

**9-sinf Matematika fanidan o'quvchilarni
mustaqil tayyorlanishlari uchun imtihon
biletlariga javoblar**

2020-2021-yil

MBAZA.UZ IMTIHON JAVOBLARI BOR JOY 😊

Matematika

9-sinf

1-BILET

1. Hisoblang: $(1\frac{2}{3} \cdot 2,2 + 1) : 2\frac{1}{5} - \frac{5}{11}$

$$\left(1\frac{2}{3} \cdot 2,2 + 1\right) : 2\frac{1}{5} - \frac{5}{11} = \left(\frac{5}{3} \cdot \frac{11}{5} + 1\right) : 2\frac{1}{5} - \frac{5}{11} = \left(\frac{11}{3} + 1\right) : 2\frac{1}{5} - \frac{5}{11} = \frac{14}{3} : 2\frac{1}{5} - \frac{5}{11} = \frac{14}{3} : \frac{11}{5} - \frac{5}{11} = \frac{14}{3} \cdot \frac{5}{11} - \frac{5}{11} = \frac{70}{33} - \frac{5}{33} = \frac{65}{33} = \frac{5}{3} = 1\frac{2}{3}$$

2. To'g'ri to'rtburchakning perimetri 32 ga, qo'shni tomonlarining ayirmasi 2 ga teng. Uning tomonlarini toping.



$$AD=a, AB=b. P=2(a+b)=32, a+b=16$$

$$a-b=2$$

$$\begin{cases} a+b=16 \\ a-b=2 \end{cases} \Rightarrow \text{sistemani hosil qilamiz}$$

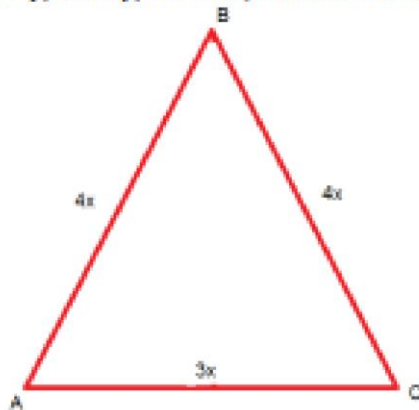
$$\text{Uni qo'shib yuboramiz: } 2a=18, a=9$$

$$9-b=2, b=7.$$

3. Soddashtiring: $\text{tg}(-\alpha)\text{ctg}(-\alpha)+\cos^2(-\alpha)+\sin^2 \alpha$

$$\text{tg}(-\alpha)\text{ctg}(-\alpha) + \cos^2(-\alpha) + \sin^2 \alpha = -\text{tg} \alpha \cdot (-\text{ctg} \alpha) + \cos^2 \alpha + \sin^2 \alpha = 1 + \cos^2 \alpha + \sin^2 \alpha = 1 + 1 = 2$$

5. Teng yonli uchburchakning perimetri 66 sm. Uning yon tomonini asosiga nisbati 4:3 ga teng bo'lsa, uchburchakning tomonlarini toping.



$$AB=BC=4x, AC=3x.$$

$$P=4x+3x+4x=66 \text{ sm}$$

$$11x=66 \text{ sm}$$

$$x=6 \text{ sm}$$

$$AB=BC=4x=4 \cdot 6=24 \text{ sm,}$$

$$AC=3x=3 \cdot 6=18 \text{ sm.}$$

2-BILET

1. Hisoblang: $\frac{4,5^2-1,5^2}{0,3 \cdot 0,7-0,3}$

$$\frac{4,5^2-1,5^2}{0,3 \cdot 0,7-0,3} = \frac{(4,5-1,5) \cdot (4,5+1,5)}{0,3(0,7-1)} = \frac{3 \cdot 6}{0,3 \cdot (-0,3)} = \frac{18}{-0,09} = -\frac{1800}{9} = -200$$

2. Usta muayyan ishni 12 kunda, uning shogirdi esa 30 kunda bajaradi. Agar 3 ta usta va 5 ta shogird birgalikda ishlasalar, o'sha ishni necha kunda bajaradilar?

$$\frac{3}{12} + \frac{5}{30} = \frac{1}{t} \Rightarrow \frac{1}{4} + \frac{1}{6} = \frac{1}{t} \Rightarrow \frac{5}{12} = \frac{1}{t} \Rightarrow t = \frac{12}{5} = 2,4 \text{ kun}$$

