rta hadi 21 ga teng. Shu progressiyaning hadlari yig‘indisini toping.

A) 398 B) 399 C) 400 D) 384 E) 392

Yechilishi: $n = 19.$

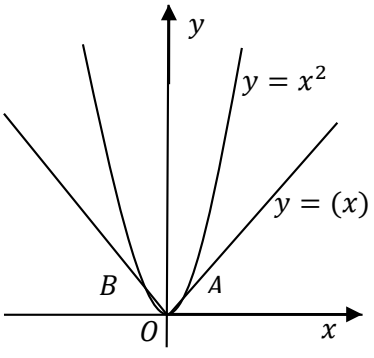
$\frac{a_1+a_{19}}{2} = 21 \Rightarrow a_1 + a_{19} = \ = 2 \cdot 21.$

$S_{19} = \frac{2 \cdot 21}{2} \cdot 19 = 399.$ Javobi: B.

24. Ishorasi almashinuvchi geometrik progressiyaning birinchi hadi 2 ga, uchinchi hadi 8 ga teng. Shu progressiyaning dastlabki oltita hadi yig‘indisini toping.

A) 20 B) -20 C) -42

D) 42 E) -64



Yechilishi: $b_1 = 2;\ \ b_3 = 8;\ \ \ S_6 = ?$

$b_3 = b_1 \cdot q^2 \Rightarrow 8 = 2q^2 \Rightarrow$

$\Rightarrow q^2 = 4 \Rightarrow q = \pm 2 \Rightarrow q = -2;$

$S_6 = \frac{b_1(q^6-1)}{q-1} = \frac{2[(-2)^6-1]}{-2-1} = \frac{2 \cdot 63}{-3} = -42.$ Javobi: C.

25. $m = \arcsin\frac{\sqrt{3}}{2}, n = \arccos\left(-\frac{1}{2}\right)$ va $p = arctg1$ sonlarni kamayish tartibida joylashtiring.

A) $m > p > n$ B) $m > n > p$

C) $n > m > p$ D) $p > n > m$

E) $p > m > n$

Yechilishi: $\begin{cases} m = \arcsin\frac{\sqrt{3}}{2} = 60° \\ n = \arccos\left(-\frac{1}{2}\right) = 120° \\ p = arctg1 = 45° \end{cases} => p < m < n.$

Javobi: C.

26. $y = \sin\frac{x}{2}$ funksiya eng kichik musbat davrining $y = \cos 8x$ funksiya eng kichik musbat davriga nisbatini toping.

A) 12 B) 14 C) 10 D) 18 E) 16

Yechilishi: 1) $y = \sin\frac{1}{2}x => \frac{2\pi}{\frac{1}{2}} = 4\pi.$

2) $y = \cos 8x => \frac{2\pi}{8} => \frac{\pi}{4}.$

3) $4\pi : \frac{\pi}{4} = 4\pi \cdot \frac{4}{\pi} = 16.$ Javobi: E.

27. $\frac{\cos^2 x + \cos x}{2\cos^2\frac{x}{2}} + 1$ ni soddalashtiring.

A) $2\sin^2\frac{x}{2}$ B) $-2\sin^2\frac{x}{2}$ C) $2\cos\frac{x}{2}$

D) $-2\cos^2\frac{x}{2}$ E) $2\cos^2\frac{x}{2}$

Yechilishi: $\frac{\cos^2 x - \cos x}{2\cos^2\frac{x}{2}} + 1 = \frac{\cos x(1+\cos x)}{2\cdot\frac{1}{2}(1+\cos x)} + 1 = \cos x +$

$+\sin^2\frac{x}{2} + \cos^2\frac{x}{2} = 2\cos^2\frac{x}{2}.$

$\boxed{\cos x = \cos 2 \cdot \frac{x}{2} = \cos^2 \frac{x}{2} - \sin^2 \frac{x}{2}}$ Javobi: E.

28. $\frac{1}{1+\text{tg}^2\, x} = \frac{1}{1+\text{ctg}^2\, x}$ tenglamani yeching.

A) $\pi + 2\pi k, k \in Z$ B) $\frac{\pi}{4} + \frac{\pi k}{2}, k \in Z$

C) $2\pi k, k \in Z$ D) $\emptyset$ E) $\pi k, k \in Z$

Yechilishi: $\frac{1}{1+\text{tg}^2\, x} = \frac{1}{1+\text{ctg}^2\, x} \Rightarrow \frac{1}{\frac{1}{\cos^2 x}} = \frac{1}{\frac{1}{\sin^2 x}} \Rightarrow$

$\Rightarrow \cos^2 x - \sin^2 x = 0 \Rightarrow \cos 2x = 0 \Rightarrow$

$\Rightarrow x = \frac{\pi}{4} + \frac{\pi}{2} k.$ Javobi: B.

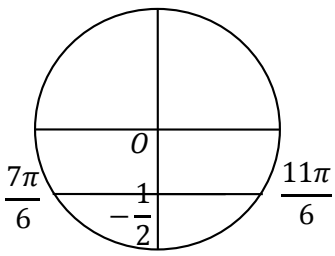
29. $|1 + \sin x| \leq \frac{1}{2}$ tengsizlikning $[0; 2\pi]$ oraliqdagi eng katta va eng kichim yechimlari ayirmasini toping.

A) π B) $1{,}5\pi$ C) $\frac{2\pi}{3}$ D) $1{,}2\pi$ E) $\frac{3\pi}{4}$

Yechilishi: $|1 + \sin x| \leq \frac{1}{2} \Rightarrow -\frac{1}{2} \leq 1 + \sin x \leq \frac{1}{2} \Rightarrow$

$\Rightarrow -\frac{1}{2} - 1 \leq \sin x \leq \frac{1}{2} - 1 \Rightarrow -\frac{3}{2} \leq \sin x \leq -\frac{1}{2} \Rightarrow$

$\Rightarrow \begin{cases} \sin x \geq -\frac{3}{2} \\ \sin x \leq -\frac{1}{2} \end{cases} \Rightarrow \frac{7\pi}{6} \leq x \leq \frac{11\pi}{6}.$



$\frac{11\pi}{6} - \frac{7\pi}{6} = \frac{4\pi}{6} = \frac{2\pi}{3}.$ Javobi: C.

30. Quyida keltirilgan tengsizliklardan qaysi biri to‘g‘ri?

1) $\log_{\frac{1}{2}} \frac{b^4+b^2}{b^2} > 0$

2) $\log_3 8 + \log_3 2 > 4$

3) $\log_4 a^2 < \frac{\log_2 a^2}{2}$

4) $\log_5 10 - \log_5 2 > 1$

A) 1 B) 2 C) 3 D) 4 E) *hech qaysisi to′g′ri emas*

Yechilishi: 1) $\log_{\frac{1}{2}} \frac{b^4+b^2}{b^2} = \log_{\frac{1}{2}} \frac{b^2(b^2+1)}{b^2} =$

$= \log_{\frac{1}{2}}(b^2+1) < 0;$

2) $\log_3 8 + \log_3 2 = \log_3 8 \cdot 2 = \log_3 16 = \log_3 2^4 =$

$= 4\log_3 2 < 4.$

3) $\log_4 a^2 = \log_{2^2} a^2 = \frac{\log_2 a^2}{2}.$

4) $\log_5 10 - \log_5 2 = \log_5 \frac{10}{2} = \log_5 5 = 1.$ Javobi: E.

31. $100^{\frac{1}{2}\lg 27 - \lg 3} \cdot 10$ ni hisoblang.

A) 20 B) 40 C) 30 D) 10 E) 50

Yechilishi: $100^{\frac{1}{2}\lg 27 - \lg 3} \cdot 10 = \frac{100^{\frac{1}{2}\lg 27}}{100^{\lg 3}} \cdot 10 =$

$= \frac{10^{lg27}}{10^{lg3^2}} \cdot 10 = \frac{27}{9} \cdot 10 = 30.$ Javobi: C.

32. $\frac{1}{2^{\log_4 x}} = 4$ tenglamaning ildizi 16 dan necha marta kam?

A) 164 B) 172 C) 312 D) 180 E) 256

Yechilishi: $\frac{1}{2^{\log_4 x}} = 4 \Rightarrow \frac{1}{2^{\frac{1}{2}\log_2 x}} = 4 \Rightarrow \frac{1}{\sqrt{x}} = 4 \Rightarrow$

$\Rightarrow 1 = 4\sqrt{x} \Rightarrow x = \frac{1}{16} \Rightarrow 16 : \frac{1}{16} = 256.$

Javobi: E.

33. $\log_{3x^2+5}(9x^4 + 27x^2 + 28) > 2$ tengsizlikning butun yechimini toping.

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

Yechilishi: $\log_{3x^2+5}(9x^4 + 27x^2 + 28) > 2$

x ning har qanday qiymatida logarifmning aniqlanish sohasi talablari o‘rinli

$9x^4 + 27x^2 + 28 > (3x^2 + 5)^2$

$9x^4 + 27x^2 + 28 > 9x^4 + 30x^2 + 25$

$3x^2 < 3 => x^2 < 1 => |x| < 1 =>$
$=> -1 < x < 1 => x = 0.$ Javobi: D.

34. a ning qanday qiymatida $2^{4x} \cdot 4^a = 32$ va $3^x \cdot 3^a = 27$ tenglamalarning ildizlari bir-biriga teng bo‘ladi?

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

Yechilishi: $\begin{cases} 2^{4x} \cdot 4^a = 32 \\ 3^x \cdot 3^a = 27 \end{cases} => \begin{cases} 2^{4x} \cdot 2^{2a} = 2^5 \\ 3^x \cdot 3^a = 3^3 \end{cases} =>$

$=> \begin{cases} 2^{4x+2a} = 2^5 \\ 3^{x+a} = 3^3 \end{cases} => \begin{cases} 4x + 2a = 5 \\ x + a = 3 \end{cases} =>$

$=> \begin{cases} x = \frac{5-2a}{4} \\ x = 3 - a \end{cases} => \frac{5-2a}{4} = 3 - a =>$

$=> 5 - 2a = 12 - 4a => a = 3{,}5.$ Javobi: C.

35. $\left(\frac{1}{2}\right)^{20-2x} > 1$ tengsizlikning eng kichik butun yechimini toping.

A) 6 B) 11 C) 10 D) 6 E) 8

Yechilishi: $\left(\frac{1}{2}\right)^{20-2x} > 1 => (0{,}5)^{20-2x} > (0{,}5)^0 =>$

$=> 20 - 2x < 0 => 2x > 20 => x > 10 => x = 11.$

Javobi: B.

36. Argumentning nechta butun qiymati $f(x) = \frac{\sqrt{8-x}}{\lg(x-1)}$ funksiyaning aniqlanish sohasiga tegishli?

A) 4 B) 8 C) 7 D) 6 E) 5

Yechilishi: $f(x) = \frac{\sqrt{8-x}}{\lg(x-1)} => \begin{cases} 8 - x \geq 0 \\ \lg(x-1) \neq 0 \end{cases} =>$

$=> \begin{cases} x \leq 8 \\ x - 1 > 0 \\ x \neq 2 \end{cases} => \begin{cases} x \leq 8 \\ x > 1 \\ x \neq 2 \end{cases} => (1; 2) \cup (2; 8]$ 6 $ta.$

Javobi: D.

37. a ning qanday qiym,atlarida $\log_a \sin x = 1$ tenglama yechimga ega?

A) $a \in [-1;1]$ B) $a \in (-1;1)$

C) $a \in (0;1]$ D) $a \in (0;1)$ E) $a \in [0;1)$

Yechilishi: $\log_a \sin x = 1 =>$

1) $\begin{cases} a > 0 \\ a \neq 1 \\ \sin x > 0 \end{cases} => \begin{cases} a > 0 \\ a \neq 1 \\ 0 < x < \pi \end{cases}$

2) $\sin x = a => x = \arcsin a + 2\pi k; \quad a \in (0;1).$

Javobi: D.

38. Quyidagi funksiyalardan qaysi biri toq funksiya?

A) $f(x) = \sin x\, tgx$ B) $f(x) = \cos x\, ctgx$

C) $f(x) = \sin|x|$ D) $f(x) = e^{|x|}$

E) $f(x) = x sin\, x$

Yechilishi: $f(-x) = \cos(-x) \cdot ctg(-x) =$

$= -\cos x\, ctgx.$ Javobi: B.

39. Moddiy nuqta $S(t) = 3t^3 - 3t^2 + 12t(m)$ qonuniyat bo‘yicha harakatlanayapti. Uning tezlanishi 0 ga teng bo‘lgan paytda tezligi necha m/min bo‘ladi?

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

Yechilishi: $\boxed{S'(t) = v; v' = 0}$

$S(t) = 3t^3 - 3t^2 + 12t => v = 9t^2 - 6t + 12 =>$

$0 = 18t - 6 => 18t - 6 = 0 => 18t = 6 =>$

$=> t = \frac{1}{3}.$

$v = 9 \cdot \left(\frac{1}{3}\right)^2 - 6 \cdot \frac{1}{3} + 12 = 1 - 2 + 12 = 11.$

Javobi: D.

40. Agar p o‘zgarmas son $(p > 0)$ bo‘lsa, p ning qanday qiymatlarida $f(x) = px - \ln x$ funksiya $(0; 8]$ oraliqda kamayuvchi bo‘ladi?

A) $\frac{1}{4}$ B) $1\frac{1}{6}$ C) $\frac{1}{7}$ D) $\frac{1}{8}$ E) $\frac{3}{5}$

Yechilishi: $f(x) = px - \ln x$;

$x > 0;\ \ p = const;\ \ p > 0;\ \ (0; 8].$

$f'(x) = p - \frac{1}{x} \le 0 => \frac{1}{x} \ge p => x \in (0; 8]$

$p \le \frac{1}{8}$. Javobi: D.

41. Absissasi $x_0 = 3$ bo‘lgan nuqtadan $f(x) = \sqrt{3}\ln x$ funksiyaga o‘tkazilgan urinma OY o‘qi bilan qanday burchak tashkil etadi?

A) $arctg3$ B) $60°$ C) $30°$

D) $arctg2$ E) $90° - arctg2$

Yechilishi: $x_0 = 3;\ \ f(x) = \sqrt{3}\ln x =>$

$=> f'(x) = \sqrt{3} \cdot \frac{1}{x} => f'(x_0) = \frac{\sqrt{3}}{x_0} =>$

$=> |k = f'(x_0) = tg\alpha| =>$

$=> tg\alpha = \frac{\sqrt{3}}{3} => \alpha = 30° => \beta = 60°.$

Javobi: B.

42. $y = 3x^4 - 4x^3$ funksiyaning $[0; 2]$ kesmadagi eng kichik qiymatini toping.

A) 0 B) -16 C) -1 D) 1 E) -12

Yechilishi: $y' = 12x^3 - 12x^2 =>$

$=> 12x^3 - 12x^2 = 0 => 12x^2(x - 1) = 0 =>$

$=> \begin{cases} x = 0 \\ x = 1 \end{cases} => x = 0; 1; 2.$

$x = 0 => y(0) = 0;$

$x = 1 => y(1) = 3 \cdot 1^4 - 4 \cdot 1^3 = -1;$

$x = 2 => y(2) = 3 \cdot 2^4 - 4 \cdot 2^3 = 16$

Javobi: C.

43. $F(x) = \frac{1}{2}x^2 + \cos x + C$ funksiya $y = f(x)$ funksiyaning boshlang‘ich funksiyasi. $y = f(x)$ funksiyaning hosilasini toping.

A) $2\cos^2\frac{x}{2}$ B) $2\sin^2\left(\frac{\pi}{4} - \frac{\pi}{2}\right)$ C) $1 + 2\cos x$

D) $2\sin^2\frac{x}{2}$ E) $1 + 2\sin x$

Yechilishi: $F(x) = \frac{1}{2}x^2 + \cos x + C$

$[F(x)]' = f(x) => f(x) = x - \sin x;\quad y = f(x) =>$

$=> y' = f'(x) => y' = 1 - \cos x = 1 - \cos 2 \cdot \frac{x}{2} =$

$= \sin^2\frac{x}{2} + \cos^2\frac{x}{2} - \cos^2\frac{x}{2} + \sin^2\frac{x}{2} = 2\sin^2\frac{x}{2}.$

Javobi: D.

44. $\int_{\frac{5\pi}{3}}^{\frac{4\pi}{3}} |\sin x| dx$ ni hisoblang.

A) 1,5 B) -2 C) 1 D) -1,5 E) -1

Yechilishi: $\int_{\frac{5\pi}{3}}^{\frac{4\pi}{3}} |\sin x| dx = -\int_{\frac{4\pi}{3}}^{\frac{5\pi}{3}} |\sin x| dx =$

$= -\int_{240^\circ}^{300^\circ} (-\sin x) dx = \int_{240^\circ}^{300^\circ} \sin x\, dx =$

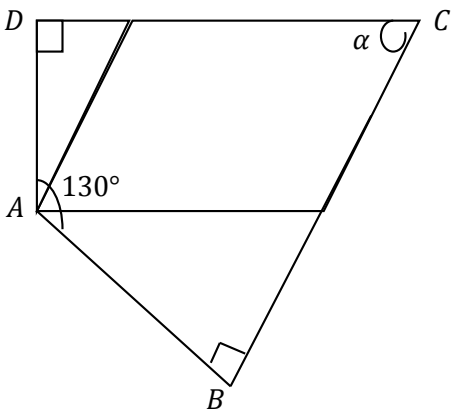
$= -\cos x\,|_{240}^{300} = -[\cos 300^\circ - \cos 240^\circ] =$

$= -[\cos(360 - 60) - \cos(180 + 60)] =$

$= -[\cos 60^\circ + \cos 60^\circ] = -1.$ Javobi: E.

45. Parallelogrammning o‘tkir burchagi uchidan uning shu uchidan o‘tmaydigan yon tomonlariga tushirilgan perpendikulyarlar orasidagi burchak 130° ga teng. Parallelogrammning o‘tkir burchagi toping.

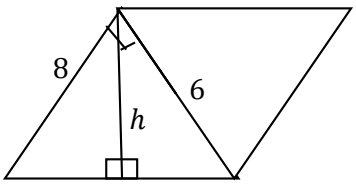
A) 40° B) 45° C) 50°
D) 55° E) 35°



Yechilishi:
$ABCD\ to'rtburchakdan\ \alpha +$
$+2 \cdot 90° + 130° = 360° =>$
$=>\ \alpha = 50°$
Javobi: C.

46. Parallelogrammning 6 ga teng bo‘lgan kichik diaganali uning 8 ga teng bo‘lgan kichik yon tomoniga perpendikulyar. Parallelogrammning katta tomoniga tushurilgan balandligini toping.

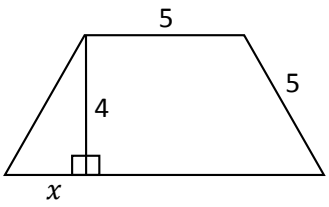
A) 4,2 B) 4,4 C) 4,6
D) 4 E) 4,8



Yechilishi: Misr uchburchagiga asosan c=10. $h = \frac{a \cdot b}{c} =$
$= \frac{6 \cdot 8}{10} = 4{,}8.$ Javobi: E.

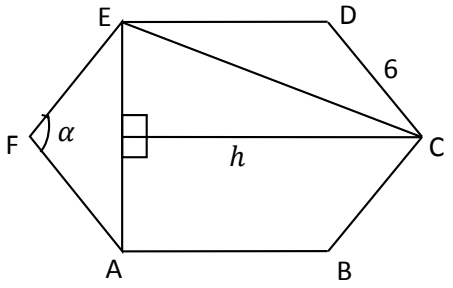
47. Teng yonli trapetsiyaning yon tomoni va kichik asosi 5 ga, balandligi 4 ga teng. Trapetsiyaning yuzi 12 dan qancha ko‘p?

A) 19 B) 22 C) 20
D) 7 E) 12



Yechilishi: Misr uchburchagidan x=3
$S = \frac{a+b}{2} \cdot h = 32 => 32 - 12 = 20.$
Javobi: C.

48. Muntazam $ABCDEF$ oltiburchakning tomoni 6 ga teng. C uchidan AE diagonalgacha bo‘lgan masofani toping.



A) 8 B) 9 C) 10 D) 7 E) 12

Yechilishi: $6\alpha = 180°(6-2) => \alpha = 120°$

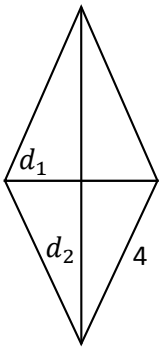
$AE^2 = AF^2 + FE^2 - 2 \cdot AF \cdot FE \cos 120° = 6^2 + 6^2 -$

$-2 \cdot 6 \cdot 6 \cdot \left(-\frac{1}{2}\right) = 108 => AE = = \sqrt{108}.$

$h^2 = CE^2 - \left(\frac{AE}{2}\right)^2 = 108 - 27 = = 81 => h = 9.$

Javobi: B.

49. Rombning tomoni 4 ga, yuzi 9 ga teng. Rombning diagonallari yig‘indisini toping.



A) 12 B) 11 C) 10

D) 9,5 E) 11,5

Yechilishi: $\begin{cases} S = \frac{1}{2} d_1 d_2 \\ d_1^2 + d_2^2 = 4a^2 \end{cases} =>$

$=> \begin{cases} 9 = \frac{1}{2} d_1 d_2 \\ d_1^2 + d_2^2 = 4 \cdot 4^2 \end{cases} => \begin{cases} d_1 d_2 = 18/2 \\ d_1^2 + d_2^2 = 64 \end{cases} =>$

$=> \begin{cases} 2d_1 d_2 = 36 \\ + \\ d_1^2 + d_2^2 = 64 \end{cases} => (d_1 + d_2)^2 = 100 =>$

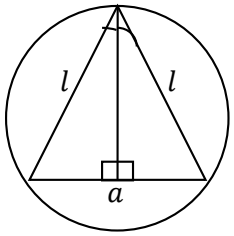
$=> d_1 + d_2 = 10.$ Javobi: C.

50. Teng yonli uchburchakning uchidagi burchagi 2α ga, unga tashqi chizilgan aylananing radiusi R ga teng. Uchburchakning yuzi nimaga teng?

A) $R^2 \sin 2\alpha \cos \alpha$ B) $2R^2 \cos \alpha \sin^2 \alpha$

C) $R^2 \sin^2 2\alpha$ D) $4R^2 \cos^3 \alpha \sin \alpha$ E) $2R^2 \cos^2 \alpha$

Yechilishi:



1) $S_{\triangle} = \frac{1}{2} l^2 \sin 2\alpha$;

2) $\frac{a}{2} : l = \sin \alpha \Rightarrow a = 2l \sin \alpha$;

3) $R = \frac{abc}{4S} = \frac{l \cdot l \cdot 2l \sin \alpha}{4 \cdot \frac{1}{2} e^2 \sin 2\alpha} = \frac{l}{2 \cos \alpha} \Rightarrow l = \ = 2R \cos \alpha.$

4) $S_{\triangle} = \frac{1}{2} (2R \cos \alpha)^2 \cdot 2 \sin \alpha \cos \alpha = 4R^2 \cos^3 \alpha \sin \alpha.$

Javobi: D.

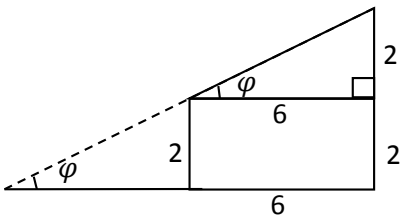
51. AB kesma α tekislikdan 2 va 4 ga teng masofada joylashgan. Kesmaning tekislikdagi proeksiyasi 6 ga teng. Kesma va tekislik orasidagi burchakni toping.

A) 45° B) 60° C) $arctg \frac{1}{3}$ D) 30° E) $\arcsin \frac{3}{5}$

Yechilishi: $\frac{2}{6} = tg\varphi \Rightarrow tg\varphi = \frac{1}{3} \Rightarrow\Rightarrow \varphi = arctg \frac{1}{3}$.

Javobi: C.

52. $A(1;0;1); B(-1;1;2)$ va $C(0;2;-1)$ nuqtalar berilgan. Koordinatalar boshi O nuqtada joylashgan. Agar $\overrightarrow{AB} + \overrightarrow{CD} = \vec{0}$ bo‘lsa, $\overrightarrow{OD}$ vektorning uzunligini toping.



A) 4 B) 2 C) 9

D) 3 E) 6

Yechilishi: $A(1;0;1); B(-1;1;2); C(0;2;-1); D(x;y;z)$

1) $\overrightarrow{AB} = \{-1-1; 1-0; 2-1\} = \{-2; 1; 1\}$

2) $\overrightarrow{AB} + \overrightarrow{CD} = \vec{O} \Rightarrow \{-2;1;1\} + \{x; y-2; z+1\} =$

$= \{0;0;0\} \Rightarrow \{-2+x; 1+y-2; 1+z+1\} =$

$= \{0;0;0\} \Rightarrow \{x-2; y-1; z+2\} = \{0;0;0\} \Rightarrow$

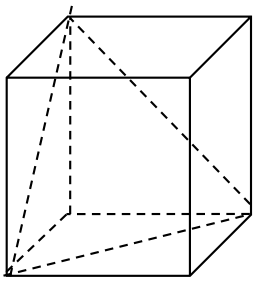
$$=> \begin{cases} x-2=0 \\ y-1=0 \\ z+2=0 \end{cases} => \begin{cases} x=2 \\ y=1 \\ z=-2 \end{cases} => D(2;1;-2).$$

3) $\overrightarrow{OD} = \{2;1;-2\} => \left|\overrightarrow{OD}\right| = \sqrt{9} = 3.$ Javobi: D.

53. Parallelepiped ostki asosining diagonali va ustki asosining unga qarama qarshi uchi orqali tekislik o‘tkazilgan. Bu tekislik parallelepipedni ikkita jismga ajratadi. Shu jismlardan biri piramidadan iborat. Parallelepiped hajmining piramida hajmiga nisbatini toping.

A) 5: 1 B) 6: 1 C) 3: 1

D) 4: 1 E) 9: 1



Yechilishi:

1) $V_{p.ped} = S_{asos} \cdot H;$

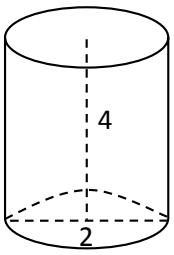
2) $V_{pir} = \frac{1}{3} \cdot \frac{S_{asos}}{2} \cdot H;$

3) $V_{p.ped} : V_{pir} = S_{asos} \cdot H \cdot \frac{6}{S_{asos} \cdot H} = 6:1.$ Javobi: B.

54. Tomonlari 2 va 4 ga teng bo‘lgan to‘g‘ri to‘rtburchak o‘zining katta tomoni atrofida aylanadi. Hosil bo‘lgan jismning to‘la sirtini toping.

A) 22π B) 23π C) 24π

D) 20π E) 18π



Yechilishi: $S_T = S_{yon} + 2S_{asos}.$

$S_{yon} = 2\pi R \cdot H = 2\pi \cdot 2 \cdot 4 = 16\pi.$

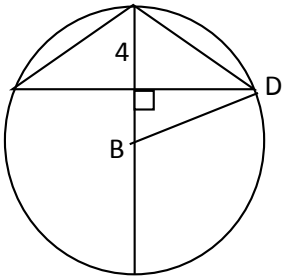
$S_{asos} = \pi R^2 = 4\pi.$

$S_T = 16\pi + 2 \cdot 4\pi = 24\pi.$ Javobi: C.

55. Radiusi 5 ga teng bo‘lgan sharga ichki chizilgan konusning balandligi 4 ga teng. Konusning hajmini toping.

A) 28π B) 18π C) 24π

D) 32π E) 16π



Yechilishi: $DB^2 = 5^2 - 1^2 = 24 =>$

$=> DB = 2\sqrt{6}$

$V_k = \frac{1}{3}\pi R^2 H = \frac{1}{3}\pi \cdot 24 \cdot 4 = 32\pi.$

Javobi: D.

56. Silindrning yon sirti yonilganda, uning diagonali asos tekisligi bilan $45°$ burchak tashkil qiladi. Silindrning yon sirti $144\pi^2$ ga teng. Silindr asosining radiusini toping.

A) 5 B) 4 C) 6 D) 8 E) 7

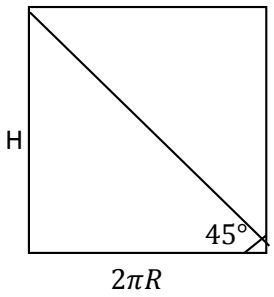
Yechilishi:

1) $2\pi RH = 144\pi^2$;

2) $\frac{H}{2\pi R} = tg45° => H = 2\pi R$;

3) $2\pi R \cdot 2\pi R = 144\pi^2 => R^2 =$

$= \frac{144}{4} = 36 => R = 6.$



Javobi: C.

1999-YIL, 3-AXBOROTNOMA

1. $\frac{0,2(4)\cdot 4\frac{1}{11}+2\frac{1}{4}:1\frac{4}{5}}{1,125+(2\frac{2}{3})^{-1}}$ ni hisoblang.

A) 1 B) 1,5 C) 1,25 D) 2,5 E) $\frac{2}{3}$

Yechilishi: $\frac{0,2(4)\cdot 4\frac{1}{11}+2\frac{1}{4}:1\frac{4}{5}}{1,125+(2\frac{2}{3})^{-1}}=\frac{\frac{24-2}{90}\cdot\frac{45}{11}+\frac{9}{4}\cdot\frac{5}{9}}{1,125+\frac{3}{8}}=\frac{\frac{11}{45}\cdot\frac{45}{11}+\frac{5}{4}}{1,125+0,375}=$

$=\frac{1+\frac{5}{4}}{1,5}=\frac{2,25}{1,5}=1,5.$ Javobi: B.

2. $1-3+5-7+9-11\ldots+97-99$ ni hisoblang.

A) -46 B) -48 C) -50 D) -52 E) -54

Yechilishi: $1-3+5-7+9-11\ldots+97-99 =>$

$=> 1+5+\cdots+97-(3+7+\cdots+99);$

$a_n=a_1+d(n-1);$

1) $a_1=1;\ d=4 => 97=1+4(n-1) => n=25;$

2) $a_1=3; d=4 => 99=3+4(n-1) => n=25;$

$S_1=\frac{1+97}{2}\cdot 25=49\cdot 25;\ S_2=\frac{3+99}{2}\cdot 25=51\cdot 25.$

$S=S_1-S_2=25(49-51)=-50.$ Javobi: C.

3. 200 ni 30% ga orttirildi, hosil bo‘lgan son 20% ga kamaytirildi. Natijada qanday son hosil bo‘ldi?

A) 206 B) 210 C) 208 D) 212 E) 205

Yechilishi: $200\cdot 1,3\cdot 0,8=208.$ Javobi: C.

4. Qaysi ifodaning qiymati ratsional sondan iborat?

1) $(1-\sqrt{2})(1+\sqrt{2});$ 2) $1+2\sqrt{7};$

3) $\frac{0,5}{1-\sqrt{0,5}}-\sqrt{0,5};$ 4) $(1+\sqrt{5})^2-(1-\sqrt{5})^2.$

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

Yechilishi: 1) $1-2=-1.$

3) $\frac{0,5}{1-\sqrt{0,5}} - \sqrt{0,5} = \frac{0,5-\sqrt{0,5}+0,5}{1-\sqrt{0,5}} = 1.$ Javobi: B.

5. 36455478354 ni 2,4,5,9,10 va 25 ga bo‘lganda hosil bo‘lgan qoldiqlar yig‘indisini toping.

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

Yechilishi: 36455478354 raqamlar yig‘indisi : 54.

$36455478354 = 36455478300 + 54$

$54:4 = 13\ (2q);\quad 54:5 = 10(4q);\quad 54:10 = 5(4q)$

$54:25 = 2(4q).\ \ 2 + 3 \cdot 4 = 14.$ Javobi: D.

6. 4^{12} ni 9 ga bo‘lganda, qoldiq necha bo‘ladi?

A) 1 B) 2 C) 4 D) 7 E) 8

Yechilishi: Har qanday son tarkibidan bo‘luvchiga karrali sonni ajratib olish mumkin:

$(mk + r)^n = lk + r^n$ bo‘ladi.

$(mk + r)^n$ ni k ga bo‘lgandagi qoldiq, r^n ni k ga bo‘lgandagi qoldiqqa teng bo‘ladi.

$4^{12} = (4^3)^4 = (9 \cdot 7 + 1)^4 = 9m + 1.$ Javobi: A.

7. Quyidagi sonli ketma-ketliklardan qaysilari tub sonlardan iborat?

1) 0,3,5,7,11;
2) 1,3,5,7,13;
3) 3,5,7,9,11;
4) 2,3,5,7,17;
5) 3,5,17,19,381.

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

Yechilishi: 4) 2, 3, 5, 7, 17. Javobi: E.

8. Proporsiyaning dastlabki uchta hadi yig‘indisi 28 ga teng. Uning ikkinchi hadi birinchi hadining $\frac{1}{2}$ qismini, uchinchi hadi esa $\frac{2}{3}$ qismini tashkil etadi. Proporsiyaning oxirgi hadini toping.

A) $4\frac{1}{13}$ B) $4\frac{2}{13}$ C) $4\frac{3}{13}$ D) $4\frac{4}{13}$ E) $4\frac{5}{13}$

Yechilishi: $a, \frac{1}{2}a, \frac{2}{3}a \Rightarrow a + \frac{a}{2} + \frac{2}{3}a = 28 \Rightarrow$

$\Rightarrow 6a + 3a + 4a = 28 \cdot 6 \Rightarrow 13a = 28 \cdot 6 \Rightarrow$

$\Rightarrow a = \frac{28 \cdot 6}{13}; \frac{1}{2}a = \frac{1}{2} \cdot \frac{28 \cdot 6}{13} = \frac{28 \cdot 3}{13}.$

$\frac{2}{3}a = \frac{2}{3} \cdot \frac{28 \cdot 6}{13} = \frac{28 \cdot 4}{13}.$

$2) \frac{2}{3} \cdot \frac{1}{2}a = \frac{2}{3} \cdot \frac{28 \cdot 3}{13} = \frac{56}{13} = 4\frac{4}{13}.$ Javobi: D.

9. Yo‘lovchilar poyezdining 3 soatda yurgan masofasi yuk poyezdining 4 soatda yurgan masofasidan 10 km ortiq. Yuk poyezdining tezligi yo‘lovchilar poyezdining tezligidan 20 km kam. Yuk poyezdining tezligini toping.

A) 40 B) 45 C) 48 D) 50 E) 52

Yechilishi: $vt = S$.

$3v = 4(v - 20) + 10 \Rightarrow 3v = 4v - 80 + 10 \Rightarrow$

$\Rightarrow v = 70\,km/s \Rightarrow v - 20 = 50.$ Javobi: D.

10. a ning qanday qiymatlarida $2ax + 3y = 3$ va $4x + 3y = 7$ to‘g‘ri chiziqlar kesishish nuqtasining absessasi manfiy bo‘ladi?

A) $a < 3$ B) $a > 3$ C) $a < 2$ D) $a > 2$ E) $a > 1$

Yechilishi: $\begin{array}{r} 2ax + 3y = 3 \\ \underline{-\ 4x + 3y = 7} \\ 2ax - 4x = -4 \end{array} \Rightarrow 4x - 2ax = 4 \Rightarrow$

$\Rightarrow (4 - 2a)x = 4 \Rightarrow x = \frac{4}{4-2a} \Rightarrow \begin{cases} x < 0 \\ \frac{4}{4-2a} < 0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 4 > 0 \\ 4 - 2a < 0 \end{cases} \Rightarrow a > 2.$ Javobi: D.

11. a ning qanday qiymatlarida $9x^2 - 12x + 35a$ parabola absissalar o‘qi bilan ikkita umumiy nuqataga ega bo‘ladi?

A) $a = \frac{4}{35}$ B) $a < \frac{4}{35}$ C) $a > \frac{4}{35}$

D) $a < \frac{18}{35}$ E) $a > \frac{18}{35}$

Yechilishi: $y = 9x^2 - 12x + 35a > 0 =>$
$=> b^2 - 4ac > 0 => (-12)^2 - 4 \cdot 9 \cdot 35a =>$
$=> 36 \cdot 35a < 144 => a < \frac{144}{36 \cdot 35} => a < \frac{4}{35}$.
Javobi: B.

12. n ning qanday qiymatlarida $4x^2 - 3nx + 36 = 0$ tenglama ikkita manfiy ildizga ega?

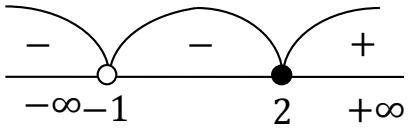
A) $|n| \geq 8$ B) $n \leq -8$ C) $n < 8$
D) $n < -8$ E) $n > 8$

Yechilishi: $4x^2 - 3nx + 36 = 0;$
$D > 0, b > 0, c > 0$ *da ikkala ildiz* "$-$".
1) $D > 0 => (-3n)^2 - 4 \cdot 4 \cdot 36 > 0 =>$
$=> 9n^2 > 16 \cdot 36 => |n| > 8 =>$ $\begin{cases} n > 8; \\ n < -8. \end{cases}$
2) $b > 0$ *ni e'tiborga olsak* $n < -8$. Javobi: D.

13. $\frac{x+2-x^2}{x^3+1} \geq 0$ tengsizlikni yeching.

A) $(-\infty; 2]$ B) $[2; \infty)$ C) $(-\infty; -1) \cup (-1; 2]$
D) $(-1; 2)$ E) $(-\infty; -1) \cup (-1; 2)$

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



$(-\infty; -1) \cup (-1; 2]$.
Javobi: C.

14. Agar $\sqrt[5]{25 + \sqrt{x + 13}} - 2 = 0$ bo'lsa, $\sqrt{x} + \frac{x}{3}$ ning qiymatini toping.

A) 18 B) 20 C) $10\sqrt{2}$ D) $14\sqrt{2}$ E) $15\sqrt{2}$

Yechilishi: $\sqrt[5]{25 + \sqrt{x + 13}} - 2 = 0 =>$

$\Rightarrow \sqrt{x+13} = 32-25 \Rightarrow x+13 = 49 \Rightarrow$
$\Rightarrow x = 36 \Rightarrow \sqrt{x} + \frac{x}{3} = 18$. Javobi: A.

15. $\frac{5^{-\log_{\sqrt{5}} \sqrt[4]{3}}}{9^{1+\log_{0,5} 2}}$ ni hisoblang.

A) $\frac{\sqrt{3}}{9}$ B) $\frac{\sqrt{3}}{3}$ C) $\frac{\sqrt[4]{27}}{9}$ D) $\frac{\sqrt[4]{3}}{3}$ E) $\frac{1}{3}$

Yechilishi: $\frac{5^{-\log_{\sqrt{5}} \sqrt[4]{3}}}{9^{1+\log_{0,5} 2}} = \frac{5^{-\log_{5^{\frac{1}{2}}} 3^{\frac{1}{4}}}}{9 \cdot 9^{\log_{\frac{1}{2}} 2}} = \frac{5^{-2 \cdot \frac{1}{4} \log_5 3}}{9 \cdot 9^{-\log_2 2}} =$

$= \frac{5^{\log_5 3^{-\frac{1}{2}}}}{9 \cdot 9^{-1}} = \frac{3^{-\frac{1}{2}}}{9 \cdot \frac{1}{9}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$. Javobi: B.

16. $x^2 - ax + a - 1 = 0$ tenglamaning ildizlari x_1 va x_2 bo‘lsin. a ning qanday qiymatida $x_1^2 + x_2^2$ yig‘indi eng kichik qiymatga ega?

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

Yechilishi: $x^2 - ax + a - 1 = 0 \Rightarrow p = -a; q = a - 1.$

$\begin{cases} x_1 + x_2 = a \\ x_1 \cdot x_2 = a - 1 \end{cases} \Rightarrow \begin{cases} x_1^2 + x_2^2 + 2x_1 \cdot x_2 = a^2 \\ x_1 \cdot x_2 = a - 1 \end{cases} \Rightarrow$

$\Rightarrow x_1^2 + x_2^2 + 2(a-1) = a^2 \Rightarrow$
$\Rightarrow x_1^2 + x_2^2 = a^2 - 2a + 2 \Rightarrow$
$\Rightarrow x_1^2 + x_2^2 = a^2 - 2a + 1 + 1 \Rightarrow$
$\Rightarrow x_1^2 + x_2^2 = (a-1)^2 + 1 \Rightarrow$
$\Rightarrow (a-1)^2 \geq 0 \Rightarrow a - 1 = 0 \Rightarrow a = 1.$
Javobi: A.

17. $\log_2 \log_{\frac{1}{3}} \log_5 x > 0$ tengsizlikni yeching.

A) $(0; \infty)$ B) $(-\infty; \sqrt[3]{5})$ C) $(-\infty; 0) \cup (\sqrt[3]{5}; \infty)$
D) $(0; \sqrt[3]{5})$ E) $(1; \sqrt[3]{5})$

Yechilishi: $\log_2 \log_{\frac{1}{3}} \log_5 x > 0$. 1) $x > 0$.

2) $\log_{\frac{1}{3}} \log_5 x > 2^0 \Rightarrow \log_{\frac{1}{3}} \log_5 x > \log_{\frac{1}{3}} \frac{1}{3} \Rightarrow$

$\Rightarrow 0 < \frac{1}{3} < 1 \Rightarrow \log_5 x < \frac{1}{3} \Rightarrow x < 5^{\frac{1}{3}} \Rightarrow$

$\Rightarrow x < \sqrt[3]{5}$.

1) va 2) dan $\left(0; \sqrt[3]{5}\right)$. Javobi: D.

18. Agar $3^{5x+1} + 3^{5x-1} = 30$ bo‘lsa, $\frac{x}{x+1}$ ning qiymatini hisoblang.

A) $\frac{2}{3}$ B) $\frac{1}{3}$ C) $\frac{2}{7}$ D) $\frac{4}{9}$ E) $\frac{2}{3}$

Yechilishi: $3^{5x+1} + 3^{5x-1} = 30 \Rightarrow$

$\Rightarrow 3^{5x}(3 + 3^{-1}) = 30 \Rightarrow 3^{5x} \cdot \frac{9+1}{3} = 30 \Rightarrow$

$\Rightarrow 3^{5x} = 3^2 \Rightarrow x = \frac{2}{5} \Rightarrow x = 0{,}4$.

$\frac{x}{x+1} = \frac{0{,}4}{1{,}4} = \frac{2}{7}$. Javobi: C.

19. $2 \cdot 3^x + \frac{7}{3^x} < 61 \cdot 3^{-x}$ tengsizlikning eng katta butun yechimini toping.

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

Yechilishi: $2 \cdot 3^x + \frac{7}{3^x} < 61 \cdot 3^{-x} \Rightarrow$

$\Rightarrow 2 \cdot 3^{2x} + 7 < 61 \Rightarrow 3^{2x} < 3^3 \Rightarrow 2x < 3 \Rightarrow$

$\Rightarrow x < 1{,}5$. $x = 1$. Javobi: C.

20. $\lg\sqrt{x-5} + \lg\sqrt{2x-3} + 1 = \lg 30$ tenglamani yeching.

A) $\frac{1}{2}$ B) 6 C) $\frac{1}{2}; 6$ D) $\frac{1}{2}; 8$ E) 8

Yechilishi: $\lg\sqrt{x-5} + \lg\sqrt{2x-3} + 1 = \lg 30 \Rightarrow$

1) $x > 5$.

2) $\lg\sqrt{x-5} + \lg\sqrt{2x-3} = \lg 30 - \lg 10 \Rightarrow$

$\Rightarrow \lg\sqrt{x-5} \cdot \sqrt{2x-3} = \lg 3$

$\sqrt{x-5} \cdot \sqrt{2x-3} = 3 \Rightarrow (x-5)(2x-3) = 9 \Rightarrow$

$\Rightarrow 2x^2 - 3x - 10x + 15 = 9 \Rightarrow$

$\Rightarrow 2x^2 - 13x + 6 = 0 \Rightarrow x_1 = 0{,}5;\ x_2 = 6. \Rightarrow$
$\Rightarrow x = 6.$ Javobi: B.

21. $\log_4(x+12) \cdot \log_x 2 = 1$ tenglamani yeching.

A) 4 B) -3 C) 2 D) 4; 2 E) -3; 4

Yechilishi: $\log_4(x+12) \cdot \log_x 2 = 1 \Rightarrow$

1) $\begin{cases} x + 12 > 0 \Rightarrow x > -12; \\ x \neq 1; \\ x > 0. \end{cases}$

2) $\frac{1}{2}\log_2(x+12) \cdot \frac{1}{\log_2 x} = 1 \Rightarrow$

$\log_2 \sqrt{x+12} = \log_2 x \Rightarrow \sqrt{x+12} = x \Rightarrow$

$\Rightarrow x^2 - x - 12 = 0 \Rightarrow \begin{cases} x_1 = -3 \\ x_2 = 4 \end{cases} \Rightarrow x = 4.$

Javobi: A.

22. Agar $a_2 + a_4 + a_6 + \cdots + a_{2n} = 126$ va $a_{n-2} + a_{n+4} = 42$ bo‘lsa, $a_1, a_2, \ldots a_{2n}$ arifmetik progressiyaning hadlar sonini toping.

A) 6 B) 8 C) 10 D) 16 E) 12

Yechilishi: $a_2 + a_4 + a_6 + \cdots + a_{2n} = 126;$

$a_{n-2} + a_{n+4} = 42 \boxed{Ikkala\ tenglikda\ n = 4\ desak} \Rightarrow =$
$> a_2 + a_{2n} = 42 \Rightarrow$

$\Rightarrow S_n = \frac{a_2 + a_{2n}}{2} \cdot n \Rightarrow 126 = \frac{42}{2} \cdot n \Rightarrow n = 6.$

2-usul: $\begin{array}{l} a_{n-2} = a_1 + d(n-3) \\ + \\ a_{n+4} = a_1 + d(n+3) \Rightarrow a_1 + dn = 21. \\ \hline 42 = 2(a_1 + dn) \end{array}$

$126 = \frac{a_1 + d + a_1 + d(2n-1)}{2} \cdot n \Rightarrow (a_1 + dn) \cdot n = 126 \Rightarrow$
$= 21 \cdot n = 126 \Rightarrow n = 6.$ Javobi: A.

23. 5 ga bo‘lganda qoldiq 1 chiqadigan datslabki 20 ta sonning yig‘indisini toping.

A) 950 B) 1070 C) 1090 D) 1030 E) 1100

Yechilishi: 6, 11, 16, 21,…,101.

$a_{20} = 6 + 5(20 - 1) = 6 + 5 \cdot 19 = 6 + 95 = 101;$
$S_{20} = \frac{6+101}{2} \cdot 20 = 1070.$ Javobi: B.

24. Geometrik progressiya barcha hadlarining yig‘indisi uning toq nomerli hadlari yig‘indisidan uch marta ko‘p. Agar geometrik progressiya hadlarining soni juft bo‘lsa, uning maxrajini toping.

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

Yechilishi: $S_n = S_t + S_j;\ \ S_j = qS_t;\ \ S_n = 3S_t;$
$3S_t = S_t + S_j \Rightarrow\ S_j = 2S_t \Rightarrow 2S_t = qS_t \Rightarrow$
$\Rightarrow q = 2$
Javobi: D.

25. 5 ta haddan iborat geometrik progressiyaning hadlari yig‘indisi, birinchi hadini hisobga olmaganda 30 ga, oxirgisini hisobga olmaganda 15 ga teng. Shu progressiyaning uchinchi hadini toping.

A) 6 B) 8 C) 4 D) 10 E) 12

Yechilishi: 1) $\begin{array}{r} b_2 + b_3 + b_4 + b_5 = 30 \\ - \ b_1 + b_2 + b_3 + b_4 = 15 \Rightarrow \\ \hline b_5 - b_1 = 15 \end{array}$

$\Rightarrow b_5 - b_1 = 15 \Rightarrow b_1 q^4 - b_1 = 15 \Rightarrow b_1 = \frac{15}{q^4-1}.$

2) $S_4 = \frac{b_1(q^4-1)}{q-1} = \frac{15}{q^4-1} \cdot \frac{q^4-1}{q-1} = \frac{15}{q-1};$

$\frac{15}{q-1} = 15 \Rightarrow 15 = 15(q-1) \Rightarrow 1 = q - 1 \Rightarrow q = 2.$

3) $b_3 = b_1 q^2 = \frac{15}{2^4-1} \cdot 2^2 = 4.$ Javobi: C.

26. $y = \frac{1}{\ln(1-x)} + \sqrt{x+2}$ funksiyaning aniqlanish sohasini toping.

A) $[-2; \infty)$ B) $[-2; 1]$ C) $(-\infty; 1)$

D) $[-2;0)\cup(0;1)$ E) $(-\infty;-2)\cup(-2;1]$

Yechilishi: $y=\frac{1}{\ln(1-x)}+\sqrt{x+2}$;

$$\begin{cases}1-x>0\\1-x\neq 1\\x+2\geq 0\end{cases}\Rightarrow\begin{cases}x<1\\x\neq 0\\x\geq -2\end{cases}\Rightarrow[-2;0)\cup(0;1).$$

Javobi: D.

27. $y_1=\frac{a^x+a^{-x}}{2}$; $y_2=\frac{a^x+1}{a^x-1}$; $y_3=\frac{x}{a^x-1}$ va $y_4=x\frac{a^x-1}{a^x+1}$ funksiyalardan qaysilari juft funksiya?

A) y_1 B) y_2 C) $y_1;y_2$ D) $y_1;y_3$ E) $y_1;y_4$

Yechilishi: $y_1(-x)=\frac{a^{-x}+a^x}{2}\Rightarrow y_1=\frac{a^x+a^{-x}}{2}$;

$$y_4(-x)=-x\frac{a^{-x}-1}{a^{-x}+1}=-x\cdot\frac{\frac{1}{a^x}-1}{\frac{1}{a^x}+1}=-x\cdot\frac{\frac{1-a^x}{a^x}}{\frac{1+a^x}{a^x}}=$$

$$=-x\cdot\frac{1-a^x}{1+a^x}=x\cdot\frac{a^x-1}{a^x+1}.$$

Javobi: E.

28. $y=\sqrt{3x^2-4x+5}$ funksiyaning qiymatlar sohasini toping.

A) $[0;\infty)$ B) $[\sqrt{3};\infty)$ C) $[\sqrt{\frac{3}{2}};\infty)$ D) $[\sqrt{\frac{11}{3}};\infty)$

E) $To'g'ri\ javob\ berilmagan.$

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

$$\Rightarrow 3x^2-4x+5\geq 0\Rightarrow y=\sqrt{-\frac{(-4)^2-4\cdot3\cdot5}{4\cdot3}}=$$

$$=\sqrt{-\frac{16-60}{12}}=\sqrt{\frac{11}{3}}\Rightarrow\left[\sqrt{\frac{11}{3}};+\infty\right).$$ Javobi: D.

29. $y=\frac{x-1}{2-3x}$ funksiyaga teskari funksiyani toping.

A) $y=\frac{2-3x}{x-1}$ B) $y=-\frac{2-3x}{x-1}$ C) $y=\frac{2-3x}{1-x}$

D) $y=\frac{2x+1}{3x+1}$ E) $y=\frac{3x+1}{2x+1}$

Yechilishi: $y = \frac{x-1}{2-3x} => 2y - 3xy = x - 1 =>$
$=> x + 3xy = 2y + 1 => x(1 + 3y) = 2y + 1 =>$
$=> x = \frac{2y+1}{3y+1} => y = \frac{2x+1}{3x+1}$. Javobi: D.

30. $y = \arcsin\frac{x-3}{2} - \lg(4 - x)$ funksiyaning aniqlanish sohasini toping.

A) $[1; 4]$ B) $[1; 5]$ C) $(1; 4)$
D) $[1; 4)$ E) $[1; 4) \cup (4; 5]$

Yechilishi: $y = \arcsin\frac{x-3}{2} - \lg(4 - x)$

1) $-\frac{\pi}{2} \le \arcsin\frac{x-3}{2} \le \frac{\pi}{2} => \sin\left(-\frac{\pi}{2}\right) \le \le \sin arc\sin\frac{x-3}{2} \le$
$\sin\frac{\pi}{2} => -1 \le \frac{x-3}{2} \le 1 =>$
$=> -2 \le x - 3 \le 2 => -2 + 3 \le x \le 2 + 3 =>$
$=> 1 \le x \le 5.$

2) $4 - x > 0 => x < 4. [1; 4).$ Javobi: D.

31. $y = 2\sin\frac{\pi x}{3} + 3\cos\frac{\pi x}{4} - tg\frac{\pi x}{2}$ funksiyaning eng kichik musbat davrini toping.

A) 12 B) 12π C) 2π D) 24π E) 24

Yechilishi: $2\pi:\frac{\pi}{3} = 6;\ 2\pi:\frac{\pi}{4} = 8;\ \pi:\frac{\pi}{2} = 2.\ Karralisi\ 24$

Javobi: E.

32. $\sin^6\alpha + \cos^6\alpha + \frac{3}{4}\sin^2 2\alpha$ ni soddalashtiring.