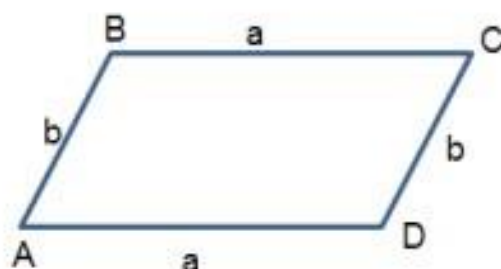
3. Agar $\sin \alpha + \cos \alpha = \frac{1}{3}$ bo'lsa, $\sin^3 \alpha + \cos^3 \alpha$ ni hisoblang.

$$\sin \alpha + \cos \alpha = \frac{1}{3} \text{ ning ikkala qismini kvadratga ko'taramiz:}$$

$$\sin^2 \alpha + 2\sin \alpha \cos \alpha + \cos^2 \alpha = \frac{1}{9}, \quad 1 + 2\sin \alpha \cos \alpha = \frac{1}{9}, \quad \sin \alpha \cos \alpha = -\frac{4}{9}$$

$$\begin{aligned}\sin^3 \alpha + \cos^3 \alpha &= (\sin \alpha + \cos \alpha)(\sin^2 \alpha - \sin \alpha \cos \alpha + \cos^2 \alpha) \\ &= \frac{1}{3}(1 - \sin \alpha \cos \alpha) = \frac{1}{3}\left(1 + \frac{4}{9}\right) = \frac{1}{3} \cdot \frac{13}{9} = \frac{13}{27}\end{aligned}$$

5. Parallelogrammning qo'shni tomonlari ayirmasi 11 sm, perimetri esa 58 sm bo'lsa, uning kichik tomonini toping.



$$AD=BC=a, AB=DC=b$$

$$P=2(a+b)=58 \text{ sm}, a+b=29 \text{ sm}$$

$$a-b=11 \text{ sm}$$

$$\begin{cases} a+b=29 \\ a-b=11 \end{cases} \Rightarrow$$

sistemani hosil qilamiz Uni qo'shib

$$\text{yuboramiz: } 2a=40, a=20$$

$$20-b=11, b=9$$

3-BILET

1. Soddalashtiring: $4+5\sqrt{2}+\frac{\sqrt{75}}{\sqrt{3}-\sqrt{6}}$

$$\begin{aligned}4+5\sqrt{2}+\frac{\sqrt{75}}{\sqrt{3}-\sqrt{6}} &= 4+5\sqrt{2}+\frac{5\sqrt{3}}{\sqrt{3}(1-\sqrt{2})} = 4+5\sqrt{2}-\frac{5}{\sqrt{2}-1} \\ &= 4+5\sqrt{2}-\frac{5(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)} = 4+5\sqrt{2}-5(\sqrt{2}+1) \\ &= 4+5\sqrt{2}-5\sqrt{2}-5 = -1\end{aligned}$$

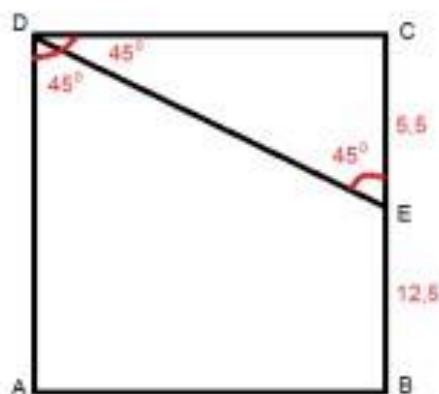
2. Ikki shahardan bir-biriga qarab ikki sayyoh yo'lga chiqdi. Birinchisi avtomashinada, tezligi 62 km/soat. Ikkinchisi avtobusda, tezligi 48 km/soat. Agar ular 0,6 soatdan keyin uchrashgan bo'lsa, shaharlar orasidagi masofani toping.

Yechish. Birinchi sayyoh 0,6 soatda $0,6 \cdot 62 = 37,2$ km, ikkinchi sayyoh esa $0,6 \cdot 48 = 28,8$ km yo'l yuradi. Ikki shahar orasidagi masofa $37,2 + 28,8 = 66$ km.

3. Soddalashtiring: $\frac{\operatorname{tg}(\frac{\pi}{2}-\alpha)}{\cos(2\pi-\alpha)} \cdot \frac{\sin(\frac{3\pi}{2}+\alpha)}{\operatorname{tg}(\frac{3\pi}{2}-\alpha)}$

$$\frac{\operatorname{tg}(\frac{\pi}{2}-\alpha)}{\cos(2\pi-\alpha)} \cdot \frac{\sin(\frac{3\pi}{2}+\alpha)}{\operatorname{tg}(\frac{3\pi}{2}-\alpha)} = \frac{\operatorname{ctg} \alpha}{\cos \alpha} \cdot \frac{-\cos \alpha}{\operatorname{ctg} \alpha} = -1$$

5. ABCD to'g'ri to'rtburchakning D burchagining bissektressasi BC tomonni E nuqtadan kesib o'tadi. BE=12,5 sm va EC=5,5 sm bo'lsa, to'g'ri to'rtburchakning perimetri va yuzasini toping.