A) 1 B) -1 C) $\sin^2\alpha$ D) $\cos^2\alpha$
E) $To'g'ri\ javob\ berilmagan.$

Yechilishi: $\sin^6\alpha + \cos^6\alpha + \frac{3}{4}\sin^2 2\alpha =$
$= (\cos^2\alpha)^3 + (\sin^2\alpha)^3 + \frac{3}{4}\sin^2 2\alpha =$
$= (\cos^2\alpha + \sin^2\alpha)(\cos^4\alpha - \cos^2\alpha\sin^2\alpha + \sin^4\alpha) +$
$+ \frac{3}{4}\sin^2 2\alpha = \cos^4\alpha - 2\cos^2\alpha\sin^2\alpha + \sin^4\alpha +$

$+\cos^2\alpha\sin^2\alpha+\frac{3}{4}\sin^2 2\alpha=(\cos^2\alpha-\sin^2\alpha)^2+$

$+\left(\frac{1}{2}\cdot 2\sin\alpha\cos\alpha\right)^2+\frac{3}{4}\sin^2 2\alpha=cos^2 2\alpha+$

$+\frac{1}{4}\sin^2 2\alpha+\frac{3}{4}\sin^2 2\alpha=1.$

Javobi: A.

33. $450°<\alpha<540°$ va $ctg\alpha=-\frac{7}{24}$ bo‘lsa, $cos\frac{\alpha}{2}$ ni hisoblang.

A) 0,6 B) $\frac{4}{5}$ C) $-\frac{4}{5}$ D) $-0{,}6$ E) 0,96

Yechilishi: $ctg\alpha=-\frac{7}{24}\Rightarrow\frac{1}{tg\alpha}=\frac{7}{24}\Rightarrow tg\alpha=-\frac{24}{7}\Rightarrow$

$\Rightarrow\alpha=-arctg\frac{24}{7}.$

$\text{Cos}\frac{\alpha}{2}=\cos\frac{1}{2}\cdot\left(-arctg\frac{24}{7}\right)=\cos\left(-\frac{1}{2}arctg\frac{24}{7}\right)=$

$=\cos\frac{1}{2}arctg\frac{24}{7}=-\sqrt{\frac{1}{2}(1+\cos arctg\frac{24}{7})}=$

$=-\sqrt{\frac{1}{2}(1+\frac{1}{\sqrt{1+\left(\frac{24}{7}\right)^2}})}=-\sqrt{\frac{1}{2}(1+\frac{1}{\sqrt{1+\frac{576}{49}}})}=$

$=-\sqrt{\frac{1}{2}(1+\sqrt{\frac{49}{625}})}=-\sqrt{\frac{1}{2}(1+\frac{7}{25})}=-\sqrt{\frac{1}{2}\cdot\frac{32}{25}}=-\frac{4}{5}.$

Javobi: C.

34. Agar $0<\alpha<\frac{\pi}{2}$ va $\cos\alpha=\frac{1}{2}\sqrt{2+\sqrt{2}}$ bo‘lsa, α ning qiymatini toping.

A) $\frac{\pi}{12}$ B) $\frac{5}{12}\pi$ C) $\frac{3}{8}\pi$ D) $\frac{\pi}{8}$ E) $\frac{7}{24}\pi$

Yechilishi: $0<\alpha<\frac{\pi}{2}$; $\cos\alpha=\frac{1}{2}\sqrt{2+\sqrt{2}}\Rightarrow$

$\Rightarrow\sqrt{\frac{1}{2}(1+\cos 2\alpha)}=\frac{1}{2}\sqrt{2+\sqrt{2}}\Rightarrow\frac{1}{2}(1+\cos 2\alpha)=$

$= \frac{1}{4}\left(2+\sqrt{2}\right) => 2(1+cos2\alpha) = 2+\sqrt{2} =>$

$=> 2cos2\alpha = \sqrt{2} => cos2\alpha = \frac{\sqrt{2}}{2} =>$

$=> 2\alpha = \pm\frac{\pi}{4} + 2\pi k => \alpha = \pm\frac{\pi}{8} + k\pi => \alpha = \frac{\pi}{8}.$

Javobi: D.

35. $\frac{1-tg\frac{x}{2}}{1-ctg\frac{x}{2}} = 2\sin\frac{x}{2}$ tenglamaning $(180°; 540°)$ intervalga tegishli ildizlari ayirmasining modulini toping.

A) $120°$ B) $135°$ C) $240°$ D) $180°$ E) $360°$

Yechilishi: $\frac{1-tg\frac{x}{2}}{1-ctg\frac{x}{2}} = 2\sin\frac{x}{2}; x \neq \frac{\pi}{2} + 2\pi k;$

1) $\frac{1-\frac{\sin\frac{x}{2}}{\cos\frac{x}{2}}}{1-\frac{\cos\frac{x}{2}}{\sin\frac{x}{2}}} = \frac{\cos\frac{x}{2}-\sin\frac{x}{2}}{\cos\frac{x}{2}} \cdot \frac{\sin\frac{x}{2}}{\sin\frac{x}{2}-\cos\frac{x}{2}} = -\frac{\sin\frac{x}{2}}{\cos\frac{x}{2}};$

2) $-\frac{\sin\frac{x}{2}}{\cos\frac{x}{2}} = 2\sin\frac{x}{2} => 2\sin\frac{x}{2}\cos\frac{x}{2} + \sin\frac{x}{2} = 0 =>$

$=> \sin\frac{x}{2}\left(2\cos\frac{x}{2}+1\right) = 0 => \begin{cases} \sin\frac{x}{2} = 0 \\ \cos\frac{x}{2} = -\frac{1}{2} \end{cases} =>$

$=> \begin{cases} \frac{x}{2} = \pi n \\ \frac{x}{2} = \pm\left(\pi - \frac{\pi}{3}\right) + 2\pi n \end{cases} => \begin{cases} x \neq 2\pi n; \\ x = \pm\frac{4\pi}{3} + 4\pi n. \end{cases}$

$|480° - 240°| = 240°.$ Javobi: C.

36. $\cos\left(\arcsin\frac{40}{41} - \arcsin\frac{4}{5}\right)$ ni hisoblang.

A) $\frac{151}{205}$ B) $-\frac{151}{205}$ C) $\frac{121}{205}$ D) $-\frac{150}{205}$ E) $\frac{187}{205}$

Yechilishi: $\cos\left(\arcsin\frac{40}{41} - \arcsin\frac{4}{5}\right) =$

$= \cos\arcsin\frac{40}{41} \cdot \cos\arcsin\frac{4}{5} + \sin\arcsin\frac{40}{41} \cdot$

$\cdot \sin\arcsin\frac{4}{5} = \sqrt{1-\left(\frac{40}{41}\right)^2}\cdot\sqrt{1-\left(\frac{4}{5}\right)^2}+\frac{40}{41}\cdot\frac{4}{5} =$

$= \sqrt{1-\frac{1600}{1681}}\cdot\sqrt{1-\frac{16}{25}}+\frac{32}{41} = \sqrt{\frac{1681-1600}{1681}}\cdot\sqrt{\frac{25-16}{25}}+$

$+\frac{32}{41} = \frac{9}{41}\cdot\frac{3}{5}+\frac{32}{41} = \frac{27+160}{5\cdot 41} = \frac{187}{205}.$ Javobi: E.

37. $\sin^2 x + \sin^2 2x = 1$ tenglamani yeching.

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

B) $\frac{\pi}{6}+\frac{\pi}{3}k, k\in Z$

C) $\frac{\pi}{2}+\pi k; \frac{\pi}{12}+\frac{\pi}{6}k, k\in Z$

D) $\frac{\pi}{12}+\frac{\pi}{6}k, k\in Z$

E) $\frac{\pi}{4}+\frac{\pi}{2}k, k\in Z$

Yechilishi:

$\sin^2 x + \sin^2 2x = 1 \Rightarrow \sin^2 x + (\sin 2x)^2 = 1 \Rightarrow$

$\Rightarrow \sin^2 x + (2\sin x\cos x)^2 = 1 \Rightarrow$

$\Rightarrow \sin^2 x + 4\sin^2 x\cos^2 x = 1 \Rightarrow$

$\Rightarrow 1-\cos^2 x + 4\sin^2 x\cos^2 x = 1 \Rightarrow$

$\Rightarrow 4\sin^2 x\cos^2 x - \cos^2 x = 0 \Rightarrow$

$\Rightarrow \cos^2 x(4\sin^2 x - 1) = 0 \Rightarrow$

$\Rightarrow \begin{cases}\cos^2 x = 0\\ 4\sin^2 x - 1 = 0\end{cases} \Rightarrow \begin{cases}\cos^2 x = 0\\ \sin^2 x = \frac{1}{4}\end{cases} \Rightarrow$

$\Rightarrow \begin{cases}\cos x = 0\\ \sin x = \pm\frac{1}{2}\end{cases} \Rightarrow \begin{cases}x = \frac{\pi}{2}+k\pi\\ x = \pm\frac{\pi}{6}+k\pi\end{cases} \Rightarrow x = \frac{\pi}{6}+\frac{\pi}{3}k.$

Javobi: B.

38. $4\cos^2 x - 3 \geq 0$ tengsizlikni yeching.

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

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

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

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

E) $\left[-\frac{\pi}{12}+\pi k;\frac{\pi}{12}+\pi k\right], k\in Z$

Yechilishi: $4\cos^2 x-3\geq 0 => 4\cos^2 x\geq 3 =>$

$=> \cos^2 x\geq \frac{3}{4} => |\cos x|\geq \frac{\sqrt{3}}{2} => \begin{cases}\cos x\geq \frac{\sqrt{3}}{2}\\ \cos x\leq -\frac{\sqrt{3}}{2}\end{cases}$

$-\frac{\pi}{6}+k\pi\leq x\leq \frac{\pi}{6}+k\pi.$ Javobi: C.

39. $arctg\frac{1}{2}+arctg\frac{1}{3}$ ni hisoblang.

A) $arctg\frac{5}{6}$ B) $\frac{\pi}{4}+\pi k, k\in Z$

C) $\pi-arctg\frac{5}{6}$ D) $arctg\frac{1}{6}$ E) $\frac{\pi}{4}$

Yechilishi: $x=arctg\frac{1}{2}+arctg\frac{1}{3} =>$

$=> tgx=tg\left(arctg\frac{1}{2}+arctg\frac{1}{3}\right)=$

$=\frac{tgarctg\frac{1}{2}+tgarctg\frac{1}{3}}{1-tgarctg\frac{1}{2}\cdot tgarctg\frac{1}{3}}=\frac{\frac{1}{2}+\frac{1}{3}}{1-\frac{1}{2}\cdot\frac{1}{3}}=\frac{\frac{5}{6}}{\frac{5}{6}}=1 => x=\frac{\pi}{4}.$

Javobi: E.

40. $|\vec{a}|=3, \left|\vec{b}\right|=4$ hamda $\vec{a}$ va $\vec{b}$ vektorlar $\frac{\pi}{3}$ ga teng burchak tashkil qiladi. $\vec{c}=3\vec{a}+2\vec{b}$ vektorlarning uzunligini toping.

A) $\sqrt{217}$ B) 12 C) 17 D) $\sqrt{221}$ E) 13

Yechilishi: $|\vec{a}|=3;\ \left|\vec{b}\right|=4;\ \left(\vec{a},\vec{b}\right)=\frac{\pi}{3};$

$\vec{c}=3\vec{a}+2\vec{b} => |\vec{c}|^2=9|\vec{a}|^2+12\vec{a}\vec{b}+4\left|\vec{b}\right|^2=$

$9\cdot 3^2+4\cdot 4^2+12\cdot|\vec{a}|\cdot\left|\vec{b}\right|\cdot\cos\frac{\pi}{3}=$

$=9\cdot 9+4\cdot 16+12\cdot 3\cdot 4\cdot\frac{1}{2}=81+64+72=217.$

$|\vec{c}|=\sqrt{217}.$ Javobi: A.

41. Agar $|\vec{a}| = 3$ va $|\vec{b}| = 5$ bo‘lsa, α ning qanday qiymatlarida $\vec{a} + \alpha\vec{b}$ va $\vec{a} - \alpha\vec{b}$ vektorlar perpendikulyar bo‘ladi?

A) $-\frac{3}{5} < \alpha < \frac{3}{5}$ B) $-\frac{3}{5}$ C) $\frac{3}{5}$ D) $\pm\frac{3}{5}$ E) $\frac{5}{3}$

Yechilishi: $(\vec{a} + \alpha\vec{b}) \cdot (\vec{a} - \alpha\vec{b}) = 0 =>$

$=> |\vec{a}|^2 - \alpha^2|\vec{b}|^2 = 0 => 3^2 - \alpha^2 \cdot 5^2 = 0 =>$

$=> \alpha^2 \cdot 5^2 = 3^2 => |\alpha| = \frac{3}{5} => \alpha = \pm\frac{3}{5}.$

Javobi: D.

42. $\vec{a} = 2\vec{i} + \vec{j}$ va $\vec{b} = -2\vec{j} + \vec{k}$ vektorlarda yasalgan parallelogrammning diagonallari orasidagi burchakni toping.

A) $\arccos\frac{1}{\sqrt{21}}$ B) $\frac{\pi}{6}$ C) $\arccos\frac{2}{\sqrt{21}}$

D) $\frac{\pi}{2}$ E) $\arccos\frac{3}{\sqrt{21}}$

Yechilishi: $\begin{cases} \vec{a} = 2\vec{i} + \vec{j} \\ \vec{b} = -2\vec{j} + \vec{k} \end{cases} => \begin{cases} \vec{a} = \{2; 1; 0\} \\ \vec{b} = \{0; -2; 1\} \end{cases}$

$|\vec{c}| = |[\vec{a} \cdot \vec{b}]| = |\vec{a}| \cdot |\vec{b}| \cdot \sin(\vec{a}\hat{,}\vec{b})$;

$\begin{cases} |\vec{a}| = \sqrt{2^2 + 1^2 + 0^2} = \sqrt{5} \\ |\vec{b}| = \sqrt{0^2 + (-2)^2 + 1^2} = \sqrt{5} \end{cases} => |\vec{a}| = |\vec{b}| => romb.$

Javobi: D.

43. m ning qanday qiymatlarida vektorning $\vec{a} = \{m; m + 1; 2\}$ uzunligi 3 dan kichik bo‘ladi?

A) $-2 < m < 2$ B) $-2 < m < 1$

C) $-1 < m < 3$ D) $-1 < m < 2$

E) $-1 < m < 1$

Yechilishi: $\vec{a} = \{m; m + 1; 2\}$

$|\vec{a}| = \sqrt{m^2 + (m + 1)^2 + 4} =>$

$=> \sqrt{m^2 + (m + 1)^2 + 4} < 3 =>$

$=> m^2 + m^2 + 2m + 1 + 4 < 9 =>$

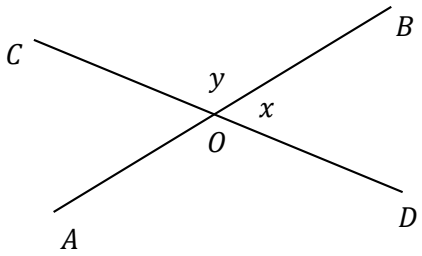
$\Rightarrow 2m^2 + 2m < 4 \Rightarrow m^2 + m - 2 < 0 \Rightarrow$

$\Rightarrow m_{1,2} = -\frac{1}{2} \pm \sqrt{\frac{1}{4} + 2} = -\frac{1}{2} \pm \frac{3}{2} \Rightarrow \begin{cases} m_1 = -2 \\ m_2 = 1 \end{cases} \Rightarrow$

$\Rightarrow -2 < m < 1.$ Javobi: B.

44. AB va CD to‘g‘ri chiziqlar O nuqtada kesishadi. AOD va COB burchaklarning yig‘indisi $230°$ ga teng. AOC burchakni toping.

A) $70°$ B) $120°$ C) $65°$
D) $95°$ E) $85°$



Yechilishi: $2y = 230° \Rightarrow$

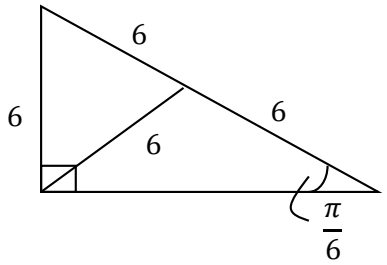
$\Rightarrow y = 115°;$

$x = 180° - y = \ = 65°$

Javobi: C.

45. To‘g‘ri burchakli uchburchakning katetlaridan biri 6 ga, uning qarshisida yotgan burchagi $\frac{\pi}{6}$ ga teng. Shu uchburchakka tashqi chizilgan doiraning yuzini hisoblang.

A) 6π B) 9π C) 36π D) 144π E) 24π



Yechilishi: $\frac{6}{\sin 30°} = 2R \Rightarrow$

$\Rightarrow R = 6. \quad S = \pi R^2 = 36\pi.$

Javobi: C.

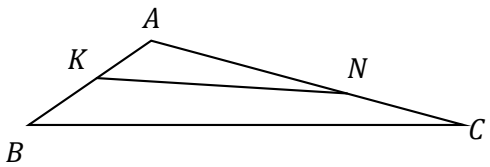
46. ABC uchburchakning AB va AC tomonlarida shunday K va N nuqtalar olinadiki, $AK = \frac{1}{3}AB$ ga va $AN = \frac{2}{3}AC$ ga teng bo‘ldi. ABC uchburchakning yuzi 18 ga teng. AKN uchburchakning yuzini toping.

A) 4 B) 6 C) 9 D) 2 E) 3

Yechilishi: $AK = \frac{1}{3} \cdot AB$;

$AN = \frac{2}{3} \cdot AC$; $S_{\triangle ABC} = 18$;

$S_{\triangle AKN} = ?$



$\frac{S_{\triangle AKN}}{S_{\triangle ABC}} = \frac{AK \cdot AN}{AB \cdot AC} \Rightarrow \frac{S_{\triangle AKN}}{18} = \frac{\frac{1}{3} \cdot AB \cdot \frac{2}{3} \cdot AC}{AB \cdot AC} \Rightarrow$

$\Rightarrow S_{\triangle AKN} = 18 \cdot \frac{2}{9} = 4.$ Javobi: A.

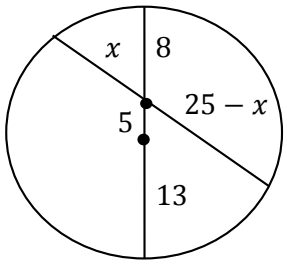
47. Radiusi 13 ga teng bo‘lgan doiraning markazidan 5 ga teng masofada M nuqta olindi. M nuqtadan uzunligi 25 ga teng bo‘lgan AB vatar o‘tkazildi. M nuqta AB vatarni qanday uzunlikdagi kesmalarga ajratgan?

A) 15; 10 B) 16; 9 C) 18; 7 D) 13; 12 E) 17,8

Yechilishi: $x \cdot (25 - x) = 8 \cdot 18 \Rightarrow$

$\Rightarrow 25x - x^2 = 144 = 0 \Rightarrow$

$\Rightarrow x^2 - 25x + 144 = 0$



$x_{1,2} = \frac{25}{2} \pm \sqrt{\frac{625}{4} - 144} =$

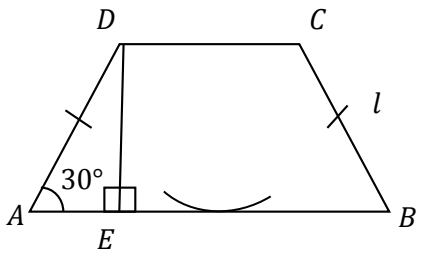
$= \frac{25}{2} \pm \sqrt{\frac{625-576}{4}} = \frac{25}{2} \pm \frac{7}{2} \Rightarrow$

$\Rightarrow \begin{cases} x_1 = 9; \\ x_2 = 16. \end{cases}$ Javobi: B.

48. Doiraga tashqi chizilgan teng yonli trapetsiyaning yuzi 18 ga teng. Agar trapetsiyaning asosidagi burchagi $\frac{\pi}{6}$ ga teng bo‘lsa, uning yon tomonini toping.

A) 6 B) 4 C) 8 D) 5 E) 3

Yechilishi: $S = 18.\ l = ?$



$AB + CD = 2l;\ \ DE = \frac{l}{2};$

$S = \frac{AB+CD}{2} \cdot DE =>$

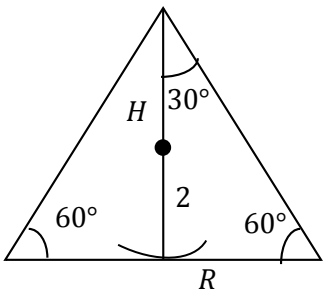
$=> 18 = \frac{2l}{2} \cdot \frac{l}{2} =>$

$=> l^2 = 36 => l = 6.$ Javobi: A.

49. Radiusi 2 ga teng shar konusga ichki chizilgan. Konus yasovchisi va balandligi orasidagi burchak $30°$ ga teng. Konus yon sirtining yuzini toping.

A) 24π B) 4π C) 16π D) 18π E) 20π

Yechilishi: $H = 3r = 6;$



$\frac{H}{l} = \cos 30° =>$

$=> H = \frac{\sqrt{3}}{2} l =>$

$=> l = \frac{12}{\sqrt{3}};\ R = \frac{6}{\sqrt{3}}.$

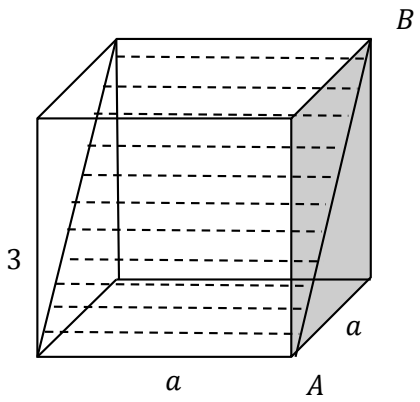
$S_{yon} = \pi R l = \pi \cdot \frac{12}{\sqrt{3}} \cdot \frac{6}{\sqrt{3}} = 24\pi.$

Javobi: A.

50. Muntazam to‘rtburchakli prizmaning balandligi 3 ga, hajmi 48 ga teng. Pastki va ustki asoslarining qarama-qarshi yon yoqlarda yotuvchi tomonlari orqali tekislik o‘tkazildi. Shu kesimning yuzini toping.

A) 15 B) 20 C) 25 D) 12 E) 8

Yechilishi: $V = 3a^2 =>$



$48 = 3a^2 => a = 4.$

$AB^2 = 4^2 + 3^2 =>$

$=> AB = 5.$

$S_{kesim} = a \cdot AB = 20.$

Javobi: B.

51. $y = e^{-x^2} + \ln\sin 2x + 3$ funksiyaning hosilasini toping.

A) $e^{-x^2} + \frac{1}{\sin 2x}$ B) $2xe^{-x^2} + ctg2x$

C) $-2xe^{-x^2} + ctg2x$ D) $-2xe^{-x^2} + 2ctg2x$

E) $e^{-x^2} + 1/\cos 2x$

Yechilishi: $y = e^{-x^2} + \ln\sin 2x + 3 = \frac{1}{e^{x^2}} + \ln\sin 2x + 3$

$y' = -\frac{e^{x^2}\cdot 2x}{\left(e^{x^2}\right)^2} + \frac{1}{\sin 2x}\cdot(\sin 2x)' + 0 = -\frac{2x}{e^{x^2}} + \frac{\cos 2x}{\sin 2x}\cdot$

$\cdot (2x)' = -2xe^{-x^2} + 2ctg2x.$ Javobi: D.

52. $y = -\frac{1}{\cos 2x} + \cos\frac{\pi}{3}. y' = \left(\frac{\pi}{8}\right)?$

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

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

Yechilishi: $y = -\frac{1}{\cos 2x} + \cos\frac{\pi}{3}$; $y' = \left(\frac{\pi}{8}\right)?$

$y' = -\frac{2\sin 2x}{\cos^2 2x} => y' = -\frac{2\sin\frac{\pi}{4}}{\left(\cos\frac{\pi}{4}\right)^2} = -\frac{2\cdot\frac{\sqrt{2}}{2}}{\left(\frac{\sqrt{2}}{2}\right)^2} =$

$= -\frac{\sqrt{2}}{\frac{2}{4}} = -2\sqrt{2}.$ Javobi: D.

53. $y = x^3 - 3x^2 + 1$ funksiyaning [-1;4] kesmadagi eng katta va eng kichik qiymatlari ayirmasini toping.

A) 20 B) 14 C) 15 D) 18 E) 16

Yechilishi: $y = x^3 - 3x^2 + 1;\ [-1; 4]$

$y' = 3x^2 - 6x => 3x^2 - 6x = 0 => x^2 - 2x = 0 =>$

$=> x(x-2) = 0 => \begin{cases} x_1 = 0 \\ x_2 = 2. \end{cases}$

$y(-1) = (-1)^3 - 3(-1)^2 + 1 = -1 - 3 + 1 = -3.$

$y(0) = 1;\ \ y(2) = 2^3 - 3\cdot 2^2 + 1 = 8 - 12 + 1 = -3;$

$y(4) = 4^3 - 3\cdot 4^2 + 1 = 64 - 48 + 1 = 17.$

$17 - (-3) = 20.$ Javobi: A.

54. $y = x^2 + 1$ egri chiziqqa o‘tkazilgan urinma $y = 2x + 3$ to‘g‘ri chiziqqa parallel. Urinish nuqtasining ordinatasini toping.

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

Yechilishi: $y = x^2 + 1 => y' = 2x \quad A(x_0; y_0)$

$u: y = kx + b; u_1: y = 2x + 3 => u // u_1 =>$

1) $k = 2; k = y'(x_0) => k = 2x_0 => 2x_0 = 2 =>$

$=> x_0 = 1.$

2) $y = x^2 + 1 => y_0 = x_0^2 + 1 => y_0 = 2.$ Javobi: B.

55. $f(x) = \frac{(x-1)^2+1}{x-1}$ funksiyaning minimum nuqtasidagi qiymatini toping.

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

Yechilishi: $f(x) = \frac{(x-1)^2+1}{x-1} = \frac{x^2-2x+2}{x-1}$

$f'(x) = \frac{(2x-2)(x-1)-(x^2-2x+2)\cdot 1}{(x-1)^2} =$

$= \frac{2x^2-2x-2x+2-x^2+2x-2}{(x-1)^2} = \frac{x^2-2x}{(x-1)^2} = \frac{x(x-2)}{(x-1)^2} => \begin{cases} x = 0 \\ x = 2 \\ x \neq 1 \end{cases}$

$f(2) = \frac{(2-1)^2+1}{2-1} = \frac{1+1}{1} = 2.$ Javobi: B.

56. $f(x) = \frac{1}{4}x^4 - \frac{5}{3}x^3 + 3x^2 + 10$ funksiyaning barcha kamayish oraliqlarini toping.

A) $(2; 3)$ B) $(-\infty; 0]$ va $[2; 3]$ C) $(-\infty; 3)$

D) $(-\infty; 0)$ va $(3; \infty)$ E) $(-\infty; 0)$ va $(2; \infty)$

Yechilishi: $f(x) = \frac{1}{4}x^4 - \frac{5}{3}x^3 + 3x^2 + 10$

$f'(x) = x^3 - 5x^2 + 6x => x(x^2 - 5x + 6) = 0 =>$

$=> \begin{cases} x = 0 \\ x^2 - 5x + 6 = 0 => x_1 = 2; \ x_2 = 3 \end{cases}$

$f'(1) = (-1)^3 - 5(-1)^2 + 6 \cdot (-1) =$
$= -1 - 5 - 6 = -12 < 0; \quad (-\infty; 0] \cup [2; 3].$
Javobi: B.

57. Ikki moddiy nuqta $S_1(t) = 2{,}5t^2 - 6t + 1$ va $S_2(t) = 0{,}5t^2 + 2t - 3$ qonuniyat bo‘yicha harakatlanayapti. Qaysi vaqtda birinchi nuqtaning tezligi ikkinchisinikidan uch marta ko‘p bo‘ladi?

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

Yechilishi: $\begin{matrix} v_1 = S_1'(t) = 5t - 6 \\ v_2 = S_2'(t) = t + 2 \end{matrix} => v_1 = 3v_2 =>$
$=> 5t - 6 = 3(t + 2) => 5t - 6 = 3t + 6 =>$
$=> 2t = 12 => t = 6.$ Javobi: E.

58. To‘la sirtining yuzi 24π ga teng silindrning hajmi eng ko‘pi bilan qanchaga teng bo‘lishi mumkin?

A) 16π B) 20π C) 28π D) 18π E) 30π

Yechilishi: $S_T = 2\pi RH + 2\pi R^2 =>$
$=> 2\pi(RH + R^2) = 24\pi => RH + R^2 = 12 =>$
$H = \frac{12 - R^2}{R}; \quad V = \pi R^2 H = \pi R^2 \cdot \frac{12 - R^2}{R} = 12\pi R - \pi R^3;$
$V' = 12\pi - 3\pi R^2 => 3\pi R^2 = 12\pi => R^2 = 4 =>$
$=> R = 2; \quad H = \frac{12 - 4}{2} = 4.$
$V = \pi R^2 H = \pi \cdot 4 \cdot 4 = 16\pi.$ Javobi: A.

59. $f(x) = x + \operatorname{ctg}^2 x$ funksiyaning boshlang‘ich funksiyasini toping.

A) $\frac{x^2}{2} + \frac{1}{3}\operatorname{ctg}^3 x + C$ B) $\frac{x^2}{2} - \frac{1}{3}\operatorname{ctg}^3 x + C$

C) $\frac{x^2}{2} - x - ctgx + C$ D) $\frac{x^2}{2} - x + ctgx + C$

E) $\frac{x^2}{2} + x - ctgx + C$

Yechilishi: $f(x) = x + \operatorname{ctg}^2 x; \quad \operatorname{ctg}^2 x = \frac{1}{\sin^2 x} - 1$

$F(x) = \int \left(x + \frac{1}{\sin^2 x} - 1\right) dx = \frac{x^2}{2} - x - ctgx + C.$

Javobi: C.

60. $f(x) = \frac{4}{(3-2x)^2}$ funksiyaning grafigi $\left(-\frac{1}{2}; \frac{1}{16}\right)$ nuqtadan o‘tuvchi boshlang‘ich funksiyasini toping.

A) $\frac{4}{3-2x} + \frac{9}{16}$ B) $-\frac{4}{3-2x} + \frac{49}{16}$ C) $-\frac{2}{3-2x} + \frac{17}{16}$

D) $\frac{8}{3-2x} + \frac{33}{16}$ E) $\frac{2}{3-2x} - \frac{7}{16}$

Yechilishi: $f(x) = \frac{4}{(3-2x)^2}$; $\left(-\frac{1}{2}; \frac{1}{16}\right)$

$F(x) = 4\int \frac{dx}{(3-2x)^2} = \frac{4}{-2}\int \frac{d(3-2x)}{(3-2x)^2} =$

$= -2\int (3-2x)^{-2} \cdot d(3-2x) = -2 \cdot \frac{(3-2x)^{-2+1}}{-2+1} + C =$

$= -2 \cdot \frac{(3-2x)^{-1}}{-1} + C = 2 \cdot \frac{1}{3-2x} + C \Rightarrow F(x) = \frac{2}{3-2x} + C;$

$\frac{1}{16} = \frac{2}{3-2\cdot(-\frac{1}{2})} + C \Rightarrow c = \frac{1}{16} - \frac{2}{3+1} = \frac{1}{16} - \frac{1}{2} = \frac{1-8}{16} = -\frac{7}{16}$

$F(x) = \frac{2}{3-2x} - \frac{7}{16}$. Javobi: E.

1999-YIL, 4-AXBOROTNOMA

1. Balandligi 10 m bo‘lgan simyog‘ochga shilliqqurt ko‘tarilyapti. Shilliqqurt kunduzi 5 m ko‘tariladi, kechasi esa 4 m pastga tushadi. Necha kundan keyin shilliqqurt simyog‘ochning uchiga chiqadi?

A) 10 B) 9 C) 6 D) 5 E) 7

Yechilishi: $5-4; 6-4; 7-4; 8-4; 9-4; 10.$

Javobi: C.

2. $6\frac{3}{4}\cdot 5\frac{1}{4}-4\frac{5}{8}\cdot 5\frac{3}{8}$ ni hisoblang.

A) $10\frac{19}{64}$ B) $11\frac{27}{64}$ C) $11\frac{9}{64}$ D) $10\frac{39}{64}$ E) $10\frac{37}{64}$

Yechilishi: $6\frac{3}{4}\cdot 5\frac{1}{4}-4\frac{5}{8}\cdot 5\frac{3}{8}=\frac{27}{4}\cdot\frac{21}{4}-\frac{37}{8}\cdot\frac{43}{8}=$

$=\frac{567}{16}-\frac{1591}{64}=\frac{2268-1591}{64}=\frac{677}{64}=10\frac{37}{64}.$

Javobi: E.

3. $\frac{3{,}2\cdot 0{,}027\cdot 0{,}005}{0{,}09\cdot 0{,}0025\cdot 0{,}64}$ ning qiymatini toping.

A) 3 B) 0,3 C) 30 D) 2 E) 0,6

Yechilishi: $\frac{3{,}2\cdot 0{,}027\cdot 0{,}005}{0{,}09\cdot 0{,}0025\cdot 0{,}64}=\frac{320\cdot 270\cdot 5}{9\cdot 25\cdot 640}=3.$ Javobi: A.

4. $2{,}8\cdot\left(2\frac{1}{3}:2{,}8-1\right)+2\frac{4}{5}$ ni hisoblang.

A) 5,6 B) $2\frac{2}{3}$ C) $2\frac{1}{3}$ D) 2,8 E) $3\frac{1}{3}$

Yechilishi: $2{,}8\cdot\left(2\frac{1}{3}:2{,}8-1\right)+2\frac{4}{5}=$

$=\frac{28}{10}\cdot\left(\frac{7}{3}\cdot\frac{10}{28}-1\right)+\frac{14}{5}=\frac{14}{5}\left(\frac{5}{6}-1\right)+\frac{14}{5}=$

$=\frac{14}{5}\left(\frac{5}{6}-1+1\right)=\frac{7}{3}=2\frac{1}{3}.$ Javobi: C.

5. $4\le|x|\le 8$ tengsizlik nechta butun yechimga ega?

A) 12 B) 10 C) 8 D) 6 E) 5

Yechilishi: $4 \le |x| \le 8 => \begin{cases} |x| \ge 4 \\ |x| \le 8 \end{cases} => \begin{cases} x \ge 4 \\ x \le -4 \\ -8 \le x \le 8 \end{cases}$

$[-8; -4] \cup [4; 8]$.

$x = \underbrace{-8, -7, -6, -5, -4; 4,5,6,7,8}_{10\ ta}$. Javobi: B.

6. Agar kasrning surati $6\frac{1}{3}$ marta kamaytirilsa, maxraji esa $4\frac{1}{2}$ marta orttirilsa, u qanday o‘zgaradi?

A) $1\frac{11}{27}$ *marta ortadi*

B) $1\frac{11}{27}$ *marta kamayadi*

C) $28\frac{1}{2}$ *marta ortadi*

D) $28\frac{1}{2}$ *marta kamayadi*

E) $\frac{27}{32}$ *marta kamayadi*

Yechilishi: $\frac{x}{y} => \begin{matrix} 1)\ x : 6\frac{1}{3} = x \cdot \frac{3}{19} = \frac{3x}{19}; \\ 2)\ y \cdot 4\frac{1}{2} = \frac{9y}{2}; \end{matrix}$

3) $\frac{3x}{19} : \frac{9y}{2} = \frac{3x}{19} \cdot \frac{2}{9y} = \frac{2x}{57y}$;

4) $\frac{x}{y} : \frac{2x}{57y} = \frac{x}{y} \cdot \frac{57y}{2x} = \frac{57}{2} = 28\frac{1}{2}$. Javobi: D.

7. $2,5 - 4,3$ ga teskari sonni toping.

A) 0,8 B) 1,8 C) $-\frac{5}{9}$ D) $-1\frac{1}{4}$ E) $\frac{5}{9}$

Yechilishi: $2,5 - 4,3 = -1,8 = -1\frac{8}{10} = -\frac{18}{10} = -\frac{9}{5} =>$

$=> -\frac{5}{9}$. Javobi: C.

8. Reja bo‘yicha ikki sex 230 ta kir yuvish mashinasi ishlab chiqarishi kerak. Birinchi sex reja bo‘yicha ishlab chiqargan mahsulotning $\frac{2}{9}$ qismi, ikkinchi sex reja bo‘yicha ishlab

chiqargan mahsulotning 80% iga teng. Ikkinchi sex reja bo‘yicha qancha mahsulot ishlab chiqargan?

A) 50 B) 60 C) 80 D) 40 E) 72

Yechilishi: $\begin{matrix} I-x \\ II-y \end{matrix} \Rightarrow \begin{cases} x+y=230 \\ \frac{2}{9}x=0{,}8y \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x=230-y \\ 2x=7{,}2y \end{cases} \Rightarrow \begin{cases} x=230-y \\ x=3{,}6y \end{cases} \Rightarrow$

$\Rightarrow 3{,}6y=230-y \Rightarrow 4{,}6y=230 \Rightarrow y=50.$

Javob: A.

9. $\left(2x+6\frac{6}{13}\right):3=4\frac{1}{3}$ tenglamani yeching.

A) $3\frac{3}{13}$ B) $3\frac{19}{26}$ C) $3\frac{7}{26}$ D) $4\frac{3}{13}$ E) $4\frac{7}{26}$

Yechilishi: $\left(2x+6\frac{6}{13}\right):3=4\frac{1}{3} \Rightarrow$

$\Rightarrow 2x+\frac{84}{13}=\frac{13}{3}\cdot 3 \Rightarrow 26x+84=169 \Rightarrow$

$\Rightarrow 26x=85 \Rightarrow x=3\frac{7}{26}.$ Javobi: C.

10. $a=\frac{7}{36}, b=\frac{11}{34}, c=\frac{7}{32}$ va $d=\frac{9}{25}$ sonlarni kamayish tartibida joylashtiring.

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

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

E) $d>b>c>a$

Yechilishi: $a=\frac{7}{36}=0{,}19(4)$

$b=\frac{11}{34}=0{,}32\ldots$

$c=\frac{7}{32}=0{,}2\ldots$

$d=\frac{9}{25}=0{,}36$ $d>b>c>a.$

Javobi: E.

11. $7\frac{5}{13}\cdot 2-1\frac{2}{5}\cdot 6+4\cdot 2\frac{4}{13}-3\cdot 1\frac{1}{5}$ ni hisoblang.

A) $11\frac{2}{5}$ B) 12 C) 13,5 D) $11\frac{8}{13}$ E) 14

Yechilishi: $7\frac{5}{13}\cdot 2-1\frac{2}{5}\cdot 6+4\cdot 2\frac{4}{13}-3\cdot 1\frac{1}{5}=$

$=\frac{96\cdot 2}{13}-\frac{7\cdot 6}{5}+\frac{4\cdot 30}{13}-\frac{3\cdot 6}{5}=\frac{192+120}{13}-\frac{42+18}{5}=\frac{312}{13}-\frac{60}{5}=$

$=24-12=12.$ Javobi: B.

12. $4{,}5-1{,}6\cdot(5x-3)=1{,}2\cdot(4x-1)-15{,}1$ tenglamani yeching.

A) 20 B) 2 C) 0,2 D) 0,5

E) $To'g'ri\ javob\ keltirilmagan$

Yechilishi:

$4{,}5-1{,}6\cdot(5x-3)=1{,}2\cdot(4x-1)-15{,}1 =>$

$=> 4{,}5-8x+4{,}8=4{,}8x-1{,}2-15{,}1 =>$

$=> 4{,}8x+8x=4{,}5+4{,}8+1{,}2+15{,}1 =>$

$=> 12{,}8x=25{,}6 => x=2.$ Javobi: B.

13. $\frac{4}{9}\cdot\left(4\frac{1}{2}y-1\frac{1}{2}\right)-\frac{2}{7}\cdot\left(1\frac{1}{6}-3\frac{1}{2}y\right)$ ni soddalashtiring.

A) $0{,}2y-1$ B) $2y+1$ C) $3y-1$

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

Yechilishi: $\frac{4}{9}\cdot\left(4\frac{1}{2}y-1\frac{1}{2}\right)-\frac{2}{7}\cdot\left(1\frac{1}{6}-3\frac{1}{2}y\right)=$

$=\frac{4}{9}\cdot\left(\frac{9}{2}y-\frac{3}{2}\right)-\frac{2}{7}\cdot\left(\frac{7}{6}-\frac{7}{2}y\right)=\frac{4}{9}\cdot\frac{3}{2}(3y-1)-$

$-\frac{2}{7}\cdot\left(\frac{7}{6}-\frac{7}{2}y\right)=\frac{4}{9}\cdot\frac{3}{2}(3y-1)-\frac{2}{7}\cdot\frac{7}{2}\left(\frac{1}{3}-y\right)=$

$=\frac{2}{3}(3y-1)-\frac{1}{3}+y=2y-\frac{2}{3}-\frac{1}{3}+y=3y-1.$

Javobi: C.

14. $\begin{cases}\frac{x+5}{4}-2x\geq 0,\\ x-\frac{2x-8}{5}\geq 1-2x\end{cases}$ tengsizliklar sestimasining eng katta butun yechimini ko‘rtsating.

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

Yechilishi: $\begin{cases} \frac{x+5}{4} - 2x \geq 0, \\ x - \frac{2x-8}{5} \geq 1 - 2x \end{cases} =>$

$=> \begin{cases} x + 5 - 8x \geq 0 \\ 5x - 2x + 8 \geq 5 - 10x \end{cases} => \begin{cases} 7x \leq 5 \\ 13x \geq -3 \end{cases} =>$

$=> \begin{cases} x \leq \frac{5}{7}; \\ x \geq -\frac{3}{13}. \end{cases}$ Javobi: E.

15. $y = \frac{k}{x+2} (k > 0)$ funksiyaning grafigi qaysi choraklar orqali o‘tadi?

A) $I \; va \; III$ B) $II \; va \; IV$ C) I, III, IV

D) $I, II \; va \; III$ E) $I, II \; va \; IV$

Yechilishi: $y = \frac{k}{x+2}, \; (k > 0); \quad I, II, III.$

Javobi: D.

16. $(a + b + 2)(a + b) - (a - b)^2 + 1$ ni ko‘paytuvchilarga ajrating.

A) $(a + b)(2a - 1)$ B) $(a + 1)(b + 1)$

C) $2b(a + 1)$ D) $(a + 1)(2b + 1)$

E) $(2b + 1)(2a + 1)$

Yechilishi: $(a + b + 2)(a + b) - (a - b)^2 + 1 =$

$= (a + b)(a + b) + 2(a + b) + 1 - (a - b)^2 =$

$= [(a + b)^2 + 2(a + b) + 1] - (a - b)^2 =$

$= [(a + b) + 1]^2 - (a - b)^2 =$

$= [(a + b) + 1 - (a - b)] \cdot [(a + b) + 1 + (a - b)] =$

$= [a + b + 1 - a + b] \cdot [a + b + 1 + a - b] =$

$= (2b + 1)(2a + 1).$

2-usul: $[(a + b) + 2] \cdot (a + b) - a^2 + 2ab - b^2 + 1 =$

$(a + b)^2 + 2(a + b) - a^2 + 2ab - b^2 + 1 =$

$= a^2 + 2ab + b^2 + 2a + 2b - a^2 + 2ab - b^2 + 1 =$

$= 2a + 2b + 4ab + 1 = 2a + 2b(1 + 2a) + 1 =$

$= (2a+1) + 2b(2a+1) = (2a+1)(2b+1).$

Javobi: E.

17. $(2a-1)(2a+1) + 3b(3b-4a)$ ning eng kichik qiymatini toping.

A) -1 B) 0 C) -2 D) 1 E) $-0{,}5$

Yechilishi: $(2a-1)(2a+1) + 3b(3b-4a) =$

$= 4a^2 + 2a - 2a - 1 + 9b^2 - 12ab =$

$= 4a^2 - 12ab + 9b^2 - 1 = (2a-3b)^2 - 1.$

Javobi: A.

18. Agar $\frac{4b+a}{5a-7b} = 2$ bo‘lsa, $\frac{3a^2-2ab+b^2}{5a^2+2b^2}$ ning qiymati nimaga teng bo‘ladi?

A) 2 B) $\frac{1}{3}$ C) 0,5 D) $\frac{9}{22}$ E) $\frac{5}{11}$

Yechilishi: $\frac{4b+a}{5a-7b} = 2 \Rightarrow 4b + a = 10a - 14b \Rightarrow$

$\Rightarrow 9a = 18b \Rightarrow \frac{a}{b} = 2.$

$\frac{3a^2-2ab+b^2}{5a^2+2b^2} = \frac{\frac{3a^2}{b^2}-\frac{2ab}{b^2}+1}{\frac{5a^2}{b^2}+2} = \frac{3\cdot(\frac{a}{b})^2-2\cdot\frac{a}{b}+1}{5\cdot(\frac{a}{b})^2+2} = \frac{3\cdot 2^2-2\cdot 2+1}{5\cdot 2^2+2} =$

$= \frac{12-4+1}{12} = \frac{9}{22}.$ Javobi: D.

19. a ning qanday qiymatlarida $ax^2 - (a+1)x + 2a - 1 = 0$ tenglama bitta ildizga ega bo‘ladi?

A) $-1; \frac{1}{7}$ B) $0; -1$ C) $1; -\frac{1}{7}$ D) $-\frac{1}{7}; 0; 1$ E) $-1; 0; \frac{1}{7}$

Yechilishi: $ax^2 - (a+1)x + 2a - 1 = 0;$

$D = 0 \Rightarrow (a+1)^2 - 4 \cdot a(2a-1) = 0 \Rightarrow$

$\Rightarrow 7a^2 - 6a - 1 = 0;$

$a_{1,2} = \frac{6 \pm \sqrt{36+4\cdot 7\cdot 1}}{2\cdot 7} = \frac{6 \pm 8}{14} \Rightarrow$

$\Rightarrow a_1 = 1;\ a_2 = -\frac{1}{7};\ a_3 = 0.$ Javobi: D.

20. $(\sqrt{7}+\sqrt{2}-1)(\sqrt{7}+1-\sqrt{2})$ ni soddalashtiring.

A) $4+2\sqrt{2}$ B) $2-\sqrt{2}$ C) $4-\sqrt{2}$
D) $6+2\sqrt{2}$ E) $3\sqrt{2}+2\sqrt{7}$

Yechilishi: $(\sqrt{7}+\sqrt{2}-1)(\sqrt{7}+1-\sqrt{2})=$
$=[\sqrt{7}+(\sqrt{2}-1)]\cdot[\sqrt{7}-(\sqrt{2}-1)]=$
$=7-(\sqrt{2}-1)^2=7-2+2\sqrt{2}-1=4+2\sqrt{2}.$
Javobi: A.

21. Agar $2x+y=6$ bo‘lsa, xy ning eng katta qiymati nechaga teng bo‘ladi?

A) 2,5 B) 4,5 C) 3 D) $-2,5$ E) 6

Yechilishi: $2x+y=6;\ \ S=x\cdot y;\ \ y=6-2x;$
$S=x(6-2x)=6x-2x^2;\ S'=6-4x=>$
$=>6-4x=0=>x=1,5;\ \ y=6-2\cdot 1,5=3.$
$x\cdot y=1,5\cdot 3=4,5.$ Javobi: B.

22. $(x+2)^2=-\frac{3}{x}$ tenglamaning nechta ildizi bor?

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

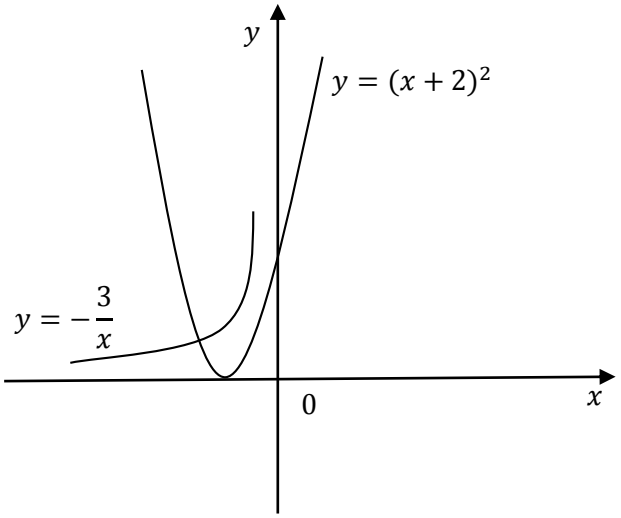
Yechilishi: $(x+2)^2=-\frac{3}{x}=>x\neq 0, x<0$

1) $y=(x+2)^2=x^2+4x+4$

x	-5	-4	-3	-2	-1	0	1
y	9	4	1	0	1	4	9

2) $y=-\frac{3}{x}$

x	-9	-6	-3	-2	-1	-0,1
y	$\frac{1}{3}$	$\frac{1}{2}$	1	1,5	3	30



Yechim 1 ta: $x = -3$. Javobi: B.

23. $y = \sqrt{x^2 - 9} + \frac{2}{\sqrt{-x}}$ funksiyaning aniqlanish sohasini toping.

A) $(0; 3)$ B) $[-3; 0)$ C) $(-\infty; 0)$ D) $(-\infty; -3]$ E) $\emptyset$

Yechilishi: $y = \sqrt{x^2 - 9} + \frac{2}{\sqrt{-x}}$;

$$1)\ x^2 - 9 \geq 0 \\ 2)\ +x < 0 \Rightarrow \begin{cases} x^2 \geq 9 \\ x < 0 \end{cases} \Rightarrow \begin{cases} |x| \geq 3 \\ x < 0 \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} x \geq 3 \\ x \leq -3 \\ x < 0 \end{cases} \Rightarrow (-\infty; -3].$$ Javobi: D.

24. $|x^2 - 2x| = 2x - x^2$ tenglamaning nechta butun ildizi bor?

A) 1 B) 2 C) 3 D) $birorta\ ham\ ildizi\ yo'q$

E) $cheksiz\ ko'p$

Yechilishi: $|x^2 - 2x| = 2x - x^2$

1) $x^2 - 2x > 0 \Rightarrow x^2 - 2x = 2x - x^2 \Rightarrow$

$$\Rightarrow 2x^2 - 4x = 0 \Rightarrow \begin{cases} x = 0; \\ x = 2. \end{cases}$$

2) $x^2 - 2x = 0 \Rightarrow x^2 - 2x = 2x - x^2$;

3) $x^2 - 2x < 0 \Rightarrow -x^2 + 2x = 2x - x^2 \Rightarrow$

$\Rightarrow 2x - x^2 = 2x - x^2\ ayniyat.\ 0 \leq x \leq 2.$

Javobi: C.

25. $f(x)=\sqrt{2-x-x^2}$ funksiyaning eng katta qiymatini toping.

A) $\sqrt{2}$ B) 1,5 C) 3

D) $2\sqrt{2}$ E) $eng\ katta\ qiymati\ yo'q$

Yechilishi: $f(x)=\sqrt{2-x-x^2} => f'(x)=\frac{-(1+2x)}{2\sqrt{2-x-x^2}}$;

$f'(x)=0 => -(1+2x)=0 => x=-\frac{1}{2}$;

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

$=\sqrt{\frac{8+2-1}{4}}=\frac{3}{2}=1{,}5.$

2-usul. $f(x)=\sqrt{-(x^2+x-2)}$;

$y=-\frac{b^2-4ac}{2a}=-\frac{9}{4}$;

$f(x)=\sqrt{-\left(\frac{9}{4}\right)}=\frac{3}{2}=1{,}5.$ Javobi: B.

26. $\frac{5x+6}{x^2-4}-\frac{x}{x^2-4}:\frac{x}{x-2}-\frac{x+2}{x-2}$ ifodani soddalashrtiring.

A) 1 B) -1 C) $\frac{x-2}{x+2}$ D) $\frac{x^2+4}{4-x^2}$ E) $\frac{1}{x+2}$

Yechilishi: $\frac{5x+6}{x^2-4}-\frac{x}{x^2-4}:\frac{x}{x-2}-\frac{x+2}{x-2}=\frac{5x+6}{(x-2)(x+2)}-$

$-\frac{x}{(x-2)(x+2)}\cdot\frac{x-2}{x}-\frac{x+2}{x-2}=\frac{5x+6}{(x-2)(x+2)}-\frac{1}{x+2}-\frac{x+2}{x-2}=$

$=\frac{5x+6-x+2-x^2-4x-4}{(x-2)(x+2)}=\frac{-(x^2-4)}{x^2-4}=-1.$ Javobi: B.

27. $0{,}5(6)$ quyidagilardan qaysi biriga teng?

A) $\frac{56}{99}$ B) $\frac{1}{18}$ C) $\frac{34}{60}$ D) $\frac{28}{45}$ E) $\frac{17}{33}$

Yechilishi:

$0{,}5(6)=\frac{56-5}{90}=\frac{51}{90}=\frac{17}{30}=\frac{34}{60}.$ Javobi: C.

28. Arifmetik progressiyaning o‘n uchinchi hadi 5 ga teng. Uning dastlabki 25 ta hadlari yig‘indisini toping.

A) 125 B) 100 C) 75
D) 225 E) $aniqlab\ bo'lmaydi$

Yechilishi: $a_{13} = 5,\ S_{25} = ?$

$a_1, a_2, \dots, a_{13}, \dots, a_{24}, a_{25} \Rightarrow a_1 + a_{25} = 10;$

$S_{25} = \frac{10}{2} \cdot 25 = 125.$ Javobi: A.

29. (b_n) geometrik progressiyada $q = 2$ va $S_4 = 5$. b_2 ni toping.

A) 0,4 B) 0,8 C) $1\frac{1}{3}$ D) $\frac{2}{3}$ E) $\frac{5}{6}$

Yechilishi: $q = 2;\ S_4 = 5.\ \ b_2 = ?$

$5 = \frac{b_1(2^4-1)}{2-1} \Rightarrow b_1 = \frac{1}{3} \Rightarrow b_2 = \frac{2}{3}.$ Javobi: D.

30. $f(x) = \sqrt{3} \cdot \sin x + \cos\frac{\pi}{3}x^2.\ f'\left(\frac{\pi}{6}\right) = ?$

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

Yechilishi: $f(x) = \sqrt{3}\sin x + \cos\frac{\pi}{3} - \frac{3}{\pi}x^2.\ \ f'\left(\frac{\pi}{6}\right) = ?$

$f'(x) = \sqrt{3}\cos x - \frac{6}{\pi} \cdot x;$

$f'\left(\frac{\pi}{6}\right) = \frac{3}{2} - 1 = \frac{1}{2} = 0{,}5.$ Javobi: B.

31. $y = e^{2-x} \cdot \cos\frac{\pi x}{2}$ funksiyaga absissasi $x_0 = 2$ bo‘lgan nuqtada o‘tkazilgan urinmaning grafigini ko‘rsating.

A) $y = x - 1$ B) $y = 1 - x$ C) $y = 2x - 1$
D) $y = x + 3$ E) $y = x - 3$

Yechilishi: $y = e^{2-x} \cdot \cos\frac{\pi x}{2};\ \ x_0 = 2.$

1) $y_0 = e^{2-2} \cdot \cos\frac{\pi \cdot 2}{2} = -1;$

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

$= -e^{2-x}\cos\frac{\pi x}{2} - e^{2-x}\sin\frac{\pi x}{2} \cdot \frac{\pi}{2};$

3) $k = y'(2) = -e^{2-2}\cos\frac{\pi \cdot 2}{2} - e^{2-2}\sin\frac{\pi \cdot 2}{2} \cdot \frac{\pi}{2} = 1;$

4) $y - y_0 = k(x - x_0) \Rightarrow y - (-1) = 1(x - 2) \Rightarrow$

$= y + 1 = x - 2 \Rightarrow y = x - 3$. Javobi: E.

32. $y = \pi \sin \pi x + 2x - 4$ funksiyaning $x = 1$ bo‘lganda qiymati 3 ga teng bo‘ladigan boshlang‘ich funksiyasi x ning qanday qiymatida nolga aylanadi?

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

Yechilishi: $y = \pi \cdot \sin \pi x + 2x - 4$. $x = 1$. $F(1) = 3$.

$F(x) = \pi \int \sin \pi x \, dx + 2 \int x \, dx - 4 \int dx =$

$= -\pi \cos \pi x + x^2 - 4x + C$

$F(1) = -\cos \pi + 1 - 4 + C;$

$3 = 1 + 1 - 4 = C \Rightarrow C = 5;$

$F(x) = -\cos \pi x + x^2 - 4x + 5.$

$x = 2 \Rightarrow F(2) = -\cos 2\pi + 2^2 - 8 + 5 = 0.$

Javobi: D.

33. Agar $f(x) = (x-2)^2 \cdot (x+4)$ bo‘lsa, $f'(x) \le 0$ tengsizlikni yeching.

A) $[-4; 2]$ B) $[2; 4]$ C) $[-2; 2]$ D) $[-3; 2]$

E) $[2; 6]$

Yechilishi: $f(x) = (x-2)^2 \cdot (x+4)$; $f'(x) \le 0$.

$f'(x) = 2(x-2) \cdot (x+4) + (x-2)^2 =$

$= (x-2)(2x + 8 + x - 2) = (x-2)(3x+6) \le 0 \Rightarrow$

$\Rightarrow \begin{cases} x = 2 \\ x = -2 \end{cases} \Rightarrow [-2; 2]$. Javobi: C.

34. $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \frac{3dx}{2\cos^2 \frac{x}{2}}$ ni hisoblang.

A) $\frac{3-\sqrt{3}}{2}$ B) $3 - \sqrt{3}$ C) $\frac{3-\sqrt{3}}{4}$ D) $3 - 3\sqrt{3}$

E) $-\sqrt{3}$

Yechilishi: $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \frac{3dx}{2\cos^2 \frac{x}{2}} = \frac{3}{2} \cdot 2 \cdot tg \frac{x}{2} \Big|_{\frac{\pi}{3}}^{\frac{\pi}{2}} = 3[tg \frac{1}{2} \cdot \frac{\pi}{2} -$

$-tg \frac{1}{2} \cdot \frac{\pi}{3}] = 3\left[1 - \frac{\sqrt{3}}{3}\right] = 3 - \sqrt{3}.$

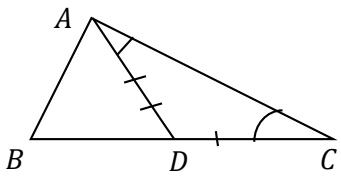
Javobi: B.

35. ABC uchburchakning BC tomoniga AD to‘g‘ri chiziq shunday tushirilganki, $\angle CAD = \angle ACD$. ABC va ABD uchburchaklarning perimetrlari mos ravishda 37 va 24 ga teng. AC tomonning uzunligini toping.

A) 6,5 B) 13 C) 10 D) 7 E) 5

Yechilishi: $P_{\triangle ABC} = 37;\ P_{\triangle ABD} = 24;\ AC = ?$

$$\begin{array}{r} AB + AC + BC = 37 \\ -\ AB + AD + BD = 24 \\ \hline AC + BC - AD - BD = 13 \end{array} \Rightarrow$$



$\Rightarrow AC + BD + DC - AD - BD = 13 \Rightarrow AC = 13.$

Javobi: B.

36. O‘ziga qo‘shni bo‘lgan burchakning $\frac{3}{7}$ qismiga teng burchakni toping.

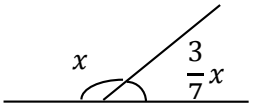
A) 54° B) 66° C) 72° D) 42° E) 63°

Yechilishi: $x + \frac{3}{7}x = 180° \Rightarrow$

$\Rightarrow 10x = 7 \cdot 180 \Rightarrow$

$\Rightarrow x = 126 \Rightarrow$

$\Rightarrow \frac{3}{7}x = \frac{3}{7} \cdot 126 = 54.$



Javobi: A.

37. Teng yonli uchburchakning uchidagi burchagi 30° ga teng. Uning yon tomoniga tushirilgan balandligi bilan asosi orasidagi burchakni toping.

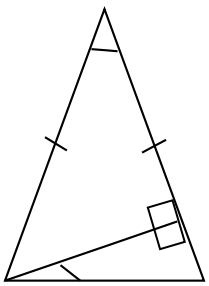
A) 75° B) 15° C) 20° D) 45° E) 65°

Yechilishi:

$\alpha = 180 - (90 + 75) =$

$= 180 - 165 = 15;$

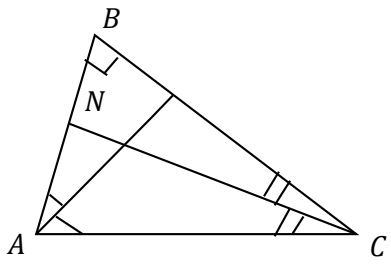
$\alpha = 15°.$ Javobi: B.



38. ABC uchburchakning B burchagi – to‘g‘ri burchak; N nuqta esa A va C burchaklar bissektrisalarining kesishish nuqtasi. ANC burchakning qiymatini toping.

A) $120°$ B) $150°$ C) $110°$ D) $135°$ E) $145°$

Yechilishi: $\angle ANC = ?$



1) $\alpha + \beta + 90° = 180° \Rightarrow$

$\Rightarrow \alpha + \beta = 90°;$

2) $\frac{\alpha}{2} + \frac{\beta}{2} + \gamma = 180° \Rightarrow$

$\Rightarrow \alpha + \beta + 2\gamma = 360° \Rightarrow$

$\Rightarrow 90 + 2\gamma = 360° \Rightarrow 2\gamma = 270 \Rightarrow \gamma = 135°.$

Javobi: D.

39. Qavariq ko‘pburchak ichki burchaklarining va bitta tashqi burchagining yig‘indisi $\frac{23\pi}{2}$ ga teng. Ko‘pburchakning nechta tomoni bor?

A) 10 B) 11 C) 13 D) 15 E) 16

Yechilishi: $180(n-2) + \frac{360°}{n} = \frac{23\pi}{2} \Rightarrow$

$\Rightarrow \pi(n-2) + \frac{2\pi}{n} = \frac{23\pi}{2} \Rightarrow n - 2 + \frac{2}{n} = \frac{23}{2} \quad /2n \Rightarrow$

$\Rightarrow 2n^2 - 4n + 4 = 23n \Rightarrow 2n^2 - 27n + 4 = 0 \Rightarrow$

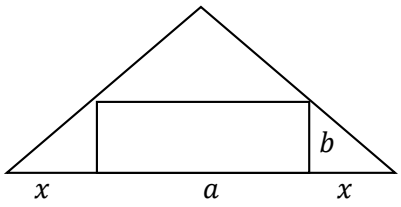
$\Rightarrow n_{1,2} = \frac{27 \pm \sqrt{729-32}}{2 \cdot 2} = \frac{27 \pm 26}{4} \Rightarrow n = 13.$

Javobi: C.

40. Teng yonli to‘g‘ri burchakli uchburchakning gepotenuzasi 45 ga teng. Unga to‘g‘ri to‘rtburchak shunday ichki chizilganki, to‘g‘ri to‘rtburchakning ikki uchi uchburchakning gepotenuzasida, qolgan ikki uchi esa katetlarida yotadi. Agar to‘g‘ri to‘rtburchak tomonlarining nisbati 5:2 kabi bo‘lsa, uning perimetrini toping.

A) 50 B) 65 C) 70 D) 90 E) 75

Yechilishi: 1) $\frac{a}{b}=\frac{5}{2} \Rightarrow a=\frac{5}{2}b$;



2) $a=45-2x$;

3) $\frac{b}{x}=tg45° \Rightarrow b=x$;

4) $a=45-2x \Rightarrow \frac{5b}{2}=45-2\cdot b \Rightarrow b=10 \Rightarrow$

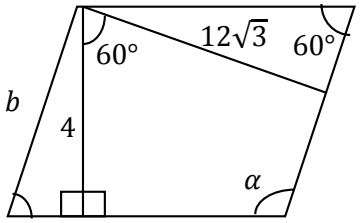
$\Rightarrow a=25 \Rightarrow p=2(a+b)=70$. Javobi: C.

41. Balandliklari $12\sqrt{3}$ va 4 ga, ular orasidagi burchagi $60°$ ga teng parallelogrammning yuzini toping.

A) $48\sqrt{3}$ B) 48 C) $24\sqrt{3}$ D) 96 E) 72

Yechilishi: $S_{\square}=?$ $\alpha+90°+60°+90°=360° \Rightarrow$

$\Rightarrow \alpha=120°$. $\frac{4}{b}=\sin 60°$;



$b=\frac{4}{\sin 60°}=\frac{4}{\frac{\sqrt{3}}{2}}=\frac{8}{\sqrt{3}} \Rightarrow$

$\Rightarrow S=\frac{8}{\sqrt{3}}\cdot 12\sqrt{3}=96$.

Javobi: D.

42. Aylananing tenglamasi $x^2+y^2-2x-2y=0$. Uning uzunligini hisoblang.

A) 2π B) 4π C) 8π D) $\pi\sqrt{2}$ E) $2\pi\sqrt{2}$

Yechilishi: $x^2-2x+1-1+y^2-2y+1-1=0 \Rightarrow$

$\Rightarrow (x-1)^2+(y-1)^2=(\sqrt{2})^2 \Rightarrow l=2\pi\cdot\sqrt{2}$.

Javobi: E.

43. Uchburchakning burchaklari 45 va $60°$ ga, unga tashqi chizilgan aylananing radiusi R ga teng. Uchburchakning yuzini aniqlang.

A) $\frac{3R^2\sqrt{3}}{4}$ B) $\frac{R^2\sqrt{3}}{2}(\sqrt{3}+1)$ C) $\frac{R^2}{2}(\sqrt{2}+\sqrt{3})$

D) $\frac{R^2\sqrt{6}}{4}$ E) $\frac{R^2}{4}(3+\sqrt{3})$

Yechilishi: $\frac{c}{\sin 60°}=2R \Rightarrow c=\sqrt{3}R$;

$\frac{b}{\sin 45°} = 2R \Rightarrow b = \sqrt{2}R;$

$S = \frac{1}{2} \cdot b \cdot c \cdot \sin 75° = \frac{1}{2} \cdot \sqrt{2}R \cdot \sqrt{3}R\sqrt{\frac{1}{2}[1 - \cos 150°]} =$

$= \frac{\sqrt{6}R^2}{2}\sqrt{\frac{1}{2}\left[1 + \frac{\sqrt{3}}{2}\right]} = \frac{\sqrt{6}R^2}{2}\sqrt{\frac{2+\sqrt{3}}{4}} = \frac{R^2}{4}\sqrt{12 + \sqrt{108}} =$

$= \frac{R^2}{4}\left[\sqrt{\frac{12+\sqrt{144-108}}{2}} + \sqrt{\frac{12-6}{2}}\right] = \frac{R^2}{4}\left(3 + \sqrt{3}\right).$ Javobi: E.

44. Uchburchakning yon tomoni uchidan boshlab hisoblaganda 2:3:4 kabi nisbatda bo‘lindi va bo‘linish nuqtalari orqali asosiga parallel to‘g‘ri chiziqlar o‘tkazildi. Hosil bo‘lgan figuralar nisbatlarini toping.

A) 4: 9: 16 B) 2: 5: 9 C) 4: 25: 49
D) 4: 21: 56 E) 4: 25: 81

Yechilishi:

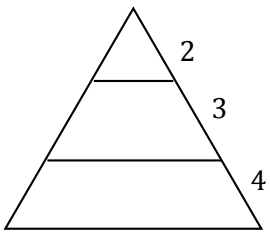
$\frac{S_1}{S_2} = \frac{4}{25} \Rightarrow S_1 = \frac{4S_2}{25};\ \frac{S_2}{S_3} = \frac{25}{81} \Rightarrow S_3 = \frac{81S_2}{25};$

$S_1 : (S_2 - S_1) : (S_3 - S_2);$

$S_2 - S_1 = S_2 - \frac{4S_2}{25} = \frac{21S_2}{25};$

$S_3 - S_2 = \frac{81S_2}{25} - S_2 = \frac{56S_2}{25};$

$4 \cdot \frac{S_2}{25} : 21 \cdot \frac{S_2}{25} : 56 \cdot \frac{S_2}{25} \Rightarrow 4 : 21 : 56.$



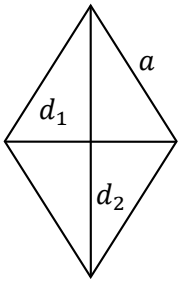
Javobi: D.

45. Rombning kichik diagonali $\sqrt[4]{3}$ ga, yuzi 1,5 ga teng. Uning o‘tmas burchagini toping.

A) 150° B) 120° C) 135° D) 110° E) 140°

Yechilishi: $d_1 = \sqrt[4]{3};\ \ S = 1{,}5.$

1) $1{,}5 = \frac{1}{2} \cdot \sqrt[4]{3} \cdot d_2 \Rightarrow d_2 = \sqrt[4]{3^3}$;



2) $a^2 = \left(\frac{d_1}{2}\right)^2 + \left(\frac{d_2}{2}\right)^2 = \frac{1}{4}\left[\sqrt[4]{3^2} + \sqrt[4]{3^6}\right] =$

$= \frac{1}{4}\left[\sqrt{3} + \sqrt{3^3}\right] = \frac{1}{4\sqrt{3}}[3 + 9] =$

$= \frac{3}{\sqrt{3}} = \sqrt{3} \Rightarrow a = \sqrt[4]{3}.$

3) $a = d_1 = \sqrt[4]{3} \Rightarrow \alpha = 120°$. Javobi: B.

46. $\vec{a}$ va $\vec{b}$ vektorlar $120°$ li burchak tashkil qiladi hamda $|\vec{a}| = 3, |\vec{b}| = 5$. $|\vec{a} - \vec{b}|$ ning qiymatini toping.

A) 7 B) $\sqrt{19}$ C) $4\sqrt{3}$ D) 8 E) 4

Yechilishi: $|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2\vec{a}\vec{b} =$

$= 9 + 25 - 2 \cdot 3 \cdot 5 \cdot \cos 120° = 34 + 30 \cdot \frac{1}{2} = 49 \Rightarrow$

$\Rightarrow |\vec{a} - \vec{b}| = 7$. Javobi: A.

47. Aylananing deametriga perpendikulyar vatar o‘tkazildi. Ularning kesishish nuqtasi diametrni uzunliklari 18 va 32 bo‘lgan kesmalarga ajratadi. Vatarning uzunligini aniqlang.

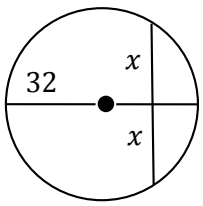
A) 24 B) 48 C) 36 D) 28 E) 40

Yechilishi: $x \cdot x = 18 \cdot 32 \Rightarrow$

$\Rightarrow x^2 = 9 \cdot 2 \cdot 16 \cdot 2 \Rightarrow$

$\Rightarrow x = 24 \Rightarrow 2x = 48.$

Javobi: B.



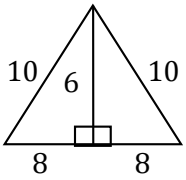
48. Balandligi 6 ga, yasovchisi 10 ga teng konusga ichki chizilgan sharning sirtini toping.

A) $\frac{32\pi}{3}$ B) $\frac{64\pi}{3}$ C) $\frac{256\pi}{9}$ D) $\frac{64\pi}{9}$ E) $\frac{128\pi}{9}$

Yechilishi: $S_{\triangle} = \frac{1}{2} \cdot 16 \cdot 6 = 48.$

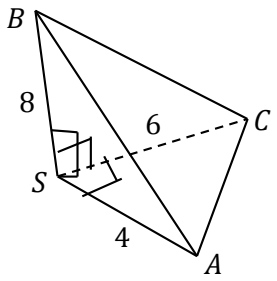
$r = \frac{2S}{a+b+c} = \frac{8}{3}$; $S_{sh} = 4\pi r^2 = \frac{256}{9}\pi.$

Javobi: C.



49. Uchburchakli piramidaning yon qirralari o‘zaro perpendikulyar hamda mos ravishda 4; 6 va 8 ga teng. Piramidaning hajmini toping.

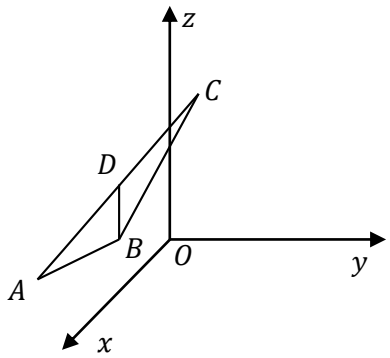
A) 64 B) 48 C) 32 D) 24
E) $aniqlab\ bo'lmaydi$



Yechilishi: $6 \perp 4 =>$
$=> S_{\Delta ASC} = \frac{1}{2} \cdot 6 \cdot 4 = 12;$
$8 \perp 6\ va\ 8 \perp 4 =>$
$=> 8 \perp S_{\Delta ASC}.\ V = \frac{1}{3} \cdot 12 \cdot 8 = 32.$
Javobi: C.

50. Uchburchakning uchlari $A(3; -2; 1), B(3; 0; 2)$ va $C(1; 2; 5)$ nuqtalarda joylashgan. Shu uchburchakning BD medianasi va AC asosi orasidagi burchakni toping.

A) 30° B) 60° C) 45°
D) $\arccos\frac{1}{3}$ E) 75°



Yechilishi: 1) $D(x; y; z) = D(2; 0; 3)$
$x = \frac{3+1}{2} = 2;\quad y = \frac{-2+2}{2} = 0;$
$z = \frac{1+5}{2} = 3.$
2) $\overrightarrow{DB} = \{1; 0; -1\} => \left|\overrightarrow{DB}\right| = \sqrt{2};$
$\overrightarrow{DA} = \{1; -2; -2\} => \left|\overrightarrow{DA}\right| = \sqrt{9} = 3;$
$\overrightarrow{DB} \cdot \overrightarrow{DA} = \left|\overrightarrow{DB}\right| \cdot \left|\overrightarrow{DA}\right| \cdot \cos\alpha =>$
$=> \cos\alpha = \frac{1+0+2}{\sqrt{2}\cdot 3} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} => \alpha = 45°.$ Javobi: C.

51. Berilgan nuqtadan tekislikkka uzunliklarining ayirmasi 6 ga teng bo‘lgan ikkita og‘ma tushirildi. Og‘malarning tekislikdagi proeksiyalari 27 va 15 ga teng. Berilgan nuqtadan tekislikkacha bo‘lgan masofani toping.

A) 32 B) 36 C) 44 D) $30\sqrt{2}$ E) 39

Yechilishi: $x - y = 6 => x = y + 6$

$\begin{cases} h^2 = y^2 - 225 \\ h^2 = x^2 - 729 \end{cases} => x^2 - 729 = y^2 - 225 =>$

$=> y^2 + 12y + 36 - 729 = y^2 - 225 =>$

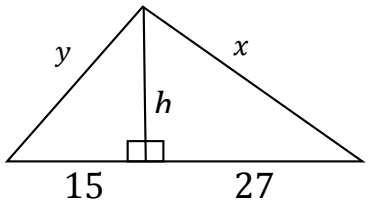
$=> 12y = 693 - 225 =>$

$=> 12y = 468 => y = 39 =>$

$=> h^2 = 39^2 - 225 =$

$= 1521 - 225 = 1296 =>$

$=> h = 36.$ Javobi: B.



52. $\cos\frac{\pi}{7} \cdot \cos\frac{3\pi}{7} \cdot \cos\frac{5\pi}{7}$ ni hisoblang.

A) $\frac{1}{8}$ B) $-\frac{1}{16}$ C) $-\frac{\sqrt{3}}{8}$ D) $\frac{1}{16}$ E) $-\frac{1}{8}$

Yechilishi: $\cos\frac{\pi}{7} \cdot \cos\frac{3\pi}{7} \cdot \cos\frac{5\pi}{7} =$

$= \frac{1}{2\sin\frac{\pi}{7}} \cdot 2\sin\frac{\pi}{7} \cdot \cos\frac{\pi}{7} \cdot \cos\frac{3\pi}{7} \cdot \cos\frac{5\pi}{7} =$

$= \frac{1}{2\sin\frac{\pi}{7}} \cdot \sin\frac{2\pi}{7} \cdot \cos\frac{3\pi}{7} \cdot \cos\frac{5\pi}{7} =$

$= \frac{1}{2\sin\frac{\pi}{7}} \cdot \sin(\pi - \frac{5\pi}{7}) \cdot \cos\frac{3\pi}{7} \cdot \cos\frac{5\pi}{7} =$

$= \frac{1}{2\sin\frac{\pi}{7}} \cdot \sin\frac{5\pi}{7} \cdot \cos\frac{5\pi}{7} \cdot \cos\frac{3\pi}{7} =$

$= \frac{1}{4\sin\frac{\pi}{7}} \cdot 2\sin\frac{5\pi}{7} \cdot \cos\frac{5\pi}{7} \cdot \cos\frac{3\pi}{7} =$

$= \frac{1}{4\sin\frac{\pi}{7}} \cdot \sin\frac{10\pi}{7} \cdot \cos\frac{3\pi}{7} = \frac{1}{4\sin\frac{\pi}{7}} \cdot \sin(\pi + \frac{3\pi}{7}) \cos\frac{3\pi}{7} =$

$= -\frac{1}{8\sin\frac{\pi}{7}} \cdot 2\sin\frac{3\pi}{7} \cdot \cos\frac{3\pi}{7} = -\frac{1}{8\sin\frac{\pi}{7}} \cdot \sin\frac{6\pi}{7} =$

$= -\frac{1}{8\sin\frac{\pi}{7}} \cdot \sin(\pi - \frac{\pi}{7}) = -\frac{1}{8\sin\frac{\pi}{7}} \cdot \sin\frac{\pi}{7} = -\frac{1}{8}.$

Javobi: E.

53. $\cos^2(x+1) \cdot \log_4(3 - 2x - x^2) \geq 1$ tengsizlikni yeching.

A) $[-1; 0)$ B) $[-2; -1]$ C) $-2; -1$

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

Yechilishi: $\cos^2(x+1)\cdot\log_4(3-2x-x^2)\geq 1$

1) $0<\cos^2(x+1)\leq 1 => 0<\cos(x+1)\leq 1;$

2) $\log_4(3-2x-x^2)\geq 1 => \begin{cases}3-2x-x^2>0\\3-2x-x^2\geq 4\end{cases} =>$

$=> \begin{cases}3-2x-x^2>0\\3-2x-x^2\geq 4\end{cases} => \begin{cases}x^2+2x-3<0\\x^2+2x+1\leq 0\end{cases} =>$

$=> \begin{cases}-3<x<1;\\ x_{1,2}=-1.\end{cases}$ Javobi: D.

54. $1+\text{tg}^4\,x=\cos^2 2x$ tenglamaning $[-2\pi;2\pi]$ kesmada nechta ildizi bor?

A) 6 B) 5 C) 4 D) 2 E) 1

Yechilishi: $1+\text{tg}^4\,x=\cos^2 2x$; $[-2\pi;2\pi]$.

$0\leq\cos^2 2x\leq 1 => \text{tg}^4\,x=0 => x=\pi n, n\in Z.$

$n=-2,-1,0,1,2.$ Javobi: B.

55. $\frac{log_5^2\,15-log_5^2\,3+2\log_5 15+2\log_5 3}{\log_5 15+\log_5 3}$ ifodaning qiymatini ko‘rsating.

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

Yechilishi: $\frac{log_5^2\,15-log_5^2\,3+2\log_5 15+2\log_5 3}{\log_5 15+\log_5 3}=$

$=\frac{(\log_5 15-\log_5 3)(\log_5 15+\log_5 3)+\log_5 15^2\cdot 3^2}{\log_5 15\cdot 3}=$

$=\frac{\log_5\frac{15}{3}\log_5 15\cdot 3+\log_5(15\cdot 3)^2}{\log_5 15\cdot 3}=\frac{1\cdot\log_5 15\cdot 3+2\log_5 15\cdot 3}{\log_5 15\cdot 3}=$

$=\frac{3\log_5 15\cdot 3}{\log_5 15\cdot 3}=3.$ Javobi: C.

56. $\cos 4\cdot\cos x\geq\sqrt{\frac{\cos x}{1+\text{ctg}^2\,x}}$ tengsizlikni yeching.

A) $\left(\pi n;\frac{\pi}{2}+\pi n\right), n\in Z$ B) $\left[0;\frac{\pi}{2}\right]$ C) $\frac{\pi}{2}+\pi n, n\in Z$

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

Yechilishi: $\cos 4 \cdot \cos x \geq \sqrt{\frac{\cos x}{1+\text{ctg}^2 x}} =>$

$$=> \begin{cases} 1 + \text{ctg}^2 x > 0 \\ \cos x \geq 0 \\ \cos 4 < 0 \end{cases} => \cos x = 0 =>$$

$=> x = \frac{\pi}{2} + \pi n, n \in Z.$

$\cos 4 -$ radianda. Bu III chorakda bo'lib, manfiy son.

$\cos 4 = \cos 4 \cdot \frac{180^\circ}{\pi}$. Javobi: C.

1999-YIL, 5-AXBOROTNOMA

1. $\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\cdots+\frac{1}{182}$ ni hisoblang.

A) $\frac{11}{42}$ B) $\frac{10}{33}$ C) $\frac{1}{4}$ D) $\frac{12}{35}$ E) $\frac{15}{56}$

Yechilishi: $\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\cdots+\frac{1}{182}=\frac{1}{3\cdot4}+\frac{1}{4\cdot5}+\frac{1}{5\cdot6}+$

$+\cdots+\frac{1}{13\cdot14}=\frac{1}{3}-\frac{1}{4}+\frac{1}{4}-\frac{1}{5}+\frac{1}{5}-\frac{1}{6}+\cdots+\frac{1}{13}-\frac{1}{14}=$

$=\frac{1}{3}-\frac{1}{14}=\frac{11}{42}$. Javobi: A.

2. Agar $A^2+B^2+C^2=AB+AC+BC$ bo‘lsa, $\frac{A+B}{C}+\frac{B+C}{A}$ ning qiymati nechaga teng bo‘ladi?

A) $aniqlab\ bo'lmaydi$ B) 1 C) 2 D) 3 E) 4

Yechilishi: $A^2+B^2+C^2=AB+AC+BC\Rightarrow$

$\Rightarrow \frac{A+B}{C}+\frac{B+C}{A}-?$

$2A^2+2B^2+2C^2=2AB+2AC+2BC\Rightarrow$

$\Rightarrow (A-B)^2+(B-C)^2+(C-A)^2=0\Rightarrow A=B=C.$

$\frac{A+B}{C}+\frac{B+C}{A}=\frac{A+A}{A}+\frac{A+A}{A}=4.$ Javobi: E.

3. $\frac{z-8}{k-10}=\frac{k}{z}$ tenglama ildizga ega bo‘lmaydigan k ning barcha natural qiymatlari yig‘indisini toping.

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

Yechilishi: $\frac{z-8}{k-10}=\frac{k}{z}\Rightarrow z(z-8)=k(k-10)\Rightarrow$

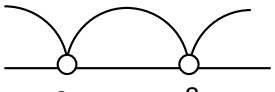
$\Rightarrow z^2-8z-k(k-10)=0\Rightarrow$

$D=b^2-4ac<0\ da\ tenglama\ ildizga\ ega\ emas.$

$(-8)^2+4\cdot k(k-10)<0\Rightarrow 64+4k^2-40k<0\Rightarrow$

$\Rightarrow 16 + k^2 - 10k < 0 \Rightarrow k^2 - 10k + 16 < 0 \Rightarrow$

$\Rightarrow \begin{cases} k_1 = 2 \\ k_2 = 8 \end{cases} \Rightarrow (k-2)(k-8) < 0 \Rightarrow$



$\Rightarrow k \in (2;8) \Rightarrow 3 + 4 + 5 + 6 + 7 = 25.$

Javobi: B.

4. $a; 2a+2; 3a+4;$ ... ketma-ketlikning dastlabki 10 ta hadi yig‘indisi 225 ga teng. a ning qiymatini toping.

A) 3 B) 2 C) 5 D) 7 E) 8

Yechilishi: $\begin{cases} a_1 = a \\ a_2 = 2a+2 \end{cases} \Rightarrow d = a_2 - a_1 = 2a + 2 - a =$

$= a + 2;\ \ n = 10;\ \ a_{10} = a_1 + 9d = 10a + 18.$

$S_{10} = \frac{a_1 + a_{10}}{2} \cdot 10 \Rightarrow \frac{a + 10a + 18}{2} \cdot 10 = 255 \Rightarrow$

$\Rightarrow (11a + 18) \cdot 5 = 255 \Rightarrow 11a + 18 = 51 \Rightarrow$

$\Rightarrow 11a = 33 \Rightarrow a = 3.$ Javobi: A.

5. $\frac{27a+1}{9a^{\frac{2}{3}} - 3\sqrt[3]{a} + 1} - \frac{27a-1}{9\sqrt[3]{a^2} + 3a^{\frac{1}{3}} + 1}$ ni soddalashtiring.

A) $\sqrt[3]{a} - 1$ B) 1 C) 2 D) $a + 1$ E) $a - 3$

Yechilishi: $\frac{27a+1}{9a^{\frac{2}{3}} - 3\sqrt[3]{a} + 1} - \frac{27a-1}{9\sqrt[3]{a^2} + 3a^{\frac{1}{3}} + 1} = \frac{(3\sqrt[3]{a})^3 + 1^3}{(3\sqrt[3]{a})^2 - 3\sqrt[3]{a} + 1} -$

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

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

$= 3\sqrt[3]{a} + 1 - 3\sqrt[3]{a} + 1 = 2.$ Javobi:C.

6. $\overline{abc} + \overline{dec} = \overline{fkmc}$ ($\overline{abc}$ va $\overline{dec}$-uch xonali sonlar; $\overline{fkmc}$-to‘rt xonali son). $f^{a+d} + (b+d)^c$ ni hisoblang.

A) $aniqlab\ bo'lmaydi$ B) 1 C) 2 D) 3 E) 4

Yechilishi: $\overline{abc}+\overline{dec}=\overline{fkmc}$; $f^{a+d}+(b+d)^c=?$

$a\cdot 100+b\cdot 10+c+d\cdot 100+e\cdot 10+c=$

$=f\cdot 1000+k\cdot 100+m\cdot 10+c$

$f=1 \quad c=0 \quad => \quad 1+1=2.$ Javobi: C.

7. Korxonada mahsulot ishlab chiqarish birinchi yili 10% ga, ikkinchi yili 15% ga oshdi. Mahsulot ishlab chiqarish ikki yil mobaynida necha foizga oshgan?

A) 25 B) 26 C) 27,5 D) 26,5 E) 28,75

Yechilishi: Mahsulotni x bilan belgilaymiz.

$I.\frac{100+10}{100}\cdot x=\frac{110}{100}x=1{,}1x;$

$II.\frac{100+15}{100}\cdot 1{,}1x=\frac{126{,}5}{100}x => 126{,}5x-x=26{,}5x.$

Javobi: D.

8. Qishloqda bolalar kattalardan ikki marta ko‘p, nafaqaxo‘rlar esa qolgan aholidan 3 marta kam. Agar 15 sonining o‘ng va chap tomoniga bir xil raqam yozilsa, qishloq aholisining soni hozil bo‘ladi. Bu qanday raqam?

A) 2 B) 3 C) 4 D) 6 E) 8

Yechilishi: $\begin{cases} I.\text{Bolalar}=x \\ II.\text{Kattalar}=y \\ III.\text{Nafaqaxo}'\text{rlar}=z \end{cases} => x+y+z=*15*;$

$\begin{cases} x=2y \\ z=\frac{x+y}{3} \end{cases} => \begin{cases} x=2y \\ z=\frac{2y+y}{3} \end{cases} => \begin{cases} x=2y \\ z=y \end{cases} =>$

$=> x+y+z=*15*=> 4y=*15*=>$

$=> (*15*)$ son 4 ga karrali bo‘lishi kerak.

Demak, izlanayotgan raqam 6. Javobi: D.

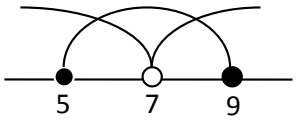
9. $y=\frac{1}{\sqrt{x-5}-\sqrt{9-x}}$ funksiyaning aniqlanish sohasiga tegishli barcha butun sonlar yig‘indisini toping.

A) 35 B) 28 C) 32 D) 30 E) 21

Yechilishi: $y = \frac{1}{\sqrt{x-5}-\sqrt{9-x}} =>$

$$=> \begin{cases} \sqrt{x-5}-\sqrt{9-x} \neq 0 \\ x-5 \geq 0 \\ 9-x \geq 0 \end{cases} => \begin{cases} x-5 \neq 9-x \\ x \geq 5 \\ x \leq 9 \end{cases} =>$$

$$=> \begin{cases} x \neq 7 \\ x \geq 5 \\ x \leq 9 \end{cases} =>$$



$=>$

$x \in [5;7) \cup (7;9] => 5+6+8+9 = 28.$ Javobi: B.

10. $m,n,k \in N.\ m^2+2n^2-2nk = 25,\ 2mn-k^2 = 25.$ $\frac{(m+n)^2}{2k}$ ni hisoblang.

A) 1 B) 2 C) 5 D) 10 E) 15

Yechilishi: $m,n,k \in N.\ m^2+2n^2-2nk = 25,$ $2mn-k^2 = 25.\ \frac{(m+n)^2}{2k} -?$

1) $m^2+2n^2-2nk = 2mn-k^2 =>$

$=> m^2-2mn+n^2+n^2-2nk+k^2 = 0 =>$

$$=> (m-n)^2+(n-k)^2 = 0 => \begin{cases} (m-n)^2 = 0 \\ (n-k)^2 = 0 \end{cases} =>$$

$$=> \begin{cases} |m-n| = 0 \\ |n-k| = 0 \end{cases} => \begin{cases} m-n = 0 \\ n-k = 0 \end{cases} => m = n = k.$$

2) $2mn-k^2 = 25 => 2 \cdot k \cdot k - k^2 = 25 => k = 5.$

3) $\frac{(m+n)^2}{2k} = \frac{(k+k)^2}{2k} = \frac{4k^2}{2k} = 2k = 2 \cdot 5 = 10.$

Javobi: D.

11. Agar $\sqrt{t^5+3}-\sqrt{t^5-2} = 1$ bo‘lsa, $\sqrt{t^5+3}+\sqrt{t^5-2}$ ning qiymati nechaga teng bo‘ladi?

A) 2 B) 3 C) 4 D) 5 E) 8

Yechilishi: $\sqrt{t^5+3}-\sqrt{t^5-2}=1$. $\sqrt{t^5+3}+\sqrt{t^5-2}-?$

$\frac{(\sqrt{t^5+3}-\sqrt{t^5-2})(\sqrt{t^5+3}+\sqrt{t^5-2})}{\sqrt{t^5+3}+\sqrt{t^5-2}}=1 \Rightarrow$

$\Rightarrow \sqrt{t^5+3}+\sqrt{t^5-2}=(\sqrt{t^5+3})^2-(\sqrt{t^5-2})^2=$

$=t^5+3-(t^5-2)=t^5+3-t^5+2=5.$

Javobi: D.

12. $5a^8+10a^{-4}b^{-4}+5b^8$ ifodaning eng kichik qiymatini toping.

A) 10 B) 20 C) 100 D) 25 E) 50

Yechilishi: $5a^8+10a^{-4}b^{-4}+5b^8=$

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

$=5\left[(a^4-b^4)^2+2a^4b^4+\frac{2}{a^4b^4}\right] \Rightarrow$

1) $a\neq 0, b\neq 0$;

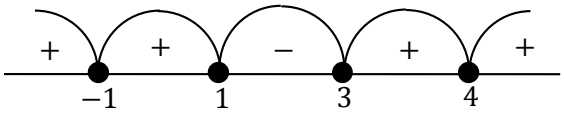
2) $a^4-b^4=0 \Rightarrow a^4=b^4$. $a=b=1 \Rightarrow$

$\Rightarrow 5(2+2)=20.$ Javobi: B.

13. $(x-1)(x+1)^2(x-3)^3(x-4)^4\leq 0$ tengsizlikning barcha butun qiymatlari yig‘indisini toping.

A) 6 B) 7 C) 8 D) 9 E) 11

Yechilishi: $(x-1)(x+1)^2(x-3)^3(x-4)^4\leq 0$



$x=-1;4;\ x\in[1;3] \Rightarrow -1+1+2+3+4=9.$

Javobi: D.

14. $\log_{0,5}(x+5)^4>\log_{0,5}(3x-1)^4$ tengsizlikni yeching.

A) $(3;\infty)$ B) $(-\infty;1)$ C) $(-\infty;1)\cup(3;\infty)$

D) $(-\infty;-1)\cup(3;\infty)$ E)$(-\infty;-5)\cup(-5;-1)\cup(3;\infty)$

Yechilishi: $\log_{0,5}(x+5)^4>\log_{0,5}(3x-1)^4$;

1) $\begin{cases}(x+5)^4>0\\(3x-1)^4>0\end{cases}\Rightarrow\begin{cases}x>-5;\\x>\frac{1}{3}.\end{cases}$

2) $0<0{,}5<1\Rightarrow(x+5)^4<(3x-1)^4\Rightarrow$

$\Rightarrow\ [(3x-1)^2]^2-[(x+5)^2]^2>0$

$[(3x-1)^2-(x+5)^2]\cdot[(3x-1)^2+(x+5)^2]>0;$

$(3x-1-x-5)(3x-1+x+5)\cdot$

$\cdot(9x^2-6x+1+x^2+10x+25)>0;$

$(3x-1-x-5)(3x-1+x+5)\cdot$

$(9x^2-6x+1+x^2+10x+25)>0;$

$(2x-6)(4x+4)(10x^2+4x+26)>0;$

$z(x-3)\cdot4(x+1)\cdot2(5x^2+2x+13)>0;$

$16(x-3)(x+1)(5x^2+2x+13)>0\Rightarrow$

$\Rightarrow\begin{cases}16\neq0\\x=3\\x=-1\\5x^2+2x+13=0\end{cases}\Rightarrow\begin{cases}x=3\\x=-1\Rightarrow\\D<0\end{cases}$

$(-\infty;-5)\cup(-5;-1)\cup(3;+\infty)$. Javobi: E.

15. $\sqrt{(3x-13)^2}=13-3x$ tenglamaning natural ildizlari nechta?

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

Yechilishi: $\sqrt{(3x-13)^2}=13-3x\Rightarrow$

$\Rightarrow\begin{cases}3x-13\geq0\\3x-13<0\end{cases}\Rightarrow\begin{cases}3x-13=13-3x\\-3x+13=13-3x\end{cases}\Rightarrow$

$\Rightarrow\begin{cases}6x=26\\ayniyat\end{cases}\Rightarrow x=\frac{13}{3}=4\frac{1}{3}<0\Rightarrow x=1,2,3,4.$

Javobi: E.

16. $\cos\left(\lg\left(2-3^{x^2}\right)\right)=3^{x^2}$ tenglamaning ildizlari nechta?

A) $\emptyset$ B) $cheksiz\ ko'p$ C) 1 D) 2 E) 3

Yechilishi: $\cos\left(\lg\left(2-3^{x^2}\right)\right)=3^{x^2} \Rightarrow$

$\Rightarrow \begin{cases} -1 \le \cos\left(lg\left(2-3^{x^2}\right)\right) \le 1 \\ 3^{x^2} \ge 1 \\ 2-3^{x^2} > 0 \Rightarrow 3^{x^2} < 2 \end{cases} \Rightarrow x=0.$ Javobi: E.

17. Agar $a,b \in N, a > 10$ va $b > 16$ bo‘lsa, quyidagilardan qaysi biri har doim o‘rinli bo‘ladi?

A) $a-b<6$ B) $\frac{3a-b}{b}>0$ C) $\frac{b-2a}{a}<0$ D) $\frac{b}{a}>1{,}5$

E) $a+b \ge 28$

Yechilishi: $a,b \in N.\ a>10 \quad b>16 \Rightarrow a+b=28.$

Doimo: ham tenglik, ham tengsizlik bori to′g′ri bo′ladi.

Javobi: E.

18. $\sqrt{x+4\sqrt{x+1}+5}+\sqrt{18+6\sqrt{9-x}-x}=9$

tenglamaning ildizlari yig‘indisini toping.

A) $\emptyset$ B) 4 C) 2 D) 8 E) 9

Yechilishi: $\sqrt{x+4\sqrt{x+1}+5}+$

$+\sqrt{18+6\sqrt{9-x}-x}=9 \Rightarrow \sqrt{(\sqrt{x+1}+2)^2}+$

$+\sqrt{\left(\sqrt{9-x}+3\right)^2}=9 \Rightarrow$

$\Rightarrow \sqrt{x+1}+2+\sqrt{9-x}+3=9 \Rightarrow$

$\Rightarrow \sqrt{x+1}=4-\sqrt{9-x} \Rightarrow$

$\Rightarrow \left(\sqrt{x+1}\right)^2=\left(4-\sqrt{9-x}\right)^2 \Rightarrow$

$\Rightarrow x+1=16-8\sqrt{9-x}+9-x \Rightarrow$

$\Rightarrow 2x-24=-8\sqrt{9-x} \Rightarrow$

$\Rightarrow (2x-24)^2=(-8\sqrt{9-x})^2 \Rightarrow$

$\Rightarrow 4x^2-96x+576=64(9-x) \Rightarrow$

$\Rightarrow 4(x^2-24x+144)=64(9-x)\Rightarrow$

$\Rightarrow x^2-24x+144=144-16x\Rightarrow$

$\Rightarrow x^2-8x=0\Rightarrow x(x-8)=0\Rightarrow$

$\Rightarrow \begin{cases} x_1=0 \\ x_2=8 \end{cases} \Rightarrow x_1+x_2=0+8=8.$ Javobi: D.

19. $(\pi-e)^{\ln(\cos^4 x-\sin^4 x)} \geq 1$ tengsizlikning $[0;\pi]$ oraliqqa tegishli barcha yechimlarini aniqlang.

A) $\left[0;\frac{\pi}{2}\right] \cup [\frac{3\pi}{2};2\pi]$ B) $\left[0;\frac{\pi}{2}\right) \cup (\frac{3\pi}{2};2\pi]$

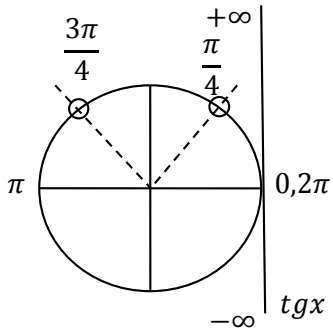
C) $\left[0;\frac{\pi}{4}\right] \cup [\frac{3\pi}{4};\pi]$ D) $\left[\frac{\pi}{4};\frac{\pi}{2}\right) \cup \left(\frac{3\pi}{2};2\pi\right]$

E) $\left[0;\frac{\pi}{4}\right) \cup (\frac{3\pi}{4};\pi]$

Yechilishi: $(\pi-e)^{\ln(\cos^4 x-\sin^4 x)} \geq 1 \quad [0;\pi]$

$(\pi-e)^{\ln(\cos^4 x-\sin^4 x)} \geq (\pi-e)^0 \Rightarrow$

$\Rightarrow 0<(\pi-e)<1\Rightarrow$



$\ln(\cos^4 x-\sin^4 x)\leq 0$

$\cos^4 x-\sin^4 x>0\Rightarrow$

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

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

$\cdot(\cos^2 x+\sin^2 x)=cos2x>0\Rightarrow$

$\Rightarrow -\frac{\pi}{2}+2\pi k<2x<\frac{\pi}{2}+2\pi k, k\in Z;$

$-\frac{\pi}{4}+\pi k<x<\frac{\pi}{4}+\pi k, \quad k\in Z.$

2) $\ln cos2x\leq 0\Rightarrow cos2x\leq 1\Rightarrow 2x\leq 2\pi k, k\in Z\Rightarrow$

$\Rightarrow x\leq \pi k, k\in Z.$

Demak, $x\in\left[0;\frac{\pi}{4}\right) \cup \left(\frac{3\pi}{4};\pi\right]$. Javobi: E.

20. x va z $7^{2x}-2\cdot 7^x\cdot\cos\frac{z}{2}+1=0$ tenglikni qanoatlantirsa, $[z+3]^x$ ning qiymatini toping.

A) 9 B) 0 C) 3 D) 1 E) 27

Yechilishi: $7^{2x} - 2 \cdot 7^x \cdot \cos\frac{z}{2} + 1 = 0 \Rightarrow$

$\Rightarrow (7^x)^2 - 2 \cdot 7^x \cdot cos\frac{z}{2} + \cos^2\frac{z}{2} + \sin^2\frac{z}{2} = 0 \Rightarrow$

$\Rightarrow \left(7^x - \cos^2\frac{z}{2}\right)^2 + \sin^2\frac{z}{2} = 0 \Rightarrow$

$\Rightarrow \begin{cases} 7^x = \cos^2\frac{z}{2} \\ \cos^2\frac{z}{2} = 0 \end{cases} \Rightarrow \begin{cases} z = 2\pi k \\ x = 0 \end{cases} \Rightarrow [2\pi k + 3]^0 = 1.$

Javobi: D.

21. $\sin^6 x + \cos^6 x$ ifodaning eng kichik qiymatini toping.

A) $\frac{1}{6}$ B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{1}{8}$ E) $\frac{1}{12}$

Yechilishi: $\sin^6 x + \cos^6 x = 1 - \frac{3}{4}\sin^2 2x \Rightarrow$

$\Rightarrow f(x) = 1 - \frac{3}{4}\sin^2 2x \Rightarrow$

$1) f'(x) = 0 - \frac{3}{4} \cdot 2 \sin 2x \cos 2x \cdot 2 \Rightarrow$

$\Rightarrow f'(x) = -\frac{3}{2}\sin 4x \Rightarrow$

$2)\ f'(x) = 0 \Rightarrow -\frac{3}{2}\sin 4x = 0 \Rightarrow \sin 4x = 0 \Rightarrow$

$\Rightarrow 4x = \pi k \Rightarrow x = \frac{\pi}{4}k, k \in z.$

$3)\ k = 1 \Rightarrow x = \frac{\pi}{4}.$

$\sin^6 x + \cos^6 x = (\sin x)^6 + (\cos x)^6 =$

$= (\sin\frac{\pi}{4})^6 + (\cos\frac{\pi}{4})^6 = (\frac{\sqrt{2}}{2})^6 + (\frac{\sqrt{2}}{2})^6 = 2(\frac{\sqrt{2}}{2})^6 =$

$= 2 \cdot \frac{8}{64} = \frac{1}{4}.$ Javobi: C.

22. $2^x + \log_3 x = 9$ tenglamaning ildizi nechta?

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

Yechilishi: $2^x + \log_3 x = 9 \Rightarrow$

$$=>\begin{cases} x>0 \\ \log_3 x = 9-2^x \end{cases} =>$$

$$=>\begin{cases} y=\log_3 x \\ y=9-2^x \end{cases} => x=3.$$ Javobi: B.

23. Agar $a,b \in N$ va $(ab)^{\frac{1}{2}}=10$ bo‘lsa, $a+b$ ning qiymati quyidagilardan qaysi biriga teng bo‘la olmaydi?

A) 29 B) 101 C) 52 D) 50 E) 25

Yechilishi: $a,b \in N \quad (ab)^{\frac{1}{2}}=10 \quad a+b-?$

$ab=100$

$$\begin{matrix} a=100 & b=1 \\ a=50 & b=2 \\ a=25 & b=4 \\ a=20 & b=5 \end{matrix} => \begin{cases} a+b=101 \\ a+b=52 \\ a+b=29 \\ a+b=25 \end{cases}$$

Javobi: D.

24. Agar x va y sonlari uchun $x\cdot y=20$ va $0<x<0{,}8$ munosabat o‘rinli bo‘lsa, quyidagi tengsizliklardan qaysi biri doimo o‘rinli bo‘ladi?

A) $\frac{y}{x}<20$ B) $x+y<20$ C) $y<16$ D) $y>25$

E) $Keltirilgan\ javoblar\ ichida\ to'g'risi\ yo'q$

Yechilishi: $x\cdot y=20 \quad 0<x<0{,}8 => \quad x=\frac{20}{y} =>$

$$=> 0<\frac{20}{y}<0{,}8 => 0<20<0{,}8y => y>25.$$

Javobi: D.

25. Agar $\alpha,\beta \in (0;\frac{\pi}{2})$ va $(tg\alpha+1)\cdot(tg\beta+1)=2$ bo‘lsa, $3{,}2\cdot\left(\frac{\alpha+\beta}{\pi}\right)^2$ ning qiymati nimaga teng?

A) 0,5 B) 0,2 C) 0,3 D) 0,4 E) 0,6

Yechilishi: $\alpha, \beta \in \left(0; \frac{\pi}{2}\right)$ $(tg\alpha + 1) \cdot (tg\beta + 1) = 2$

$3{,}2 \cdot \left(\frac{\alpha+\beta}{\pi}\right)^2 - ?$

$tg\alpha tg\beta + tg\alpha + tg\beta + 1 = 2 => \frac{tg\alpha+tg\beta}{1-tg\alpha tg\beta} = 1 =>$

$=> tg(\alpha + \beta) = 1 => \alpha + \beta = \frac{\pi}{4} => 3{,}2 \cdot (\frac{\pi}{4 \cdot \pi})^2 =$

$= 3{,}2 \cdot (\frac{1}{4})^2 = 3{,}2 \cdot \frac{1}{16} = 0{,}2.$ Javobi: B.

26. Agar $4 \arcsin x + \arccos x = \pi$ bo‘lsa, $3x^2$ ning qiymatini hisoblang.

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

Yechilishi: $4 \arcsin x + \arccos x = \pi$ $3x^2 - ?$

$\arcsin x + \arccos x + 3 \arcsin x = \pi;$

$arcsinx = \frac{\pi}{2} - arccosx$ ga asosan

$\frac{\pi}{2} + 3 \arcsin x = \pi => 3 \arcsin x = \frac{\pi}{2} =>$

$=> arcsinx = \frac{\pi}{6} =>$

$=> sinarcsinx = sin\frac{\pi}{6} => x = \frac{1}{2}$

$3 \cdot (\frac{1}{2})^2 = 3 \cdot \frac{1}{4} = \frac{3}{4} = 0{,}75.$ Javobi: D.

27. $5 \sin 2x + 8 \cos x = 13$ tenglama $[-\pi; 2\pi]$ oraliqda nechta ildizga ega?