DE bissektirisa $\angle ADC$ burchakni teng ikkiga 45° dan bo'ladi. $\angle DCB$ to'g'ri bo'ganligidan $\angle DEC = 90^\circ - 45^\circ = 45^\circ$ bo'ladi. U holda $DC = EC = 5,5$ sm
U holda to'g'ri to'rtburchak tomonlari $DC = 5,5$ sm, $BC = 12,5 + 5,5 = 18$ sm
 $S = 5,5 \cdot 18 = 99$ sm²
 $P = 2(a+b) = 2(5,5+18) = 47$ sm

4-BILET

1. $-10m^2 - 20mn - 10n^2$ ifodani soddalashtirib, $n=19,8$ va $m=-20$ bo'lganda qiymatini hisoblang.

Yechish:

$$-10m^2 - 20mn - 10n^2 = -10(m^2 + 2mn + n^2) = -10(m+n)^2 = -10(-20+19,8)^2 = -10 \cdot (-0,2)^2 = -10 \cdot 0,04 = -0,4$$

2. Paraxod daryo oqimi bo'ylab 48 km va oqimga qarshi shuncha masofani 5 soatda bosib o'tdi. Agar daryo oqimining tezligi soatiga 4 km bo'lsa, paraxodning turg'un suvdagi tezligini toping.

Yechish: $v_{oqim} = 4 \frac{km}{soat}$, $v_{oqim} \text{ bo'yab} = v_{turg'un} + v_{oqim} = v_{turg'un} + 4$

$$\frac{48}{v_{turg'un} + 4} + \frac{48}{v_{turg'un} - 4} = 5, \quad \frac{v_{turg'un} - 4 + v_{turg'un} + 4}{v_{turg'un}^2 - 16} = \frac{5}{48}$$

$$\frac{v_{turg'un}}{v_{turg'un}^2 - 16} = \frac{5}{96}, \quad 96v_{turg'un} = 5(v_{turg'un}^2 - 16)$$

$$5v_{turg'un}^2 - 96v_{turg'un} - 80 = 0, \quad v_{turg'un} = 20 \text{ km/soat}$$

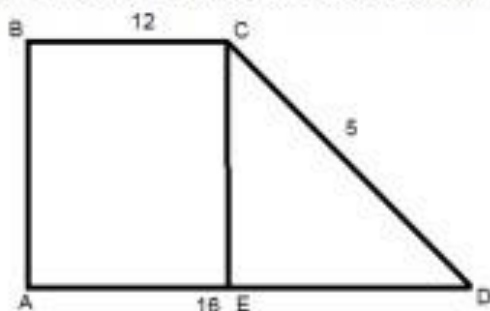
3. Agar $tg\alpha + ctg\alpha = a$ bo'lsa, $tg^2\alpha + ctg^2\alpha$ ni toping

$tg\alpha + ctg\alpha = a$ ning ikkala qismini kvadratga ko'taramiz:

$$tg^2\alpha + 2tg\alpha ctg\alpha + ctg^2\alpha = a^2, \quad tg^2\alpha + 2 + ctg^2\alpha = a^2,$$

$$tg^2\alpha + ctg^2\alpha = a^2 - 2$$

5. To'g'ri burchakli trapetsiyaning asoslari 12 sm va 16 sm bo'lib, katta yon tomoni 5 sm ga teng. Trapetsiyaning yuzini hisoblang.



$$BC = 12 \text{ sm}, AD = 16 \text{ sm}, DC = 5 \text{ sm},$$

$$AE = BC = 12 \text{ sm}, ED = 16 - 12 = 4 \text{ sm}$$

Pifagor teoremasiga ko'ra $CE^2 = CD^2 - ED^2 = 5^2 - 4^2 = 25 - 16 = 9 \text{ sm}^2$,

$$CE = 3 \text{ sm}$$

$$S_{TR} = \frac{BC + AD}{2} \cdot CE = \frac{12 + 16}{2} \cdot 3 = \frac{28}{2} \cdot 3 = 14 \cdot 3 = 42 \text{ sm}^2$$