A) ∅ B) 1 C) 2 D) 3 E) 4

Yechilishi: $5 \sin 2x + 8 \cos x = 13;$

$\begin{cases} \sin 2x = 1 \\ \cos x = 1 \end{cases} => \begin{cases} 2x = \frac{\pi}{2} + 2\pi k, \ \ k \in z \\ x = 2\pi k \end{cases} =>$

$=> \begin{cases} x = \frac{\pi}{4} + \pi k, \ \ k \in z \\ x = 2\pi k, \ \ k \in z \end{cases} => \frac{\pi}{4} + \pi k = 2\pi k =>$

$=> k = \frac{1}{4} \notin z$. Javobi: A.

28. $y = (\sin 3x - \cos 3x)^{12}$ funksiyaning eng katta qiymatini toping.

A) 36 B) 32 C) 2^{12} D) 64 E) 256

Yechilishi: $y = (\sin 3x - \cos 3x)^{12}$

$y = a\sin x \pm b\cos x =>$

$=> \left[-\sqrt{a^2 + b^2} \le y \le \sqrt{a^2 + b^2}\right] =>$

$=> y_{max} = (\sqrt{1+1})^{12} = 2^6 = 64.$ Javobi: D.

29. $\sin^4 x + \cos^4 x = a \sin x \cdot \cos x$ tenglama ildizga ega bo‘ladigan a ning barcha qiymatlarini ko‘rsating.

A) $[1; \infty)$ B) $[-1; 1]$ C) $[1; 5]$

D) $(-\infty; -1] \cup [1; \infty)$ E) $[-3; -1] \cup [1; 3]$

Yechlishi: $\sin^4 x + \cos^4 x = a \sin x \cdot \cos x$

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

$=> 2 - \sin^2 2x = a \sin 2x => \sin^2 2x + asin2x - 2 = 0 => sin2x = y => y^2 + ay - 2 = 0;$

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

$-1 \le sin2x \le 1\ dan$

$1) -1 \le -\frac{a}{2} - \sqrt{\frac{a^2}{4} + 2} => \frac{a}{2} - 1 \le -\sqrt{\frac{a^2}{4} + 2} =>$

$=> \frac{a^2}{4} - a + 1 \ge \frac{a^2}{4} + 2 => a \le -1;$

$2)\ -\frac{a}{2} - \sqrt{\frac{a^2}{4} + 2} \le 1 =>\ -\frac{a}{2} - 1 \le \sqrt{\frac{a^2}{4} + 2} =>$

$=> \frac{a^2}{4} + a + 1 \le \frac{a^2}{4} + 2 => a \le 1$

$1) va\ \ 2)\ \ dan\ \ -1 \le a => (-\infty; -1]$

$3) -1 \le -\frac{a}{2} + \sqrt{\frac{a^2}{4} + 2} => \frac{a}{2} - 1 \le \sqrt{\frac{a^2}{4} + 2} =>$

$=> \frac{a^2}{4} - a + 1 \le \frac{a^2}{4} + 2 => a \ge -1;$

$4)\ -\frac{a}{2} + \sqrt{\frac{a^2}{4} + 2} \le 1 =>\ \sqrt{\frac{a^2}{4} + 2} \le \frac{a}{2} + 1 =>$

$=> \frac{a^2}{4} + 2 \le \frac{a^2}{4} + a + 1 => a \ge 1 => [1; \infty)$

$a \in (-\infty; -1] \cup [1; \infty)$. Javobi: D.

30. $\frac{8\cos 2\alpha - 5\cos\beta}{7 + 2\cos 4\gamma}$ ifodaning eng katta qiymatini toping.

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

Yechilishi: Kasrning eng katta qiymatini toppish uchun suratini maksimum, maxrajini minimum qiymatga keltirish kerak.

$\left(\frac{8\cos 2\alpha - 5\cos\beta}{7 + 2\cos 4\gamma}\right)_{max} => \alpha = 0, \beta = \pi, \gamma = \frac{\pi}{4}$

$=> -1 \le \cos x \le 1 => \left(\frac{8\cos 2\alpha - 5\cos\beta}{7 + 2\cos 4\gamma}\right)_{max} =$

$= \frac{8+5}{7-2} = \frac{13}{5} = 2{,}6.$ Javobi: E.

31. $\sin\left(\frac{\pi\sqrt{5}}{20}x\right) = 21 - 4\sqrt{5}x + x^2$ tenglama $[-3\pi; 3\pi]$ oraliqda nechta ildizga ega?

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

Yechilishi: $\sin\left(\frac{\pi\sqrt{5}}{20}x\right) = 21 - 4\sqrt{5}x + x^2 =>$

$=> \sin\left(\frac{\pi\sqrt{5}}{20}x\right) = 1 + (2\sqrt{5} - x)^2 => x = 2\sqrt{5}$

Javobi: B.

32. $tg\left(\frac{\pi}{2} + \frac{\pi\sqrt{2}}{4}\cos 2x\right) = 1$ tenglamani yeching.

A) $\pm\frac{3\pi}{4} + 2\pi n, n \in Z$ B) $\pm\frac{3\pi}{8} + \pi n, n \in Z$

C) $\pm\frac{\pi}{4} + \pi n, n \in Z$ D) $\pm\frac{3\pi}{8} + 2\pi n, n \in Z$

E) $\pm\frac{\pi}{8} + \pi n, n \in Z$

Yechilishi: $tg\left(\frac{\pi}{2} + \frac{\pi\sqrt{2}}{4}\cos 2x\right) = 1 =>$

$=> -ctg\frac{\pi}{4}\sqrt{2}\cos 2x = 1 => \sqrt{2}\cos 2x = -1 =>$

$=> \cos 2x = -\frac{1}{\sqrt{2}} =>$

$=> 2x = \pm\left(\pi - \arccos\frac{1}{\sqrt{2}}\right) + 2\pi k, k \in Z =>$

$=> 2x = \pm\left(\pi - \frac{\pi}{4}\right) + 2\pi k, k \in Z =>$

$=> x = \pm\frac{3\pi}{8} + \pi k, k \in Z.$ Javobi: B.

33. Agar $8(x^4 + y^4) - 4(x^2 + y^2) + 1 = 0$ bo‘lsa, $|x| + |y|$ ning qiymatini toping.

A) 1 B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) 2 E) $\frac{1}{16}$

Yechilishi: $8(x^4 + y^4) - 4(x^2 + y^2) + 1 = 0 =>$

$=> 8x^4 + 8y^4 - 4x^2 - 4y^2 + 1 = 0 =>$

$=> 8x^4 - 4x^2 + 8y^4 - 4y^2 + 1 = 0 =>$

$=> 16x^4 - 8x^2 + 1 + 16y^4 - 8y^2 + 1 = 0 =>$

$=> (4x^2 - 1)^2 + (4y^2 - 1)^2 = 0 => \begin{cases} |x| = \frac{1}{2} \\ |y| = \frac{1}{2} \end{cases} =>$

$\Rightarrow |x| + |y| = \frac{1}{2} + \frac{1}{2} = 1.$ Javobi: A.

34. Agar $2 < a < 3$ va $-3 < b < -2$ bo‘lsa, quyidagilardan qaysi biri har doim o‘rinli bo‘ladi?

A) $a^2b^2 - 50 < 0$ B) $\frac{(a+b)^2-2ab}{a-b} < 0$

C) $b^3a^2 - 5 < 0$ D) $a^3b^2 - 2 < 0$

E) $a^3b^3 + 3 > 0$

Yechilishi: $2 < a < 3;\ \ -3 < b < -2 \Rightarrow$

$a = \frac{2+3}{2} = \frac{5}{2};\ \ b = \frac{-2-3}{2} = -\frac{5}{2}.$

$b^3a^2 - 5 < 0 \Rightarrow \left(-\frac{5}{2}\right)^3 \cdot \left(\frac{5}{2}\right)^2 < 5 \Rightarrow$

$\Rightarrow\ -\left(\frac{5}{2}\right)^5 < 5.$ Javobi: C.

35. $0,(328); x$ va $0,(671)$ sonlari arifmetik progressiyani tashkil qiladi. x ning qiymatini toping.

A) 0,(45) B) 0,(523) C) 0,(532) D) 0,47 E) 0,50

Yechilishi: $a_1 = 0,(328);\ \ a_2 = x;\ \ a_3 = 0,(671)\ \ x-?$

1) $a_3 = a_1 + 2d \Rightarrow d = \frac{a_3-a_1}{2} = \frac{\frac{671}{999}-\frac{328}{999}}{2} = \frac{343}{2\cdot 999};$

2) $x = a_2 = a_1 + d = \frac{328}{999} + \frac{343}{2\cdot 999} = \frac{656+343}{2\cdot 999} = \frac{999}{2\cdot 999} =$

$= \frac{1}{2} = 0,5.$ Javobi: E.

36. $\int_0^{\pi} \cos^4 5x dx$ ni hisoblang.

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

Yechilishi: $\int_0^{\pi} \cos^4 5x dx = \int_0^{\pi} \frac{(1+\cos 10x)^2}{4} dx =$

$= \frac{1}{4} \cdot \int_0^{\pi} \left(1 + 2\cos 10x + \frac{1+\cos 20x}{2}\right) dx =$

$= \frac{1}{8} \int_0^{\pi} (3 + 4\cos 10x + \cos 20x) dx =$

$= \frac{1}{8}\left[\int_0^{\pi} 3dx + \int_0^{\pi} 4\cos 10x\, dx + \int_0^{\pi} \cos 20x\, dx\right] =$

$= \frac{1}{8}\left[3x|_0^{\pi} + \frac{4}{10}\sin 10x\,|_0^{\pi} + \frac{1}{20}\sin 20x\,|_0^{\pi}\right] =$

$= \frac{1}{8}[3(\pi - 0) + \frac{2}{5}(\sin 10\pi - \sin 0) +$

$+ \frac{1}{20}(\sin 20\pi - \sin 0)] = \frac{1}{8} \cdot 3\pi = \frac{3\pi}{8}.$ Javobi: C.

37. $y = \left(x - \frac{1}{2}\right)^2 + \frac{3}{2}$ egri chiziqqa o‘tkazilgan urinmasi $y = 3x + 7$ to‘g‘ri chiziqqa parallel bo‘lgan nuqtadan koordinata boshigacha bo‘lgan masofani aniqlang.

A) 5,5 B) 3,75 C) 4,25 D) 6,85 E) 4,75

Yechilishi: $y = \left(x - \frac{1}{2}\right)^2 + \frac{3}{2}$; $y = 3x + 7 \Rightarrow$

$\Rightarrow \boxed{y = kx + b} \Rightarrow k = 3, b = 7.$

1) $y = x^2 - x + \frac{1}{4} + \frac{3}{2} \Rightarrow y = x^2 - x + \frac{7}{4} \Rightarrow$

$\Rightarrow y'(x) = 2x - 1;$

2) $y'(x_0) = 2x_0 - 1 \Rightarrow 2x_0 - 1 = 3 \Rightarrow 2x_0 = 4 \Rightarrow$

$\Rightarrow x_0 = 2;$

3) $y_0 = \left(x_0 - \frac{1}{2}\right)^2 + \frac{3}{2} = \left(2 - \frac{1}{2}\right)^2 + \frac{3}{2} = \frac{9}{4} + \frac{3}{2} = \frac{16}{4} \Rightarrow$

$\Rightarrow 3{,}75 \Rightarrow y_0 = 3{,}75;$

4) $y - y_0 = y'(x_0) \cdot (x - x_0) \Rightarrow$

$\Rightarrow y - 3{,}75 = 3 \cdot (x - 2) \Rightarrow y_{urinma} = 3x - 2{,}25.$

$A(x_0; y_0) = A(2; 3{,}75);$

$|OA| = \sqrt{2^2 + 3{,}75^2} = 4{,}25.$ Javobi: C.

38. Agar $f(x) = x^2$ va $\varphi(x) = 2x - 1$ bo‘lsa, x ning nechta qiymatida $f(\varphi(x)) = \varphi(f(x))$ bo‘ladi?

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

Yechilishi: $f(x)=x^2;\ \varphi(x)=2x-1 =>$
$=> f(\varphi(x))=\varphi(f(x)) => (2x-1)^2=2x^2-1 =>$
$=> 4x^2-4x+1=2x-1 => 2x^2-4x+2=0 =>$
$=> x^2-2x+1=0 => x_1=x_2=1.$
Javobi: B.

39. $f(x)=\log_2(64^{-x}-8^{1-x})$ funksiyaning aniqlanish sohasini toping.

A) $(-\infty;0)$ B) $(-\infty;-1)$ C) $(-\infty;-2)$
D) $(1;\infty)$ E) $(2;\infty)$

Yechilishi: $f(x)=\log_2(64^{-x}-8^{1-x})$;
$2>0,\ 2\neq 1.\ 64^{-x}-8^{1-x}>0 => 8^{-2x}>8^{1-x} =>$
$=> -2x>1-x => x<-1.\ x\in(-\infty;-1).$
Javobi: B.

40. $f(x)=|x-1|+|x-3|$ funksiyaning qiymatlar sohasini toping.

A) $[0;\infty)$ B) $[1;\infty)$ C) $[2;\infty)$ D) $[3;\infty)$ E) $[4;\infty)$

Yechilishi: $f(x)=|x-1|+|x-3|$
$f(1)=2;\ \ f(3)=2 => y\in[2;\infty)$. Javobi: C.

41. $y=\log_3(x^2-8x+7)$ funksiya grafigining ikkala koordinatasi ham butun sonlardan iborat bo‘lgan nechta nuqtasi bor?

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

Yechilishi: $y=\log_3(x^2-8x+7) => \begin{cases} x=1 \\ x=7 \end{cases} =>$
$x\in(-\infty;1)\cup(7;\infty)$.
y butun soni bo‘lishi uchun x^2-8x+7 kvadrat uchhad, asos 3 ning butun darajalariga teng bo‘lishi kerak.
$x^2-8x+7=3^3 => x^2-8x-20=0 =>$

$=> x_{1,2} = 4 \pm \sqrt{16+20} = 4+6 =>$

$=> \begin{cases} x_1 = -2 \\ x_2 = 10 \end{cases} => \begin{cases} y_1 = 3 \\ y_2 = 3 \end{cases} => \begin{cases} (-2;3); \\ (10;3). \end{cases}$

Javobi: C.

42. Agar $x, y, z \in [-\frac{\pi}{2}; \frac{\pi}{2}]$ va $\sqrt{2 - tgx - ctgx} + \sqrt[4]{sin\, y - 1} + \sqrt[6]{\cos 2z - 1} = 0$ bo‘lsa, $\frac{3y}{2x+5z}$ ning qiymatini hisoblang.

A) $\frac{1}{2}$ B) 1 C) 2 D) 3 E) $\frac{3}{7}$

Yechilishi:

$\sqrt{2 - tgx - ctgx} + \sqrt[4]{\sin y - 1} + \sqrt[6]{\cos 2z - 1} = 0 =>$

$=> \begin{cases} 2 - tgx - ctgx = 0 \\ \sin y - 1 = 0 \\ \cos 2z - 1 = 0 \end{cases} => \begin{cases} x = 45° \\ y = 90° => \\ z = 0° \end{cases}$

$=> \frac{3y}{2x+5z} = \frac{3 \cdot 90}{2 \cdot 45 + 5 \cdot 0} = \frac{270}{90} = 3.$ Javobi: D.

43. To‘rtta nuqta aylanani yoylarga ajratadi. Yoylaring uzunliklari maxraji 2 ga teng geometrik progressiyani tashkil etadi. Shu to‘rtta nuqtani ketma-ket tutashtirish natijasida hosil bo‘lgan to‘tburchakning diagonallari orasidagi eng katta burchakni toping.

A) 100° B) 120° C) 150° D) 130° E) 140°

Yechilishi: $\alpha, \beta, \sigma, \varphi - yoylar.$

$b_1 = \alpha;\ \ b_2 = \beta;\ \ b_3 = \sigma;\ \ b_4 = \varphi;\ \ q = 2.$

1) $\begin{cases} b_2 = b_1 q = \alpha \cdot 2 = 2\alpha => \beta = 2\alpha; \\ b_3 = b_1 q^2 = \alpha \cdot 4 = 4\alpha => \sigma = 4\alpha; \\ b_4 = b_1 q^3 = \alpha \cdot 8 = 8\alpha => \varphi = 8\alpha. \end{cases}$

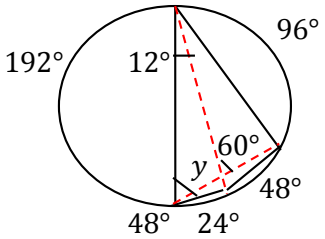
2) $\alpha+\beta+\sigma+\varphi=360°\Rightarrow$

$\Rightarrow \alpha+2\alpha+4\alpha+8\alpha=360°\Rightarrow$

$\Rightarrow \alpha=24°.$

$\alpha=24°;\ \beta=48°;\ \sigma=96°;$

$\varphi=192°;\ y=120°.$



Javobi: B.

44. BC va AD - trapetsiyaning asoslari; $O-AC$ va BD diagonallarning kesishish nuqtasi. BOC va AOD uchburchaklarning yuzlari mos ravishda 4 va 9 ga teng. Trapetsiyaning yuzini toping.

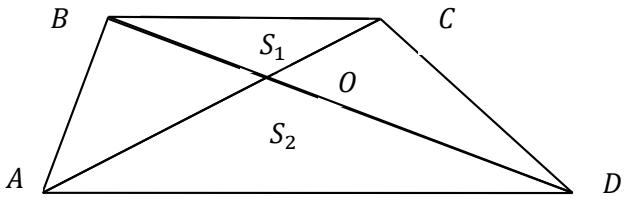
A) 16 B) 25 C) 26 D) 30 E) 36

Yechilishi:

$S_1=4$

$S_2=9$

$S_t=?$



$S_t=\left(\sqrt{S_1}+\sqrt{S_2}\right)^2=(\sqrt{4}+\sqrt{9})^2=25.$ Javobi: B.

45. Burchagi 60° ga, katta asosi 10 ga teng bo‘lgan teng yonli trapetsiyaga aylana ichki chizilgan. Trapetsiyaning kichik asosi uchi va aylana markazi orasidagi masofani toping.

A) $\frac{4\sqrt{2}}{3}$ B) $\frac{3\sqrt{3}}{2}$ C) $3\frac{2}{5}$ D) $3\frac{1}{3}$ E) $4\frac{1}{5}$

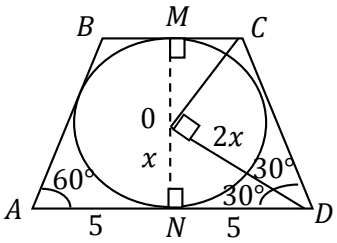
Yechilishi:

1) $\triangle NOD\Rightarrow x^2+5^2=4x^2\Rightarrow$

$\Rightarrow 3x^2=25\Rightarrow x=\frac{5}{\sqrt{3}};$

$NO=x=\frac{5}{\sqrt{3}}\Rightarrow$

$\Rightarrow OD=2NO=2\cdot\frac{5}{\sqrt{3}}=\frac{10}{\sqrt{3}};$



2) $\triangle COD\Rightarrow OC\perp OD\Rightarrow \frac{OC}{OD}=tg30°\Rightarrow$

$=> OC = OD \cdot tg30° = \frac{10}{\sqrt{3}} \cdot \frac{\sqrt{3}}{3} = \frac{10}{3} = 3\frac{1}{3}$. Javobi: D.

46. O‘lchovlari $11 \times 20 \times 16$ bo‘lgan to‘g‘ri burchakli parallelepipedga eng ko‘pi bilan tomoni 3 ga teng bo‘lgan kublardan nechtasini joylashtirish mumkin(barcha kublarning qirralari parallelepepidning qirralariga parallel)?

A) 137 B) 138 C) 130 D) 120 E) 90

Yechilishi: $\begin{cases} a = 11 \\ b = 20 \quad d = 3 \\ c = 16 \end{cases}$

$N = \left[\frac{a}{d}\right] \cdot \left[\frac{b}{d}\right] \cdot \left[\frac{c}{d}\right] = \left[\frac{11}{3}\right] \cdot \left[\frac{20}{3}\right] \cdot \left[\frac{16}{3}\right] = 3 \cdot 6 \cdot 5 = 90.$

$N_{MAX} = 90\ ta.$ Javobi: E.

47. Muntazam tetraedrning uchrashmaydigan (ayqash) qirralari orasidagi burchakni toping.

A) 160° B) 90° C) 45° D) 120°

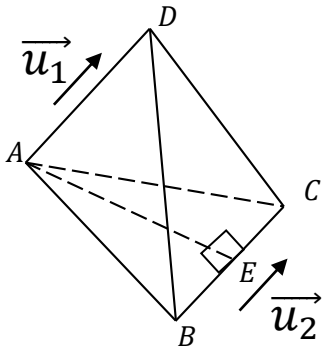
E) $aniqlab\ bo'lmaydi$

Yechilishi: $AE \perp BC$.

Shuningdek, ikki to‘g‘ri chiziqlar orasidagi burchak deb, ularni yunaltiruvchi vektorlar orasidagi burchakka aytiladi. Demak,

$\overrightarrow{u_1} \perp \overrightarrow{u_2} => AD \perp BC$.

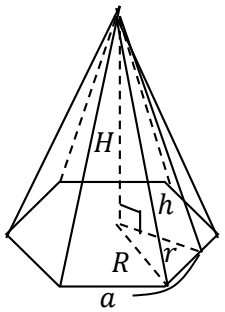
Javobi: B.



48. Muntazam oltiburchakli piramidaning apofemasi 5 ga, uning asosiga tashqi chizilgan doiraning yuzi 12π ga teng. Shu piramidaga ichki chizilgan sharning radiusini toping.

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

Yechilishi:



$\begin{cases} h = 5 \\ S = 12\pi \end{cases}$ $r_{shar} - ?$

1) $S = \pi R^2 => \pi R^2 = 12\pi =>$

$R = 2\sqrt{3} => a = R = 2\sqrt{3};$

2) $\begin{cases} P_{as} = 6a = 6 \cdot 2\sqrt{3} = 12\sqrt{3} \\ S_{yon} = \frac{P_{ac} \cdot h}{2} = \frac{12\sqrt{3} \cdot 5}{2} = 30\sqrt{3} \end{cases}$

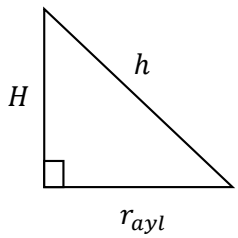
3) $S_{as} = 6 \cdot S_{\Delta} = 6 \cdot \frac{a^2\sqrt{3}}{4} = \frac{6 \cdot 12 \cdot \sqrt{3}}{4} = 18\sqrt{3}$

$S_T = S_{as} + S_{yon} = 30\sqrt{3} + 18\sqrt{3} = 48\sqrt{3}.$

4) $\frac{r_{aylana}}{R_{aylana}} = \cos 30° => r_{ayl} = R \cdot \cos 30° = 2\sqrt{3} \cdot \frac{\sqrt{3}}{2} = 3.$

5) $Misrdan\ H = 4.$

6) $\begin{cases} V_n = \frac{1}{3} \cdot S_a \cdot H \\ V_n = \frac{1}{3} \cdot S_T \cdot r_{shar} \end{cases} => V_n = V_n =>$



$=> \frac{1}{3} \cdot S_a \cdot H =$

$= \frac{1}{3} \cdot S_T \cdot r_{shar} => r_{shar} = \frac{S_a \cdot H}{S_T} = \frac{18\sqrt{3} \cdot 4}{48\sqrt{3}} = \frac{3}{2} = 1{,}5.$

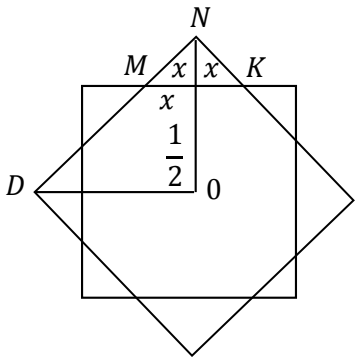
Javobi: C.

49. Tomoni 1 ga teng bo‘lgan ikkita kvadrat ustma-ust qo‘yildi. Shundan so‘ng kvadratlardan biri ularning umumiy semmetriya markaziga nisbatan 45° ga buruldi. Hosil bo‘lgan figuraning yuzini hisoblang.

A) $4 - 2\sqrt{2}$ B) 1,2 C) 1,25 D) $3 - \sqrt{2}$ E) $\frac{2\sqrt{2}+1}{2}$

Yechilishi: $ON = \frac{\sqrt{2}}{2};$

$x = \frac{\sqrt{2}}{2} - \frac{1}{2} = \frac{\sqrt{2}-1}{2}$.



$S_{MNK} = \frac{1}{2} \cdot x \cdot 2x = x^2 =$

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

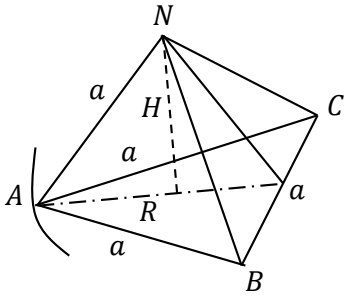
$S = 1 + 4S_{MNK} = 1 + 3 - 2\sqrt{2} =$

$= 4 - 2\sqrt{2}$. Javobi: A.

50. Muntazam tetraedrning qirrasi 1 ga teng. Shu tetraedrga tashqi chizilgan sharning radiusini toping.

A) $\frac{2\sqrt{2}}{3}$ B) $\frac{\sqrt{6}}{4}$ C) $\frac{3\sqrt{2}}{8}$ D) $\frac{11\sqrt{2}}{24}$ E) $\frac{2\sqrt{3}}{5}$

Yechilishi: $a = 1$;



$I\ usul$: $R_{sh} = \frac{a\sqrt{6}}{4} = \frac{\sqrt{6}}{4}$.

$II\ usul$:

1) $R_{ABC} = \frac{a}{\sqrt{3}} = \frac{1}{\sqrt{3}}$;

2) $H = \sqrt{a^2 - R_{ABC}^2} = \sqrt{1 - \frac{1}{3}} = \sqrt{\frac{2}{3}}$;

3) $R^2 = (H - R)^2 + R_{ABC}^2 => R^2 = H^2 - 2HR +$

$+R^2 + \frac{1}{3} => \frac{2}{3} - 2\sqrt{\frac{2}{3}}R + \frac{1}{3} = 0 =>$

$=> 2\sqrt{\frac{2}{3}}R = 1 => R = \frac{\sqrt{3}}{2\sqrt{2}} = \frac{\sqrt{6}}{4}$.

Javobi: B.

51. $7^{x^2+|x|} = 5^{-x^4}$ munosabat x ning nechta qiymatida o‘rinli?

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

Yechilishi: $7^{x^2+|x|} = 5^{-x^4} => 7^{x^2+|x|} = \frac{1}{5^{x^4}} =>$

$=> 7^{x^2+|x|} = (\frac{1}{5})^{x^4}$.

$Bu\ ifoda\ ma'noga\ ega\ bo'ladigan\ faqat\ 1\ ta\ qiymat\ bor: x = 0.$ Javobi: B.

52. Birinchi son 20% ga, ikkinchisi 30% ga orttirilsa, ularning ko‘paytmasi necha foizga ortadi?

A) 60 B) 50 C) 65 D) 56 E) 40

Yechilishi: 1) $\begin{cases} a = x \\ b = y \end{cases} => a \cdot b = x \cdot y$

2) $\begin{cases} a' = \frac{100+20}{100} \cdot x = 1{,}2x \\ b' = \frac{100+30}{100} \cdot y = 1{,}3y \end{cases} => a' \cdot b' = 1{,}2x \cdot 1{,}3y =$

$= 1{,}56x \cdot y => a' \cdot b' = 1{,}56 \cdot a \cdot b = 56\%.$

Javobi: D.

53. Agar $\varphi(x) = \ln x$ bo‘lsa, x ning $\varphi'(x) + \varphi(x) = \frac{1}{x} - \varphi(\frac{1}{x})$ tenglikni qanoatlantiradigan barcha qiymatlarini toping.

A) $\emptyset$ B) $[1;\infty)$ C) $(1;\infty)$ D) $(0;\infty)$ E) (0;1)

Yechilishi: $\varphi(x) = \ln x => \varphi'(x) + \varphi(x) = \frac{1}{x} - \varphi\left(\frac{1}{x}\right) =>$

$=> x \in -?$

1) $e > 0,\ e \neq 1,\ x > 0.$

2) $\frac{1}{x} + \ln x = \frac{1}{x} - \ln\frac{1}{x} => \ln x + \ln\frac{1}{x} = 0 =>$

$=> \ln x \cdot \frac{1}{x} = 0.$

1) va 2) $dan => x \in (0;\infty).$ Javobi: D.

54. $\sqrt[3]{8 + \left(\cos\frac{\pi}{5} + \cos\frac{2\pi}{5} + \cos\frac{3\pi}{5} + \cos\frac{4\pi}{5}\right)^3}$ ni hisoblang.

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

Yechilishi: $\sqrt[3]{8 + \left(\cos\frac{\pi}{5} + \cos\frac{2\pi}{5} + \cos\frac{3\pi}{5} + \cos\frac{4\pi}{5}\right)^3} =>$

1) $\cos\frac{\pi}{5} + \cos\frac{4\pi}{5} = 2\cos\frac{\frac{\pi}{5}+\frac{4\pi}{5}}{2}\cos\frac{\frac{\pi}{5}-\frac{4\pi}{5}}{2} =$

$= 2 \cdot \cos\frac{\pi}{2} \cdot \cos\frac{3\pi}{10} = 0;$

2) $\cos\frac{2\pi}{5} + \cos\frac{3\pi}{5} = 2\cos\frac{\frac{2\pi}{5}+\frac{3\pi}{5}}{2} \cdot \cos\frac{\frac{2\pi}{5}-\frac{3\pi}{5}}{2} =$

$= 2\cos\frac{\pi}{2}\cdot\cos\frac{\pi}{10} = 0.$

3) $\sqrt[3]{8} = 2.$ Javobi: B.

55. $\vec{a} = \{1;2;1\};\ \vec{b} = \{2;-1;0\};\ \alpha - \vec{a} + \vec{b}$ va $\vec{a} - \vec{b}$ vektorlar orasidagi burchak $\text{ctg}^2\,\alpha$ ni hisoblang.

A) $\frac{1}{5}$ B) $\frac{1}{25}$ C) $\frac{1}{60}$ D) $\frac{1}{120}$ E) $\frac{1}{80}$

Yechilishi: $\begin{matrix}\vec{a} = \{1;2;1\}\\ \vec{b} = \{2;-1;0\}\end{matrix}$ $\alpha = (\vec{a} + \vec{b})\text{^}\left(\vec{a} - \vec{b}\right).$

1) $\vec{a} + \vec{b} = \{3;1;1\}, \left|\vec{a} + \vec{b}\right| = \sqrt{11}$

2) $\vec{a} - \vec{b} = \{-1;3;1\}, \left|\vec{a} - \vec{b}\right| = \sqrt{11}$

3) $\cos\alpha = \frac{(\vec{a}+\vec{b})(\vec{a}-\vec{b})}{\left|\vec{a}+\vec{b}\right|\cdot\left|\vec{a}-\vec{b}\right|} = \frac{\{3;1;1\}\cdot\{-1;3;1\}}{\sqrt{11}\cdot\sqrt{11}} = \frac{-3+3+1}{11} = \frac{1}{11}.$

4) $\sin\alpha = \sqrt{1-\cos^2\alpha} = \sqrt{1-\frac{1}{121}} = \frac{\sqrt{120}}{11} =>$

$=> \text{ctg}^2\,\alpha = \frac{\cos^2\alpha}{\sin^2\alpha} = \frac{\frac{1}{121}}{\frac{120}{121}} = \frac{1}{120}.$ Javobi: D.

56. $[-10;10]$ oraliqdagi nechta butun son $y = 2^{\cos x}\cdot\sqrt{x^3\cdot\sin^2(\frac{\pi x}{3})\cdot e^{-x}}$ funksiyaning aniqlanish sohasiga tegishli?

A) 10 B) 11 C) 12 D)13 E) 14

Yechilishi: $x^3\cdot\sin^2\frac{\pi x}{3}e^{-x} \geq 0 =>$

1) $x^3 = 0 => x \geq 0 => x = 0,1,2,\ldots,9,10;$

3) $\sin^2\frac{\pi x}{3} = 0 => \frac{\pi x}{3} = \pi k => x = 3k =>$

$=> -10 \leq 3k \leq 10 => k = -3,-2,-1,0,1,2,3 =>$

$=> x = 3k = -9,-6,-3;$

3) $e^{-x} > 0.$

1) va 2) dan 14 ta. Javobi: E.

1999-YIL, 6-AXBOROTNOMA

1. $\frac{10^9 \cdot 3^5}{3^3 \cdot 10^{11}}$ ni hisoblang.

A) 0,09 B) 0,9 C) 9 D) 0,03 E) 0,3

Yechilishi: $\frac{10^9 \cdot 3^5}{3^3 \cdot 10^{11}} = \frac{3^2}{10^2} = \frac{9}{100} = 0{,}09$. Javobi: A.

2. $13{,}5 \cdot 5{,}8 - 8{,}3 \cdot 4{,}2 - 5{,}8 \cdot 8{,}3 + 4{,}2 \cdot 13{,}5$ ni hisoblang.

A) 42 B) 52 C) 50 D) 48 E) 54

Yechilishi: $13{,}5 \cdot 5{,}8 - 8{,}3 \cdot 4{,}2 - 5{,}8 \cdot 8{,}3 + 4{,}2 \cdot 13{,}5 =$

$= 13{,}5(5{,}8 + 4{,}2) - 8{,}3(4{,}2 + 5{,}8) =$

$= 13{,}5 \cdot 10 - 8{,}3 \cdot 10 = 135 - 83 = 52$. Javobi: B.

3. Uchburchak burchaklarining kattaliklari 2; 3 va 10 sonlariga proporsional. Uchburchakning burchaklarini toping.

A) $24°; 36°; 120°$ B) $20°; 46°; 120°$ C) $10°; 50°; 120°$

D) $30°; 40°; 110°$ E) $60°; 90°; 10°$

Yechilishi: $2x + 3x + 10x = 180° \Rightarrow 15x = 180° \Rightarrow$

$\Rightarrow x = 12 \Rightarrow 24°; 36°; 120°$. Javobi: A.

4. k ning qanday qiymatlarida $y = kx - 10$ funksiyaning grafigi $A_0(-4; 14)$ nuqtadan o‘tadi?

A) -2 B) -1 C) -6 D) -3 E) -4

Yechilishi: $y = kx - 10$; $A_0(-4; 14)$

$14 = k(-4) - 10 \Rightarrow 4k = -24 \Rightarrow k = -6$. Javobi: C.

5. $\left(-\frac{16x^{31}}{9y^3}\right)^3 : \left(\frac{8x^{23}}{3y^2}\right)^4$ ni soddalashtiring.

A) $-\frac{y}{x}$ B) $-\frac{x}{y}$ C) $\frac{x}{9y}$ D) $-\frac{y}{9x}$ E) $-\frac{x}{9y}$

Yechilishi: $\left(-\frac{16x^{31}}{9y^3}\right)^3 : \left(\frac{8x^{23}}{3y^2}\right)^4 = -\frac{16^3x^{93}}{9^3y^9} \cdot \frac{3^4y^8}{8^4x^{92}} =$

$= -\frac{2^3 \cdot 8^3x^{93} \cdot 3^4y^8}{3^6 \cdot y^9 \cdot 8^4x^{92}} = -\frac{2^3 \cdot x}{3^2y \cdot 8} = -\frac{x}{9y}$. Javobi: E.

6. $(202^2 - 54^2 + 256 \cdot 352) : (4^4 \cdot 10^2)$ ni hisoblang.

A) 4 B) 1 C) 2 D) 5 E) 10

Yechilishi: $(202^2 - 54^2 + 256 \cdot 352) : (4^4 \cdot 10^2) =$

$= [(202 - 54)(202 + 54) + 256 \cdot 352] : 256 \cdot 100 =$

$= (148 \cdot 256 + 256 \cdot 352) : 256 \cdot 100 =$

$= \frac{256(148+352)}{256 \cdot 100} = 5.$ Javobi: D.

7. $11^6 + 14^6 - 13^3 - 8$ ning qiymati qanday raqam bilan tugaydi?

A) 1 B) 2 C) 3 D) 4 E) 6

Yechilishi: $11^6 + 14^6 - 13^3 - 8 =$

$= (10 + 1)^6 + (10 + 4)^6 - (10 + 3)^3 =$

$= \cdots 1 + \cdots 6 - \cdots 7 - 8 = \cdots 0 - 8 = 2.$ Javobi: B.

8. $(3{,}5)^{x-5} = \left(\frac{4}{49}\right)^2$ tenglamani yeching.

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

Yechilish: $(3{,}5)^{x-5} = \left(\frac{4}{49}\right)^2 \Rightarrow \left(\frac{7}{2}\right)^{x-5} = \left(\frac{2}{7}\right)^4 \Rightarrow$

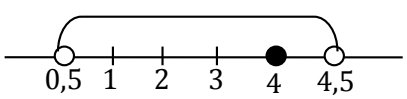
$\Rightarrow x - 5 = -4 \Rightarrow x = 1.$ Javobi: C.

9. $\log_2(2x - 1) < 3$ tengsizlikning eng katta butun yechimi toping.

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

Yechilishi: $\log_2(2x - 1) < 3 \Rightarrow \begin{cases} 2x - 1 > 0 \\ 2x - 1 < 2^3 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x > \frac{1}{2}; \\ x < 4{,}5. \end{cases}$ Javobi: D.



10. $f(x)=\frac{\cos x}{1-x}.\ f'(0)=?$

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

Yechilishi: $f(x)=\frac{\cos x}{1-x}.\ f'(0)=?$

$f'(x)=\frac{-\sin x(1-x)-\cos x(-1)}{(1-x)^2} => f'(0)=1.$ Javobi: E.

11. $9^{1996}+9^{1997}$ yig‘indi qanday raqam bilan tugaydi?

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

Yechilishi: $9^{1996}+9^{1997}=\cdots 1+\cdots 9=0.$ Javobi: A.

12. $\frac{2tg240^\circ}{1-\mathrm{tg}^2\,240^\circ}$ ni hisoblang.

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

Yechilishi: $\frac{2tg240^\circ}{1-\mathrm{tg}^2\,240^\circ}=tg2\cdot 240^\circ=tg480^\circ=$

$=tg(3\pi-60^\circ)=-tg60^\circ=-\sqrt{3}.$ Javobi: A.

13. $\log_9 17\cdot\log_{17}7\cdot\log_7 3$ ni hisoblang.

A) $\frac{7}{14}$ B) $\frac{1}{7}$ C) 1 D) 2 E) $\frac{1}{14}$

Yechilishi: $\log_9 17\cdot\log_{17}7\cdot\log_7 3=$

$=\log_9 17\cdot\log_{17}7\cdot\frac{\log_{17}3}{\log_{17}7}=\log_9 17\cdot\log_{17}7=$

$=\frac{1}{\log_{17}9}\cdot\log_{17}3=\frac{1}{2\log_{17}3}\cdot\log_{17}3=\frac{1}{2}=\frac{7}{14}.$ Javobi: A.

14. $f(x)=2\sqrt{3}\cos 4x.\ f'\left(\frac{\pi}{6}\right)=?$

A) -12 B) 12 C) 6 D) -6 E) $\frac{\sqrt{13}}{2}$

Yechilishi: $f(x)=2\sqrt{3}\cos 4x.\ f'\left(\frac{\pi}{6}\right)=?$

$f'(x)=-8\sqrt{3}\sin 4x => f'\left(\frac{\pi}{6}\right)=-8\sqrt{3}\sin 4\cdot\frac{\pi}{6}=$

$=-8\sqrt{3}\cdot\sin(90+30)=-8\sqrt{3}cos30^\circ=$

$= -8\sqrt{3} \cdot \frac{\sqrt{3}}{2} = -12.$ Javobi: A.

15. $14\sqrt{2}(\sin^4 \frac{3\pi}{8} - \cos^4 \frac{3\pi}{8})$ ni hisoblang.

A) 14 B) 7 C) $-14\sqrt{2}$ D) -14 E) $7\sqrt{2}$

Yechilishi: $14\sqrt{2}\left(\sin^4 \frac{3\pi}{8} - \cos^4 \frac{3\pi}{8}\right) =$

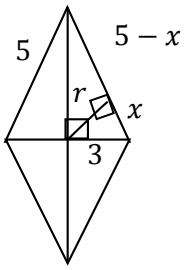
$= 14\sqrt{2}\left(\sin^2 \frac{3\pi}{8} + \cos^2 \frac{3\pi}{8}\right)\left(\sin^2 \frac{3\pi}{8} - \cos^2 \frac{3\pi}{8}\right) =$

$= -14\sqrt{2}\left(\cos^2 \frac{3\pi}{8} - \sin^2 \frac{3\pi}{8}\right) = -14\sqrt{2} \cdot \cos 2 \cdot \frac{3\pi}{8} =$

$= -14\sqrt{2} \cdot \cos \frac{3\pi}{4} = -14\sqrt{2}\left(-\frac{\sqrt{2}}{2}\right) = 14.$ Javobi: A.

16. $2^{3-6x} > 1$ tengsizlikning eng katta butun yechimini toping.

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



Yechilishi: $2^{3-6x} > 1 => 3 - 6x > 0 =$ $>$

$=> x < \frac{1}{2} => x = 0.$

Javobi: A.

17. Rombning diagonallari 6 va 8 ga teng bo‘lsa, unga ichki chizilgan aylananing radiusini toping.

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

Yechilishi: Misr uchburchagidan $a = 3, b - 4, c = 5.$

$r = h = \frac{3 \cdot 4}{5} = 2{,}4.$ Javobi: E.

18. k ning qandaymusbat qiymatida $25x^2 + kx + 2 = 0$ tenglama bitta ildizga ega bo‘ladi?

A) $10\sqrt{2}$ B) 10 C) $5\sqrt{2}$ D) 5 E) $3\sqrt{2}$

Yechilishi: $25x^2 + kx + 2 = 0$

$D = k^2 - 200 = 0 => k^2 = 200 => k = \pm 10\sqrt{2} =>$

$=> k = 10\sqrt{2}.$ Javobi: A.

19. $\vec{a}\{3;2\}$ va $\vec{b}\{0;-1\}$ vektorlar berilgan. $-2\vec{a}+4\vec{b}$ vektorning modulini toping.

A) 10 B) 6 C) 8 D) 3 E) 5

Yechilishi: $\vec{a}=\{3;2\};\ \vec{b}=\{0;-1\};$

$-2\vec{a}+4\vec{b}=-2\{3;2\}+4\{0;-1\}=\{-6;-4\}+$

$+\{0;-4\}=\{-6;-8\}=>$

$=>\left|-2\vec{a}+4\vec{b}\right|=\sqrt{(-6)^2+(-8)^2}=10.$ Javobi: A.

20. $n(n>0)$ ning qanday qiymatida $\vec{a}=\{2n;3\}$ va $\overrightarrow{b=}\{6;n\}$ vektorlar kollinear bo‘ladi?

A) 1 B) 3 C) 2 D) 4 E) 6

Yechilishi: $\vec{a}=\{2n;3\};\ \vec{b}=\{6;n\}.\quad n>0$

$\vec{a}=ג\vec{b}=>\{2n;3\}=ג\{6;n\}=>\{2n;3\}=\{6ג;nג\}=>$

$=>\begin{cases}2n=6ג\\3=nג\end{cases}=>\begin{cases}ג=\frac{1}{3}n\\ג=\frac{3}{n}\end{cases}=>n=\pm3=>n=3.$

Javobi: B.

21. $\sin^2\alpha+\sin^2\beta-\sin^2\alpha\cdot\sin^2\beta+\cos^2\alpha\cdot\cos^2\beta$ ni soddalashtiring.

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

Yechilishi: $\sin^2\alpha+\sin^2\beta-\sin^2\alpha\cdot\sin^2\beta+$

$+\cos^2\alpha\cdot\cos^2\beta=\sin^2\alpha-\sin^2\alpha\sin^2\beta+1-\cos^2\beta+$

$+\cos^2\alpha\cdot\cos^2\beta=\sin^2\alpha\,(1-\sin^2\beta)+1-$

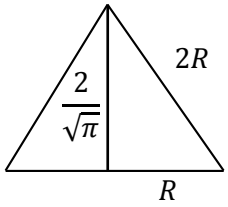
$-\cos^2\beta\,(1-\cos^2\alpha)=\sin^2\alpha\cdot\cos^2\beta+1-$

$-\cos^2\beta\cdot\sin^2\alpha=1.$ Javobi: A.

22. Yasovchisi asos diametriga teng bo‘lgan konusning balandligi $\frac{2}{\sqrt{\pi}}$ ga teng. Konus yon sirtining yuzini toping.

A) 24 B) 16π C) 12 D) $4\sqrt{\frac{3}{\pi}}$ E) $\frac{8}{3}$

Yechilishi: $(2R)^2 = R^2 + \left(\frac{2}{\sqrt{\pi}}\right)^2 =>$



$=> 4R^2 = R^2 + \frac{4}{\pi} =>$

$=> 3R^2 = \frac{4}{\pi} => R^2 = \frac{4}{3\pi} =>$

$=> R = \frac{2}{\sqrt{3\pi}};\ l = \frac{4}{\sqrt{3\pi}};$

$S = \pi Rl = \pi \cdot \frac{2}{\sqrt{3\pi}} \cdot \frac{4}{\sqrt{3\pi}} = \frac{8}{3}.$ Javobi: E.

23. $1 + \frac{\text{tg}^2(-\alpha)-1}{\sin(0{,}5\pi+2\alpha)}$ ni soddalashtiring.

A) $-\text{tg}^2\,\alpha$ B) $\text{tg}^2\,\alpha$ C) $c\text{tg}^2\,\alpha$ D) $c\text{tg}^2\,\alpha$ E) $-c\text{tg}^2\,\alpha$

Yechilishi: $1 + \frac{\text{tg}^2(-\alpha)-1}{\sin(0{,}5\pi+2\alpha)} = 1 + \frac{\{-tg\alpha]^2-1}{\sin\left(\frac{\pi}{2}+2\alpha\right)} =$

$= \frac{\text{tg}^2\,\alpha-1}{\cos 2\alpha} + 1 = \frac{\text{tg}^2\,\alpha-1+\cos 2\alpha}{\cos 2\alpha} =$

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

$= \frac{\left(\frac{\sin\alpha}{\cos\alpha}-1\right)\left(\frac{\sin\alpha}{\cos\alpha}+1\right)+\cos^2\alpha-\sin^2\alpha}{\cos^2\alpha-\sin^2\alpha} =$

$= \frac{\frac{\sin\alpha-\cos\alpha}{\cos\alpha}\cdot\frac{\sin\alpha+\cos\alpha}{\cos\alpha}+\cos^2\alpha-\sin^2\alpha}{\cos^2\alpha-\sin^2\alpha} =$

$= \frac{\frac{\sin^2\alpha-\cos^2\alpha}{\cos^2\alpha}}{-(\sin^2\alpha-\cos^2\alpha)} + 1 = -\frac{\sin^2\alpha-\cos^2\alpha}{\cos^2\alpha}\cdot\frac{1}{\sin^2\alpha-\cos^2\alpha} + 1 =$

$= -\frac{1}{\cos^2\alpha} + 1 = \frac{-1+\cos^2\alpha}{\cos^2\alpha} = \frac{-(1-\cos^2\alpha)}{\cos^2\alpha} =$

$= -\frac{\sin^2\alpha}{\cos^2\alpha} = -\text{tg}^2\,\alpha.$ Javobi: A.

24. $\int_{\frac{2\pi}{3}}^{2\pi} \cos(0{,}25x)dx$ ni soddalashtiring.

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

Yechilishi: $\int_{\frac{2\pi}{3}}^{2\pi}\cos(\frac{1}{4}x)dx = 4\sin\left(\frac{1}{4}x\right)|_{\frac{2\pi}{3}}^{2\pi} = 4[\sin\frac{1}{4}\cdot 2\pi -$

$-\sin\frac{1}{4}\cdot\frac{2\pi}{3}] = 4\left[\sin\frac{\pi}{2}-\sin\frac{\pi}{6}\right] = 4\left[1-\frac{1}{2}\right] = 2.$

Javobi: D.

25. $\frac{\sin^4\alpha+2\cos\alpha\cdot\sin\alpha-\cos^4\alpha}{2\cos^2\alpha-1}$ ni soddalshtiring.

A) $tg2\alpha-1$ B) $tg\alpha-1$ C) $tg\alpha+1$

D) $1-tg2\alpha$ E) $ctg2\alpha-1$

Yechilishi: $\frac{\sin^4\alpha+2\cos\alpha\cdot\sin\alpha-\cos^4\alpha}{2\cos^2\alpha-1} =$

$= \frac{(\sin^2\alpha-\cos^2\alpha)(\sin^2\alpha+\cos^2\alpha)+2\sin\alpha\cos\alpha}{2\cos^2\alpha-\sin^2\alpha-\cos^2\alpha} =$

$= \frac{-\cos 2\alpha+\sin 2\alpha}{\cos^2\alpha-\sin^2\alpha} = \frac{\sin 2\alpha-\cos 2\alpha}{\cos 2\alpha} = tg2\alpha-1.$ Javobi: A.

26. $\log_{18}\log_2\log_2(-\frac{1}{x}) = 0$ tenglamani yeching.

A) $-\frac{1}{16}$ B) $-\frac{1}{8}$ C) $\frac{1}{8}$ D) $-\frac{1}{4}$ E) $\frac{1}{16}$

Yechilishi: $\log_{18}\log_2\log_2(-\frac{1}{x}) = 0;\ x<0,\ x\neq 0.$

$\log_2\log_2\left(-\frac{1}{x}\right) = 1 => \log_2\left(-\frac{1}{x}\right) = 2 =>$

$=> -\frac{1}{x} = 4 => 4x = -1 => x = -\frac{1}{4}.$ Javobi: D.

27. $\frac{1}{27}\cdot\sqrt[4]{9^{3x-1}} = 27^{-\frac{2}{3}}$ tenglamani yeching.

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

Yechilishi: $\frac{1}{27}\cdot\sqrt[4]{9^{3x-1}} = 27^{-\frac{2}{3}}$

$\frac{1}{27}\cdot\sqrt[4]{9^{3x-1}} = \frac{1}{\sqrt[3]{27^2}} = \frac{1}{\sqrt[3]{3^6}} = \frac{1}{3^2} = \frac{1}{9} => \frac{1}{27}\cdot\sqrt[4]{9^{3x-1}} = \frac{1}{9} =$

$>$

$=> \sqrt[4]{9^{3x-1}} = 3 => 9^{3x-1} = 3^4 => 9^{3x-1} = 9^2 =>$

$=> 3x-1 = 2 => x = 1.$ Javobi: C.

28. $\log_2(54-x^3)=3\log_2 x$ tenglamani yeching.

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

Yechilishi: $\log_2(54-x^3)=3\log_2 x \Rightarrow$

$\Rightarrow \log_2(54-x^3)=\log_2 x^3 \Rightarrow 54-x^3=x^3 \Rightarrow$

$\Rightarrow 2x^3=54 \Rightarrow x^3=27 \Rightarrow x=3$. Javobi: D.

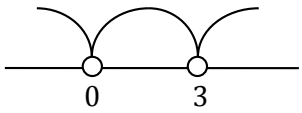
29. $y=\log_3(x(x-3))-\log_3 x$ funksiyaning aniqlanish sohasini toping.

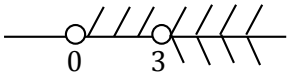
A) $(3;\infty)$ B) $(-\infty;3)$ C) $[3;\infty)$ D) $(-\infty;3]$

E) $(-3;3)$

Yechilishi: $y=\log_3[x(x-3)]-\log_3 x \Rightarrow$

$$\Rightarrow \begin{cases} x(x-3)>0 \\ x>0 \end{cases} \Rightarrow \begin{cases} x=0 \\ x=3 \\ x>0. \end{cases}$$





Javobi: A.

30. $\frac{x^2}{x+3}<x-3$ tengsizlikni yeching.

A) $(-\infty;-3)$ B) $(-3;3)$ C) $(0;3)$

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

Yechilishi: $\frac{x^2}{x+3}<x-3 \Rightarrow \frac{x^2}{x+3}-x+3<0 \Rightarrow$

$\Rightarrow \frac{x^2-x^2+3x-3x+9}{x+3}<0 \Rightarrow \frac{9}{x+3}<0 \Rightarrow x<-3 \Rightarrow$

$\Rightarrow (-\infty;-3)$. Javobi: A.

31. Noto‘g‘ri tenglikni ko‘rsating.

A) $\cos(-x)=-\cos x$ B) $\cos(\pi+x)=-\cos x$

C) $ctg\left(\frac{3\pi}{2}-x\right)=tgx$ D) $tg(2\pi-x)=-tgx$

E) $tg(\pi+x)=tgx$

Yechilishi: $\cos(-x)=-\cos x$. Javobi: A.

32. $a = \cos(-13°)$, $b = -\sin(-75°)$ va $c = \sin 100°$ sonlarni o‘sish tartibida joylashtiring.

A) $b < a < c$ B) $a < b < c$ C) $a < c < b$

D) $b < c < a$ E) $c < b < a$

Yechilishi: $\begin{cases} a = \cos(-13°) \\ b = -\sin(-75°) \\ c = \sin 100° \end{cases} => \begin{cases} a = \cos 13° \\ b = \sin 75° \\ c = \cos 10° \end{cases} =>$

$=> \begin{cases} a = \cos 13° \\ b = \cos 15° \\ c = \cos 10° \end{cases} => b < a < c.$ Javobi: A.

33. $\frac{2sinx-cosx}{2cosx+sinx} = 3;\quad tgx = ?$

A) 7 B) -3 C) 3 D) -7 E) 2

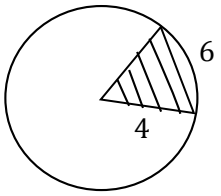
Yechilishi: $\frac{2sinx-cosx}{2cosx+sinx} = 3;\quad tgx = ?$

$2\sin x - \cos x = 6\cos x + 3\sin x =>$

$=> 7\cos x = -\sin x => tgx = -7.$ Javobi: D.

34. Bo‘yalgan sohaning yuzini toping.

A) 12 B) 8 C)10 D) 14 E) 16



Yechilishi: 1) $l = \frac{\pi R}{180°} n^{\circ} =>$

$=> n^{\circ} = \frac{180 \cdot l}{\pi R} = \frac{180 \cdot 6}{\pi \cdot 4} = \frac{45 \cdot 6}{\pi};$

2) $S_{sktor} = \frac{\pi R^2}{360°} \cdot n^{\circ} = \frac{\pi \cdot 16}{360°} \cdot \frac{45 \cdot 6}{\pi} = 12.$ Javobi: A.

35. $a = 2^5 + 2^{-5}$ va $b = 2^5 - 2^{-5}$ bo‘lsa, $a^2 - b^2$ nimaga teng?

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

Yechilishi: $\begin{cases} a = 2^5 + 2^{-5} \\ b = 2^5 - 2^{-5} \end{cases} => \begin{array}{r} a^2 = 2^{10} + 2^{-10} + 2 \\ -\ b^2 = 2^{10} + 2^{-10} - 2 \\ \hline a^2 - b^2 = 4 \end{array}$

Javobi: E.

36. $\sqrt{192}-\sqrt{108}+\frac{\sqrt{243}}{3}$ ni hisoblang.

A) $5\sqrt{3}$ B) $5\sqrt{2}$ C) $3\sqrt{5}$ D) $3\sqrt{3}$ E) $8\sqrt{3}$

Yechilishi: $\sqrt{192}-\sqrt{108}+\frac{\sqrt{243}}{3}=\sqrt{192}-\sqrt{108}+\sqrt{27}=$

$=\sqrt{64\cdot 3}-\sqrt{36\cdot 3}+\sqrt{9\cdot 3}=8\sqrt{3}-6\sqrt{3}+3\sqrt{3}=5\sqrt{3}.$

Javobi: A.

37. Agar $a\cdot b=18, b\cdot c=25$ va $a\cdot c=8$ bo‘lsa, $\sqrt{a\cdot b\cdot c}$ nimaga teng?

A) $2\sqrt{15}$ B) $15\sqrt{2}$ C) $6\sqrt{5}$ D) $8\sqrt{3}$ E) $3\sqrt{15}$

Yechilishi: $\begin{cases} a\cdot b=18 \\ b\cdot c=25 \\ a\cdot c=8 \end{cases} \Rightarrow a\cdot b\cdot b\cdot c\cdot a\cdot c=$

$=18\cdot 25\cdot 8 \Rightarrow a^2b^2c^2=2\cdot 9\cdot 25\cdot 2\cdot 4 \Rightarrow$

$\Rightarrow (abc)^2=9\cdot 16\cdot 25 \Rightarrow abc=3\cdot 4\cdot 5 \Rightarrow$

$\Rightarrow \sqrt{abc}=2\sqrt{15}.$ Javobi: A.

38. $\frac{\sqrt{5}}{\sqrt{5}-2}-\frac{10}{\sqrt{5}}$ ni soddalashtiring.

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

Yechilishi: $\frac{\sqrt{5}}{\sqrt{5}-2}-\frac{10}{\sqrt{5}}=\frac{\sqrt{5}(\sqrt{5}+2)}{(\sqrt{5}-2)(\sqrt{5}+2)}-\frac{10\sqrt{5}}{\sqrt{5}\cdot\sqrt{5}}=$

$=\frac{5+2\sqrt{5}}{5-4}-\frac{10\sqrt{5}}{5}=5+2\sqrt{5}-2\sqrt{5}=5.$ Javobi: E.

39. $\frac{1}{2+\sqrt{3}}+\frac{2}{\sqrt{5}-\sqrt{3}}-\frac{1}{2+\sqrt{5}}$ ning qiymatini toping.

A) 4 B) 0 C) $\sqrt{5}-\sqrt{3}$ D) $\sqrt{5}+\sqrt{3}$ E) 2

Yechilishi: $\frac{1}{2+\sqrt{3}}+\frac{2}{\sqrt{5}-\sqrt{3}}-\frac{1}{2+\sqrt{5}}=$

$=\frac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}+\frac{2(\sqrt{5}+\sqrt{3})}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})}-\frac{2-\sqrt{5}}{(2+\sqrt{5})(2-\sqrt{5})}=$

$=\frac{2-\sqrt{3}}{4-3}+\frac{2(\sqrt{5}+\sqrt{3})}{5-3}-\frac{2-\sqrt{5}}{4-5}=2-\sqrt{3}+\sqrt{5}+\sqrt{3}+$

$+2-\sqrt{5}=4$. Javobi: A.

40. $a^2+\frac{9}{a^2}=22$ bo‘lsa, $a-\frac{3}{a}$ nimaga teng?

A) 3 B) -3 C) 2 D) ± 4 E) 1

Yechilishi: $a^2+\frac{9}{a^2}=22;\quad a-\frac{3}{a}=?$

1) $a^4-22a^2+9=0 \Rightarrow a^2=x \Rightarrow a=\sqrt{x} \Rightarrow$

$\Rightarrow x^2-22x+9=0 \Rightarrow \begin{cases} x_1=11-\sqrt{112}; \\ x_2=11+\sqrt{112}. \end{cases}$

2) $a=\sqrt{11-\sqrt{112}}=\sqrt{\frac{11+\sqrt{121-112}}{2}}-\sqrt{\frac{11-3}{2}}=\sqrt{7}-2;$

$a=\sqrt{7}+2;$

3) $a-\frac{3}{a}=\frac{a^2-3}{a}=\frac{(\sqrt{7}-2)^2-3}{\sqrt{7}-2}=\frac{7-4\sqrt{7}+4-3}{\sqrt{7}-2}=\frac{8-4\sqrt{7}}{\sqrt{7}-2}=$

$=\frac{4(2-\sqrt{7})}{-(2-\sqrt{7})}=-4. \quad a-\frac{3}{a}=\frac{a^2-3}{a}=\frac{(\sqrt{7}+2)^2-3}{\sqrt{7}+3}=4.$

Javobi: D.

41. $\sqrt{a}-\sqrt{b}=4$ va $a-b=24$ bo‘lsa, $\sqrt{a}+\sqrt{b}$ nimaga teng?

A) 6 B) 4 C) 5 D) 3 E) 8

Yechilishi: $\begin{cases} \sqrt{a}-\sqrt{b}=4 \\ a-b=24 \end{cases} \Rightarrow \begin{cases} \frac{(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})}{\sqrt{a}+\sqrt{b}}=4 \Rightarrow \\ a-b=24 \end{cases}$

$\Rightarrow \begin{cases} \frac{a-b}{\sqrt{a}+\sqrt{b}}=4 \\ a-b=24 \end{cases} \Rightarrow a-b=4\left(\sqrt{a}+\sqrt{b}\right) \Rightarrow$

$\Rightarrow \sqrt{a}+\sqrt{b}=\frac{a-b}{4} \Rightarrow \sqrt{a}+\sqrt{b}=6.$ Javobi: A.

42. $\begin{cases} x^3+y^3=10, \\ 3xy^2+3x^2y=17. \end{cases} \quad x+y=?$

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

Yechilishi: $\begin{cases} x^3+y^3=10 \\ 3xy^2+3x^2y=17 \end{cases} =>$

$=> x^3+3xy^2+3x^2y+y^3=27 => (x+y)^3=3^3 =>$

$=> x+y=3.$ Javobi: A.

43. $y=\frac{x}{\ln x}$ funksiyaning o‘sish oralig‘ini toping.

A) $(e;\infty)$ B) $(0;1)$ C) $(1;e)$ D) $(-\infty;0)$ E) $(-1;e)$

Yechilishi: $y=\frac{x}{\ln x} => x\neq 1; x>0;$

$y'=\frac{x'\cdot\ln x-x(\ln x)'}{(\ln x)^2}=\frac{\ln x-1}{\ln^2 x} => y'\geq 0 => \frac{\ln x-1}{\ln^2 x}\geq 0 =>$

$=> \ln x-1\geq 0 => \ln x\geq 1 => x\geq e => (e;+\infty).$

Javobi: A.

44. $y=-2x^2+2x+3$ parabola uchining absessasini toping.

A) $-0{,}5$ B) 3.5 C) 0,5 D) 2 E) 1

Yechilshi: $y=-2x^2+2x+3 => y'=-4x+2 =>$

$=> y'=0 => 4x=2 => x=0{,}5.$

Shuningdek, $x=-\frac{b}{2a}=-\frac{2}{2(-2)}=0{,}5.$ Javobi: C.

45. $\frac{5x+8}{4-x}<2$ tengsizlikni yeching.

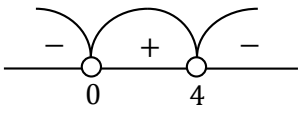
A) $(-\infty;0)\cup(4;\infty)$ B) $(-\infty;-4)\cup(0;4)$

C) $[-4;4]$ D) $\emptyset$ E) $(-\infty;\infty)$

Yechilishi: $\frac{5x+8}{4-x}<2 => 4-x\neq 0 => x\neq 4.$

$\frac{5x+8}{4-x}-2<0 => \frac{5x+8-8+2x}{4-x}<0 => \frac{7x}{4-x}<0 =>$

$=> \begin{cases} x=0 \\ x\neq 4 \end{cases}$



$(-\infty;0)\cup(4;+\infty).$ Javobi: A.

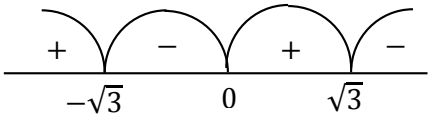
46. $y = \sqrt{3x - x^3}$ funksiyaning aniqlanish sohasini toping.

A) $(-\infty; \sqrt{3}] \cup [0; \sqrt{3}]$ B) $\left(-\infty; -\sqrt{3}\right) \cup (0; \sqrt{3})$

C) $[0; \sqrt{3})$ D) $\left(-\infty; \sqrt{3}\right) \cup (\sqrt{3}; \infty)$ E) $[0; \infty)$

Yechilishi: $y = \sqrt{3x - x^3} => 3x - x^3 \geq 0 =>$

$$=> x(3 - x^2) = 0 => \begin{cases} x = 0 \\ x^2 = 3 \end{cases} => \begin{cases} x_1 = -\sqrt{3} \\ x_2 = 0 \\ x_3 = \sqrt{3} \end{cases}$$



$\left(-\infty; -\sqrt{3}\right] \cup \left[0; \sqrt{3}\right]$. Javobi: A.

47. $|x^2 + 5x| = 6$ tenglama ildizlarining yig‘indisini toping.

A) 10 B) -6 C) -3 D) -10 E) 1

Yechilishi: $|x^2 + 5x| = 6 => \begin{cases} x^2 + 5x = 6 \\ -x^2 - 5x = 6 \end{cases} =>$

$$=> \begin{cases} x^2 + 5x - 6 = 0 \\ x^2 + 5x + 6 = 0 \end{cases}$$

1) $x_{1,2} = -\frac{5}{2} \pm \sqrt{\frac{25}{4} + 6} = -\frac{5}{2} \pm \frac{7}{2} => \begin{cases} x_1 = -6; \\ x_2 = 1. \end{cases}$

2) $x_{3,4} = -\frac{5}{2} \pm \sqrt{\frac{25}{4} - 6} = -\frac{5}{2} \pm \frac{1}{2} => \begin{cases} x_3 = -3; \\ x_4 = -2. \end{cases}$

$x_1 + x_2 + x_3 + x_4 = -10$. Javobi: D.

48. $|2 - 3x| - |5 - 2x| = 0$ tenglamani yeching.

A) $-3; \frac{7}{5}$ B) $3; \frac{7}{5}$ C) $3;\ -1$ D) $-3; 0$ E) $-1;\ -3$

Yechilishi: $|2 - 3x| - |5 - 2x| = 0;$

$$\begin{cases} 2 - 3x \geq 0 \\ 2 - 3x < 0 \end{cases} => \begin{cases} 2 - 3x - |5 - 2x| = 0; \\ -2 + 3x - |5 - 2x| = 0; \end{cases}$$

$$\begin{cases} 5-2x \geq 0 \Rightarrow \begin{cases} 2-3x-5+2x=0 \\ -2+3x-5+2x=0 \end{cases} \\ 5-2x < 0 \Rightarrow \begin{cases} 2-3x+5-2x=0 \\ -2+3x+5-2x=0 \end{cases} \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} x=-3; \\ x=\frac{7}{5}; \\ x=\frac{7}{5}; \\ x=-3. \end{cases}$$ Javobi: A.

49. $3^{\sqrt{x}} - 3^{1-\sqrt{x}} = \frac{26}{3}$ tenglamani yeching.

A) $\emptyset$ B) 9 C) 2 D) 0 E) 4

Yechilishi: $3^{\sqrt{x}} - 3^{1-\sqrt{x}} = \frac{26}{3} \Rightarrow 3^{\sqrt{x}} - 3 \cdot \frac{1}{3^{\sqrt{x}}} = \frac{26}{3}$.

$3 \cdot 3^{2\sqrt{x}} - 9 = 26 \cdot 3^{\sqrt{x}} \Rightarrow 3 \cdot 3^{2\sqrt{x}} - 26 \cdot 3^{\sqrt{x}} - 9 = 0 \Rightarrow$

$\Rightarrow 3^{\sqrt{x}} = y \Rightarrow 3y^2 - 26y - 9 = 0 \Rightarrow$

$\Rightarrow y_{1,2} = \frac{26 \pm \sqrt{676+4 \cdot 3 \cdot 9}}{2 \cdot 3} = \frac{26 \pm \sqrt{676+108}}{6} = \frac{26 \pm \sqrt{784}}{6} \Rightarrow$

$\Rightarrow \frac{26 \pm 28}{6} \Rightarrow \begin{cases} y_1 = -\frac{1}{3}; \\ y_2 = 9. \end{cases}$

$3^{\sqrt{x}} \neq -\frac{1}{3}; \quad 3^{\sqrt{x}} = 9 \Rightarrow 3^{\sqrt{x}} = 3^2 \Rightarrow \sqrt{x} = 2 \Rightarrow x = 4.$

Javobi: E.

50. $\log_{\frac{1}{5}} \log_5 \sqrt{5x} = 0$ tenglamani yeching.

A) -5 B) 1 C) 0 D) 4 E) 5

Yechilishi: $\log_{\frac{1}{5}} \log_5 \sqrt{5x} = 0; \quad x > 0$

$\log_5 \sqrt{5x} = 1 \Rightarrow \sqrt{5x} = 5 \Rightarrow 5x = 25 \Rightarrow x = 5.$

Javobi: E.

51. $\sin^6 \alpha + \cos^6 \alpha + 3 \sin^2 \alpha \cos^2 \alpha$ ni soddalashtiring.

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

Yechilishi: $\sin^6\alpha+\cos^6\alpha+3\sin^2\alpha\cos^2\alpha=$

$=(\sin^2\alpha)^3+(\cos^2\alpha)^3+3\sin^2\alpha\cos^2\alpha=$

$=(\sin^2\alpha+\cos^2\alpha)(\sin^4\alpha-\sin^2\alpha\cos^2\alpha+\cos^4\alpha)+$

$+3\sin^2\alpha\cos^2\alpha=\sin^4\alpha-\sin^2\alpha\cos^2\alpha+\cos^4\alpha+$

$+3\sin^2\alpha\cos^2\alpha=\sin^4\alpha+2\sin^2\alpha\cos^2\alpha+\cos^4\alpha=$

$=(\sin^2\alpha+\cos^2\alpha)^2=1.$ Javobi: C.

52. $\sqrt[3]{x^2\sqrt[3]{x^2\sqrt[3]{x^2}\ldots}}=49$ tenglamani yeching.

A) 49 B) 7 C) 39 D) 50 E) 24

Yechilishi: $\sqrt[3]{x^2\sqrt[3]{x^2\sqrt[3]{x^2}\ldots}}=49 \Rightarrow$

$$\Rightarrow \begin{cases} y=\sqrt[3]{x^2\sqrt[3]{x^2\sqrt[3]{x^2}\ldots}}; \quad y^3=x^2\sqrt[3]{x^2\sqrt[3]{x^2\sqrt[3]{x^2}\ldots}} \Rightarrow \\ y=49 \end{cases}$$

$\Rightarrow y^3=x^2y \Rightarrow 49^3=x^2\cdot 49 \Rightarrow 49^2=x^2 \Rightarrow x=49.$

Javobi: A.

53. $\cos\frac{\pi}{7}\cdot\cos\frac{4\pi}{7}\cdot\cos\frac{5\pi}{7}$ ni hisoblang.

A) $-\frac{1}{8}$ B) $\frac{1}{4}$ C) $\frac{1}{2}$ D) 1 E) $\frac{1}{8}$

Yechilishi: $\cos\frac{\pi}{7}\cdot\cos\frac{4\pi}{7}\cdot\cos\frac{5\pi}{7}=$

$=\cos\frac{\pi}{7}\left(-\cos\left(\pi-\frac{3\pi}{7}\right)\right)\cos\frac{5\pi}{7}=$

$=-\cos\frac{\pi}{7}\cdot\cos\frac{3\pi}{7}\cdot\cos\frac{5\pi}{7}=$

$=-\frac{1}{2\sin\frac{\pi}{7}}\cdot 2\sin\frac{\pi}{7}\cdot\cos\frac{\pi}{7}\cdot\cos\frac{3\pi}{7}\cdot\cos\frac{5\pi}{7}=$

$=-\frac{1}{2\sin\frac{\pi}{7}}\sin\frac{2\pi}{7}\cos\frac{3\pi}{7}\cos\frac{5\pi}{7}=$

$=-\frac{1}{2\sin\frac{\pi}{7}}\sin\left(\pi-\frac{5\pi}{7}\right)\cos\frac{3\pi}{7}\cos\frac{5\pi}{7}=$

$= -\frac{1}{2\sin\frac{\pi}{7}} \cdot \frac{1}{2} \cdot 2\sin\frac{5\pi}{7}\cos\frac{5\pi}{7}\cos\frac{3\pi}{7} =$

$= -\frac{1}{4\sin\frac{\pi}{7}} \cdot \sin\frac{10\pi}{7} \cdot \cos\frac{3\pi}{7} = -\frac{1}{4\sin\frac{\pi}{7}} \cdot \sin\left(\pi + \frac{3\pi}{7}\right)\cos\frac{3\pi}{7} =$

$= -\frac{1}{4\sin\frac{\pi}{7}}\left[-\sin\frac{3\pi}{7}\right]\cos\frac{3\pi}{7} = \frac{1}{4\sin\frac{\pi}{7}} \cdot \frac{1}{2} \cdot 2\sin\frac{3\pi}{7}\cos\frac{3\pi}{7} =$

$= \frac{1}{8\sin\frac{\pi}{7}}\sin\frac{6\pi}{7} = \frac{1}{8\sin\frac{\pi}{7}} \cdot \sin\left(\pi - \frac{\pi}{7}\right) = \frac{1}{8\sin\frac{\pi}{7}} \cdot \sin\frac{\pi}{7} = \frac{1}{8}.$

Javobi: E.

54. Arifmetik progressiyaning dastlabki n ta hadining yig‘indisi 91 ga teng. Agar $a_3 = 9$ va $a_7 - a_2 = 20$ ekanligi ma’lum bo‘lsa, n ni toping.

A) 7 B) 5 C) 3 D) 9 E) 8

Yechilishi: $S_n = 91.$

$\begin{cases} a_3 = a_1 + 2d \\ a_7 = a_1 + 6d \\ a_2 = a_1 + d \end{cases} => \begin{cases} 9 = a_1 + 2d \\ a_1 + 6d - a_1 - d = 20 \end{cases} => \begin{cases} a_1 = 1; \\ d = 4. \end{cases}$

$a_n = a_1 + d(n-1) = 1 + 4(n-1) = 1 + 4n - 4 =$

$= 4n - 3. => a_n = 4n - 3.$

$S_n = \frac{a_1 + a_n}{2}n => 91 = \frac{1+4n-3}{2} \cdot n => 91 = \frac{4n-2}{2} \cdot n =>$

$=> 91 = (2n-1)n => 91 = 2n^2 - n =>$

$=> 2n^2 - n - 91 = 0 => n_{1,2} = \frac{1 \pm \sqrt{1 + 4 \cdot 2 \cdot 91}}{2 \cdot 2} = \frac{1 \pm \sqrt{729}}{4} =$

$= \frac{1 \pm 27}{4} => \begin{cases} n_1 = -\frac{26}{4} \, mumkin\ emas; \\ n_2 = 7. \end{cases}$ Javobi: A.

55. $\log_{\sqrt{2}} x + \frac{2}{\log_x 2} = 4$ tenglamani yeching.

A) 2 B) 1 C) 3 D) 4 E) 6

Yechilishi: $\log_{\sqrt{2}} x + \frac{2}{\log_x 2} = 4 =>$

$\Rightarrow \log_{\sqrt{2}} x + 2\log_2 x = 4 \Rightarrow \log_{2^{\frac{1}{2}}} x + 2\log_2 x = 4 \Rightarrow$

$\Rightarrow 4\log_2 x = 4 \Rightarrow x = 2.$ Javobi: A.

56. 100 dan ortiq bo‘lmagan 3 ga karrali barcha natural sonlarning yig‘indisini toping.

A) 1683 B) 1783 C) 1680 D) 1693 E) 1608

Yechilishi: $3, 6, \ldots, 99.$ $99 = 3 + 3(n-1) \Rightarrow$

$\Rightarrow 99 = 3 + 3n - 3 \Rightarrow n = 33.$

$S_{33} = \frac{3+99}{2} \cdot 33 = 1683.$ Javobi: A.

57. $y = -x^2 + 6x - 8$ funksiyaning eng katta qiymatini toping.

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

Yechilishi: $y = -x^2 + 6x - 8 \Rightarrow y' = -2x + 6 \Rightarrow$

$\Rightarrow 2x = 6 \Rightarrow x = 3.$

Berilgan funksiyaning hosilasi $x = 3$ kretik nuqtadan o‘tishda, o‘zining ishorasini " + " dan " − " ga o‘zgartiradi. Demak, $x = 3$ maksimal nuqta. Bundan,

$y(3) = -3^2 + 6 \cdot 3 - 8 = -9 + 18 - 8 = 1.$ Javobi: B.

58. $(0{,}1(6))^{3x-5} = 1296$ tenglamani yeching.

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

Yechilishi: $(0{,}1(6))^{3x-5} = 1296 \Rightarrow$

$\Rightarrow \left|0{,}1(6) = \frac{16-1}{90} = \frac{1}{6}\right| \Rightarrow \left(\frac{1}{6}\right)^{3x-5} = 6^4 \Rightarrow$

$\Rightarrow 6^{5-3x} = 6^4 \Rightarrow 5 - 3x = 4 \Rightarrow 3x = 1 \Rightarrow x = \frac{1}{3}.$

Javobi: A.

59. $\frac{65}{6}$ va $\frac{39}{8}$ kasrlar butun qismlarining o‘rta arifmetigini toping.

A) 7 B) 6 C) 8 D) 5 E) 5

Yechilishi: $\frac{65}{6} = 10\frac{5}{6}$; $\frac{39}{8} = 4\frac{7}{8}$; $\frac{10+4}{2} = 7.$ Javobi: A.

1999-YIL, 7-AXBOROTNOMA

1. 56 va 16 sonlarining umumiy bo‘luvchilari nechta?

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

Yechilishi:

56	2
28	2
14	2
7	7
1	

16	2
8	2
4	2
2	2
1	

$$56 = 2^3 \cdot 7;$$
$$16 = 2^4.$$

56 va 16 sonlari uchun umumiy bo‘lgan kichik 2 ning kubi olinadi: $D(56;16) = 2^3$.

Demak, $1, 2, 4, 8$. Javobi: A.

2. $889^3 + 3000 \cdot 889 \cdot 111 + 111^3 + 889 + 111$ ni hisoblang.

A) 10001000 B) 1001000 C) 1001001000

D) 100001000 E) 1001011000

Yechilishi:

$$889^3 + 3000 \cdot 889 \cdot 111 + 111^3 + 889 + 111 =$$
$$= 889^3 + 111^3 + 3000 \cdot 889 \cdot 111 + 889 + 111 =$$
$$= (889 + 111)(889^2 - 889 \cdot 111 + 111^2) +$$
$$+3 \cdot 1000 \cdot 889 \cdot 111 + 889 + 111 =$$
$$= 1000(889^2 - 889 \cdot 111 + 111^2) +$$
$$+3 \cdot 1000 \cdot 889 \cdot 111 + 1000 =$$
$$= 1000(889^2 - 889 \cdot 111 + 111^2 +$$
$$+3 \cdot 889 \cdot 111 + 1) = 1000(889^2 - 2 \cdot 889 \cdot 111 +$$

$+111^2+1)=100\cdot[(889+111)^2+1]=$

$=1000(1000^2+1)=1000^3+1000=1000001000.$

Javobi: D.

3. $\sqrt{50}$ qiymatining butun qismini toping.

A) 8 B) 7 C) 6 D) 9 E) 5

Yechilishi: $\sqrt{50}=7,...$ Javobi: B.

4. $\sqrt{9+\sqrt{77}}\cdot\sqrt{9-\sqrt{77}}$ ni hisoblang.

A) 3 B) 12 C) 2 D) 4 E) 1

Yechilishi: $\sqrt{9+\sqrt{77}}\cdot\sqrt{9-\sqrt{77}}=$

$=\sqrt{(9+\sqrt{77})(9-\sqrt{77})}=\sqrt{9^2-(\sqrt{77})^2}=$

$=\sqrt{81-77}=\sqrt{4}=2.$ Javobi: C.

5. Bug‘doydan 90% un olinadi. 3 t bug‘doydan qancha un olish mumkin?

A) 2,5 B) 2,6 C) 2,1 D) 2,9 E) 2,7

Yechilishi: $\frac{90}{100}\cdot 3=0{,}9\cdot 3=2{,}7(t).$ Javobi: E.

6. $0,(5)+0,(1)$ ni hisoblang.

A) $\frac{2}{3}$ B) $\frac{1}{3}$ C) 1,5 D) $\frac{1}{4}$ E) $\frac{1}{9}$

Yechilishi: $0,(5)+0,(1)=\frac{5}{9}+\frac{1}{9}=\frac{6}{9}=\frac{2}{3}.$ Javobi: A.

7. $\frac{100^5}{(80+20)^{10}}\cdot 50^5$ ni hisoblang.

A) $\frac{1}{32}$ B) 16 C) 8 D) $\frac{1}{64}$ E) $\frac{1}{128}$

Yechilishi: $\frac{100^5}{(80+20)^{10}}\cdot 50^5=\frac{100^5}{100^{10}}\cdot 10^5\cdot 5^5=$

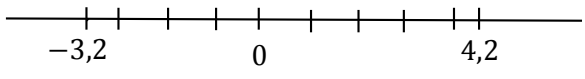
$=\frac{1}{10^{10}}\cdot 10^5\cdot 5^5=10^{5-10}\cdot 5^5=10^{-5}\cdot 5^5=$

$= \frac{1}{5^5 \cdot 2^5} \cdot 5^5 = \frac{1}{32}.$ Javobi: A.

8. Koordinatalari – 3,2 va 4,2 bo‘lgan sonlar orasida nechta butun son bor?

A) 7 B) 6 C) 9 D) 8 E) 10

Yechilishi:



Javobi: D.

9. $\frac{30^{1/3} \cdot 3^{2/3}}{10^{-2/3}}$ ni hisoblang.

A) 15 B) 20 C) 60 D) 45 E) 30

Yechilishi: $\frac{30^{\frac{1}{3}} \cdot 3^{\frac{2}{3}}}{10^{-\frac{2}{3}}} = 30^{\frac{1}{3}} \cdot 3^{\frac{2}{3}} \cdot 10^{\frac{2}{3}} =$

$= 3^{\frac{1}{3}} \cdot 10^{\frac{1}{3}} \cdot 3^{\frac{2}{3}} \cdot 10^{\frac{2}{3}} = 3 \cdot 10 = 30.$ Javobi: E.

10. 30 dan kichik tub sonlar nechta?

A) 11 B) 9 C) 10 D) 12 E) 8

Yechilishi: $2, 3, 5, 7, 11, 13, 17, 19, 23, 29.$ Javobi: C.

11. $\frac{|4-4\cdot|3-6|-8|}{|4-|3-5|-7|}$ ni hisoblang.

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

Yechilishi: $\frac{|4-4\cdot|3-6|-8|}{|4-|3-8|-7|} = \frac{|4-4\cdot 3-8|}{|4-5-7|} = \frac{16}{8} = 2.$ Javobi: A.

12. $\sqrt{11-6\sqrt{2}}$ ni soddalashtiring.

Yechilishi:

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

Yechilishi: $\sqrt{11-6\sqrt{2}} = \sqrt{11-\sqrt{72}} =$

$= \sqrt{\frac{11+\sqrt{121-72}}{2}} - \sqrt{\frac{11-\sqrt{121-72}}{2}} = \sqrt{\frac{11+7}{2}} - \sqrt{\frac{11-7}{2}} =$

$= 3-\sqrt{2}.$ Javobi: B.

13. Ikki xonali son o‘zining raqamlari yig‘indisidan 4 marta katta. Raqamlari kvadratlarining yig‘indisi 5 ga teng. Shu ikki xonali sonning kvadratini hisoblang.

A) 441 B) 169 C) 121 D) 196 E) 144

Yechilishi: $\begin{cases} xy = 4(x+y) \\ x^2 + y^2 = 5 \end{cases} \Rightarrow 10x + y = 4x + 4y \Rightarrow$

$\Rightarrow 6x = 3y \Rightarrow \begin{cases} x = 1 \\ y = 2 \end{cases} \Rightarrow (xy)^2 = 144.$ Javobi: E.

14. $\frac{2}{1+\frac{1}{1+2^{-1}}} - \frac{2}{1+\frac{1}{1-2^{-1}}}$ ni hisoblang.

A) $\frac{7}{15}$ B) $\frac{1}{2}$ C) $\frac{11}{18}$ D) $\frac{8}{15}$ E) $\frac{1}{3}$

Yechilishi: $\frac{2}{1+\frac{1}{1+2^{-1}}} - \frac{2}{1+\frac{1}{1-2^{-1}}} = \frac{2}{1+\frac{1}{1+\frac{1}{2}}} - \frac{2}{1+\frac{1}{1-\frac{1}{2}}} =$

$= \frac{2}{1+\frac{1}{\frac{3}{2}}} - \frac{2}{1+\frac{1}{\frac{1}{2}}} = \frac{2}{1+\frac{2}{3}} - \frac{2}{1+2} = \frac{2}{\frac{5}{3}} - \frac{2}{3} = \frac{6}{5} - \frac{2}{3} = \frac{18-10}{15} = \frac{8}{15}.$

Javobi: D.

15. k ning qanday qiymatlarida $y = \lg(kx^2 - 2x + 1)$ funksiya faqat $x = 1$ nuqatada aniqlanmagan?

A) $k < 2$ B) $k < 3$ C) $k \leq 1$ D) $k = -1$ E) $k = 1$

Yechilishi: $y = \lg(kx^2 - 2x + 1)$; $x = 1.$

$kx^2 - 2x + 1 \leq 0 \Rightarrow k - 2 + 1 \leq 0 \Rightarrow$

$\Rightarrow k - 1 \leq 0 \Rightarrow k \leq 1.$ Javobi: E.

16. $f(x) = 6\cos x - 7$ funksiyaning eng katta qiymatini toping.

A) -1 B) -7 C) 1 D) 0 E) 7

Yechilishi: $f(x) = 6\cos x - 7 \Rightarrow$

$\Rightarrow f'(x) = -6\sin x \Rightarrow -6\sin x = 0 \Rightarrow$

$\sin x = 0 \Rightarrow x = \pi n,\ n \in Z.$

1) $f(0) = 6 \cdot \cos 0 - 7 = 6 \cdot 1 - 7 = -1;$

2) $f(\pi) = 6 \cdot \cos \pi - 7 = -6 - 7 = -13.$

Javobi: A.

17. $y_1 = 2^x + 2^{-x}, y_2 = 5^x - 5^{-x}, y_3 = \sqrt{\sin x} + \sqrt{\cos x}$ va $y_4 = x^3 + \cos x$ funksiyalardan qaysilari juft ham, toq ham bo‘lmagan funksiyalardir?

A) $y_1; y_2$ B) $y_1; y_3$ C) $y_3; y_4$ D) $y_2; y_3$ E) $y_2; y_4$

Yechilishi: $y_3; y_4$. Javobi: C.

18. n ning nechta natural qiymati $9 \le 3^n \le 79$ qo‘shtengsizlikni qanoatlantiradi?

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

Yechilishi: $9 \le 3^n \le 79 => n = 2; 3.$ Javobi: D.

19. $\left(a^{\frac{1}{2}} + b^{\frac{1}{2}}\right) \cdot (a - a^{\frac{1}{2}} b^{\frac{1}{2}} + b)$ soddalashtirib, a va b asosli darajalar ko‘rsatkichlarining yig‘indisini hisoblang.

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

Yechilishi: $\left(a^{\frac{1}{2}} + b^{\frac{1}{2}}\right) \cdot \left(a - a^{\frac{1}{2}} b^{\frac{1}{2}} + b\right) =$

$= \left(\sqrt{a} + \sqrt{b}\right) \left[\left(\sqrt{a}\right)^2 - \sqrt{a} \cdot \sqrt{b} + \left(\sqrt{b}\right)^2\right] =$

$= (\sqrt{a})^3 + (\sqrt{b})^3 = \sqrt{a^3} + \sqrt{b^3} = a^{\frac{3}{2}} + b^{\frac{3}{2}}.$

$\frac{3}{2} + \frac{3}{2} = \frac{6}{2} = 3.$ Javobi: E.

20. $\frac{\left(30 - 15a^{\frac{1}{4}}\right) \cdot \left(2a^{\frac{1}{4}} + a^{\frac{1}{2}}\right)}{8a^{\frac{1}{4}} - a^{\frac{3}{4}}}$ kasrni qisqartiring.

A) 15 B) 10 C) 7,5 D) $-7{,}5$ E) -10

Yechilishi: $\frac{\left(30 - 15a^{\frac{1}{4}}\right) \cdot \left(2a^{\frac{1}{4}} + a^{\frac{1}{2}}\right)}{8a^{\frac{1}{4}} - a^{\frac{3}{4}}} = \frac{15\left(2 - a^{\frac{1}{4}}\right) \cdot a^{\frac{1}{4}}\left(2 + a^{\frac{1}{4}}\right)}{2a^{\frac{1}{4}}\left(4 - a^{\frac{1}{2}}\right)} =$

$= \frac{15\left(2-a^{\frac{1}{4}}\right)\left(2+a^{\frac{1}{4}}\right)}{2\left(4-a^{\frac{1}{2}}\right)} = \frac{15\left(4-a^{\frac{1}{2}}\right)}{2\left(4-a^{\frac{1}{2}}\right)} = 7{,}5.$ Javobi: C.

21. a ning $(a^2-4)x+5=0$ tenglama yechimga ega bo‘lmaydigan barcha qiymatlari ko‘paytmasini hisoblang.

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

Yechilishi: $(a^2-4)x+5=0$

$(a^2-4)x=-5 \Rightarrow x=-\frac{5}{a^2-4} \Rightarrow a^2-4=0 \Rightarrow$

$\Rightarrow a^2=4 \Rightarrow a=\pm 2.$

$a_1 \cdot a_2 = 2\cdot(-2) = -4.$ Javobi: B.

22. a ning qanday qiymatida $\begin{cases} ax+2y=4 \\ 2x+y=3 \end{cases}$ tenglamalar sestemasi yechimga ega bo‘lmaydi?

A) 4 B) -4 C) 2 D) -2 E) 3

Yechilishi: $\begin{array}{r} ax+2y=4 \\ \underline{-\ 4x+2y=3} \\ (a-4)x=-2 \end{array} \Rightarrow x=-\frac{2}{a-4}.$

Shuningdek, $\frac{a}{4}=\frac{2}{2} \Rightarrow a=4.$ Javobi: A.

23. $x^2+2x+1=0$ tenglamaning ildizlari x_1 va x_2 bo‘lsa, $x_1^3-x_2^3$ ni hisoblang.

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

Yechilishi: $x^2+2x+1=0 \Rightarrow (x+1)^2=0 \Rightarrow$

$\Rightarrow x_1=x_2=-1.$

$x_1^3-x_2^3=(-1)^3-(-1)^3=-1+1=0.$ Javobi: D.

24. $|x-6| \le 8$ tengsizlikning eng kichik natural yechimini toping.

A) 2 B) 7 C) 3 D) 0 E) 1

Yechilishi: $|x-6| \le 8 \Rightarrow -8 \le x-6 \le 8 \Rightarrow$

$\Rightarrow -8+6 \le x \le 8+6 \Rightarrow -2 \le x \le 14.\ x=1.$

Javobi: E.

25. $\{a_n\}$ arifmetik progressiyaning hadlari ayirmasi 1 ga teng. $(a_3-a_1)+(a_5-a_3)^2+\cdots+(a_{19}-a_{17})^9$ yig‘indini hisoblang.

A) 1022 B) 8192 C) 4094 D) 8194 E) 4098

Yechilishi:

$(a_3-a_1)+(a_5-a_3)^2+\cdots+(a_{19}-a_{17})^9=$

$=2+2^2+\cdots+2^9 \Rightarrow S_9=\frac{2(2^9-1)}{2-1}=$

$=\frac{2(512-1)}{1}=1022.$ Javobi: A.

26. x ning qanday qiymatlarida $f(x)=\frac{1}{3}x^3$ va $g(x)=-x^2+3x$ funksiyalar uchun $f'(x)<g'(x)$ tengsizlik o‘rinli bo‘ladi?

A) $(-\infty;-3)\cup(1;\infty)$ B) $(-3;1)$

C) $(1;\infty)$ D) $(-\infty;-3)$ E) $(-3;\infty)$

Yechilishi: $f(x)=\frac{1}{3}x^3;\ \ g(x)=-x^2+3x;$

$f'(x)=x^2;\quad g'(x)=-2x+3$

$f'(x)<g'(x) \Rightarrow x^2<-2x+3 \Rightarrow$

$\Rightarrow x^2+2x-3<0 \Rightarrow x_1=-3;\ \ x=1.$

$(-3;1)$. Javobi: B.

27. $y=tgx\cdot ctgx$ funksiyaning hosilasini toping.

A) 1 B) 2 C) $-\frac{1}{\sin^2 x\cdot\cos^2 x}$ D) 0 E) -2

Yechilishi: $y=tgx\cdot ctgx \Rightarrow y=1.\ y'=0.$

Javobi: D.

28. $y=x^2-2x-1$ funksiyaning $[-1;1]$ kesmadagi eng katta qiymatini toping.

A) 4 B) 2 C) 0 D) 6 E) 5

Yechilishi: $y = x^2 - 2x - 1; \quad [-1; 1]$

$y' = 2x - 2 => x = 1.$

$y(-1) = (-1)^2 - 2(-1) - 1 = 2;$

$y(1) = 1^2 - 2 \cdot 1 - 1 = -2.$ Javobi: B.

29. $y = \frac{2x}{(x^2+1)\ln 10}$ funksiyaning boshlang‘ich funksiyasini toping.

A) $Y = \frac{\lg(x^2+1)}{\ln 10} + C$ B) $Y = \lg(x+1) + C$

C) $Y = \frac{x^2}{(x^2+1)\ln 10} + C$ D) $Y = \lg(x^2+1) + C$

E) $Y = \ln(x^2+1) + C$

Yechilishi: $y = \frac{2x}{(x^2+1)\ln 10};$

Kasr qanday funksiyaning hosilasi degan savol javobi sifatida toppish qulay.

$F(x) = \lg(x^2+1) + C.$ Javobi: D.

30. $\log_2 3 = a$ va $\log_2 5 = b$ bo‘lsa, $\log_{45} 135$ ni a va b orqali ifodalang.

A) $\frac{b+3a}{b+2a}$ B) $\frac{b+2a}{b+3a}$ C) $\frac{b+a}{b+2a}$ D) $\frac{b+2a}{b+5a}$ E) $\frac{b+3a}{b+a}$

Yechilishi: $\log_2 3 = a, \log_2 5 = b;$

$\log_{45} 135 = \frac{\log_2 135}{\log_2 45} = \frac{\log_2 3^3 \cdot 5}{\log_2 3^2 \cdot 5} = \frac{3\log_2 3 + \log_2 5}{2\log_2 3 + \log_2 5} =$

$= \frac{3a+b}{2a+b}.$ Javobi: A.

31. $\left(\frac{2}{3}\right)^x = 2$ tenglamaning yechimi qaysi oraliqqa tegishli?

A) $(-\infty; -2)$ B) $(-1; 0)$ C) $(1; \infty)$

D) $(-2; -1)$ E) $(0; 1)$

Yechilishi: $\left(\frac{2}{3}\right)^x = 2$

$x lg\frac{2}{3} = lg2 => x(lg2 - lg3) = lg2 =>$

$=> x(0{,}301 - 0{,}4771) = 0{,}301 =>$

$=> x(-0{,}1761) = 0{,}301 => x = -1{,}709 \in (-2; 1).$

Javobi: D.

32. $y = \sqrt[4]{x}$ funksiya uchun quyidagi mulohazalardan qaysi biri noto‘g‘ri?

A) $toq\ funksiya$

B) $grafigi\ (16; 2)\ nuqtadan\ o'tadi$

C) $aniqlanish\ sohasida\ o'suvchi$

D) $grafigi\ I\ chorakda\ joylashgan$

E) $aniqlanish\ sohasi\ [0; \infty)\ oraliqdan\ o'tadi$

Yechilishi: $y = \sqrt[4]{x}$. Javobi: A.

33. ABC uchburchakda $AB = 3, CB = 4$ va $\cos B = 2/3$ bo‘lsa, AC ning qiymatini toping.

A) 2 B) 4 C) 3 D) 6 E) 1

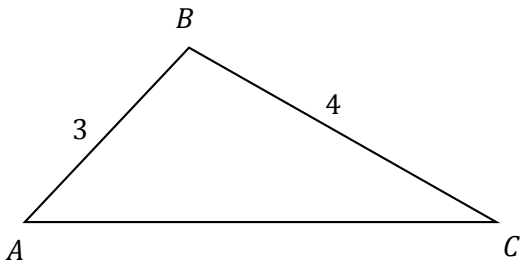
Yechilishi: $AC^2 = AB^2 + BC^2 - 2AB \cdot BC \cos \angle B =$

$= 9 + 16 - 2 \cdot 3 \cdot 4 \cdot \frac{2}{3} =$

$= 25 - 16 = 9 =>$

$=> AC = 3.$

Javobi: C.

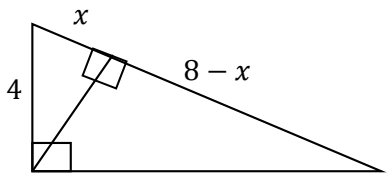


34. To‘g‘ri burchakli uchburchakning gepotenuzasi 8 ga, katetlaridan biri 4 ga teng. Ikkinchi katetning gepotenuzadagi proeksiyasini toping.

A) 4 B) 3 C) 5 D) 7 E) 6

Yechilishi: $4^2 = 8x \Rightarrow$

$\Rightarrow x = 2 \Rightarrow 8 - x = 6.$



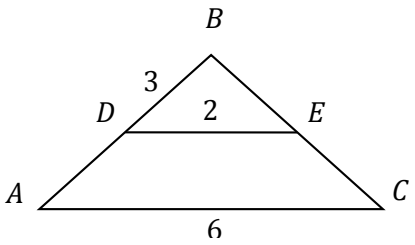
Javobi: E.

35. ABC uchburchakda $AC = 6, DB = 3$ va $DE = 2$ $(AC \parallel DE)$. AB tomonning uzunligini toping.

A) 6 B) 12 C) 8 D) 9 E) 10

Yechilishi: $AB = ?$

$\frac{AB}{3} = \frac{6}{2} \Rightarrow AB = 9.$



Javobi: D.

36. $\vec{a} = \{1; 2\}$va $\vec{b} = \{2; 1\}$ vektorlar orasidagi burchakning sinusini toping.

A) $\frac{3}{5}$ B) $\frac{4}{5}$ C) $\frac{4}{7}$ D) $\frac{1}{6}$ E) $\frac{5}{7}$

Yechilishi: $\vec{a} = \{1; 2\}$; $\vec{b} = \{2; 1\}$

$\vec{a} \cdot \vec{b} = 2 + 2 = 4.$ $|\vec{a}| = \sqrt{5}$; $|\vec{b}| = \sqrt{5}.$

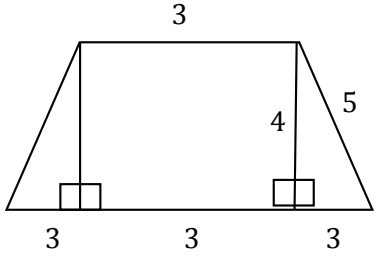
$\cos\alpha = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{4}{5} \Rightarrow \alpha = arccos\frac{4}{5} \Rightarrow$

$= sin\alpha = sinarccos\frac{4}{5} = \sqrt{1 - \left(\frac{4}{5}\right)^2} = \frac{3}{5}.$ Javobi: A.

37. Teng yonli trapetsiyaning yon tomoni 5 ga, balandligi 4 ga va katta asosi 9 ga teng. Uning o‘rta chizig‘ini toping.

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

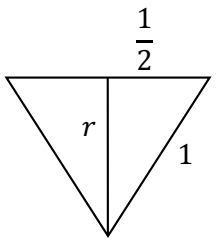
Yechilishi: $MN = \frac{9+3}{2} = 6.$



Javobi: E.

38. Muntazam oltiburchakka tashqi chizilgan aylananing uzunligi 2π ga teng. Unga ichki chizilgan doiraning yuzini hisoblang.

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



Yechilishi: $2\pi R = 2\pi \Rightarrow R = 1.$

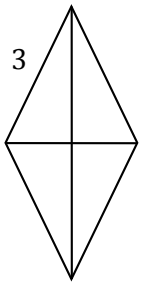
$r^2 = 1 - \frac{1}{4} = \frac{3}{4} \Rightarrow S = \pi r^2 \Rightarrow S = \frac{3}{4}\pi.$

Javobi: D.

39. Rombning yuzi 16 ga, perimetri 12 ga teng. Uning diagonallari yig‘indisini toping.

A) 8 B) 12 C) 11 D) 10 E) 9

Yechilishi: $16 = \frac{1}{2}d_1d_2 \Rightarrow d_1d_2 = 32;$



$d_1^2 + d_2^2 = 4 \cdot a^2 \Rightarrow d_1^2 + d_2^2 = 36;$

$(d_1 + d_2)^2 = d_1^2 + 2d_1d_2 + d_2^2 =$

$= 36 + 64 = 100 \Rightarrow d_1 + d_2 = 10.$

Javobi: D.

40. Markazi $(2; 3)$ nuqtada joylashgan va radiusi 2 ga teng bo‘lgan aylananing tenglamasini ko‘rsating.

A) $x^2 + y^2 - 4x - 6y = 0$

B) $x^2 + y^2 - 6x - 4y + 6 = 0$

C) $x^2 + y^2 - 4x - 6y + 9 = 0$

D) $x^2 + y^2 - 6x - 4y + 10 = 0$

E) $x^2 + y^2 - 4x - 6y + 8 = 0$

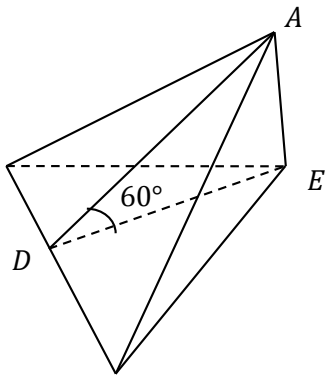
Yechilishi: $(x-2)^2 + (y-3)^2 = 2^2 \Rightarrow$

$\Rightarrow x^2 - 4x + 4 + y^2 - 6y + 9 - 4 = 0 \Rightarrow$

$\Rightarrow x^2 + y^2 - 4x - 6y + 9 = 0.$ Javobi: C.

41. α va β tekislar orasidagi burchak $60°$ ga teng. α tekislikdagi A nuqtadan tekislarning kesishish chizig‘igacha bo‘lgan

masofa 3 ga teng. A nuqtadan β tekislikkacha bo‘lgan masofani toping.



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

Yechilishi: $\frac{AE}{AD} = \sin 60°$;

$AE = 3 \cdot \frac{\sqrt{3}}{2} = 1{,}5\sqrt{3}$.

Javobi: D.

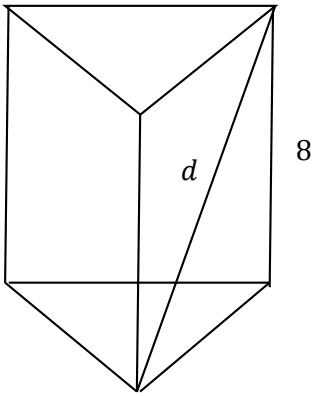
42. x ning qanday qiymatlarida $\vec{a}\{2; x; 4\}$ va $\vec{b}\{4; 2; 8\}$ vektorlar parallel bo‘ladi?

A) 2 B) 1,5 C) $\emptyset$ D) $-\infty < x < \infty$ E)1

Yechilishi: $\vec{a} = \{2; x; 4\}$; $\vec{b} = \{4; 2; 8\}$

$\frac{2}{4} = \frac{x}{2} => \frac{x}{2} = \frac{1}{2} => x = 1$. Javobi: E.

43. Uchburchakli muntazam prizmaning balandligi 8 ga, asosining yuzi $9\sqrt{3}$ ga teng. Prizma yon tomonining diagonalini toping.



A) $2\sqrt{22}$ B) 10 C) $3\sqrt{11}$

D) 11 E) 12

Yechilishi: $S = \frac{a^2\sqrt{3}}{4} => 9\sqrt{3} \cdot 4 =$

$= a^2\sqrt{3} => a^2 = 36 =>$

$=> a = 6.\ d = 10.$

Javobi: B.

44. Konus o‘q kesimining yuzi 8 ga, asosining radiusi 2 ga teng. Konus yon sirtining yuzini hisoblang.

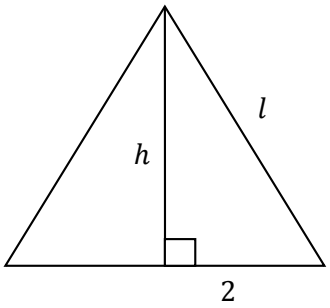
A) 6π B) $4\sqrt{5}\pi$ C) $5\sqrt{5}\pi$ D) 5π E) 7π

Yechilishi: $S_{\triangle} = \frac{1}{2}ah \Rightarrow$

$8 = \frac{1}{2} \cdot 4 \cdot h \Rightarrow h = 4.$

$l^2 = h^2 + 2^2 = 20 \Rightarrow l = 2\sqrt{5}.$

$S_{yon} = \pi Rl = 4\sqrt{5}\pi.$



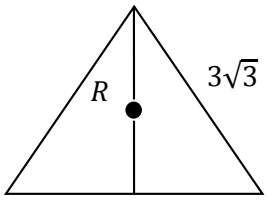
Javobi: B.

45. Silindirning balandligi 5 ga, uning asosiga ichki chizilgan muntazam uchburchakning tomoni $3\sqrt{3}$ ga teng. Slindirning hajmini toping.

A) 25π B) 35π C) 45π D) 40π E) 20π

Yechilishi: $R = \frac{a\sqrt{3}}{3} = \frac{3\sqrt{3}\cdot\sqrt{3}}{3} = 3.$

$V = \pi R^2 H = 3^2 \cdot \pi \cdot 5 = 45\pi.$



Javobi: C.

46. $tg(\arcsin\frac{\sqrt{3}}{2} + arctg\,\sqrt{3})$ ni hisoblang.

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

Yechilishi: $tg\left(\arcsin\frac{\sqrt{3}}{2} + arctg\,\sqrt{3}\right) =$

$= tg(60° + 60°) = tg120° = -\sqrt{3}.$ Javobi: D.

47. Agar $\alpha \in (\frac{\pi}{2}; \pi)$ va $\sin\alpha = \frac{1}{4}$ bo‘lsa, $ctg\alpha$ ni toping.

A) -4 B) $-\sqrt{17}$ C) $-\frac{1}{\sqrt{15}}$ D) $-\sqrt{13}$ E) $-\sqrt{15}$

Yechilishi: $\alpha \in \left(\frac{\pi}{2}; \pi\right);\ \sin\alpha = \frac{1}{4}$

$ctg\alpha = \frac{\cos\alpha}{\sin\alpha} = \frac{-\sqrt{1-\sin^2\alpha}}{\frac{1}{4}} = -4\sqrt{1 - \frac{1}{16}} =$

$= -4 \cdot \frac{\sqrt{15}}{4} = -\sqrt{15}.$ Javobi: E.

48. $5 \cdot 5^{\sin^2 x+\cos 2x} = \frac{1}{25}$ tenglamani yeching.

A) $\emptyset$ B) $\pi n, n \in Z$ C) $\frac{\pi}{2} + 2\pi n, n \in Z$

D) $2\pi n, n \in Z$ E) $\frac{\pi}{4} + 2\pi n, n \in Z$

Yechilishi: $5 \cdot 5^{\sin^2 x+\cos 2x} = \frac{1}{25} =>$

$=> 5^{\sin^2 x+\cos 2x} = 5^{-3} =>$

$=> \sin^2 x + \cos^2 x - \sin^2 x = -3 =>$

$=> \cos^2 x \neq -3.$ Javobi: A.

49. $\cos 5x \cos 4x + \sin 5x \sin 4x < \frac{\sqrt{3}}{2}$ tengsizlikni yeching.

A) $\frac{\pi}{3} + 2\pi n < x < \frac{5\pi}{3} + 2\pi n, n \in Z$

B) $\frac{\pi}{6} + 2\pi n < x < \frac{11\pi}{6} + 2\pi n, n \in Z$

C) $\frac{\pi}{3} + \pi n < x < \frac{5\pi}{3} + \pi n, n \in Z$

D) $\frac{\pi}{6} + \pi n < x < \frac{11\pi}{6} + \pi n, n \in Z$

E) $\frac{\pi}{4} + 2\pi n < x < \frac{7\pi}{4} + 2\pi n, n \in Z$

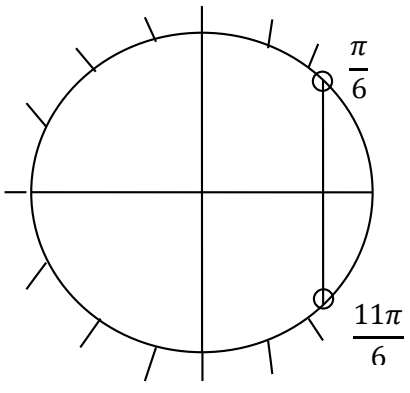
Yechilishi: $\cos 5x \cos 4x + \sin 5x \sin 4x < \frac{\sqrt{3}}{2}$

$\mathrm{Cos}(5x - 4x) < \frac{\sqrt{3}}{2} =>$

$=> \cos x < \frac{\sqrt{3}}{2} =>$

$=> \frac{\pi}{6} < x < \frac{11\pi}{6} =>$

$=> \frac{\pi}{6} + 2\pi n < x < \frac{11\pi}{6} + 2\pi n.$



Javobi: B.

Pirnazar DAVRONOV

1999-YIL, 8-AXBOROTNOMA

1. Agar $f'(x) = sin2x + \frac{1}{x-1}$ bo‘lsa, $f(x)$ funksiyani toping.

A) $cos2x + ln|x-1| + C$

B) $2cos2x + ln|x-1| + C$

C) $-cos2x + ln|x-1| + C$

D) $-\frac{1}{2}cos2x + ln|x-1| + C$

E) $-2cos2x + ln|x-1| + C$

Yechilishi: $f'(x) = sin2x + \frac{1}{x-1}$

$f(x) = \int f'(x)\,dx = \int sin2x\,dx + \int \frac{dx}{x-1} =$

$= -\frac{1}{2}cos2x + ln|x-1| + C.$

Javobi: D.

2. $5^x - 5^{3-x} = 20$ tenglamani yeching.

A) -5 B) 1 C) $-5; 1$ D) 2;-5 E) 2

Yechilishi: $5^x - 5^{3-x} = 20 => 5^x - 5^3 \cdot 5^{-x} = 20 =>$

$=> 5^x - 125 \cdot \frac{1}{5^x} = 20 => 5^{2x} - 125 = 20 \cdot 5^x =>$

$=> (5^x)^2 - 20 \cdot 5^x - 125 = 0 => 5^x = y;$

$y^2 - 20y - 125 = 0 => y_{1,2} = 10 \pm \sqrt{100 + 125} =$

$= 10 \pm 15 => \begin{cases} y_1 = -5; \\ y_2 = 25. \end{cases}$

1) $5^x \neq -5;$

2) $5^x = 25 => 5^x = 5^2 => x = 2.$ Javobi: E.

3. $\sqrt{x+1} + \sqrt{2x+3} = 1$ tenglamani yeching.

A) -1 B) 3 C) $-1; 3$ D) 1 E) -3

Yechilishi: $\sqrt{x+1} + \sqrt{2x+3} = 1 =>$

$x \geq -1;\ x \geq -1{,}5 => x \geq -1.$

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

$=> x+1 = 1-2\sqrt{2x+3}+2x+3 =>$

$=> 2\sqrt{2x+3} = x+3 => 4(2x+3) =$

$= x^2+6x+9 => x^2-2x-3 = 0 =>$

$=> \begin{cases} x_1 = -1 \\ x_2 = 3 \end{cases} => x = -1.$ Javobi: A.

4. $|x+1|+|x-4| > 7$ qanoatlantiruvchi x ning eng kichik natural qiymatini toping.

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

Yechilishi: $|x+1|+|x-4| > 7;$

Bundan

$\begin{cases} x+1 \geq 0 => x+1+\{x-4\} > 7 \\ x+1 < 0 => -x-1+\{x-4\} > 7 \end{cases} =>$

$=> \begin{cases} x-4 \geq 0 => \begin{cases} x+1+x-4 > 7 \\ -x-1+x-4 > 7 \end{cases} \\ x-4 < 0 => \begin{cases} x+1-x+4 > 7 \\ -x-1-x+4 > 7 \end{cases} \end{cases} =>$

$=> \begin{cases} 2x > 10 \\ -2x > 4 \end{cases} => \begin{cases} x > 5 \\ x < -2 \end{cases} =>$

$=> x \in (-\infty;-2) \cup (5;\infty) => x = 6.$ Javob: C.

5. $\sqrt[3]{5\sqrt{2}-7}$ ni hisoblang.

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

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

Yechilishi: $\sqrt[3]{5\sqrt{2}-7} = a\sqrt{2}-b;$

$5\sqrt{2}-7 = \left(a\sqrt{2}-b\right)^3 = 2\sqrt{2}a^3-6a^2b+3\sqrt{2}ab^2-$

$-b^3 => \begin{cases} 2\sqrt{2}a^3+3\sqrt{2}ab^2 = 5\sqrt{2} \\ -6a^2b-b^3 = -7 \end{cases} =>$

$=> \begin{cases} 2a^3+3ab^2 = 5; \\ 6a^2b+b^3 = 7. \end{cases}$

Bu sistemada a va b ning natural qiymatlari:
$a = b = 1$.
Bundan,
$\sqrt[3]{5\sqrt{2} - 7} = \sqrt{2} - 1$. Javobi: E.

6. 3680 va 5060 sonlarini ayni bir songa bo‘lganda, birinchisida bo‘linma 32 ga teng bo‘lsa, ikkinchisiga nechaga teng bo‘ladi?

A) 44 B) 38 C) 48 D) 52 E) 46

Yechilishi: $3680 = 32x \Rightarrow x = 115$.
$5060 : 115 = 44$.
Javobi: A.

7. $79{,}9 - 79{,}8 + 79{,}7 - 79{,}6 + 79{,}5 - 79{,}4 + \cdots + 60{,}3 - 60{,}2 + 60{,}1 - 60$ ifodaning qiymatini toping.

A) 100 B) 20 C) 10 D) 18,8 E) 9,9

Yechilishi: $79{,}9 - 79{,}8 + 79{,}7 - 79{,}6 + 79{,}5 - 79{,}4 + ... + 60{,}3 - 60{,}2 + 60{,}1 - 60$
$a) \ 79{,}9 + 79{,}7 + 79{,}5 + \cdots + 60{,}3 + 60{,}1$
$a_1 = 60{,}1; \quad a_n = 79{,}9; \quad d = 0{,}2$
$a_n = a_1 + d(n-1) \Rightarrow 79{,}9 = 60{,}1 + 0{,}2(n-1) \Rightarrow$
$\Rightarrow 79{,}9 = 60{,}1 + 0{,}2n - 0{,}2 \Rightarrow$
$\Rightarrow 0{,}2n = 20 \Rightarrow n = 100$.
$S_{100} = \frac{60{,}1 + 79{,}9}{2} \cdot 100 = 7000$.
$b) \ -79{,}8 - 79{,}6 - 79{,}4 - \cdots - 60 =$
$= -(60 + \cdots + 79{,}4 + 79{,}6 + 79{,}8)$
$a_1 = 60; \quad a_n = 79{,}8; \quad d = 0{,}2$.
$79{,}8 = 60 + 0{,}2(n-1) \Rightarrow 0{,}2(n-1) = 19{,}8 \Rightarrow$
$\Rightarrow n - 1 = 99 \Rightarrow n = 100$;
$S_{100} = \frac{60 + 79{,}8}{2} \cdot 100 = 6990$;
$v) \ 7000 - 6990 = 10$.
Javobi: C.

8. Oxirgi raqami 3 ga teng bo‘lgan 13 ta ko‘paytuvchining ko‘paytmasi qanday raqam bilan tugaydi?

A) 3 B) 1 C) 9 D) 7 E) 6

Yechilishi: $\underbrace{\overline{x3}\cdot\overline{xyz3}\ldots\overline{mnt3}}_{13\ ta}=\cdots 3^{13}$

1) 3 darajaga ko‘tarilganda, hosil bo‘layotgan sonlarning oxirida 3, 9, 7, 1 lar takrorlanadi.

Demak, takorlanish soni 4 ga teng.

2) Daraja 13, takrorlanish soni 4 ga bo‘lingada qoldiq 1 bo‘ladi.

Takrorlanuvchi sonning birinchisi 3. Javobi: A.

9. $5<x<98$ tengsizlikni qanoatlantiruvchi, bo‘luvchisi 12 ga teng bo‘lgan nechta natural son mavjud?

A) 8 B) 10 C) 12 D) 6 E) 14

Yechilishi: $5<x<98 \Rightarrow 5<12n<98 \Rightarrow$

$\Rightarrow 1\le n\le 8.$ Javobi: A.

10. Agar $a+b+3=10$ bo‘lsa, $3{,}8a+7{,}7+1{,}7b+2{,}5a+11{,}2+4{,}6b$ ifodaning qiymatini toping.

A) 53 B) 58 C) 72 D) 63 E) 70

Yechilishi: $a+b+3=10$

$3{,}8a+7{,}7+1{,}7b+2{,}5a+11{,}2+4{,}6b=$

$=6{,}3a+6{,}3b+18{,}9=6{,}3(a+b+3)=63.$ Javobi: D.

11. $\frac{(x-12):\frac{3}{8}}{0{,}3\cdot 3\frac{1}{3}+7}=1$ tenglamani yeching.

A) 25 B) 14 C) 15 D) 16 E) 18

Yechilishi: $\frac{(x-12):\frac{3}{8}}{0{,}3\cdot 3\frac{1}{3}+7}=1 \Rightarrow (x-12):\frac{3}{8}=$

$=\frac{3}{10}\cdot\frac{10}{3}+7 \Rightarrow (x-12):\frac{3}{8}=8 \Rightarrow x-12=8\cdot\frac{3}{8} \Rightarrow$

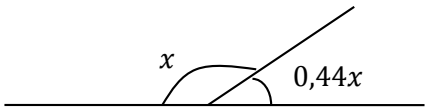
$\Rightarrow x=15.$

Javobi: C.

12. O‘ziga qo‘shni burchakning 44% iga teng bo‘lgan burchakning kattaligini aniqlang.

A) $55°$ B) $80°$ C) $60°$ D) $52°$ E) $78°$

Yechilishi:



$\Rightarrow x + \frac{44}{100}x = 180° \Rightarrow$

$\Rightarrow 1{,}44x = 180° \Rightarrow x = 125°;$

$0{,}44x = 55°.$ Javobi: A.

13. Nechta $(x; y)$ butun sonlar jufti $(x+1)(y-2) = 2$ tenglikni qanoatlantiradi?

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

Yechilishi: $(x+1)(y-2) = 2.$ $(x; y)$

$(1; 3),\ (0; 4),\ (-2; 0),\ (-3; 1).$

Javobi: A.

14. Barcha ikki xonali sonlar yig‘indisi qanday raqam bilan tugaydi?

A) 5 B) 0 C) 4 D) 2 E) 9

Yechilishi: $10, 11, \dots, 99 \Rightarrow a_1 = 10;\ a_n = 99;\ d = 1$

$99 = 10 + n - 1 \Rightarrow n = 90.$

$S_{90} = \frac{10+99}{2} \cdot 90 = 109 \cdot 45 = \cdots 5.$

Javobi: A.

15. Agar $-2 < a < -1$ va $-3 < b < -2{,}5$ bo‘lsa, $a - b$ ayirma qaysi sonlar orasida bo‘ladi?

A) $(0{,}5; 2)$ B) $(1; 1{,}5)$ C) $(-1{,}5; -1)$

D) $(-1{,}5; 1)$ E) $(-1; 1{,}5)$

Yechilishi: $-2 < a < -1;\ \ -3 < b < -2{,}5;\ \ a - b = ?$

1) a tengsizlikning kichigi -2 dan, b tengsizlikning kattasi $-2{,}5$ ayriladi: $-2 - (-2{,}5) = 0{,}5;$

2) a tengsizlikning kattasi -1 dan, b tengsizlikning kichigi -3 ayriladi: $-1-(-3)=2$.

Demak, $(0{,}5;2)$. Javobi: A.

16. $\frac{1}{243}$ sonini 9 asosli daraja shaklida ifodalang.

A) $9^{-\frac{5}{2}}$ B) $9^{-\frac{3}{4}}$ C) $9^{-\frac{5}{3}}$ D) $9^{-\frac{3}{2}}$ E) $9^{-\frac{5}{4}}$

Yechlishi: $\frac{1}{243} => 9 \ \ asosli$:

$$243^{-1}=(3^5)^{-1}=(9^2\cdot 3)^{-1}=\left[9^2\cdot 9^{\frac{1}{2}}\right]^{-1}=$$

$$=\left[9^{2+\frac{1}{2}}\right]^{-1}=9^{-\frac{5}{2}}.$$

Javobi: A.

17. $\sqrt[7]{243\cdot 81^2\cdot 9^4}$ ni hisoblang.

A) 27 B) 81 C) 9 D) $9\sqrt[7]{3}$ E) $27\sqrt[7]{3}$

Yechilishi: $\sqrt[7]{243\cdot 81^2\cdot 9^4}=\sqrt[7]{3^5\cdot 3^8\cdot 3^8}=27$.

Javobi: A.

18. Ikki sonning nisbati $11:13$ kabi, ularning eng katta umumiy bo‘luvchisi 5 ga teng. Bu sonlarning yig‘indisini toping.

A) 130 B) 120 C) 125 D) 150 E) 100

Yechilishi: $\frac{x}{y}=\frac{11}{13}$ $D(x;y)=5$.

$\frac{55}{65} => 55+65=120$.

Javobi: B.

19. Ikki sonning ko‘paytmasi 294 ga, ularning eng katta umumiy bo‘luvchisi 7 ga teng. Bu sonlarning eng kichik umumiy karralisini toping.

A) 42 B) 52 C) 56 D) 49 E) 70

Yechilishi: $x\cdot y=294$ $D(x;y)=7$.

$7\cdot 42=294 => 42$.

Javobi: A.

20. $5 \cdot 4^{2n-3} - 20 \cdot (2^{n-2})^4$ ifodani soddalashtiring.

A) 2 B) 4^{2n} C) 4 D) 2^{n-1} E) 0

Yechilishi: $5 \cdot 4^{2n-3} - 20 \cdot (2^{n-2})^4 =$

$= 5(4^{2n-3} - 4 \cdot 2^{4n-8}) = 5(2^{4n-6} - 2^2 \cdot 2^{4n-8}) =$

$= 5(2^{4n-6} - 2^{4n-6}) = 5 \cdot 0 = 0.$

Javobi: E.

21. $6x - a - 6 = (a + 2)(x + 2)$ tenglama a ning qanday qiymatida yechimga ega emas?

A) 4 B) 2 C) -2 D) 6 E) -6

Yechilishi: $6x - a - 6 = (a + 2)(x + 2)$

$6x - a - 6 = ax + 2a + 4$

$ax + 2x - 6x = -a - 6 - 2a - 4$

$ax - 4x = -3a - 10$

$x(a - 4) = -(3a + 10)$

$x = -\frac{3a+10}{a-4} => a = 4.$

Javobi: A.

22. $x^2 - 2x + 2y^2 + 8y + 9$ ko‘phadning eng kichik qiymatini aniqlang.

A) 0 B) 8 C) 1 D) 9 E) -1

Yechilishi: $x^2 - 2x + 1^2 - 1^2 + y^2 + 4y + 2^2 - 2^2 +$

$+y^2 + 4y + 2^2 - 2^2 + 9 = (x - 1)^2 + 2(y + 2)^2 = 0.$

Javobi: A.

23. Agar $a = \frac{1}{2b}$ bo‘lsa, $a^2b^2 - ab + 1$ ifodaning qiymatini toping.

A) $\frac{3}{4}$ B) $1\frac{1}{2}$ C) 1 D) $1\frac{1}{4}$ E) 2

Yechilishi: $a = \frac{1}{2b}$; $a^2b^2 - ab + 1 =$

$= \frac{1}{4b^2} \cdot b^2 - \frac{1}{2b} \cdot b + 1 = \frac{1}{4} - \frac{1}{2} + 1 = \frac{3}{4}.$

Javobi: A.

24. $P=\left(\frac{1}{3}x-\frac{1}{3}y\right)-(x+2y)$ va $Q=\frac{1}{3}x+\frac{1}{3}y-(x-y)$ ko‘phadlar ayirmasini toping.

A) $-\frac{11}{3}y$ B) 4y C) $-4y$ D) $\frac{13}{3}y$ E) $-\frac{13}{3}y$

Yechilishi:

$$P=\left(\frac{1}{3}x-\frac{1}{3}y\right)-(x+2y)$$

$$-\quad Q=\frac{1}{3}x+\frac{1}{3}y-(x-y)$$

$$P-Q=-\frac{2}{3}y-x-2y+x-y=-\frac{2}{3}y-3y=-\frac{11}{3}y$$

Javobi: A.

25. Ikkita natural sonni 5 ga bo‘lganda, mos ravishda 1 va 3 qoldiq hosil bo‘ladi. Bu sonlar kvadratlarining yig‘indisini 5 ga bo‘lganda, qoldiq nechaga teng bo‘ladi?

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

Yechilishi: $\begin{cases}x=5a+1\\y=5b+3\end{cases}\Rightarrow\begin{cases}x^2=25a^2+10a+1\\y^2=25b^2+30b+9\end{cases}$

$x^2+y^2=25(a^2+b^2)+10(a+1)+30\cdot b=$

$=5(5a^2+5b^2+2a+2+6b).$

Bu 5 ga karrali, qoldiq nolga teng. Javobi: E.

26. n sonini 7 ga bo‘lganda, qoldiq 5 ga, m sonini 7 ga bo‘lganda, qoldiq 6 ga teng. mn ko‘paytmani 7ga bo‘lganda, qoldiq nechaga teng bo‘ladi?

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

Yechilishi: $\begin{cases}n=7a+5\\m=7b+6\end{cases}\Rightarrow$

$\Rightarrow m\cdot n=(7a+5)(7b+6)=$

$\Rightarrow 49ab+42a+35b+30=$

$=7(7ab+6a+5b)+30\Rightarrow 30:7=4\cdot 7+2.$

Javobi: D.

27. $2x^2 - 5x + 1 = 0$ tenglama ildizlari kublarining yig‘indisini toping.

A) $11\frac{7}{8}$ B) 12 C) $12\frac{8}{9}$ D) $12\frac{7}{8}$ E) 13

Yechilishi: $2x^2 - 5x + 1 = 0 =>$

$=> x_{1,2} = \frac{5 \pm \sqrt{25-4\cdot2\cdot1}}{2\cdot2} = \frac{5 \pm \sqrt{17}}{4}$

$x_1^3 + x_2^3 = \left[\frac{5-\sqrt{17}}{4}\right]^3 + \left[\frac{5+\sqrt{17}}{4}\right]^3 = \frac{(5-\sqrt{17})^3+(5+\sqrt{17})^3}{64} =$

$= \frac{5^3-3\cdot5^2\cdot\sqrt{17}+3\cdot5\cdot17-(\sqrt{17})^3+5^3+3\cdot5^2\cdot\sqrt{17}+}{64}$

$\frac{+3\cdot5^2\cdot\sqrt{17}+3\cdot5\cdot17+(\sqrt{17})^3}{64} = \frac{250+255+255}{64} = \frac{760}{864} = 11\frac{7}{8}.$

Javobi: A.

28. Ildizlari $x_1^2 + x_2^2 = 13$ va $x_1 + x_2 = 5(x_1 - x_2)$ shartni qanoatlantiruvchi kvadrat tenglamani tuzing. Bunda $x_1 > x_2$.

A) $x^2 - 5x + 6 = 0$ B) $5x^2 - x - 4 = 0$

C) $3x^2 + 2x - 5 = 0$ D) $2x^2 - 3x + 1 = 0$

E) $x^2 - 6x + 5$

Yechilishi: $x^2 + px + q = 0 => x_1 = -\frac{p}{2} + \sqrt{\frac{p^2}{4} - q};$

$x_2 = -\frac{p}{2} - \sqrt{\frac{p^2}{4} - q};\ \ x_1 + x_2 = -p;$

$5(x_1 - x_2) = 10\sqrt{\frac{p^2}{4} - q}.$

$$\begin{cases} x_1^2 = \frac{p}{2} - p\sqrt{\frac{p^2}{4} - q} - q; \\ x_2^2 = \frac{p}{2} + p\sqrt{\frac{p^2}{4} - q} - q \end{cases} => x_1^2 + x_2^2 = p^2 - 2q;$$

$p^2 - 2q = 13 => p^2 = 13 + 2q;$

$-p = 10\sqrt{\frac{p^2}{4} - q} => p^2 = 100\left(\frac{p^2}{4} - q\right) =>$

$=> 6p^2 - 25q = 0 => 6(13 + 2q) - 25q = 0 =>$

$=> q = 6;$

$p^2 = 13 + 2 \cdot 6 = 25 => p = 5.$

U holda, $x^2 + 5x + 6 = 0$. Javobi: A.

29. Agar $x^2 + \left(\frac{x}{x-1}\right)^2 = 8$ bo‘lsa, $\frac{x^2}{x-1}$ ifodaning katta qiymatini toping.

A) 4 B) 8 C) 2 D) 16 E) $\frac{1}{4}$

Yechilishi: $x^2 + \left(\frac{x}{x-1}\right)^2 = 8$, $\frac{x^2}{x-1}$.

$\left(x + \frac{x}{x-1}\right)^2 - 2x \cdot \frac{x}{x-1} = 8 =>$

$=> \left(\frac{x^2}{x-1}\right)^2 - 2 \cdot \frac{x^2}{x-1} = 8 => \frac{x^2}{x-1} = t =>$

$=> t^2 - 2t - 8 = 0 => \begin{cases} t_1 = -2; \\ t_2 = 4. \end{cases}$

$\left(\frac{x^2}{x-1}\right)_{min} = -2; \quad \left(\frac{x^2}{x-1}\right)_{mak} = 4.$

Javobi: A.

30. $[lg28] + [lg0{,}026]$ yig‘indini hisoblang. Bunda $[a]$ yozuv a sonning butun qismini bildiradi.

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

Yechilishi: $[lg28] + [lg0{,}026] = 1 + [\lg 10^{-3} \cdot 26] =$

$= 1 + [-3 + \lg 26] = 1 + [-3 + 1, \dots] = 1 + [-1, \dots] =$

$= 1 - 2 = -1.$ Javobi: C.

31. $(\sqrt{3})^{\log_{\sqrt{5}} x - 4} = \frac{1}{3}$ tenglamani yeching.

A) 125 B) 25 C) 1 D) 5 E) 3

Yechilishi: $(\sqrt{3})^{\log_{\sqrt{5}} x - 4} = \frac{1}{3}$

$(\sqrt{3})^{\log_{\sqrt{5}} x} \cdot (\sqrt{3})^{-4} = \frac{1}{3} => (\sqrt{3})^{\log_{\sqrt{5}} x} = 3 =>$

$=> (\sqrt{3})^{\log_{\sqrt{5}} x} = (\sqrt{3})^2 => \log_{\sqrt{5}} x = 2 => x = 5.$

Javobi: D.

32. $\lg(10x^2)\, lgx = 1$ tenglamaning kichik ildizini toping.

A) 0,01 B) 0,1 C) $\sqrt{10}$ D) $\frac{1}{\sqrt{10}}$ E) 1

Yechilishi: $\lg(10x^2) \cdot lgx = 1$

$(lg10 + lgx^2)lgx = 1$

$(1 + 2lgx)lgx = 1$

$2\lg^2 x + lgx - 1 = 0$

$lgx_{1,2} = \frac{-1 \pm \sqrt{1+4\cdot 2\cdot 1}}{2\cdot 2} = \frac{-1\pm 3}{4} => \begin{cases} lgx = -1 \\ lgx = \frac{1}{2} \end{cases} =>$

$=> \begin{cases} x = 0{,}1 \\ x = \sqrt{10} \end{cases}$

Javobi: B.

33. $f(-2) = 3$ va $f(2) = 5$ shartni qanoatlantiruvchi chiziqli funksiyani aniqlang.

A) $f(x) = \frac{1}{2}x + 4$ B) $f(x) = 2x - 1$

C) $f(x) = 2x + 1$ D) $f(x) = 3x + 9$

E) $f(x) = x + 3$

Yechilishi: $f(-2) = 3; \quad f(2) = 5;$

$f(x) = kx + b => \begin{cases} 3 = k(-2) + b \\ 5 = k\cdot 2 + b \end{cases} =>$

$=> \begin{cases} b = 2k + 3 \\ 5 = 2k + 2k + 3 \end{cases} => \begin{cases} b = 4 \\ k = \frac{1}{2} \end{cases}$

$f(x) = \frac{1}{2}x + 4.$

Javobi: A.

34. Quyidagi funksiyalardan qaysi birining aniqlanish sohasi $(0; 1)$ oraliqdan iborat?

A) $y = \sqrt{\frac{1}{1-x}} + \log_2 x$ B) $y = \frac{1}{\sqrt{1-x^2}}$

C) $y=\sqrt{1-x}-\sqrt{x}$ D) $y=\frac{1}{1-x}$ E) $y=\frac{2}{1-x^2}$

Yechilishi: $y=\sqrt{\frac{1}{1-x}}+\log_2 x \Rightarrow \begin{cases}\frac{1}{1-x}\geq 0\\ \log_2 x\end{cases} \Rightarrow$

$\Rightarrow \begin{cases}1>0\\ 1-x\\ x>0\end{cases} \Rightarrow 0<x<1.$ Javobi: A.

35. $y=arcsinx+\frac{\pi}{2}$ funksiyaning qiymatlari to‘plamini toping.

A) $[0;\pi]$ B) $\left[-\frac{\pi}{2};\frac{\pi}{2}\right]$ C) $\left[\frac{\pi}{2}-1;\frac{\pi}{2}+1\right]$

D) $\left[0;\frac{\pi}{2}\right]$ E) $(0;\pi)$

Yechilishi: $y=arcsinx+\frac{\pi}{2}$

$-\frac{\pi}{2}\leq arcsinx\leq\frac{\pi}{2}. \Rightarrow -\frac{\pi}{2}+\frac{\pi}{2}\leq arcsinsinx\leq$

$\leq\frac{\pi}{2}+\frac{\pi}{2}\Rightarrow 0\leq arcsinx\leq\pi\Rightarrow[0;\pi].$

Javobi: A.

36. $f(x)=\log_3(x^2-6x+36)$ funksiyaning eng kichik qiymatini toping.

A) 1 B) 9 C) 2 D) 3 E) $aniqlab\ bo'lmaydi$

Yechilishi: $f(x)=\log_3(x^2-6x+36)$

$f'(x)=\frac{2x-6}{(x^2-6x+36)ln3}\Rightarrow 2x-6=0\Rightarrow x=3.$

$f(3)=\log_3(3^2-6\cdot 3+36)=\log_3 3^3=3.$

Shuningdek

$f(x)=\log_3[(x-3)^2+27]=\log_3(0+27)=$

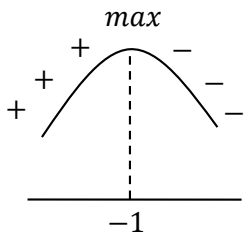
$=\log_3 3^3=3.$ Javobi: D.

37. $y=\sqrt{3-x^2-2x}$ funksiyaning eng katta qiymatini toping.

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

Yechilishi: $y=\sqrt{3-x^2-2x}\Rightarrow$

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



$=> -2x-2=0 =>$

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

$x=-2 => y'(-2) = \frac{-2(-2)-2}{2\sqrt{3-(-2)^2-2(-2)}} =$

$= \frac{2}{2\sqrt{3-4+4}} = \frac{1}{\sqrt{3}} > 0.$

$x=0 => y'(0) = \frac{-2\cdot 0-2}{2\sqrt{3-0^2-2\cdot 0}} = \frac{-2}{2\sqrt{3}} = -\frac{1}{\sqrt{3}} < 0.$

$y(-1) = \sqrt{3-(-1)^2-2\cdot(-1)} = \sqrt{3-1+2} = 2.$

Javobi: C.

38. $f(x) = x^3 + 3^x.\quad f'(0) = ?$

A) $ln3$ B) 1 C) 3 D) 0 E) $mavjud\ emas$

Yechilishi: $f(x) = x^3 + 3^x;\quad f'(0) = ?$

$f'(x) = 3x^2 + 3^x ln3 =>$

$=> f'(0) = 3\cdot 0^2 + 3^0 \cdot ln3 = ln3.$ Javobi: A.

39. $f(x) = 4 - x^2$ funksiya grafigining absisasi o‘qini musbat yo‘nalishi bilan kesishgan nuqtasiga o‘tkazilgan urinmasi tenglamasini yozing.

A) $y = -4x + 8$ B) $y = 4x + 8$ C) $y = 2x - 3$

D) $y = -2x + 5$ E) $y = -4x$

Yechilishi: $f(x) = 4 - x^2;\ (Ox): f(x) = 0;$

$4 - x^2 = 0 => x_{1,2} = \pm 2 => A(2;0) => x_0 = 2.$

$k = f'^{(x_0)} => f'(x) = -2x => f'(x_0) = -2x_0 =>$

$=> f'(2) = -4 => k = -4.$

$y_0 = f(x_0) = 4 - 2^2 = 0;$

$y - 0 = -4(x-2) => y = -4x + 8.$ Javobi: A.

40. $f(x) = \frac{3}{4\sqrt{x}}$ funksiyaning boshlang‘ich funksiyasini toping.

A) $\frac{3\sqrt{x}}{2} + C$ B) $3\sqrt{x} + C$ C) $\frac{4}{3}\sqrt{x} + C$

D) $-\frac{3}{2}\sqrt{x} + C$ E) $6\sqrt{x} + C$

Yechilishi: $f(x)=\frac{3}{4\sqrt{x}}=\frac{3}{4}\cdot x^{-\frac{1}{2}}$

$F(x)=\frac{3}{4}\int x^{-\frac{1}{2}}dx=\frac{3}{4}\cdot\frac{x^{-\frac{1}{2}+1}}{-\frac{1}{2}+1}+C=\frac{3}{4}\cdot\frac{\sqrt{x}}{\frac{1}{2}}+C=\frac{3}{2}\sqrt{x}+C.$

Javobi: A.

41. $f(x)=3x^2-2$ funksiya boshlang‘ich funksiyalaridan qaysi birining grafigi $M(2;4)$ nuqtadan o‘tadi?

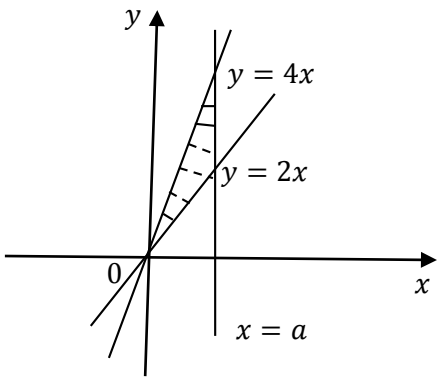
A) $F(x)=x^3-2x$
B) $F(x)=x^3-2x+1$
C) $F(x)=x^3-2x+5$
D) $F(x)=x^3-2x+8$
E) $F(x)=x^3-2x-2$

Yechilishi: $f(x)=3x^2-2 \Rightarrow F(x)=3\cdot\frac{x^3}{3}-2x+C=$
$=x^3-2x+C \Rightarrow 4=2^3-2\cdot 2+C \Rightarrow C=0 \Rightarrow$
$\Rightarrow F(x)=x^3-2x.$

Javobi: A.

42. a ning qanday qiymatida $y=4x, y=2x$ va $x=a$ to‘g‘ri chiziqlar bilan chegaralangan figuraning yuzi 4 ga teng bo‘ladi?

A) 8 B) 1 C) 3 D) 4
E) 2



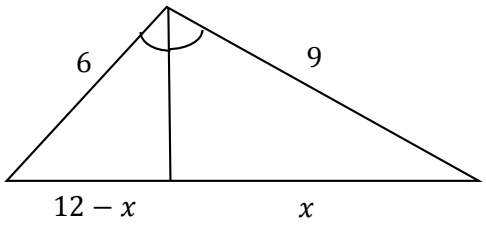
Yechilishi: $4=\int_0^a[4x-2x]dx=$
$=\int_0^a 2xdx=2\cdot\frac{x^2}{2}|_0^a=$
$=x^2|_0^a=a^2 \quad a=\pm 2 \Rightarrow$
$\Rightarrow a=2.$

Javobi: E.

43. Uchburchakning tomonlari 6; 9 va 12 ga teng. Eng katta burchak bissektrisasi uchburchakning tomonidan ajratgan kesmalarning kattasini toping.

A) 7,2 B) 4,8 C) 6,8 D) 8,4 E) 5,6

Yechilishi: $\frac{6}{12-x} = \frac{9}{x} \Rightarrow$



$6x = 9 \cdot 12 - 9x \Rightarrow$

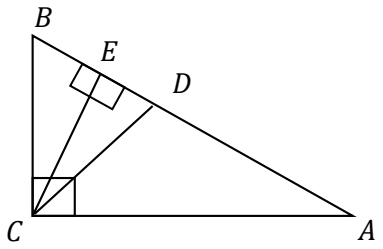
$\Rightarrow 15x = 9 \cdot 12 \Rightarrow x = 7{,}2.$

Javobi: A.

44. To‘g‘ri burchakli uchburchakda to‘g‘ri burchak bissektrisasi gipotenuzani $3:2$ nisbatda bo‘lgan kesmalarga ajratadi. Katetlarning gepotenuzadagi proeksiyalari nisbatini toping.

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) $\frac{4}{5}$ D) $\frac{2}{3}$ E) $\frac{5}{6}$

Yechilishi: $\frac{AD}{DB} = \frac{3}{2} \Rightarrow$



$\Rightarrow AD = \frac{3}{2}DB;\ \frac{AC}{AD} = \frac{BC}{BD} \Rightarrow$

$\Rightarrow AC \cdot BD = AD \cdot BC \Rightarrow$

$\Rightarrow \frac{AC}{BC} = \frac{AD}{BD} = \frac{3}{2}.$

$\begin{cases} AC^2 = AB \cdot AE \\ BC^2 = AB \cdot BE \end{cases} \Rightarrow \frac{AC^2}{BC^2} =$

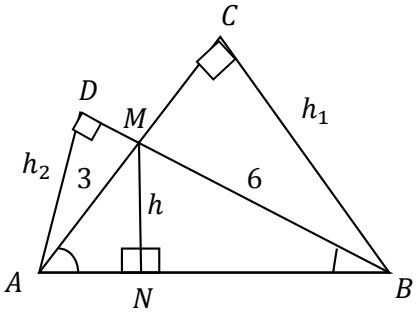
$\frac{AE}{BE} \Rightarrow \frac{AE}{BE} = \left(\frac{AC}{BC}\right)^2 = \frac{9}{4}.$

Javobi: A.

45. Uchburchakning ikki tomoni uzunliklari 6 va 3 ga teng. Agar bu tomonlarga o‘tkazilgan balandliklar uzunliklari yig‘indisining yarmi uchinchi tomonga o‘tkazilgan balandlikka teng bo‘lsa, uchinchi tomon uzunligini aniqlang.

A) 6 B) 5 C) 3 D) 4 E) 7

Yechilishi: $\frac{h_1+h_2}{2}=h$



1) $\Delta ACB \sim \Delta ANM \Rightarrow \frac{3}{AB}=\frac{h}{h_1}$

$ABh=3h_1 \Rightarrow h_1=\frac{AB\cdot h}{3}$;

$\Delta ADB \sim \Delta BNM \Rightarrow \frac{6}{AB}=\frac{h}{h_2} \Rightarrow$

$\Rightarrow AB\cdot h=6h_2 h_2=\frac{AB\cdot h}{6}$;

$h_1+h_2=\frac{1}{3}AB\cdot h+\frac{1}{6}AB\cdot h \Rightarrow \Rightarrow \frac{1}{2}(h_1+h_2)=$

$=\frac{1}{6}Ab\cdot h+\frac{1}{12}AB\cdot h \Rightarrow h=AB\cdot h\left(\frac{1}{6}+\frac{1}{12}\right) \Rightarrow$

$\Rightarrow \frac{2+1}{12}AB=1 \Rightarrow 3AB=12 \Rightarrow AB=4.$

Javobi: D.

46. Trapetsiyaning asoslari 44 va 16 ga, yon tomonlari esa 25 va 17 ga teng. Trapetsiyaning balandligini toping.

A) 15 B) 14 C) 12 D) 16 E) 10

Yechilishi: $44-16=28$ $\begin{cases} h^2=17^2-x^2 \\ h^2=25^2-(28-x)^2 \end{cases} \Rightarrow$

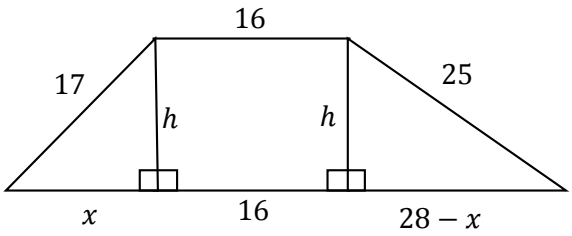
$\Rightarrow 17^2-x^2=$

$=25^2-(28^2-56x+$

$+x^2)=289-x^2=$

$=625-784+56x-$

$-x^2=56x=448 \Rightarrow$



$\Rightarrow x=8 \Rightarrow h^2=289-64=225 \Rightarrow h=15.$

Javobi: A.

47. Teng yonli trapetsiyaning yon tomoni 7 ga, diagonali 8 ga, o‘rta chizig‘i 4 ga teng. Trapetsiyaning kichik asosini toping.

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

Yechilishi: $\frac{a+b}{2}=4 \Rightarrow \frac{b+2x+b}{2}=4 \Rightarrow b+x=4 \Rightarrow$

$=> x = 4 - b \quad \begin{cases} h^2 = 64 - (b+x)^2 \\ h^2 = 49 - x^2 \end{cases} =>$

$=> 64 - b^2 - 2bx - x^2 =$

$= 49 - x^2 =>$

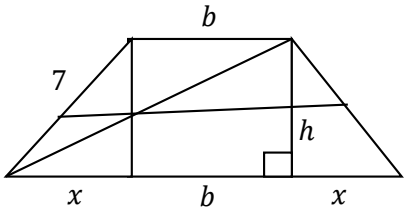
$=> b^2 + 2b(4-b) - 15 = 0 =>$

$=> b^2 + 8b - 2b^2 - 15 = 0 =>$

$=> b^2 - 8b + 15 = 0 =>$

$=> b_{1,2} = 4 \pm \sqrt{16-15} = 4 \pm 1 =>$

$=> \begin{cases} b_1 = 3 \\ b_2 = 5 \end{cases} => \begin{cases} x_1 = 1 \\ x_2 = -1 \end{cases} => b = 3.$



Javobi: A.

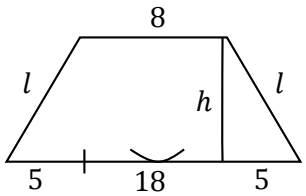
48. Aylanaga tashqi chizilgan teng yonli trapetsiyaning asoslari 18 va 8 ga teng. Aylananing diametrini aniqlang.

A) 14 B) 10 C) 12 D) 11 E) 12,4

Yechilishi: $d = h \quad 2l = 26 =>$

$=> l = 13;$

$h^2 = 169 - 25 = 144 => h = 12.$



Javobi: C.

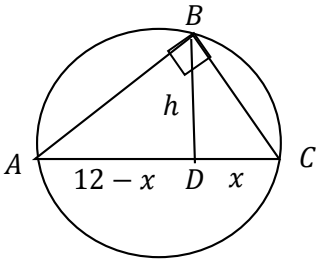
49. Radiusi 6 ga teng bo‘lgan aylanadagi nuqtadan uning deametriga tushirilgan perpendikulyar deametrni 1: 3 nisbatda bo‘ladi. Perpendikulyarning uzunligini toping.

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

Yechilishi: $\frac{x}{12-x} = \frac{1}{3} =>$

$=> 3x = 12 - x => x = 3;$

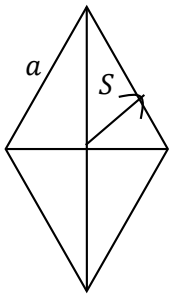
$h^2 = 9 \cdot 3 => h = 3\sqrt{3}.$



Javobi: A.

50. Radiusi 5 ga teng bo‘lgan doiraga o‘tkir burchagi 30° bo‘lgan romb tashqi chizilgan. Rombning yuzini toping.

A) 100 B) 240 C) 200 D) 250 E) 180

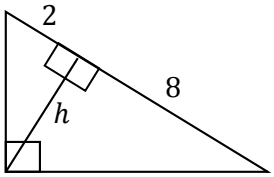


Yechilishi: $a = \frac{2r}{\sin\alpha} = \frac{2\cdot 5}{\sin 30^\circ} = 20$

$S = a^2 \sin\alpha = 20^2 \cdot \frac{1}{2} = 200.$

Javobi: C.

51. To‘g‘ri burchakli uchburchak katetlarining gepotenuzadagi proeksiyalari 8 va 2 ga teng. Uchburchakning yuzini toping.



A) 10 B) 20 C) 40 D) 24 E) 16

Yechilishi: $h^2 = 2 \cdot 8 => h = 4;$

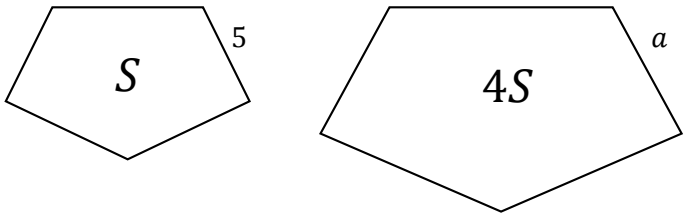
$S = \frac{1}{2} \cdot 10 \cdot 4 = 20.$

Javobi: B.

52. Ko‘pburchakning tomoni 5 ga teng. Yuzasi berilgan ko‘pburchakning yuzasidan 4 marta katta hamda unga o‘xshash bo‘lgan ko‘pburchakning mos tomonini toping.

A) 20 B) 10 C) 12 D) 16 E) 14

Yechilishi: $k^2 = \frac{4S}{S} = 4 => k = 2 => \frac{a}{5} = 2 => a = 10.$



Javobi: B.

53. Radiusi 5 sm bo‘lgan doiradagi 8 sm li vatar doira markazidan necha sm uzoqlikda bo‘ladi?

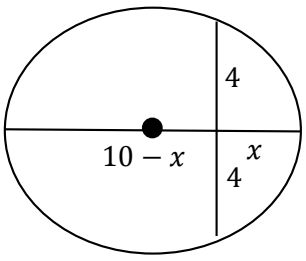
A) 3 B) 4 C) 2,6 D) 2,8 E) 3,2

Yechilishi: $(10 - x) \cdot x = 4 \cdot 4 =>$

$=> 10x - x^2 = 16 =>$

$=> x^2 - 10x + 16 = 0 =>$

$=> \begin{cases} x_1 = 2 \\ x_2 = 8 \end{cases} => 5 - 2 = 3.$



Javob: A.

54. Teng yonli uchburchakning asosi 12 ga, balandligi 3 ga teng. Unga tashqi chizilgan aylananing diametrini toping.

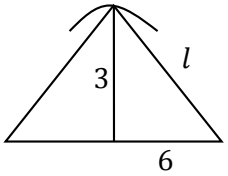
A) 17 B) 18 C) 14 D) 16 E) 15

Yechilishi: $l^2 = 9 + 36 = 45 => l = \sqrt{45} = 3\sqrt{5}$;

$S = \frac{1}{2} \cdot 12 \cdot 3 = 18$;

$R = \frac{abc}{4S} = \frac{12 \cdot \sqrt{45} \cdot \sqrt{45}}{4 \cdot 18} = \frac{45}{6} =>$

$=> d = 2R = \frac{45}{3} = 15.$



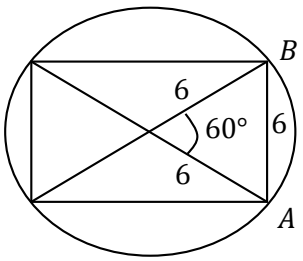
Javobi: E.

55. Radiusi 6 ga teng bo‘lgan doiraga diagonallari orasidagi burchagi $60°$ bo‘lgan to‘g‘ri to‘rtburchakichki chizilgan. To‘g‘ri to‘rtburchakning kichik tomonini toping.

A) 6 B) $6\sqrt{3}$ C) 3 D) 4 E) 4,8

Yechilishi: $AB^2 = 6^2 + 6^2 - 2 \cdot 6 \cdot 6 \cdot cos60° =$

$= 72 - 36 = 36 => AB = 6.$



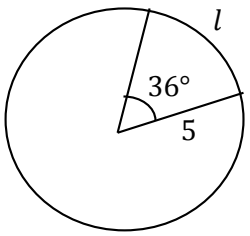
Javobi: A.

56. Radiuslari orasidagi burchak $36°$ va radiusi uzunligi 5 ga teng bo‘lgan sektor yoyining uzunligini toping.

A) 2π B) π C) $\frac{\pi}{2}$ D) $\frac{\pi}{3}$ E) $1{,}5\pi$

Yechilishi:

$l = \frac{\pi r n°}{180°} = \frac{\pi \cdot 5 \cdot 36°}{180°} = \pi.$



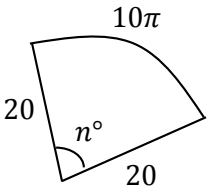
Javobi: B.

57. Uzunligi 10π ga teng bo‘lgan aylana, radiusi 20 ga teng bo‘lgan yoy shakliga keltirilgan. Hosil bo‘lgan yoyning markaziy burchagini toping.

A) 90° B) 60° C) 120° D) 75° E) 45°

Yechilishi: $2\pi R = 10\pi \Rightarrow$

$\Rightarrow R = 5;\ l = \frac{\pi r}{180^\circ} n^\circ$



$10\pi = \frac{20}{180}\pi n^\circ;$

$20n^\circ = 180 \cdot 10 \Rightarrow n^\circ = 90^\circ.$

Javobi: A.

58. $A(2;4), B(3;6)$ va $C(6;14)$ nuqtalar berilgan. $\left|\overrightarrow{AB} + \overrightarrow{AC}\right|$ ni hisoblang.

A) 13 B) 12 C) 10 D) 14 E) $13\sqrt{2}$

Yechilishi: $\overrightarrow{AB} = \{3-2; 6-4\} = \{1; 2\};$

$\overrightarrow{AC} = \{6-2; 14-4\} = \{4; 10\};$

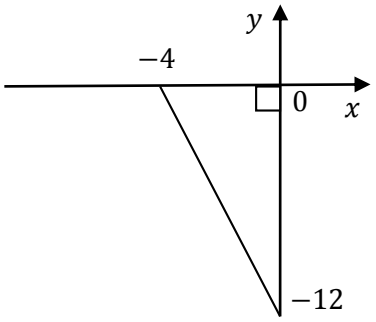
$\left|\overrightarrow{AB} + \overrightarrow{AC}\right| = |\{1; 2\} + \{4; 10\}| = |\{1+4; 2+10\}| =$

$= |\{5; 12\}| = \sqrt{5^2 + 12^2} = 13.$ Javobi: A.

59. $3x + y + 12 = 0$ to‘g‘ri chiziq va koordinata o‘qlari bilan chegaralangan uchburchakning yuzini aniqlang.

A) 64 B) 12 C) 48 D) 36 E) 24

Yechilishi: $y = -3x - 12$



$x = 0 \Rightarrow y = -12;$

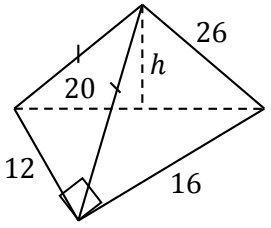
$y = 0 \Rightarrow x = -4;$

$S_\Delta = \frac{1}{2} \cdot 12 \cdot 4 = 24.$

Javobi: E.

60. Katetlari 12 va 16 sm bo‘lgan to‘g‘ri burchakli uchburchakning uchlaridan bir xil 26 sm uzoqlikda joylashgan nuqta uchburchak tekisligidan qanday masofada (sm) yotadi?

A) 22 B) 20 C) 24 D) 18 E) 16



Yechilishi: $h^2 = 26^2 - 10^2 =$

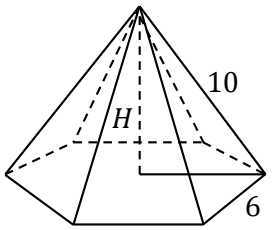
$= 676 - 100 = 576 \Rightarrow h = 24.$

Javobi: C.

61. Muntazam piramidaning asosi ichki burchaklarining yig‘indisi $720°$ ga, tomoni 6 ga teng bo‘lgan ko‘pburchakdan iborat. Agar piramiodaning yon qirrasi 10 ga teng bo‘lsa, piramidaning balandligini aniqlang.

A) 8 B) 6 C) 9 D) 7 E) 6,2

Yechilishi: $720 = 180(n-2) => n = 6.$



Muntazam oltiburchakka tshqi chizilgan aylana radiusi, ko‘pburchak tomoniga teng: $a = R = 6.$

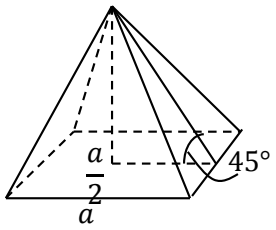
Misr uchburchagiga asosan $H = 8.$

Javobi: A.

62. Hajmi 36 ga teng bo‘lgan muntazam to‘rtburchakli piramidaning asosidagi ikki yoqli burchaklari $45°$. Piramida asosining tomonini toping.

A) 6 B) 8 C) 4 D) 12 E) 10

Yechilishi: $V = \frac{1}{3}a^2H, \quad \alpha = 45°$



$H : \frac{a}{2} = tg45° =>$

$=> H \cdot \frac{2}{a} = 1 =>$

$H = \frac{a}{2} => 36 = \frac{1}{3}a^2 \cdot \frac{1}{2}a =>$

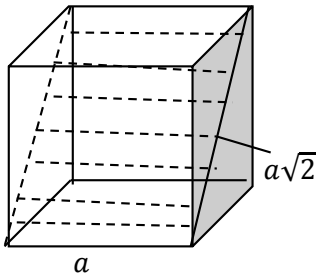
$=> a^3 = 216 => a^3 = 6^3 => a = 6.$

Javobi: A.

63. Kubning ikkita qarama – qarshi yoqlarining diagonallari orqali o‘tkazilgan kesimning yuzi $16\sqrt{2}$ ga teng. Kubning qirrasini aniqlang.

A) 4 B) $2\sqrt{2}$ C) $4\sqrt{2}$

D) 8 E) $2\sqrt{3}$

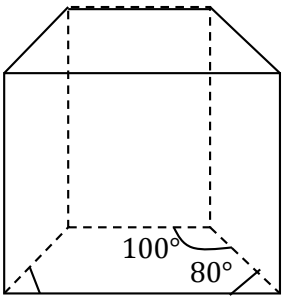


Yechilishi: $16\sqrt{2} = a \cdot a\sqrt{2} =>$

$=> a^2 = 16 => a = 4.$

Javobi: A.

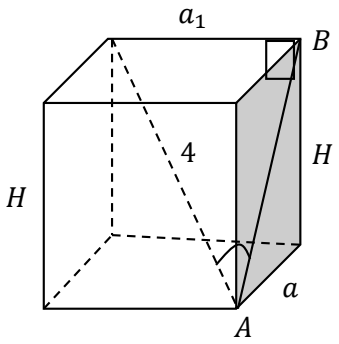
64. To‘g‘ri prizmaning asosi burchaklaridan biri 80° bo‘lgan teng yonli trapetsiyadan iborat. Prizmaning yon yoqlari hosil qiladigan eng katta ikki yoqli burchakni aniqlang.



A) 100° B) 80° C) 120°
D) 90° E) 150°

Yechilishi: To‘g‘ri prizmaning yon yoqlari orasidagi burchaklar, asosidagi burchaklariga teng.
Shuning uchun eng katta burchak $\alpha = 180° - 80° = 100°$.
Javobi: A.

65. Muntazam to‘rtburchakli prizmaning diagonali 4 ga teng bo‘lib, yon yog‘i bilan 30° li burchak tashkil qiladi. Prizmaning yon sirtini toping.



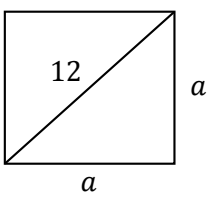
A) $16\sqrt{2}$ B) 16 C) 18
D) $18\sqrt{2}$ E) $14\sqrt{2}$

Yechilishi: $\frac{a}{4} = sin30° => a = 2;$
$\frac{AB}{4} = cos30° => AB = 2\sqrt{3};$
$H^2 = AB^2 - a^2 = 12 - 4 = 8 =>$
$=> H = 2\sqrt{2}.$
$S_{yon} = P_{asos} \cdot H = 8 \cdot 2\sqrt{2} = 16\sqrt{2}.$
Javobi: A.

66. Silindrning o‘q kesimi diagonali 12 ga teng bo‘lgan kvadratdan iborat. Uning hajmini toping.

A) $108\sqrt{2}\pi$ B) $54\sqrt{2}\pi$ C) $36\sqrt{2}\pi$ D) $216\sqrt{2}\pi$
E) $144\sqrt{2}\pi$

Yechilishi: $a\sqrt{2} = 12 =>$
$=> a = \frac{12}{\sqrt{2}} = 6\sqrt{2} => R = 3\sqrt{2}.$



$V = \pi R^2 H = \pi \cdot \left(3\sqrt{2}\right)^2 \cdot 6\sqrt{2} =$

$= \pi \cdot 9 \cdot 2 \cdot 6 \cdot \sqrt{2} = 108\sqrt{2}\pi.$

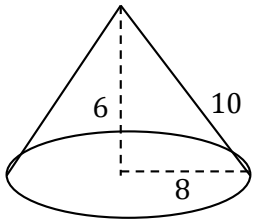
Javobi: A.

67. Katetlari 6 va 8 ga teng bo‘lgan to‘g‘ri burchakli uchburchakning kichik kateti atrofida aylanishidan hosil bo‘lgan jismning to‘la sirtini toping.

A) 144π B) 100π C) 80π D) 150π E) 90π

Yechilishi: $S_T = \pi Rl + \pi R^2 =$

$= \pi \cdot 8 \cdot 10 + \pi \cdot 8^2 = 144\pi.$

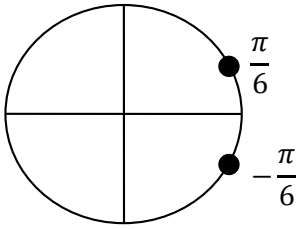


Javobi: A.

68. $2\arcsin\left(-\frac{1}{2}\right) + \frac{1}{2}arccos\frac{\sqrt{3}}{2}$ ni hisoblang.

A) $-\frac{\pi}{4}$ B) $\frac{\pi}{6}$ C) 0 D) $\frac{\pi}{3}$ E) $-\frac{\pi}{3}$

Yechilishi: $\boxed{\begin{matrix} -\frac{\pi}{2} \le arc\sin a \le \frac{\pi}{2} \\ 0 \le arc\cos a \le \pi \end{matrix}}$



$2arc\sin\left(-\frac{1}{2}\right) + \frac{1}{2}arc\cos\frac{\sqrt{3}}{2} =$

$= 2 \cdot \left(-\frac{\pi}{6}\right) + \frac{1}{2} \cdot \frac{\pi}{6} = -\frac{\pi}{3} + \frac{\pi}{12} = \frac{-4\pi+\pi}{12} = -\frac{3\pi}{12} = -\frac{\pi}{4}.$

Javobi: A.

69. $sin202°30'$ ni hisoblang.

A) $-\frac{\sqrt{2-\sqrt{2}}}{2}$ B) $-\frac{\sqrt{2+\sqrt{2}}}{2}$ C) $\frac{\sqrt{2-\sqrt{2}}}{2}$ D) $-\frac{\sqrt{2}}{4}$

E) $\sqrt{2} - 1$

Yechilishi: $\sin 202°30' = \sin(180° + 22°30') =$

$= -\sin 22°30' = -\sin\frac{\pi}{8} = -\sqrt{\frac{1}{2}\left(1 - \cos\frac{\pi}{4}\right)} =$

$= -\sqrt{\frac{1}{2}\left(1 - \frac{\sqrt{2}}{2}\right)} = -\sqrt{\frac{2-\sqrt{2}}{4}} = -\frac{1}{2}\sqrt{2-\sqrt{2}}.$

Javobi: A.

70. $y = 2sin\frac{x}{3}$ funksiya grafigining $M(\frac{3\pi}{2}; 2)$ nuqtasiga o‘tkazilgan urinmaning tenglamasini yozing.

A) $y=2$ B) $y-1=0$ C) $y=x$
D) $y=x-2$ E) $y=-2x$

Yechilishi: $y=2\sin\frac{1}{3}x$; $x_0=\frac{3\pi}{2}$; $y_0=2$;

$y'=\frac{2}{3}\cos\frac{1}{3}\cdot x \Rightarrow k=\frac{2}{3}\cos\frac{1}{3}\cdot\frac{3\pi}{2}=0$;

$y-2=0\left(x-\frac{3\pi}{2}\right) \Rightarrow y=2.$

Javobi: A.

71. $y=3\sin(2x+\frac{\pi}{4})$ funksiya $[0;2\pi]$ kesmada nechta nollarga ega bo‘ladi?

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

Yechilishi: $y=3\sin(2x+\frac{\pi}{4})$; $y=0$; $[0;2\pi]$

$\Rightarrow 3\sin\left(2x+\frac{\pi}{4}\right)=0 \Rightarrow 2x+\frac{\pi}{4}=\pi n \Rightarrow$

$\Rightarrow x=-\frac{\pi}{8}+\frac{\pi}{2}n \quad n=1 \Rightarrow$

$\Rightarrow x=-\frac{\pi}{8}+\frac{\pi}{2}\in[0;2\pi] \quad n=2; \quad n=3; \quad n=4.$

Javobi: A.

72. $y=\frac{2\cos^2 x+sin2x}{2\sin^2 x}$ funksiyaning eng kichik qiymatini toping.

A) $-\frac{1}{4}$ B) $\frac{1}{4}$ C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) 1

Yechilishi: $y=\frac{2\cos^2 x+sin2x}{2\sin^2 x}=\frac{2\cos^2 x}{2\sin^2 x}+\frac{2\sin x\cos x}{2\sin^2 x}=$

$=ctg^2x+ctgx;$

$y'=-2ctgx\cdot\frac{1}{\sin^2 x}-\frac{1}{\sin^2 x}=-\frac{1}{\sin^2 x}(2ctgx+1) \Rightarrow$

$\Rightarrow -\frac{1}{\sin^2 x}(2ctgx+1)=0 \Rightarrow \frac{1}{\sin^2 x}\neq 0 \Rightarrow x\neq\pi n;$

$2ctgx=-1 \Rightarrow ctgx=-\frac{1}{2} \Rightarrow$

$\Rightarrow x=\left(\pi-arc\ ctg\frac{1}{2}\right)+k\pi;$

$y=\left[ctg\left(\pi-arc\ ctg\frac{1}{2}\right)\right]^2+ctg\left(\pi-arc\ ctg\frac{1}{2}\right)=$

$= \left[-ctg\ arc\ ctg\frac{1}{2}\right]^2 - ctg\ arc\ ctg\frac{1}{2} = \left[-\frac{1}{2}\right]^2 - \frac{1}{2} =$
$= \frac{1}{4} - \frac{1}{2} = \frac{1-2}{4} = -\frac{1}{4}.$
Javobi: A.

73. $y = arcsin\frac{x^3}{8}$ funksiyaning aniqlanish sohasini toping.

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

Yechilishi: $y = arc\sin\frac{x^3}{8}$; $-\frac{\pi}{2} \le arc\sin x \le \frac{\pi}{2}$;
$-\frac{\pi}{2} \le arcsin\frac{x^3}{8} \le \frac{\pi}{2} =>$
$=> \sin\left(-\frac{\pi}{2}\right) \le sinarcsin\frac{x^3}{8} \le sin\frac{\pi}{2} =>$
$=> -1 \le \frac{x^3}{8} < 1 => -8 \le x^3 \le 8 =>\ x \in [-2;2].$
Javobi: A.

74. $\arcsin(\log_3 x) > 0$ tengsizlikni yeching.

A) $(1;3]$ B) $(-1;1)$ C) $[1;\infty)$ D) $(3;\infty)$
E) $(1;3)$

Yechilishi: $arc\sin(\log_3 x) > 0$; $-\frac{\pi}{2} \le arc\sin x \le \frac{\pi}{2} =>=$
$> 0 < arc\sin(\log_3 x) \le \frac{\pi}{2} =>$
$=> \sin 0 < \sin arc\sin(\log_3 x) \le \sin\frac{\pi}{2} =>$
$=> 0 < \log_3 x \le 1 => \begin{cases}\log_3 x > 0\\ \log_3 x \le 1\end{cases} =>$
$=> \begin{cases}x > 1\\ x \le 3\end{cases} => (1;3].$
Javobi: A.

75. $y = sin2x,\ y = 0,\ x = 0$ va $x = \frac{\pi}{2}$ chiziqlar bilan chegaralangan figuraning yuzini hisoblang.

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

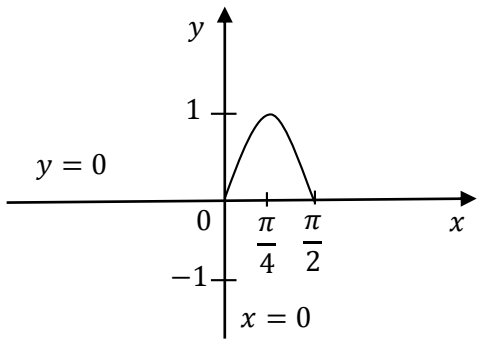
Yechilishi: $y = sin2x,\ y = 0,\ x = 0;\ \ x = \frac{\pi}{2}$.

$$S = \int_0^{\frac{\pi}{2}} \sin 2x\, dx =$$

$$= \frac{1}{2}(-\cos 2x)\Big|_0^{\frac{\pi}{2}} =$$

$$= -\frac{1}{2}\left[\cos 2 \cdot \frac{\pi}{2} - \cos 0\right] =$$

$$= -\frac{1}{2}[-1 - 1] = 1.$$



Javobi: A.

76. $\frac{\sin^2 2{,}5a - \sin^2 5a}{sin4asina + cos3acos2a}$ ni soddalashtiring.

A) $2tg2a$ B) $tg2a \cdot tga$ C) $2sin2a$

D) $4\cos^2 a$ E) $4\sin^2 a$

Yechilishi: $\frac{\sin^2 2{,}5\alpha - \sin^2 1{,}5\alpha}{\sin 4\alpha \cdot \sin\alpha + \cos 3\alpha \cdot \cos 2\alpha} =$

$$= \frac{\left(\sin\frac{5\alpha}{2} - \sin\frac{3\alpha}{2}\right)\cdot\left(\sin\frac{5\alpha}{2} + \sin\frac{3\alpha}{2}\right)}{2\sin 2\alpha\cos 2\alpha\sin\alpha + (\cos 2\alpha\cos\alpha - \sin 2\alpha\sin\alpha)\cos 2\alpha} =$$

$$= \frac{2\cos\frac{\frac{5\alpha}{2}+\frac{3\alpha}{2}}{2}\sin\frac{\frac{5\alpha}{2}-\frac{3\alpha}{2}}{2}\cdot 2\sin\frac{\frac{5\alpha}{2}+\frac{3\alpha}{2}}{2}\cos\frac{\frac{5\alpha}{2}-\frac{3\alpha}{2}}{2}}{\cos 2\alpha(2\sin 2\alpha\sin\alpha + \cos 2\alpha\cos\alpha - \sin 2\alpha\sin\alpha)} =$$

$$= \frac{2\cos 2\alpha\sin\frac{\alpha}{2}\cdot 2\sin 2\alpha\cos\frac{\alpha}{2}}{\cos 2\alpha(\cos 2\alpha\cos\alpha + \sin 2\alpha\sin\alpha)} = \frac{2\sin 2\alpha\sin\alpha}{\cos\alpha} =$$

$$= 2\sin 2\alpha \cdot tg\alpha = 2 \cdot \frac{2tg\alpha}{1+tg^2\alpha} \cdot tg\alpha = \frac{4tg^2\alpha}{1+tg^2\alpha} =$$

$$= \frac{4\cdot\frac{\sin^2\alpha}{\cos^2\alpha}}{\frac{1}{\cos^2\alpha}} = 4\sin^2\alpha.$$

Javobi: E.

77. $2^{-1+sinx-\sin^2 x+\cdots} = \frac{1}{4}$ tenglamani yeching.

A) $(-1)^n \cdot \frac{\pi}{3} + \pi n, n \in Z$

B) $(-1)^{n+1} \cdot \frac{\pi}{6} + \pi n, n \in Z$

C) $(-1)^n \cdot \frac{\pi}{6} + \pi n, n \in Z$

D) $(-1)^{n+1}\cdot\frac{\pi}{4}+\pi n, n\in Z$

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

Yechilishi: $2^{-1+\sin x-\sin^2 x+\cdots}=\frac{1}{4}=>$

$=> 2^{-1+\sin x-\sin^2 x+\cdots}=2^{-2}=>$

$=> -1+\sin x-\sin^2 x+\cdots=-2;$

$\sin x-\sin^2 x+\cdots=-1=>$

$=> b_1=\sin x,\ \ q=-\sin x,\ \ \ S=-1.$

$S=\frac{b_1}{1-q}=> -1=\frac{sinx}{1+sinx}=> -1-sinx=sinx=>$

$=> 2sinx=-1=> sinx=-\frac{1}{2}=>$

$=> x=(-1)^{k+1}\frac{\pi}{6}+n\pi,\ \ n\in Z.$

Javobi: B.

78. $y=\frac{\arccos(x-2)+\sqrt{9-x^2}}{\log_3(5-2x)}$ funksiyaning aniqlanish sohasiga tegishli butun sonlar nechta?

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

E) $Bunday\ sonlar\ yo'q$

Yechilishi: $y=\frac{\arccos(x-2)+\sqrt{9-x^2}}{\log_3(5-2x)}$

1) $0\le\arccos(x-2)\le\pi=>$

$=> cos0\ge cosarccos(x-2)\ge cos\pi=>$

$=> 1\ge(x-2)\ge-1=> -1\le x-2\le 1=>$

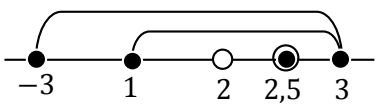
$=> 1\le x\le 3;$

2) $9-x^2\ge 0=> x^2\le 9=> |x|\le 3=>$

$=> -3\le x\le 3;$

3) $\log_3(5-2x)=>\begin{cases}5-2x>0\\5-2x\ne 1\end{cases}=>\begin{cases}x<2{,}5\\x\ne 2\end{cases}$

1), 2) va 3) dan



$[1;2)\cup(2;2{,}5)=> x=1.$

Javobi: D.

79. $17{,}556 : 5{,}7 \leq y < 31{,}465 : 3{,}5$ tengsizlik nechta natural yechimga ega?

A) 1 B) 2 C) 4 D) 5 E) 6

Yechilishi: $17{,}556 : 5{,}7 \leq y < 31{,}465 : 3{,}5$

$\frac{17556}{5700} \leq y < \frac{31465}{3500} \Rightarrow 3{,}08 \leq y < 8{,}99$

$y = \underbrace{4,5,6,7,8}_{5\ ta}$.

Javobi: D.

80. $\sin^2 x + \cos^2 x + \mathrm{tg}^2 x$ ni soddalashtiring.

A) $-\frac{1}{\cos^2 x}$ B) $-\frac{1}{\sin^2 x}$ C) $\frac{1}{\sin^2 x}$

D) $\frac{1}{cosx}$ E) $\frac{1}{\cos^2 x}$

Yechilishi: $\sin^2 x + \cos^2 x + \mathrm{tg}^2 x = 1 + \mathrm{tg}^2 x = \frac{1}{\cos^2 x}$.

Javobi: E.

Pirnazar DAVRONOV

1999-YIL, 9-AXBOROTNOMA

1. $\frac{1{,}28\cdot 6{,}4\cdot 0{,}32}{0{,}512} - 1\frac{1}{5}$ ni hisoblang.

A) 4,92 B) 4,9 C) 3,92 D) 3,82 E) 4,82

Yechilishi: $\frac{1{,}28\cdot 6{,}4\cdot 0{,}32}{0{,}512} - 1\frac{1}{5} = 5{,}12 - 1{,}2 = 3{,}92.$

Javobi: C.

2. Agar $a = 27$ bo‘lsa, $\left(\frac{a-b}{\sqrt[3]{a}-\sqrt[3]{b}} + \sqrt[3]{ab}\right) : \left(\sqrt[3]{a} + \sqrt[3]{b}\right) +$

$+\left(\sqrt[3]{a^2} - \sqrt[3]{b^2}\right) : \left(\sqrt[3]{a} + \sqrt[3]{b}\right)$ ning qiymatini hisoblang.

A) 4 B) 4,5 C) 5 D) 6 E) 6,5

Yechilishi: $a = 27.$

$$\left(\frac{a-b}{\sqrt[3]{a}-\sqrt[3]{b}} + \sqrt[3]{ab}\right) : \left(\sqrt[3]{a} + \sqrt[3]{b}\right) + \left(\sqrt[3]{a^2} - \sqrt[3]{b^2}\right) :$$

$$: \left(\sqrt[3]{a} + \sqrt[3]{b}\right) = \left[\frac{\left(\sqrt[3]{a}\right)^3 - \left(\sqrt[3]{b}\right)^3}{\sqrt[3]{a}-\sqrt[3]{b}} + \sqrt[3]{ab}\right] : \left(\sqrt[3]{a} + \sqrt[3]{b}\right) +$$

$$+ \left[\left(\sqrt[3]{a}\right)^2 - \left(\sqrt[3]{b}\right)^2\right] : \left(\sqrt[3]{a} + \sqrt[3]{b}\right) =$$

$$= \left[\frac{\left(\sqrt[3]{a}-\sqrt[3]{b}\right)\left[\left(\sqrt[3]{a}\right)^2 + \sqrt[3]{a}\cdot\sqrt[3]{b} + \left(\sqrt[3]{b}\right)^2\right]}{\sqrt[3]{a}-\sqrt[3]{b}} + \sqrt[3]{ab}\right] : \left(\sqrt[3]{a} + \sqrt[3]{b}\right) +$$

$$+ \frac{\left(\sqrt[3]{a}-\sqrt[3]{b}\right)\left(\sqrt[3]{a}+\sqrt[3]{b}\right)}{\sqrt[3]{a}+\sqrt[3]{b}} = \left[\left(\sqrt[3]{a}\right)^2 + 2\sqrt[3]{a}\cdot\sqrt[3]{b} + \left(\sqrt[3]{b}\right)^2\right]:$$

$$: \left(\sqrt[3]{a} + \sqrt[3]{b}\right) + \sqrt[3]{a} - \sqrt[3]{b} = \frac{\left(\sqrt[3]{a}+\sqrt[3]{b}\right)^2}{\sqrt[3]{a}+\sqrt[3]{b}} + \sqrt[3]{a}. - \sqrt[3]{b} =$$

$$= \sqrt[3]{a} + \sqrt[3]{b} + \sqrt[3]{a} - \sqrt[3]{b} = 2\sqrt[3]{a} = 2\cdot\sqrt[3]{3^3} = 6.$$

Javobi: D.

3. Toshkentga kelgan sayyohlarning 75% i ingliz tilini, 47%i esa fransuz tilini biladi. Shu sayyohlardan 22 tasi ikkala tilni

ham biladi. Agar sayyohlar ingliz tili va fransuz tilidan boshqa tilni ham bilishmasa, ularning umumiy soni qancha?

A) 105 B) 100 C) 90 D) 120 E) 85

Yechilishi: $0{,}75x + 0{,}47x - 22 = x \Rightarrow$

$\Rightarrow 1{,}22x - x = 22 \Rightarrow 0{,}22x = 22 \Rightarrow x = 100.$

Javobi: B.

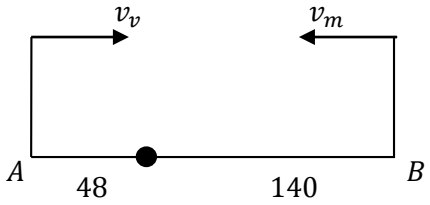
4. A va B shaharlar orasidagi masofa 188 km. Bir vaqtning o‘zidan bir-biriga qarab A shahardan velosapedchi, B shahardan mototsiklchi yo‘lga tushdi va ular A shahardan 48 km masofada uchrashishdi. Agar velosipedchining tezligi 12 km/soat bo‘lsa, mototsiklchining tezligini toping.

A) 45 B) 42 C) 30 D) 32 E) 35

Yechilishi: $\begin{cases} 48 = v_v \cdot t \\ 140 = v_m \cdot t \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 48 = 12 \cdot t \\ 140 = v_m \cdot t \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} t = 4 \\ v_m = 35. \end{cases}$



Javobi: E.

5. Mahsulotning bozordagi narxi uning tannarxidan 20% ga qimmat. Bozorda mahsulot yaxshi sotilmagani uchun uning sotuvdagi narxi 5% kamaytirildi. Shundan keyin uning narxi 285 so‘mga teng bo‘ldi. Mahsulotning tannarxini toping.

A) 210 B) 230 C) 250 D) 250 E) 260

Yechilishi: $\begin{matrix} Tannarx - x \\ Bozor\ narxi - 1{,}2x \end{matrix} \Rightarrow$

$\Rightarrow 1{,}2x - 1{,}2x \cdot 0{,}05 = 285 \Rightarrow$

$\Rightarrow 1{,}2x - 0{,}06x = 285 \Rightarrow 1{,}14x = 285 \Rightarrow x = 250.$

Javobi: C.

6. t ning qanday qiymatlarida $x^2 + (t-2)x + 0{,}25 = 0$ tenglamaning ikkala ildizi ham manfiy bo‘ladi?

A) $t < 2$ B) $t < 1$ C) $t > 2$ D) $t \leq 1$ E) $t > 3$

Yechilishi: $x^2 + (t-2)x + 0{,}25 = 0 \Rightarrow$

$\Rightarrow \begin{cases} b > 0 \\ c > 0 \end{cases} \Rightarrow t - 2 > 0 \Rightarrow t > 2 \Rightarrow t = 3 \Rightarrow$

$\Rightarrow D = 0 \Rightarrow t > 3.$

Javobi: E.

7. $\frac{(x+3)(x-7)}{2x^2-x+4} < 0$ tengsizlikning eng katta va eng kichik butun yechimlari ayirmasini toping.

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

Yechilishi: $\frac{(x+3)(x-7)}{2x^2-x+4} < 0$

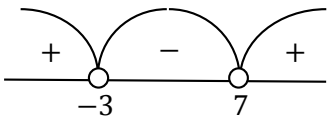
1) $2x^2 - x + 4 = 0 \Rightarrow x_{1,2} = \frac{1 \pm \sqrt{1-4\cdot 2\cdot 4}}{2\cdot 2} = \frac{1 \pm \sqrt{-31}}{4} \Rightarrow$

$\Rightarrow D < 0 \Rightarrow 2x^2 - x + 4 > 0 \Rightarrow$

$\Rightarrow (x+3)(x-7) < 0.$

2) $\begin{cases} x + 3 = 0 \\ x - 7 = 0 \end{cases} \Rightarrow \begin{cases} x = -3 \\ x = 7 \end{cases} \Rightarrow (-3; 7) \Rightarrow$

$\Rightarrow \begin{cases} x_1 = 6 \\ x_2 = -2 \end{cases} \Rightarrow x_1 - x_2 = 8.$



Javobi: C.

8. Agar $n - m = (a-2)^2, p - n = (b-3)^2$ va $m - p = (c-4)^2$ bo‘lsa, $a + b + c$ yig‘indi nechaga teng bo‘ladi?

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

Yechilishi: $\begin{cases} n - m = (a-2)^2 \\ p - n = (b-3)^2 \\ m - p = (c-4)^2 \end{cases} \Rightarrow$

$\Rightarrow (a-2)^2 + (b-3)^2 + (c-4)^2 = 0 \Rightarrow$

$\Rightarrow \begin{cases} a - 2 = 0 \\ b - 3 = 0 \\ c - 4 = 0 \end{cases} \Rightarrow \begin{cases} a = 2 \\ b = 3 \\ c = 4 \end{cases} \Rightarrow a + b + c = 9.$

Javobi: E.

9. $x^{12}-1$ ni ko‘paytuvchilarga ajratganda, nechta ratsional ko‘paytuvchidan iborat bo‘ladi?

A) 4 B) 5 C) 6 D) 8 E) 7

Yechilishi: $x^{12}-1=(x^6)^2-1^2=(x^6-1)\cdot(x^6+1)=$
$=[(x^3)^2-1^2]\cdot[(x^2)^3+1^3]=$
$=(x^3-1)\cdot(x^3+1)\cdot(x^2+1)\cdot(x^4-x^2+1)=$
$=(x-1)\cdot(x^2+x+1)\cdot(x+1)\cdot(x^2-x+1)\cdot$
$\cdot(x^2+1)\cdot(x^4-x^2+1).$

Javobi: C.

10. $\frac{x^2+2x+8}{x^2+2x+3}$ ifodaning eng katta qiymatini toping.

A) 3,5 B) 2,6 C) 2,4 D) 2,8 E) 3

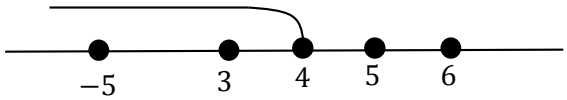
Yechilishi: $\frac{x^2+2x+8}{x^2+2x+3}=\frac{(x+1)^2+7}{(x+1)^2+2}=3{,}5.$

Javobi: A.

11. $(x^2-25)(x-3)(x-6)\sqrt{4-x}=0$ tenglama ildizlarining o‘rta arifmetigini toping.

A) $4\frac{1}{3}$ B) $1\frac{1}{3}$ C) $\frac{2}{3}$ D) $4\frac{1}{2}$ E) 2

Yechilishi: $(x^2-25)(x-3)(x-6)\sqrt{4-x}=0 \Rightarrow$
$x_1=-5;\ x_2=5;\ x_3=3;\ x_4=6;\ x_5\le 4.$



$\frac{-5+3+4}{3}=\frac{2}{3}.$ Javobi: C.

12. $\sqrt{x^2+77}-2\sqrt[4]{x^2+77}-3=0$ tenglama ildizlarining ko‘paytmasini toping.

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

Yechilishi: $\sqrt{x^2+77}-2\sqrt[4]{x^2+77}-3=0$
$\left(\sqrt[4]{x^2+77}\right)^2-2\sqrt[4]{x^2+77}-3=0$
$\sqrt[4]{x^2+77}=y$

$y^2 - 2y - 3 = 0 => y_{1,2} = 1 \pm \sqrt{1+3} =$

$= 1 \pm 2 => \begin{cases} y_1 = -1 \\ y_2 = 3. \end{cases}$

$\sqrt[4]{x^2+77} \neq -1$

$\sqrt[4]{x^2+77} = 3 => x^2 + 77 = 81 => x^2 = 4 =>$

$=> x_{1,2} = \pm 2 => \begin{cases} x_1 = -2 \\ x_2 = 2 \end{cases} => x_1 \cdot x_2 = -4.$

Javobi: D.

13. $y = \sqrt{3}x + 2$ va $-x + 2$ to‘g‘ri chiziqlarning kesishishidan hosil bo‘lgan o‘tkir burchakni toping.

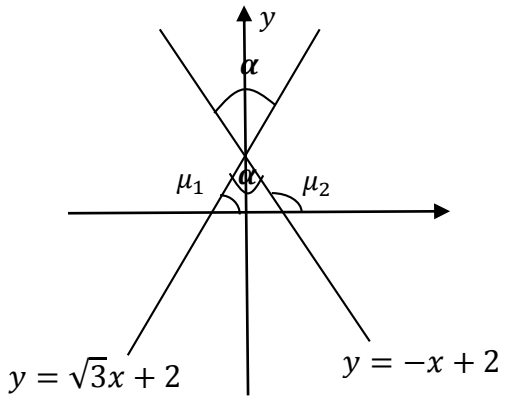
A) 65° B) 75° C) 60° D) 85° E) 55°

Yechilishi: $y = \sqrt{3}x + 2;\ \ y = -x + 2 =>$

$=> \begin{cases} k_1 = \sqrt{3} \\ k_2 = -1 \end{cases} =>$

$=> \begin{cases} tg\varphi_2 = -1 \\ tg\varphi_1 = \sqrt{3} \end{cases} =>$

$=> \begin{cases} \varphi_2 = 135°; \\ \varphi_1 = 60°. \end{cases}$



Qo‘shni burchaklar inobatga olinsa $\alpha + 45° + 60° =$ $180° => \alpha = 75°.$

Javobi: B.

14. Agar $a > 0$ bo‘lsa, $y = x^2 - 2x - a$ parabolaning uchi koordinatalar tekisligining qaysi choragida joylashadi?

A) I B) II C) III D) IV E) $aniqlab\ bo'lmaydi$

Yechilishi: $a > 0;\ \ y = x^2 - 2x - a;$

$a = 1;\ b = -2;\ c = -a$

$x = -\frac{-2}{2 \cdot 1} = 1;\ \ y = -\frac{b^2 - 4ac}{4a} = -\frac{(-2)^2 - 4 \cdot 1 \cdot (-a)}{4 \cdot 1} =$

$= -\frac{4 + 4a}{4} = -(1 + a).$

Javobi: D.

15. Quyidagi porabolalardan qaysi biri OX o‘qi bilan kesishadi?

1) $y = 2x^2 - 5x + 8$; 2) $y = -2x^2 - 8x - 8$;
3) $y = x^2 - 3x - 8$; 4) $y = -3x^2 + 6x - 12$.
A) 1 B) 2 C) 3 D) 4 E) $hech\ qaysisi$
Yechilishi: 1) $y = 2x^2 - 5x + 8 =>$
$=> D = (-5)^2 - 4 \cdot 2 \cdot 8 = 25 - 64 < 0$;
2) $y = -2x^2 - 8x - 8 =>$
$=> D = (-8)^2 - 4 \cdot (-2)(-8) = 64 - 64 = 0$;
3) $y = x^2 - 3x - 8 => D = (-3)^2 - 4 \cdot 1 \cdot (-8) =$
$= 9 + 32 > 0$;
4) $y = -3x^2 + 6x - 12 => D = 6^2 - 4 \cdot (-3)(-12) =$
$= 36 - 144 < 0$;
Javobi: C.

16. k ning qanday qiymatida $\begin{cases} 3x + 6y = k, \\ 9x + 18y = k + 1 \end{cases}$ sistemasi cheksiz ko‘p yechimga ega?

A) $\frac{1}{3}$ B) 1 C) $\frac{1}{2}$ D) $\frac{2}{3}$ E) $\frac{4}{5}$
Yechilishi: $\begin{cases} 3x + 6y = k, \ / \ 3 \\ 9x + 18y = k + 1 \end{cases} =>$
$=> \begin{cases} 9x + 18y = 3k \\ 9x + 18y = k + 1 \end{cases} => \frac{9}{9} = \frac{18}{18} = \frac{3k}{k+1} =>$
$=> 3k = k + 1 => k = \frac{1}{2}$. Javobi: C.

17. a ning qanday qiymatlarida $ax^2 + 8x + a < 0$ tengsizlik x ning barcha qiymatlarida o‘rinli bo‘ladi?

A) $(0; 4)$ B) $(4; 0)$ C) $(-4; 4)$ D) $(-\infty; -4)$
E) $(4; \infty)$
Yechilishi: $ax^2 + 8x + a < 0 => a \neq 0; D > 0$;
$D = 64 - 4 \cdot a^2 > 0 = 4a^2 - 64 < 0 =>$
$=> a^2 - 16 < 0 => (a - 4)(a + 4) < 0 =>$
$=> a \in (-4; 4)$. Javobi: C.

18. $|x-4| \le 12$ tengsizlikning eng kichik va eng katta butun yechimlari yig‘indisini toping.

A) 6 B) 8 C) -6 D) -8 E) 10

Yechilishi: $|x-4| \le 12 => -12 \le x-4 =\le 12 =>$
$=> -12+4 \le x \le 12+4 => -8 \le x \le 16 =>$
$=> -8+16 = 8.$

Javobi: B.

19. $\left(\frac{1}{a(a+1)} + \frac{1}{(a+1)(a+2)}\right) \cdot \frac{a^2+2a}{8}$ ni soddalashtiring.

A) $\frac{1}{6}$ B) $\frac{1}{8}$ C) $\frac{3}{4}$ D) $\frac{1}{4}$ E) $\frac{5}{8}$

Yechilishi: $\left[\frac{a+2/1}{a(a+1)} + \frac{a/1}{(a+1)(a+2)}\right] \cdot \frac{a^2+2a}{8} =$

$= \frac{a+2+a}{a(a+1)(a+2)} \cdot \frac{a^2+2a}{8} = \frac{2(a+1)}{8(a+1)} = \frac{1}{4}.$

Javobi: D.

20. $x^2+px+q=0$ tenglamaning ildizlari $x^2-3x+2=0$ tenglamaning ildizlaridan ikki marta katta. $p+q$ ning qiymatini toping.

A) 14 B) 2 C) -2 D) -14 E) 10

Yechilishi: $x^2+px+q=0 => \begin{cases} x_1+x_2=-p; \\ x_1 \cdot x_2 = q. \end{cases}$ $=>$

$x^2-3x+2=0 => \begin{cases} x_1=1; \\ x_2=2. \end{cases}$

$=> \begin{cases} 2x_1=2; \\ 2x_2=4. \end{cases}$

$\begin{cases} 2+4=-p \\ 4 \cdot 1 \cdot 2 = q \end{cases} => \begin{cases} p=-6 \\ q=8 \end{cases} => p+q=2.$

Javobi: B.

21. $[0;3]$ oraliqdagi maxraji 3 ga teng bo‘lgan barcha qisqarmaydigan kasrlarning yig‘indisini toping.

A) $8\frac{1}{3}$ B) $8\frac{2}{3}$ C) $7\frac{1}{3}$ D) 9 E) 8

Yechilishi: $\frac{0}{3};\frac{1}{3};\frac{2}{3};\frac{3}{3};\frac{4}{3};\frac{5}{3};\frac{6}{3};\frac{7}{3};\frac{8}{3};\frac{9}{3} =>$

$=> \frac{1}{3}+\frac{2}{3}+\frac{4}{3}+\frac{5}{3}+\frac{7}{3}+\frac{8}{3}=\frac{1+2+4+5+7+8}{3}=9.$

Javobi: D.

22. $\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+\cdots+\frac{1}{\sqrt{9}+\sqrt{8}}$ ni hisoblang.

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

Yechilishi: $\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+\cdots+\frac{1}{\sqrt{9}+\sqrt{8}}=$

$=\frac{\sqrt{2}-1}{2-1}+\frac{\sqrt{3}-\sqrt{2}}{3-2}+\frac{\sqrt{4}-\sqrt{3}}{4-3}+\cdots+\frac{\sqrt{8}-\sqrt{7}}{8-7}+\frac{\sqrt{9}-\sqrt{8}}{9-8}=$

$=\sqrt{2}-1+\sqrt{3}-\sqrt{2}+\sqrt{4}-\sqrt{3}+\cdots+\sqrt{8}-\sqrt{7}+$

$+\sqrt{9}-\sqrt{8}=-1+\sqrt{9}=3-1=2.$

Javobi: A.

23. Agar $a^2+b^2+ab=91$ va $a^2+b^2=61$ bo‘lsa, $|a+b|$ ning qiymati nechaga teng bo‘ladi?

A) 10 B) 9 C) 11 D) 12 E) 13

Yechilishi: $\begin{matrix} a^2+b^2+ab=91 \\ a^2+b^2=61 \end{matrix} => ab=30.$

$|a+b|^2=a^2+2ab+b^2=61+2\cdot 30=121.$

$|a+b|=11.$

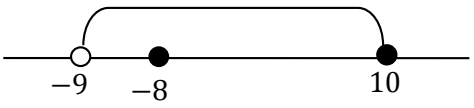
Javobi: C.

24. $\begin{cases} 2x-3\le 17, \\ 14+3x>-13 \end{cases}$ tengsizlikning eng katta butun yechimi eng kichik butun yechimidan qanchaga katta?

A) 17 B) 19 C) 16 D) 12 E) 18

Yechilishi: $\begin{cases} 2x-3\le 17, \\ 14+3x>-13 \end{cases} => \begin{cases} 2x\le 20 \\ 3x>-27 \end{cases} =>$

$=> \begin{cases} x\le 10 \\ x>9 \end{cases} => -9<x\le 10.$



$10-(-8)=18.$

Javobi: E.

25. $\sqrt{a^2(3-a)}$ va $a\sqrt{3-a}$ ifodalar qaysi oraliqda aynan teng bo‘ladi?

A) $[0;\infty)$ B) $[3;\infty)$ C) $(0;3)$ D) $[0;3]$ E) $[0;3)$

Yechilishi: 1) $\sqrt{a^2(3-a)} => |a|\sqrt{3-a} =>$

$=> \begin{cases} -a\sqrt{3-a} \\ a\sqrt{3-a} \end{cases} => -a = a => 0.$

2) $a\sqrt{3-a} => 3-a \geq 0 => a \leq 3;$

1) va 2) dan $[0;3]$. Javobi: D.

26. Arifmetik progressiyada $a_2 - a_1 = 6$ bo‘lsa, $a_8 - a_6$ ning qiymati nechaga teng bo‘ladi?

A) 10 B) 12 C) 9 D) 18 E) 14

Yechilishi: $a_2 - a_1 = 6 => a_1 + d - a_1 = 6 => d = 6;$

$a_8 - a_6 = a_1 + 7d - a_1 - 5d = 2d = 12.$

Javobi: B.

27. $M = sin72°, N = cos220°$ va $Q = ctg184°sin4°$ sonlarni kamayish tartibida yozing.

A) $N > Q > M$ B) $N > M > Q$

C) $Q > M > N$ D) $Q > N > M$

E) $M > N > Q$

Yechilishi: $M = sin72°;$

$N = \cos(180° + 40°) = -cos40°;$

$Q = ctg184°sin4° = ctg(180° + 4°)sin4° =$

$= ctg4°sin4° = \frac{cos4°}{sin4°} \cdot sin4° = cos4°;$

$M = \sin(90 - 18°) = cos18°.$ $Q > M > N$

Javobi: C.

28. $\sqrt{\frac{1+\sin\left(\frac{3\pi}{2}+\alpha\right)}{1+\sin\left(\frac{\pi}{2}+\alpha\right)}}$ ni soddalashtiring.

A) $tg\frac{\alpha}{2}$ B) $ctg\frac{\alpha}{2}$ C) $-tg\frac{\alpha}{2}$ D) $-ctg\frac{\alpha}{2}$ E) $\left|tg\frac{\alpha}{2}\right|$

Yechilishi: $\sqrt{\frac{1-cos\alpha}{1+cos\alpha}} = \left|tg\frac{\alpha}{2}\right|$.

Javobi: E.

29. $sin150°$ ning qiymati $cos20° \cdot cos40° \cdot cos80°$ ning qiymatidan qanchaga katta?

A) $\frac{1}{8}$ B) $\frac{5}{8}$ C) $\frac{3}{8}$ D) $\frac{7}{8}$ E) $\frac{1}{4}$

Yechilishi: 1) $sin150° = \sin(90° + 60°) = cos60° = \frac{1}{2}$;

2) $cos20° \cdot cos40° \cdot cos80° =$

$= \frac{1}{2}[\cos(20° - 40°) + \cos(20° + 40°)]cos80° =$

$= \frac{1}{2}\left[cos20° + \frac{1}{2}\right]cos80° = \frac{1}{2}cos80°cos20° + \frac{1}{4}cos80° =$

$= \frac{1}{2} \cdot \frac{1}{2}[\cos(80° - 20°) + \cos(80° + 20°)] + \frac{1}{4}cos80° =$

$= \frac{1}{8} + \frac{1}{4}cos100° + \frac{1}{4}cos80° =$

$= \frac{1}{8} + \frac{1}{4}[cos100° + cos80°] =$

$= \frac{1}{8} + \frac{1}{4} \cdot 2 \cdot cos\frac{180°}{2} \cdot cos10° = \frac{1}{8}$;

3) $\frac{1}{2} - \frac{1}{8} = \frac{3}{8}$. Javobi: C.

30. $\sin^4\alpha + \cos^4\alpha$ ning kichik qiymatini toping.

A) 0 B) 1 C) $\frac{1}{2}$ D) $\frac{3}{4}$ E) $\frac{2}{3}$

Yechilishi: $\sin^4\alpha + \cos^4\alpha = \left[\frac{1}{2}(1 - cos2\alpha)\right]^2 +$

$+\left[\frac{1}{2}(1 + cos2\alpha)\right]^2 = \frac{1}{4}(1 - 2cos2\alpha + \cos^2 2\alpha) +$

$+\frac{1}{4}(1 + 2cos2\alpha + \cos^2 2\alpha) = \frac{1}{4}(2 + 2\cos^2 2\alpha) =$

$= \frac{1}{2}(1 + \cos^2 2\alpha) = \frac{1}{2}$.

Javobi: C.

31. Agar $tg\alpha + ctg\alpha = 4$ bo‘lsa, $sin2\alpha$ ni hisoblang.

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $\frac{2}{3}$ E) $\frac{3}{4}$

Yechilishi: $tg\alpha + ctg\alpha = 4 => \frac{sin\alpha}{cos\alpha} + \frac{cos\alpha}{sin\alpha} = 4 =>$

$=> \frac{1}{sin\alpha cos\alpha} = 4 => 1 = 2 \cdot 2sin\alpha cos\alpha => sin2\alpha = \frac{1}{2}.$

Javobi: A.

32. $\frac{\sqrt{3}cos2\alpha + sin2\alpha}{cos\alpha + \sqrt{3}sin\alpha}$ ni soddalashtiring.

A) $2\cos(\alpha + \frac{\pi}{3})$ B) $\frac{1}{2}\cos(\alpha + \frac{\pi}{6})$

C) $2\cos(\alpha - \frac{\pi}{3})$ D) $\frac{1}{2}\sin(\alpha + \frac{\pi}{6})$

E) $2\cos(\alpha + \frac{\pi}{6})$

Yechilishi: $\frac{\sqrt{3}cos2\alpha + sin2\alpha}{cos\alpha + \sqrt{3}sin\alpha} = \frac{\frac{\sqrt{3}}{2}cos2\alpha + \frac{1}{2}sin2\alpha}{\frac{1}{2}cos\alpha + \frac{\sqrt{3}}{2}sin\alpha} =$

$= \frac{sin2\alpha cos60° + cos2\alpha sin60°}{sin\alpha cos30° + cos\alpha sin30°} = \frac{\sin(2\alpha + 60°)}{\sin(\alpha + 30°)} = \frac{sin2(\alpha + 30°)}{\sin(\alpha + 30°)} =$

$= \frac{2\sin(\alpha + 30°)\cos(\alpha + 30°)}{\sin(\alpha + 30°)} = 2\cos\left(\alpha + \frac{\pi}{6}\right).$

Javobi: E.

33. $\begin{cases} 0 \le x \le \pi, \\ 2\cos^2 x - 1 \ge \frac{1}{2} \end{cases}$ tengsizlikni yeching.

A) $[0; \frac{\pi}{3}]$ B) $\left[0; \frac{\pi}{6}\right] \cup \left[\frac{5\pi}{6}; \pi\right]$

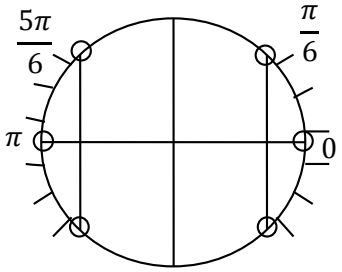
C) $\left[0; \frac{2\pi}{3}\right]$ D) $[\frac{2\pi}{3}; \pi]$ E) $\left[\frac{\pi}{6}; \frac{\pi}{2}\right] \cup \left[\frac{2\pi}{3}; \pi\right]$

Yechilishi: $\begin{cases} 0 \le x \le \pi, \\ 2\cos^2 x - 1 \ge \frac{1}{2} \end{cases} => \cos^2 x \ge \frac{3}{4} =>$

$=> |cosx| \ge \frac{\sqrt{3}}{2} =>$

$=> \begin{cases} cosx \ge \frac{\sqrt{3}}{2} \\ cosx \le -\frac{\sqrt{3}}{2} \end{cases} =>$

$=> \left[0; \frac{\pi}{6}\right] \cup \left[\frac{5\pi}{6}; \pi\right].$



Javobi: B.

34. $tgx - tg\frac{\pi}{3} - tgxtg\frac{\pi}{3} = 1$ tenglamini yeching.

A) $\frac{7\pi}{6} + \pi k, k \in Z$ B) $\frac{5\pi}{6} + 2\pi k, k \in Z$

C) $\frac{7\pi}{12} + 2\pi k, k \in Z$ D) $\frac{7\pi}{12} + \pi k, k \in Z$

E) $\frac{5\pi}{6} + \pi k, k \in Z$

Yechilishi: $tgx - tg\frac{\pi}{3} - tgxtg\frac{\pi}{3} = 1$

$-tg\frac{\pi}{3}(1 + tgx) = 1 - tgx => \frac{1-tgx}{1+tgx} = -\sqrt{3} =>$

$=> tg\left(\frac{\pi}{4} - x\right) = -\sqrt{3} => \frac{\pi}{4} - x = -\frac{\pi}{3} =>$

$=> x = \frac{\pi}{4} + \frac{\pi}{3} = \frac{7\pi}{12} + \pi k.$

Javobi: D.

35. t ning qanday qiymtida $y = 1 - co2x - t(1 + cos2x)$ funksiyaning qiymati o‘zgarmas bo‘ladi?

A) 1 B) 2 C) -2 D) -1 E) $-1{,}5$

Yechilishi: $y = 1 - co2x - t(1 + cos2x) => t = -1.$

Javobi: D.

36. Quyidagi mulohazalardan qaysi biri noto‘g‘ri?

A) $muntazam\ uchburchak\ medianasining\ \frac{1}{3}\ qismi\ unga\ ichki\ chizilgan\ aylananing\ radiusiga\ teng.$

B) $to'g'riburchakli\ uchburchakning\ gipotenuzasiga\ tushirilgan\ medianasi, unga\ tashqi\ chizilgan\ aylananing\ radiusiga\ teng$

C) $muntazam\ oltiburchakning\ katta\ diagonali\ unga\ tashqi\ chizilgan\ aylananing\ deametriga\ teng$

D) $rombning\ diagonallari\ o'zaro\ perpendikulyardir$

E) $o'xshash\ uchburchaklar\ yuzlarining\ nisbati\ ularning\ perimetrlar\ nisbati\ kabidir$

Yechilishi: Javobi: E.

37. O‘tkir burchagi 30° bo‘lgan to‘g‘ri burchakli trapetsiya diametri 8 ga teng aylanaga tashqi chizilgan. Trapetsiyaning yuzini toping.

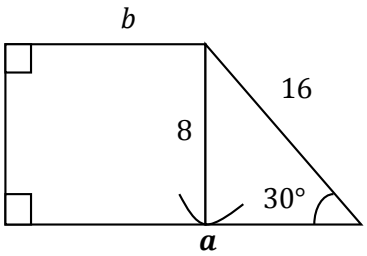
A) 106 B) 98 C) 96 D) 104 E) 94

Yechilishi: $a + b = 16 + 8 =>$

$=> a + 6 = 24;$

$S = \frac{24}{2} \cdot 8 = 96.$

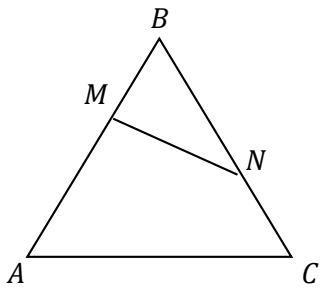
Javobi: C.



38. Shaklga ko‘ra $BM : MA = 3 : 5$ va $BN : NC = 4 : 2$ bo‘lsa, $\triangle ABC$ yuzining $\triangle MBN$ yuziga nisbatini hisoblang.

A) 4: 1 B) 6: 1 C) 3: 2

D) 10: 3 E) 9: 4



Yechilishi: $\frac{BM}{MA} = \frac{3}{5}; \quad \frac{BN}{NC} = \frac{4}{2};$

$\frac{S_{\triangle ABC}}{S_{\triangle} MBN} = \frac{AB \cdot BC}{BM \cdot BN};\ AB = MA + MB = MA + \frac{3}{5}MA = \frac{8}{5}MA$

$BC = BN + NC = 2NC + NC + 3NC$

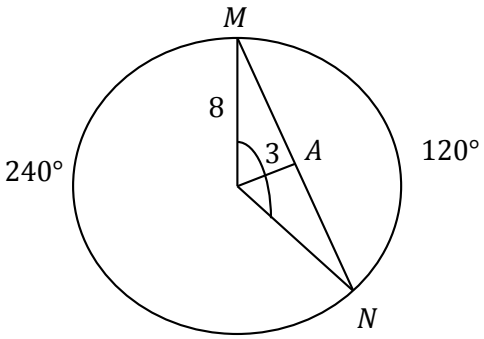
$\frac{S_{\triangle ABC}}{S_{\triangle} MBN} = \frac{\frac{8}{5}MA \cdot 3NC}{\frac{3}{5}MA \cdot 2NC} = \frac{24}{5} : \frac{6}{5} = 4 : 1.$

Javobi: A.

39. MN vatar radiusi 8 ga teng bo‘lgan aylanani bir-biriga teng bo‘lmagan ikkita yoyga ajratadi. Bu vatar kichik yoyning ixtiyoriy nuqtasidan $120°$ li burchak ostida ko‘rinadi. MN vatarning uzunligini toping.

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

Yechilishi: $n° = 120°$;



$\frac{MA}{8} = cos30° =>$

$=> MA = 8 \cdot \frac{\sqrt{3}}{2} = 4\sqrt{3}.$

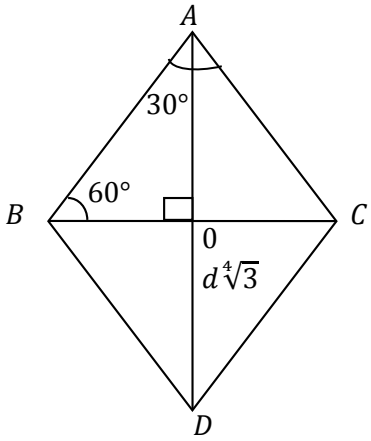
$MN = 8\sqrt{3}.$

Javobi: D.

40. Rombning o‘tmas burchagi $120°$ ga, katta diagonali $d\sqrt[4]{3}$ ga teng. Rombning yuzini hisoblang.

A) $\frac{3}{4}d^2\sqrt{3}$ B) $0{,}6d^2\sqrt{3}$ C) $\frac{3d^2}{4}$

D) $\frac{1}{2}d^2$ E) $0{,}9d^2$



Yechilishi: $S =?$ $\frac{BO}{AO} = tg30° =>$

$=> OB = AO \cdot \frac{\sqrt{3}}{3} =$

$= \frac{d\sqrt[4]{3}}{2} \cdot \frac{\sqrt{3}}{3} = \frac{d\sqrt[4]{3}\sqrt{3}}{6} = \frac{d}{6} \cdot 3^{\frac{1}{4}} \cdot 3^{\frac{1}{2}} =$

$= \frac{d}{6} \cdot 3^{\frac{1}{4}+\frac{1}{2}} = \frac{d}{6} \cdot \sqrt[4]{3^3}.$

$BC = 2 \cdot BO = 2 \cdot \frac{d}{6}\sqrt[4]{3^3} = \frac{d}{3}\sqrt[4]{3^3}.$

$$S = \frac{1}{2} \cdot AD \cdot BC = \frac{1}{2}d\sqrt[4]{3} \cdot \frac{d}{3}\sqrt[4]{3^3} = \frac{1}{2}d^2$$

Javobi: D.

41. $\vec{a}\{2; x; 10\}$ va $\vec{b}\{y; 4; 5\}$ vektorlar kollinear. xy ko‘paytmaning qiymatini toping.

A) 10 B) 4 C) 12 D) 6 E) 8

Yechilishi: $\frac{2}{y} = \frac{x}{4} = \frac{10}{5} =>$ $\begin{cases} y = 1 \\ x = 8 \end{cases} => x \cdot y = 8.$

Javobi: E.

42. $\vec{m}, \vec{n}$ va $\vec{p}$ birlik vektorlar berilgan. Agar $\vec{m} \perp \vec{n}$ va $\vec{n} \perp \vec{p}$ bo‘lib, $\vec{p}$ va $\vec{m}$ vektorlar orasidagi burchak $60°$ ga teng

bo‘lsa, $(2\vec{m}+\vec{p})(\vec{m}+2\vec{n})$ skalyar ko‘paytmaning qiymatini toping.

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

Yechilishi: $\vec{m}=\vec{n}=\vec{p}=1.\ \vec{m}\perp\vec{n};\ \ \vec{n}\perp\vec{p};$

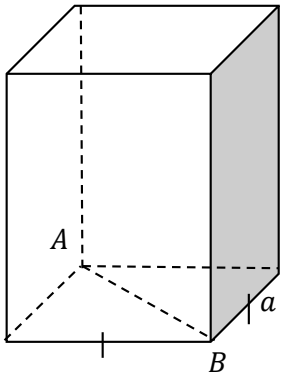
$(\vec{p}\,\hat{}\,\vec{m})=60°;$

$(2\vec{m}+\vec{p})(\vec{m}+2\vec{n})=2\vec{m}^2+4\vec{m}\vec{n}+\vec{p}\vec{m}+2\vec{p}\vec{n}=$

$=2+0+|\vec{p}|\cdot|\vec{m}|cos60°+0=2+\frac{1}{2}=2{,}5.$

Javobi: D.

43. Muntazam to‘rtburchakli prizmaning yon sirti 160 ga, to‘la sirti 210 ga teng. Shu prizma asosining diagonali toping.



A) $6\sqrt{2}$ B) $8\sqrt{2}$ C) $7\sqrt{2}$

D) $5\sqrt{2}$ E) $9\sqrt{2}$

Yechilishi: $S_{yon}=160.$

$S_T=210;\quad AB=?$

$2S_{asos}=S_T-S_{yon}=210-160=50.$

$S_{asos}=25 => a=5 => AB=5\sqrt{2}.$

Javobi: D.

44. $SABC$ piramidaning SBC yon yog‘ining yuzi 60 ga teng. Bu yon yoq A uchidan 8 ga teng masofada joylashgan. Piramidaning hajmini toping.

A) 170 B) 150 C) 120 D) 180 E) 160

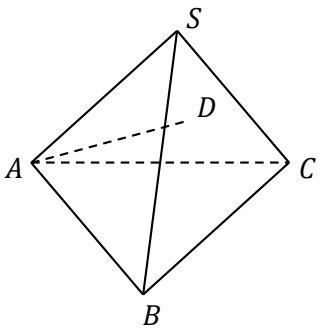
Yechilishi: $S_{\Delta SBC}=60;$

$AD=8;\quad V=?$

$V=\frac{1}{3}S_{asos}\cdot H=$

$=\frac{1}{3}\cdot 60\cdot 8=20\cdot 8=160.$

Javobi: E.



45. To‘g‘ri prizmaning asosi o‘tkir burchagi $\alpha = 60°$ bo‘lgan rombdan iborat. Agar α burchak 2 marta orttirilsa va prizmaning barcha qirralari uzunligi o‘zgarmasa, prizmaning hajmi qanday o‘zgaradi?

A) $2\ marta\ ortadi$

B) $2\ marta\ kamayadi$

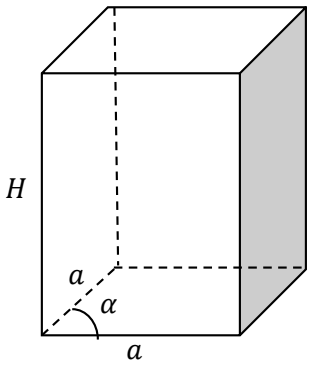
C) $\frac{\sqrt{3}}{2}\ marta\ ortadi$ D) $o'zgarmaydi$

E) $\frac{\sqrt{3}}{2}\ marta\ kamayadi$

Yechilishi: 1) $\alpha = 60°$.

$S_{asos} = a^2 sin\alpha = a^2 sin60° = \frac{\sqrt{3}}{2}a^2$

$V_1 = S_{asos} \cdot H = \frac{\sqrt{3}a^2H}{2}$.



2) $S_{asos} = a^2 sin2\alpha = a^2 sin120° =$

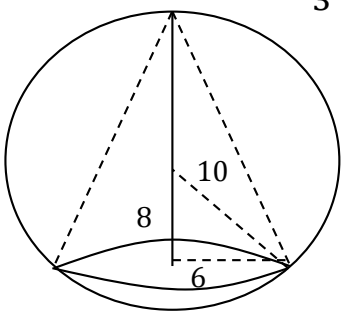
$= a^2 cos30° = \frac{\sqrt{3}}{2}a^2 => V_2 = \frac{\sqrt{3}a^2H}{2}$.

$V_1 = V_2$. Javobi: D.

46. Radiusi 10 ga teng bo‘lgan sferaga balandligi 18 ga teng bo‘lgan konus ichki chizilgan. Konusning hajmini toping.

A) 210π B) 216π C) 220π D) 228π E) 204π

Yechilishi: $V_k = \frac{1}{3}\pi 6^2 \cdot 18 = 216\pi$.



Javobi: B.

47. Agar $0 < p < 1$ va $1 < n < m$ bo‘lsa, quyidagi ko‘paytmalardan qaysi biri musbat?

A) $\log_p m \cdot \log_m 1$ B) $\log_p n \cdot \log_p m$
C) $\log_m p \cdot \log_n m$ D) $\log_p m \cdot \log_m 1$
E) $\log_p n \cdot \log_n m$

Yechilishi: $0 < p < 1;\quad 1 < n < m$

A) $(-) \cdot 0 = 0;$ B) $(-) \cdot (-) = +;$
C) $(-)(+) = -;$ D) $(-) \cdot 0 = 0;$ E) $(-) \cdot (+) = -$

Javobi: B.

48. $y = -x^2 + 6x - 12$ funksiyaning qiymatlar sohasini toping.

A) $(-3; \infty)$ B) $[-3; \infty)$ C) $(-\infty; -3)$
D) $(-\infty; -3]$ E) $(-\infty; 3]$

Yechilishi: $y = -x^2 + 6x - 12 =>$

$y = -\frac{36-4\cdot1\cdot12}{4\cdot(-1)} = -3 => (-\infty; -3].$

Javobi: D.

49. $9^{\log_3(x-3)} > 1$ tengsizlikning eng kichik butun yechimini toping.

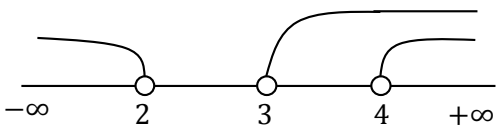
A) 4 B) 6 C) 5 D) 3 E) 7

Yechilishi: $9^{\log_3(x-3)} > 1 => 3^{2\log_3(x-3)} > 1 =>$

$=> 3^{\log_3(x-3)^2} > 1 => (x-3)^2 > 1 =>$

$|x-3| > 1 => x-3 > 1 => x > 4;$

$x - 3 < -1 => x < 2;\quad x - 3 > 0 => x > 3;$



$= x = 5.$

Javobi: C.

50. $y = \ln\left(\frac{1}{4}x^2 - 2x\right) + \sqrt{9-x}$ funksiyaning aniqlanish sohasini toping.

A) $(8; 9]$ B) $[8; 9]$ C) $(-\infty; 0) \cup [8; 9]$
D) $(8; 9)$ E) $(-\infty; 0) \cup (8; 9]$

Yechilishi: $y = \ln\left(\frac{1}{4}x^2 - 2x\right) + \sqrt{9-x}$

$$\begin{cases} \frac{1}{4}x^2 - 2x > 0 \\ 9 - x \geq 0 \end{cases} => \begin{cases} x^2 > 8x \\ x \leq 9 \end{cases} => \begin{cases} x < 0 \\ x > 8 \\ x \leq 9 \end{cases} =>$$

$=> (-\infty; 0) \cup (8; 9]$.

Javobi: E.

51. Moddiy nuqta to‘g‘ri chiziq bo‘ylab $S(t) = 6t^2 - 2t^3 + 5$ qonuniyat bo‘yicha harakatlanayapti. Uning tezlanishi 0 ga teng bo‘lgandagi oniy tezligi nimaga teng.

A) 8 B) 6 C) 7 D) 9 E) 6,5

Yechilishi: $S(t) = 6t^2 - 2t^3 + 5 => v = 12t - 6t^2 =>$
$=> a = 12 - 12t => a = 0 => 12 - 12t = 0 =>$
$=> t = 1 => v = 12 \cdot 1 - 6 \cdot 1^2 = 6.$

Javobi: B.

52. Absissasi $x_0 = 0$ bo‘lgan nuqtadan $y = x^3$ funksiyaning grafigiga o‘tkazilgan urinmaning tenglamasini ko‘rsating.

A) $y = x$ B) $y = -0{,}5x$ C) $y = 0$ D) $y = 0{,}5x$
E) $y = 2x$

Yechilishi: $y = x^3;\ x_0 = 0 => y_0 = 0.$
$k = y'(x_0) => y' = 3x^2 => k = 3 \cdot 0^2 = 0$
$y - y_0 = k(x - x_0) => y - 0 = 0(x - 0) => y = 0.$

Javobi: C.

Pirnazar DAVRONOV

1999-YIL, 10-AXBOROTNOMA

1. $\frac{0,48\cdot0,75+0,52:1\frac{1}{3}}{(0,(3)+0,(6)):0,012}$ ni hisoblang.

A) 1 B) 0,08 C)0,008 D) 0,009 E) 0,09

Yechilishi: $\frac{0,48\cdot0,75+0,52:1\frac{1}{3}}{(0,(3)+0,(6)):0,012}=\frac{0,48\cdot0,75+0,52\cdot\frac{3}{4}}{\left(\frac{3}{9}+\frac{6}{9}\right):0,012}=$

$=\frac{0,36+0,39}{1\cdot\frac{1}{0,012}}=0,75\cdot0,012=0,009.$

Javobi: D.

2. Yaylovda qo‘ylar va g‘ozlar boqilayotgandi. Bola sanaganda ularning boshlari 30 ta, oyoqlari esa 96 ta chiqdi. Yaylovda qancha qo‘y boqilgan?

A) 18 B) 14 C) 10 D) 12 E) 11

Yechilishi: $\begin{cases} Q+G'=30 \\ 4Q+2G'=96 \end{cases}\Rightarrow\begin{cases} G'=30-Q \\ 4Q+2(30-Q)=96 \end{cases}\Rightarrow$

$\Rightarrow\begin{cases} G'=30-Q \\ 4Q+60-2Q=96 \end{cases}\Rightarrow\begin{cases} G'=12 \\ Q=18. \end{cases}$

Javobi: A.

3. $\sqrt[4]{\frac{4,1^3-2,15^3}{1,95}+4,1\cdot2,15}$ ni hisoblang.

A) 1,5 B) 1,75 C) 2,25 D) 2,75 E) 2,5

Yechilishi: $\sqrt[4]{\frac{4,1^3-2,15^3}{1,95}+4,1\cdot2,15}=$

$=\sqrt[4]{\frac{(4,1-2,15)(4,1^2+4,1\cdot2,15+2,15^2)}{1,95}+4,1\cdot2,15}=$

$=\sqrt[4]{4,1^2+2\cdot4,1\cdot2,15+2,15^2}=\sqrt[4]{(4,1+2,15)^2}=$

$=\sqrt[4]{[(2,5)^2]^2}=2,5.$ Javobi: E.

4. $(k-2)^2y = k^2 - 25$ tenglamaning ildizlari manfiy bo‘ladigan k ning barcha butun musbat qiymatlari yig‘indisini toping.

A) 10 B) 13 C) 11 D) 8 E) 9

Yechilishi: $(k-2)^2y = k^2 - 25 \Rightarrow y = \frac{(k-5)(k+5)}{(k-2)^2} \Rightarrow$

$\Rightarrow \begin{cases} y < 0 \\ \frac{(k-5)(k+5)}{(k-2)^2} < 0 \end{cases} \Rightarrow \begin{cases} k^2 - 25 < 0 \\ (k-2)^2 > 0 \end{cases} \Rightarrow \begin{matrix} k^2 < 25 \\ k \neq 2 \end{matrix} \Rightarrow$

$\Rightarrow |k| < 5 \Rightarrow -5 < x < 5 \Rightarrow k = 0; 1; 2; 3; 4 \Rightarrow$

$\Rightarrow 0 + 1 + 3 + 4 = 8.$ Javobi: D.

5. $\frac{x^2+16}{x} = 10$ tenglama ildizlarining o‘rta arifmetigi ularning ko‘paytmasidan qanchaga kam?

A) 13 B) 12 C) 14 D) 11 E) 10

Yechilishi: $\frac{x^2+16}{x} = 10 \Rightarrow x \neq 0$

$x^2 - 10x + 16 = 0 \Rightarrow x_{1,2} = 5 \pm \sqrt{25-16} = 5 \pm 3;$

$x_1 = 2;\ x_2 = 8$

$\frac{x_1+x_2}{2} = 5; \quad x_1 \cdot x_2 = 16; \quad x_1 \cdot x_2 - \frac{x_1+x_2}{2} = 11.$

Javobi: D.

6. $x^3 - px^2 - qx + 4 = 0$ tenglamaning ildizlaridan biri 1 ga teng. Shu tenglamaning barcha ildizlari yig‘indisini toping.

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

Yechilishi: $x^3 - px^2 - qx + 4 = 0;\ x_1 = 1.$

Ildizni e’tiborga olgan holda, berilgan ko‘phad $x-1$ ga bo‘linsa, qoldiq nolga, bo‘linma esa $x^2 - 4$ ga teng bo‘ladi.

$x^3 - px^2 - qx + 4 : (x-1) = x^2 - 4;$

U holda

$x^3 - px^2 - qx + 4 = (x-1) \cdot (x^2 - 4) =$

$= (x-1)(x-2)(x+2)$ bo‘ladi.

Bundan $(x-1)(x-2)(x+2) = 0 \Rightarrow$

$\Rightarrow x_1 = 1;\ \ x_2 = 2;\ \ x_3 = -2.\ \ x_1 + x_2 + x_3 = 1.$

Topilgan ildizlardan foydalanib, p va q larni ham toppish mumkin.

$x_1 = 1 \Rightarrow 1 - p - q + 4 = 0 \Rightarrow p + q = 5.$

$x_2 = 2 \Rightarrow 8 - 4p - 2q + 4 = 0 \Rightarrow$

$x_3 = -2 \Rightarrow -8 - 4p + 2p + 4 \Rightarrow \ \Rightarrow$

$\Rightarrow \begin{cases} 4p + 2q = 12 \\ -4p - 2q = -4 \end{cases} \Rightarrow 4q = 16 \Rightarrow \begin{cases} q = 4; \\ p = 1. \end{cases}$

Javobi: C.

7. $a^5 + a^4 - 2a^3 - 2a^2 + a + 1$ ni ko‘paytuvchilarga ajrating.

A) $(a+1)^2(a-1)^3$ B) $(a+1)^3(a-1)^2$

C) $(a+1)^4(a-1)$ D) $(a+1)(a-1)^4$

E) $(a^2+1)^2(a-1)$

Yechilishi: $a^5 + a^4 - 2a^3 - 2a^2 + a + 1 =$

$= a^4(a+1) - 2a^2(a+1) + (a+1) =$

$(a+1)(a^4 - 2a^2 + 1) = (a+1)(a^2-1)^2 =$

$= (a+1)[(a-1)(a+1)]^2 = (a+1)^3(a-1)^2.$

Javobi: B.

8. Agar $m - n = (2x - y)^2$ va $n - m = (4x - y - 12)^2$ bo‘lsa, xy ning qiymatini hisoblang.

A) -6 B) 6 C) -8 D) 8 E) 9

Yechilishi: $+\begin{matrix} m - n = (2x - y)^2 \\ n - m = (4x - y - 12)^2 \end{matrix} \Rightarrow$

$\Rightarrow (4x - y - 12)^2 + (2x + y)^2 = 0 \Rightarrow$

$\Rightarrow \begin{cases} 4x - y - 12 = 0 \\ 2x + y = 0 \end{cases} \Rightarrow \begin{cases} 4x + 2x - 12 = 0 \\ y = -2x \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x = 2 \\ y = -4 \end{cases} \Rightarrow x \cdot y = 2 \cdot (-4) = -8.$

Javobi: C.

9. $\left(\frac{y}{6}+\frac{y}{3}+\frac{y}{2}\right)(y^2-3|y|+2)=0$ tenglamaning manfiy ildizlari nechta?

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

Yechilishi: $\left(\frac{y}{6}+\frac{y}{3}+\frac{y}{2}\right)(y^2-3|y|+2)=0 \Rightarrow$

$\Rightarrow y\cdot(y^2-3|y|+2)=0 \Rightarrow \begin{cases} y=0 \\ y^2-3|y|+2=0 \end{cases} \Rightarrow$

$\Rightarrow y^2-3(\pm y)+2=0$

1) $y^2+3y+2=0 \Rightarrow y_{1,2}=-\frac{3}{2}\pm\sqrt{\frac{9}{4}-2}=-\frac{3}{2}\pm\frac{1}{2};$

$y_1=-2; \quad y_2=-1.$

2) $y^2-3y+2=0 \Rightarrow y_{3,4}=\frac{3}{2}\pm\frac{1}{2};$

$y_3=1; \quad y_4=2.$

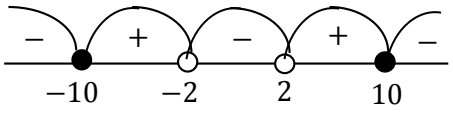
Javobi: B.

10. $\frac{|x|-10}{2-|x|}\geq 0$ tengsizlikning eng katta va eng kichik butun musbat yechimlarining ayirmasini toping.

A) 6 B) 8 C) 9 D) 7 E) 5

Yechilishi: $\frac{|x|-10}{2-|x|}\geq 0 \Rightarrow \begin{cases} |x|-10=0 \\ 2-|x|\neq 0 \end{cases} \Rightarrow$

$\begin{cases} |x|=10 \\ |x|\neq 2 \end{cases} \Rightarrow \begin{cases} x\pm 10 \\ x\neq \pm 2 \end{cases} \Rightarrow \begin{cases} x_1=-10 \\ x_2\neq -2 \\ x_3=10 \\ x_4=2 \end{cases}$



$[-10;-2)\cup(2;10]$

$x=10; \quad x=3 \Rightarrow 10-3=7.$ Javobi: D.

11. Agar $\begin{cases} x^2y=50, \\ xy^2=20 \end{cases}$ bo‘lsa, xy ning qiymatini hisoblang.

A) 8 B) 10 C) 6 D) 12 E) 15

Yechilishi:

$\begin{cases} x^2y = 50 \\ xy^2 = 20 \end{cases}$ Tenglamalar hadlab ko′paytiriladi $x^3y^3 = 1000 => xy = 10.$

Javobi: B.

12. $\begin{cases} 2x + 5 \geq x + 7, \\ 3x - 4 \leq 2x + 4 \end{cases}$ tengsizlikning eng katta va eng kichik yechimlarining o‘rta proporsional qiymatini toping.

A) 2 B) 10 C) 4 D) 6 E) 8

Yechilishi: $\begin{cases} 2x + 5 \geq x + 7 \\ 3x - 4 \leq 2x + 4 \end{cases} => \begin{cases} x \geq 2 \\ x \leq 8 \end{cases} =>$

$=> \begin{matrix} x = 2 \\ x = 8 \end{matrix} => \sqrt{2 \cdot 8} = 4.$

Javobi: C.

13. $\big(8 + (2x - 4)\big)\big(8 - (2x - 4)\big)$ ifoda x ning qanday qiymatida eng katta qiymatga erishadi?

A) -2 B) 2,5 C) 1,5 D) $-1,5$ E) 2

Yechilishi: $[8 + (2x - 4)] \cdot [8 - (2x - 4)] =$

$= 64 - (2x - 4)^2 => x = 2.$

Javobi: E.

14. $\frac{\sqrt{3+2\sqrt{2}}+\sqrt{3-2\sqrt{2}}}{4\sqrt{2}}$ ni hisoblang.

A) $\frac{\sqrt{2}}{4}$ B) 0,5 C) $\frac{\sqrt{2}}{2}$ D) 0,75 E) 0,8

Yechilishi: $\frac{\sqrt{3+2\sqrt{2}}+\sqrt{3-2\sqrt{2}}}{4\sqrt{2}} = \frac{\sqrt{2}+1+\sqrt{2}-1}{4\sqrt{2}} = \frac{1}{2}$

$\sqrt{3 + \sqrt{8}} = \sqrt{\frac{3+\sqrt{9-8}}{2}} + \sqrt{\frac{3-1}{2}} = \sqrt{2} + 1$

$\sqrt{3 - \sqrt{8}} = \sqrt{2} - 1.$

Javobi: B.

15. $\left(\frac{1}{\sqrt{3}+\sqrt{2}} + \frac{1}{2+\sqrt{3}}\right) \cdot (2 + \sqrt{2})$ ni soddalashtiring.

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

Yechilishi: $\left(\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{2+\sqrt{3}}\right)\cdot\left(2+\sqrt{2}\right)=$

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

$\cdot\left(2+\sqrt{2}\right)=\left(2-\sqrt{2}\right)\left(2+\sqrt{2}\right)=4-2=2.$

Javobi: C.

16. $m=\sqrt[3]{3},\ n=\sqrt{2}$ va $p=\sqrt[6]{10}$ sonlarni o‘sish tartibida yozing.

A) $p<n<m$ B) $n<p<m$

C) $m<p<n$ D) $n<m<p$

E) $p<m<n$

Yechilishi: $m=\sqrt[3]{3};\ \ n=\sqrt{2};\ \ p=\sqrt[6]{10}$

$m^6=9;\ \ n^6=8;\ \ p^6=10 => n<m<p.$

Javobi: D.

17. $\left(\frac{a^{\frac{3}{2}}+b^{\frac{3}{2}}}{\left(a^{\frac{1}{2}}+b^{\frac{1}{2}}\right)^2}-\frac{a^{\frac{1}{2}}b^{\frac{1}{2}}}{a^{\frac{1}{2}}+b^{\frac{1}{2}}}\right)\cdot(a-b)$ ning $a=0{,}16$ va $b=0{,}81$ bo‘lgandagi qiymatini hisoblang.

A) $-\frac{1}{4}$ B) $-\frac{1}{8}$ C) $\frac{1}{3}$ D) $-\frac{1}{5}$ E) $\frac{1}{6}$

Yechilishi: $\left(\frac{a^{\frac{3}{2}}+b^{\frac{3}{2}}}{\left(a^{\frac{1}{2}}+b^{\frac{1}{2}}\right)^2}-\frac{a^{\frac{1}{2}}b^{\frac{1}{2}}}{a^{\frac{1}{2}}+b^{\frac{1}{2}}}\right)\cdot(a-b)=$

$=\left[\frac{\sqrt{a^3}+\sqrt{b^3}}{\left(\sqrt{a}+\sqrt{b}\right)^2}-\frac{\sqrt{a}\cdot\sqrt{b}}{\sqrt{a}+\sqrt{b}}\right]\cdot(a-b)=$

$=\frac{a\sqrt{a}+b\sqrt{b}-(\sqrt{a}+\sqrt{b})\sqrt{a}\cdot\sqrt{b}}{\left(\sqrt{a}+\sqrt{b}\right)^2}\cdot\left[\left(\sqrt{a}\right)^2-\left(\sqrt{b}\right)^2\right]=$

$=\frac{a\sqrt{a}+b\sqrt{b}-a\sqrt{b}-b\sqrt{a}}{\left(\sqrt{a}+\sqrt{b}\right)^2}\cdot\left(\sqrt{a}+\sqrt{b}\right)\left(\sqrt{a}-\sqrt{b}\right)=$

$=\frac{a\left(\sqrt{a}-\sqrt{b}\right)-b\left(\sqrt{a}-\sqrt{b}\right)}{\sqrt{a}+\sqrt{b}}\cdot\left(\sqrt{a}-\sqrt{b}\right)=$

$= \frac{(\sqrt{a}-\sqrt{b})(a-b)}{\sqrt{a}+\sqrt{b}} \cdot (\sqrt{a}-\sqrt{b}) = \frac{(\sqrt{a}-\sqrt{b})^2(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})}{\sqrt{a}+\sqrt{b}} =$

$= (\sqrt{a}-\sqrt{b})^3 = (\sqrt{0{,}16}-\sqrt{0{,}81})^3 = (0{,}4-0{,}9)^3 =$

$= (-0{,}5)^3 = \left[-\frac{1}{2}\right]^3 = -\frac{1}{8}.$

Javobi: B.

18. Nuqtaning koordinatlari $x^2-4x+y^2-6y+13=0$ tenglamani qanoatlantiradi. Nechta nuqta shu tenglamani qanoatlantiradi?

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

E) $Birorta\ ham\ nuqta\ qanoatlantirmaydi$

Yechilishi: $x^2-4x+y^2-6y+13=0$

$x^2-4x+2^2-2^2+y^2-6y+3^2-3^2+13=0$

$(x-2)^2+(y-3)^2=0$

$x=2;\ \ y=3 => A(x;y)=A(2;3)$

Javobi: C.

19. $y=\frac{1}{x^2}$ va $y=x^2$ funksiyalarning grafiklari kesishgan nuqtalardan o‘tuvchi to‘g‘ri chiziqning tenglamasini toping.

A) $y=x$ B) $y=-1$ C) $y=1$ D) $y=x+1$

E) $y=x-1$

Yechilishi: $y=\frac{1}{x^2}; y=x^2 => \frac{1}{x^2}=x^2 => x^4=1 =>$

$=> x=\pm 1 => \begin{cases} x_1=-1 \\ x_2=1 \end{cases} => \begin{matrix} x\neq 0 \\ \begin{cases} y_1=1 \\ y_2=1 \end{cases} \end{matrix} =>$

$=> \begin{cases} A(x_1;y_1)=A(-1;1) \\ B(x_2;y_2)=B(1;1) \end{cases}$

$\frac{x-(-1)}{1-(-1)}=\frac{y-1}{1-1} => \frac{x+1}{2}=\frac{y-1}{0} => 2y-2=0 => y=1.$

Javobi: C.

20. Koordinatalar boshidan $y = x^2 - 4x + 3$ parabolaning simmetriya o‘qigacha bo‘lgan masofani toping.

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

Yechilishi: $y = x^2 - 4x + 3; \quad x = -\frac{-4}{2 \cdot 1} = 2;$

Javobi: E.

21. $\sqrt{x^3 - 2x^2 - 4x} = x$ tenglamaning ildizlari yig‘indisi 10 dan qancha kam?

A) 4 B) 7 C) 5 D) 6 E) 8

Yechilishi: $\sqrt{x^3 - 2x^2 - 4x} = x \Rightarrow \quad x \geq 0;$

$x^3 - 2x^2 - 4x = x^2 \Rightarrow x(x^2 - 3x - 4) = 0 \Rightarrow$

$\Rightarrow \begin{cases} x = 0 \\ x^2 - 3x - 4 = 0 \Rightarrow x_{1,2} = \frac{3}{2} \pm \sqrt{\frac{9}{4} + 4} = \frac{3}{2} \pm \frac{5}{2} \Rightarrow \end{cases}$

$\Rightarrow \begin{cases} x_1 = -1 \; chet \; ildiz \\ x_2 = 4 \end{cases} \quad 10 - 4 = 6.$

Javobi: D.

22. Agar $x^2y + xy^2 = 48$ va $x^2y - xy^2 = 16$ bo‘lsa, $\frac{x}{y}$ ning qiymatini toping.

A) $\frac{1}{4}$ B) -2 C) 2 D) $-\frac{1}{2}$ E) $\frac{1}{2}$

Yechilishi: $\begin{matrix} x^2y + xy^2 = 48 \\ x^2y - xy^2 = 16 \end{matrix} \Rightarrow 2x^2y = 64 \Rightarrow$

$\Rightarrow x^2y = 32; \; xy^2 = 16.$

$\frac{x^2y}{xy^2} = \frac{32}{16} \Rightarrow \frac{x}{y} = 2.$

Javobi: C.

23. Agar $x > y > 0$ bo‘lsa, $\left|\sqrt{xy} - \frac{x+y}{2}\right| + \left|\frac{x+y}{2} + \sqrt{xy}\right|$ ni soddalashtiring.

A) $x - y$ B) $2\sqrt{xy}$ C) $-2\sqrt{xy}$

D) $x + y$ E) $y - x$

Yechilishi: O‘rta arifmetik qiymat, o‘rta geometric qiymatdan kichik bo‘lmaydi.

$x > y > 0;\ \left|\sqrt{xy} - \frac{x+y}{2}\right| + \left|\frac{x+y}{2} + \sqrt{xy}\right| =$

$= -\sqrt{xy} + \frac{x+y}{2} + \frac{x+y}{2} + \sqrt{xy} = x + y.$

Javobi: D.

24. Arifmetik progressiya 26 haddan iborat. Agar $a_6 = -0{,}25$ va $a_{21} = -0{,}5$ bo‘lsa, uning hadlari yig‘indisini toping.

A) $-10{,}5$ B) $-10{,}75$ C) $-7{,}85$ D) $-8{,}5$ E) $-9{,}75$

Yechilishi: $n = 26.\ a_6 = -0{,}25;\ a_{21} = -0{,}5$

$S_{26} = \frac{-0{,}25-0{,}5}{2} \cdot 26 = -9{,}75.$

Javobi: E.

25. Cheksiz kamayuvchi geometrik progressiyaning hadlari yig‘indisi 8 ga, dastlabki to‘rttasiniki esa $\frac{15}{2}$ ga teng. Agar uning barcha hadlari musbat bo‘lsa, progressiyaning birinchi hadini toping.

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

Yechilishi: $S = \frac{b_1}{1-q};\ \frac{b_1}{1-q} = 8 => b_1 8(1-q);$

$b_1 + b_2 + b_3 + b_4 = \frac{15}{2} =>$

$=> b_1 + b_1 q + b_1 q^2 + b_1 q^3 = \frac{15}{2} =>$

$=> b_1(1 + q + q^2 + q^3) = \frac{15}{2};$

$8(1-q)(1 + q + q^2 + q^3) = \frac{15}{2} =>$

$=> 1 + q + q^2 + q^3 - q - q^2 - q^3 - q^4 = \frac{15}{16} =>$

$=> 1 - q^4 = \frac{15}{16} => q^4 = 1 - \frac{15}{16} = \frac{1}{16} => q = \frac{1}{2};$

U holda $b_1 = 8\left(1 - \frac{1}{2}\right) = 4.$ Javobi: C.

26. $k = tg248°, t = \cos 32°$, va $q = \sin 112°$ sonlarni o‘sish tartibida joylashtiring.

A) $q < t < k$ B) $k < t < q$ C) $t < k < q$
D) $t < q < k$ E) $k < q < t$

Yechilishi: $k = tg248° = tg(\pi + 68°) = tg68° > 1;$
$t = \cos 32°;$
$q = \sin 112° = \sin(90° + 22°) = cos22°.$
$t < q < k.$ Javobi: D.

27. $a = sin540°, b = cos640°, c = tg545°$ va $d = ctg405°$ sonlardan qaysi biri manfiy?

A) a B) b C) c D) d
E) $Hech\ qaysisi\ manfiy\ emas$

Yechilishi: $a = sin540° = sin3\pi = 0;$
$b = cos640° = \cos(4\pi - 80) = cos80° > 0;$
$c = tg545° = tg(3\pi + 5) = tg5° > 0;$
$d = ctg405° = ctg(2\pi + 45) = ctg45° > 0.$
Javobi: E.

28. $(1 + \cos^2 2\alpha)(1 + \mathrm{tg}^2\,\alpha) + 4\sin^2\alpha$ ifodaning eng kichik qiymatini toping.

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

Yechilishi: $(1 + \cos^2 2\alpha)(1 + \mathrm{tg}^2\,\alpha) + 4\sin^2\alpha =$
$= [1 + (2\cos^2\alpha - 1)^2] \cdot \frac{1}{\cos^2\alpha} + 4(1 - \cos^2\alpha) =$
$= (1 + 4\cos^4\alpha - 4\cos^2\alpha + 1) \cdot \frac{1}{\cos^2\alpha} +$
$+4 - 4\cos^2\alpha = \frac{2}{\cos^2\alpha} + 4\cos^2\alpha - 4 + 4 - 4\cos^2\alpha =$
$= \frac{2}{\cos^2\alpha};$
Eng katta qiymat $\cos^2\alpha = 1$ bo‘lganda 2 bo‘ladi.
Javobi: C.

29. $\frac{1}{sin10°} - \frac{\sqrt{3}}{cos10°}$ ning qiymatini hisoblang.

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

Yechilishi: $\frac{1}{sin10°}-\frac{\sqrt{3}}{cos10°}=\frac{cos10°-\sqrt{3}sin10°}{sin10°cos10°}=$

$=\frac{cos10°-\frac{cos30°}{sin30°}\cdot sin10°}{\frac{1}{2}sin20°}=\frac{\frac{sin30°cos10°-cos30°sin10°}{sin30°}}{\frac{1}{2}sin20°}=$

$=\frac{sin20°}{sin30°}:\frac{sin20°}{2}=\frac{sin20°}{\frac{1}{2}}\cdot\frac{2}{sin20°}=4.$

Javobi: A.

30. Agar $tg(\alpha-\beta)=5$ va $\alpha=45°$ bo‘lsa, $tg\beta$ ning qiymatini hisoblang.

A) $\frac{1}{3}$ B) $-\frac{3}{4}$ C) $\frac{2}{3}$ D) $-\frac{1}{2}$ E) $-\frac{2}{3}$

Yechilishi: $tg(\alpha-\beta)=5;\ \ \alpha=45°;\ \ tg\beta=?$

$\frac{tg\alpha-tg\beta}{1+tg\alpha\cdot tg\beta}=5 => \frac{1-tg\beta}{1+tg\beta}=5 =>$

$=> 1-tg\beta=5+5tg\beta => 6tg\beta=-4 =>$

$=> tg\beta=-\frac{2}{3}.$ Javobi: E.

31. $\frac{2\cos^2\alpha}{ctg\frac{\alpha}{2}-tg\frac{\alpha}{2}}$ ni soddalashtiring.

A) $-sin2\alpha$ B) $cos2\alpha$ C) $sin2\alpha$

D) $\frac{1}{2}sin2\alpha$ E) $-\frac{1}{2}cos2\alpha$

Yechilishi: $\frac{2\cos^2\alpha}{ctg\frac{\alpha}{2}-tg\frac{\alpha}{2}}=\frac{2\cos^2\alpha}{\frac{1}{tg\frac{\alpha}{2}}-tg\frac{\alpha}{2}}=\frac{2\cos^2\alpha}{\frac{1-\mathrm{tg}^2\frac{\alpha}{2}}{tg\frac{\alpha}{2}}}=$

$=\frac{2tg\frac{\alpha}{2}}{1-\mathrm{tg}^2\frac{\alpha}{2}}\cos^2\alpha=tg\alpha\cdot\cos^2\alpha=\frac{sin\alpha}{cos\alpha}\cdot\cos^2\alpha=$

$=sin\alpha cos\alpha=\frac{1}{2}\cdot 2sin\alpha cos\alpha=\frac{1}{2}sin2\alpha.$

Javobi: D.

32. $f(x)=1-cos2x-kcos2x$ funksiya k ning qanday qiymatlarida o‘zgarmas bo‘ladi?

A) 2 B) -2 C) 1,5 D) $-1{,}5$ E) -1

Yechilishi: $f(x)=1-cos2x-kcos2x => k=-1.$

Javobi: E.

33. $\begin{cases} 0 < x < \frac{\pi}{2}, \\ 1 \le tgx \le \sqrt{3} \end{cases}$ tengsizliklar sestemasining eng katta va eng kichik yechimlari ayirmasini toping.

A) $-\frac{\pi}{12}$ B) $\frac{\pi}{6}$ C) $-\frac{\pi}{6}$ D) $\frac{\pi}{8}$ E) $\frac{\pi}{12}$

Yechilishi: $\begin{cases} 0 < x < \frac{\pi}{2}, \\ 1 \le tgx \le \sqrt{3} \end{cases} => \frac{\pi}{4} \le x \le \frac{\pi}{3} =>$

$=> \frac{\pi}{3} - \frac{\pi}{4} = \frac{\pi}{12}$. Javobi: E.

34. $(1 + cosx)tg\frac{x}{2} = 0$ tenglamani yeching.

A) $\pi k, k \in Z$ B) $\pi + 2\pi k, k \in Z$

C) $2\pi k, k \in Z$ D) $\pi + \pi k, k \in Z$

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

Yechilishi: $(1 + cosx)tg\frac{x}{2} = 0 =>$

$=> \begin{cases} cosx = -1 \\ tg\frac{x}{2} = 0 \end{cases} => \begin{cases} x = \pi + 2\pi k \\ \frac{x}{2} = \pi k \end{cases} =>$

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

Javobi: C.

35. Agar $\log_2 a = 2$ va $\log_3 b = 2$ bo‘lsa, $\log_6 ab$ ning qiymatini hisoblang.

A) -2 B) 3 C) -3 D) 4 E) 2

Yechilishi: $\log_2 a = 2;\ \log_3 b = 2;\ \log_6 ab = ?$

$a = 4;\ b = 9 => \log_6 4 \cdot 9 = \log_6 6^2 = 2 \cdot \log_6 6 = 2.$

Javobi: E.

36. $2^x x^2 - 2x^2 + 2 - 2^x = 0$ tenglamaning ildizlari ko‘paytmasini toping.

A) 1 B) -1 C) 2 D) -2 E) $-0{,}5$

Yechilishi: $2^x x^2 - 2x^2 + 2 - 2^x = 0$

$2^x x^2 - 2^x - 2x^2 + 2 = 0 =>$

$\Rightarrow 2^x(x^2-1)-2(x^2-1)=0 \Rightarrow$

$\Rightarrow (x^2-1)(2^x-2)=0 \Rightarrow \begin{cases} x^2=1 \\ 2^x=2 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x=\pm 1 \\ x=1 \end{cases} \Rightarrow \begin{cases} x_1=-1 \\ x_2=1 \end{cases} \Rightarrow x_1 \cdot x_2=-1.$

Javobi: B.

37. $lgtg22° + lgtg68° + lgsin90°$ ni hisoblang.

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

Yechilishi: $lgtg22° + lgtg68° + lgsin90° =$

$= lgtg22° \cdot tg68° = lgtg(90° - 68°)tg68° =$

$= lgctg68° \cdot tg68° = lg1 = 0.$

Javobi: C.

38. $4^{\log_2 x} + x^2 < 32$ tengsizlikning barcha butun yechimlaari yig‘indisini toping.

A) 10 B) 8 C) 9 D) 7 E) 6

Yechilishi: $4^{\log_2 x} + x^2 < 32 \Rightarrow x > 0;$

$2^{\log_2 x^2} + x^2 < 32 \Rightarrow 2x^2 < 32 \Rightarrow x^2 < 16 \Rightarrow$

$\Rightarrow |x| < 4 \Rightarrow -4 < x < 4 \Rightarrow 0 < x < 4. \Rightarrow$

$\Rightarrow 1+2+3=6.$ Javobi: E.

39. $3^{x+1} \cdot 27^{x-1} = 9^7$ tenglamaning ildizi 10 dan qancha kam?

A) 5 B) 4 C) 8 D) 6 E) 7

Yechilishi: $3^{x+1} \cdot 3^{3(x-1)} = 3^{14} \Rightarrow$

$\Rightarrow 3^{3x-3+x+1} = 3^{14} \Rightarrow 4x-2=14 \Rightarrow x=4.$

$10-4=6.$ Javobi: D.

40. $y = \left(\frac{1}{3}\right)^{x^2-4x}$ funksiyaning eng katta qiymatini toping.

A) 82 B) 81 C) 27 D) 36 E) 45

Yechilishi: $y = \left(\frac{1}{3}\right)^{x^2-4x}$;

Asos 1 dan kichik. Daraja ko‘rsatkich qancha kichik bo‘lsa, berilgan funksiya qiymati shuncha katta bo‘ladi.

x^2-4x *parabola uchi absessasi topladi*:

$x = -\frac{b}{2a} = -\frac{-4}{2\cdot 1} = 2; \quad x = 2\ da\ y = 81.$

Javobi: B.

41. $y = \frac{\sqrt{x+0,2}}{arccosx}$ funksiyaning aniqlanish sohasini toping.

A) $(-0,2; 1)$ B) $(-0,2; 1]$ C) [-0,2;1]

D) $[-0,2; 1)$ E) $[-1; 1)$

Yechilishi: $y = \frac{\sqrt{x+0,2}}{arccosx} => \begin{cases} x + 0,2 \geq 0 \\ 0 < arccosx < \pi \end{cases} =>$

$=> \begin{cases} x \geq -0,2 \\ cos0 > \cos arccosx > cos\pi \end{cases} => \begin{cases} x \geq -0,2 \\ -1 < x < 1 \end{cases} =>$

$=> -0,2 \leq x < 1.$ Javobi: D.

42. $y = \sqrt{x^2 - 2x + 10}$ funksiyaning qiymatlar sohasini toping.

A) $[3; \infty)$ B) $(3; \infty)$ C) $[5; \infty)$ D) $[2; \infty)$ E) $(2; \infty)$

Yechilishi: $y = \sqrt{x^2 - 2x + 10}; x = -\frac{b}{2a} = -\frac{-2}{2\cdot 1} = 1$

$y = -\frac{b^2-4ac}{4a} = -\frac{4-4\cdot 1\cdot 10}{4\cdot 1} = -\frac{-36}{4} = 9.$

$y = \sqrt{9} = 3 => [3; +\infty)$ Javobi: A.

43. Agar $f(x) = \sin^2 3x$ bo‘lsa, $f'\left(\frac{\pi}{12}\right)$ ning qiymatini hisoblang.

A) -3 B) 3 C) 2 D) -2 E) 4

Yechilishi:

$f(x) = \sin^2 3x => f'(x) = 2sin3x(sin3x)' =$

$= 2sin3x \cdot cos3x(3x)' = 6sin3xcos3x = 3sin6x;$

$f'\left(\frac{\pi}{12}\right) = 3 \cdot sin6 \cdot \frac{\pi}{12} = 3.$ Javobi: B.

44. $y = \sqrt{3}x^2 - 3\sqrt{3}x + 4$ funksiyaning grafigiga $x_0 = 1$ nuqtadan o‘tkazilgan urinma OY o‘qi bilan qanday burchak tashkil qiladi?

A) 120° B) 60° C) 30° D) 150° E) 135°

Yechilishi: $y = \sqrt{3}x^2 - 3\sqrt{3}x + 4; \ x_0 = 1.$

$y' = 2\sqrt{3}x - 3\sqrt{3} => k = 2\sqrt{3} \cdot 1 - 3\sqrt{3} = -\sqrt{3} =>$
$=> tg\alpha = -\sqrt{3} => \alpha = 120°\ Demak, 30°.$
Javobi: C.

45. $f(x) = 2\cos^2\frac{x}{2}$ funksiyaning $M(0;3)$ nuqtadan o‘tadigan boshlang‘ich funksiyasini toping.

A) $F(x) = x - sinx + 3$
B) $F(x) = -x + sinx + 3$
C) $F(x) = x + sinx + 3$
D) $F(x) = x + cosx + 3$
E) $F(x) = x - cosx + 3$

Yechilishi: $f(x) = 2\cos^2\frac{x}{2} = 2 \cdot \frac{1}{2}[1 + cosx] = 1 + cosx$
$F(x) = \int f(x)\,dx = x + sinx + C =>$
$=> 3 = 0 + sin0 + C => C = 3$
$F(x) = x + sinx + 3.$ Javobi: C.

46. t ning qanday qiymatlarida $y = x^2$, $x = 0$ va $x = t$ chiziqlar bilan chegaralangan yuza 9 ga teng bo‘ladi?

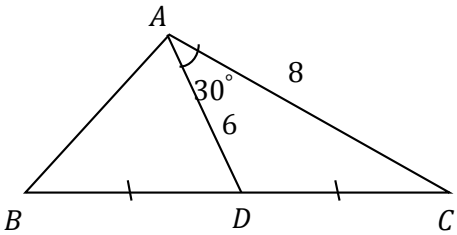
A) 6 B) 4 C) 5 D) 2 E) 3

Yechilishi: $S = \int_0^t x^2\,dx = \frac{1}{3}x^3|_0^t = \frac{1}{3}[t^3 - 0^3] = \frac{1}{3}t^3 =>$
$=> \frac{1}{3}t^3 = 9 => t^3 = 27 => t = 3.$ Javobi: E.

47. ABC uchburchakning AD medianasi 6 ga, AC tomoni 8 ga va ular orasidagi burchak 30° ga teng. ABC uchburchakning yuzini toping.

A) 28 B) 26 C) 22 D) 30 E) 24

Yechilishi: $DC^2 = 8^2 + 6^2 - 2 \cdot 6 \cdot 8 \cdot cos30° =$
$= 64 + 36 - 96 \cdot \frac{\sqrt{3}}{2} =$
$= 100 - 48\sqrt{3}.$
$DC = \sqrt{100 - 48\sqrt{3}}$
$\frac{DC}{sin30} = \frac{6}{sin\angle C} => 2DC = \frac{6}{sinC} =>$



$=> sin\angle C = \frac{6}{2\sqrt{100-48\sqrt{3}}} = \frac{3}{\sqrt{100-48\sqrt{3}}}$

$S_{\Delta ABC} = \frac{1}{2} \cdot BC \cdot AC \cdot sinC =$

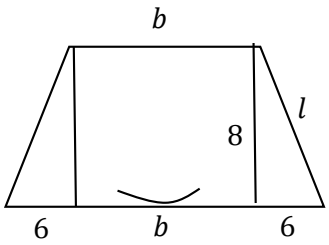
$= \frac{1}{2} \cdot 2 \cdot \sqrt{100 - 48\sqrt{3}} \cdot 8 \cdot \frac{3}{\sqrt{100-48\sqrt{3}}} => S_{\Delta ABC} = 24.$

Javob: E.

48. Radiusi 4 ga teng bo‘lgan doiraga tashqi chizilgan teng yonli trapetsiyaning perimetri 40 ga teng. Trapetsiyaning kichik asosini toping.

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

Yechilishi:



$a + b + 2l = 40$

$a + b = 2l => \begin{cases} a + b = 20 \\ 2l = 20 \end{cases} => l = 10$

$a + b = 12 + b + b =>$

$=> 2b + 12 = 20 =>$

$=> 2b = 8 => b = 4.$ Javobi: B.

49. Munatazam ko‘pburchakning tashqi burchagi $60°$ ga, perimetri 54 ga teng. Uning katta diagonalini toping.

A) 12 B) 16 C) 18 D) 20 E) 10

Yechilishi: $360°:60 = 6\ burchakli$

$6R = 54 => R = 9 => 2R = 18.$

Demak, 360:60=6 burchak ekan.

$p = 54 => p = 6 \cdot a => a = 9.$

$R = a => 2R = 18.$ Javobi: C.

FOYDALANILGAN ADABIYOTLAR

1.O‘zbekiston Respublikasi Prezidentining “Yoshlarni ma’naviy-axloqiy va jismoniy barkamol etib tarbiyalash, ularga ta’lim-tarbiya berish tizimini sifat jihatidan yangi bosqichga ko‘tarish chora-tadbirlari to‘g‘risida”gi 2018-yil 14-avgustdagi PQ-3907 sojnli Qarori. - O‘zbekiston Republikasi Prezidentining “Xalq ta’limi tizimiga oid farmon va qarorlari” to‘plami. – Samarqand, 2018.

2.O‘zbekiston Respublikasi Prezidentining “Xalq ta’limi tizimiga boshqaruvning yangi tamoyillarini joriy etish chora-tadbirlari to‘g‘risida”gi 2018-yil 5-sentabrdagi PQ-3931 sonli Qarori. - O‘zbekiston Respublikasi Prezidentining “Xalq ta’limi tizimiga oid farmon va qarorlari” to‘plami. –Samarqand, 2018.

3.O‘zbekiston Respublikasi Prezidentining “Xalq ta’limi tizimini boshqarish tizimini takomillashtirish bo‘yicha qo‘shimcha chora-tadbirlari to‘g‘risida”gi 2018-yil 5-sentabrdagi PF-5538-sonli Farmoni. - O‘zbekiston Respublikasi Prezidentining “Xalq ta’limi tizimiga oid farmon va qarorlari” to‘plami. –Samarqand, 2018.

4.O‘zbekiston Respublikasi Prezidentining 2019-yil 23-avgust kuni “Yoshlarni vatanparvarlik ruxida tarbiyalash va jamiyatda o‘qituvchi mavqeini oshirish” masalalariga bag‘ishlab o‘tkazilgan videoselektr majlisi Bayoni. – 2019-yil 27-avgust, № 19750-hh.

5. O‘zbekiston Pespublikasi Prezidentining 2023-yilgi Oliy Majlis va O‘zbekiston xalqiga Murojaatnomasida “Insonga e’tibor va sifatli ta’lim yili” nomi berildi.

6. O‘zbekiston Respublikasi Prezidentining “Matematika sohasidagi ta’lim sifatini oshirish va ilmiy-tadqiqotlarnirivojlantirish chora-tadbirlari to‘g‘risida”gi 2020-yil 7-maydagi PQ-4708-sonli Qarori.

7.O‘zbek sovet ensiklopediyasi. 4-tom. –Toshkent, 1973.

8.Rahmatov M.A., Zaripov B.Z. Iste’dodli insonlar mamlakatning bebaho boyligidir. –Toshkent: “Zamin nashr” MChJ , 2019. – 160 bet.

9.Muxitdinov M.M., Ahmedov Sh.B., Xusanov N.O. Matematika: Algebraik tenglamalar va tengsizliklarga oid test savollari va ularning yechimlari. 1-kitob. -Toshkent: “Zamin nashr”, 2019, -512 bet.

10.Muxitdinov M.M., Ahmedov Sh.B., Xusanov N.O. Matematika: Trigonometrik tenglamalar va tengsizliklar, xosila va integrallarga oid test savollari va ularning yechimlari. 2-kitob. -Toshkent: “Zamin nashr”, 2019, -368 bet.

11.Muxitdinov M.M., Ahmedov Sh.B., Xusanov N.O. Matematika: Planimitriya va stereometriyaga oid test savollari va ularning yechimlari. 3-kitob. -Toshkent: “Zamin nashr”, 2019, -312 bet.

12.Смышляев В.К. Развитие интереса к математике у учащихся старших классов (На материале внеклассной работы в школе-интернате). –Дис. … канд. пед.наук. – М.:1963.

13. Антонов Н.П., Вигодский М.Я., Никитин В.В., Санкин А.И. Элементар математика масалалари тўплами. – Тошкент: “Ўқитувчи” нашриёти. 1975. – 456 бет.

14. Ахборотнома. Ўқув юртларига кириш учун тест саволлари. –Тошкент, 1999.

15. Выгодский М.Я. Справочник по элементарной математике. – Москва: Наука, 1978. – 336 с.

16. Davronov P.Z., Raximov X.A., Moshonov M. Elementar matematikaning asosiy tushunchalari. – Samarqand, 2015. – 112 bet.

17.Davronov P.Z., Raximqulova M. Matematikadan misol va masalalar yechish. Metodik qo‘llanma. 7-kitob. – Toshkent: “Qamar media” nashriyoti, 2021. – 316 bet.

18. Davronov P.Z. Matematikadan misol va masalalar yechish. Metodik qo‘llanma. 1 – kitob. – “Qamar media” nashriyoti. –Toshkent 2022-yil, 380 bet.

19. Davronov P.Z. Matematikadan misol va masalalar yechish. Metodik qo‘llanma. 2-kitob. – “Qamar media” nashriyoti. -Toshkent 2023-yil, 297 bet.

20. Jo‘raev A. Matematikadan yon daftarcha. – Yakkabog‘, 2018. – 116 bet.

21. Математика терминлари изоҳли луғати. –Т.: “Ўқитувчи” нашриёти, 1974. – 552 бет.

M U N D A R I J A

Pirnazar DAVRONOV

MATEMATIKADAN

MISOL VA MASALALAR YECHISH

3-KITOB

“QAMAR MEDIA” NASHRIYOTI

Muharrir: Muhammad Sobir
Musahhih: Osima Sobirjon qizi

Texnik muharrir: Sherzod Xujakulov
Nashrga tayyorlovchi: Shahlo Pirnazarova
Sahifalovchi dizayner: Ulug‘bek Umarov

ISBN 978-9943-7049-3-0

“Qamar media” nashriyoti, Toshkent shahar, Mirobod tumani
Qo‘yliq mavze-4, 3-uy, 26-xonadon. tel.: +998 94-672-71-11

Terishga berildi: 12.01.2024-yil. Bosishga ruxsat etildi: 17.02.2024-yil.
Bichimi 60x84 $^{1/16}$, “Times New Roman” garniturasi.
Bosma tabog‘i 18,5. Adadi 100 nusxa. Buyurtma № 2024/01
Bahosi kelishilgan narxda
Noshirlik litsenziyasi: № 18-4178

Samarqand viloyati pedagoglarni yangi metodikalarga o‘rgatish
milliy markazi bosmaxonasida nashr etildi

ISBN 978-9943-7049-3-0