5-BILET

1. Hisoblang: $\sqrt[4]{\frac{4,1^3 - 2,15^3}{1,95}} + 4,1 \cdot 2,15$

$$\begin{aligned} \sqrt[4]{\frac{4,1^3 - 2,15^3}{1,95}} + 4,1 \cdot 2,15 &= \sqrt[4]{\frac{(4,1 - 2,15)(4,1^2 + 4,1 \cdot 2,15 + 2,15^2)}{1,95}} + 4,1 \cdot 2,15 = \\ &= \sqrt[4]{4,1^2 + 4,1 \cdot 2,15 + 2,15^2} + 4,1 \cdot 2,15 = \sqrt[4]{(4,1 + 2,15)^2} = \sqrt{6,25} = 2,5 \end{aligned}$$

2. $y = 4x^2 + 12x + 11$ parabola uchining koordinatalarini uchini grafigini chizmasdan, aniqlang.

$$x_0 = -\frac{b}{2a} \text{ va } y_0 = c - \frac{b^2}{4a} \text{ formulalar bilan topilar edi}$$

$$x_0 = -\frac{12}{2 \cdot 4} = -\frac{3}{2} \text{ va } y_0 = 11 - \frac{12^2}{4 \cdot 2} = 11 - 18 = -7$$

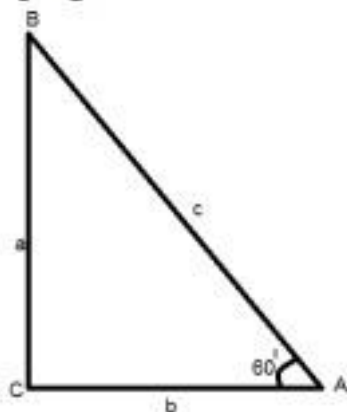
3. Agar $\frac{5 \sin x - 2 \cos x}{3 \cos x + 2 \sin x} = 3$ bo'lsa, ctgx ni toping.

$$\frac{5 \sin x - 2 \cos x}{3 \cos x + 2 \sin x} = 3, \quad 5 \sin x - 2 \cos x = 9 \cos x + 6 \sin x$$

$$9 \cos x + 2 \cos x = 5 \sin x - 6 \sin x, \quad 11 \cos x = -\sin x$$

$\sin x$ ga bo'lib yuborsak $\operatorname{ctgx} = -\frac{1}{11}$

5. To'g'ri burchakli uchburchakning burchaklaridan biri 60° ga teng. Uning gipotenuzasi bilan kichik kateti yig'indisi 60 sm bo'lsa, uning gipotenuzasini toping.



ABC uchburchak to'g'ri burchakli uchburchaklogidan $\angle CBA = 30^\circ$ bo'ladi. Uchburchakda katta tomon qarshisida katta burchak, kichik tomon qarshisida kichik burchak yotadi. Demak, b tomoni kichik katet ekan. $b + c = 60$ sm

$$\frac{b}{c} = \cos 60^\circ = \frac{1}{2}, \quad c = 2b \text{ kelib chiqadi}$$

$$b + c = b + 2b = 60, \quad 3b = 60, \quad b = 20 \text{ sm,}$$

$$c = 2b = 2 \cdot 20 = 40 \text{ sm}$$

6-BILET

1. Soddalashtiring: $\frac{(5b^{\frac{1}{4}} + 10)(b^{\frac{3}{4}} - 2b^{\frac{1}{2}})}{b - 4^{\frac{1}{2}}}$

$$\frac{(5b^{\frac{1}{4}} + 10)(b^{\frac{3}{4}} - 2b^{\frac{1}{2}})}{b - 4^{\frac{1}{2}}} = \frac{5(b^{\frac{1}{4}} + 2)b^{\frac{1}{2}}(b^{\frac{1}{4}} - 2)}{b - 4^{\frac{1}{2}}} = \frac{5b^{\frac{1}{2}}(b^{\frac{1}{2}} - 4)}{(b^{\frac{1}{2}} - 4)(b^{\frac{1}{2}} + 4)} = \frac{5b^{\frac{1}{2}}}{(b^{\frac{1}{2}} + 4)}$$

2. $y = 3x^2$ va $y = x + 2$ funksiyalar grafiklarini kesishish nuqtalarining koordinatalarini toping.

Yechish: ikki funksiyaning grafiklarining kesishish nuqtalari topish uchun grafiklarini tenglaymiz: $3x^2 = x + 2$, $3x^2 - x - 2 = 0$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{1 \pm \sqrt{(-1)^2 - 4 \cdot 3 \cdot (-2)}}{2 \cdot 3} = \frac{1 \pm \sqrt{25}}{6} = \frac{1 \pm 5}{6}$$

$$x_1 = 1, x_2 = -\frac{2}{3}$$

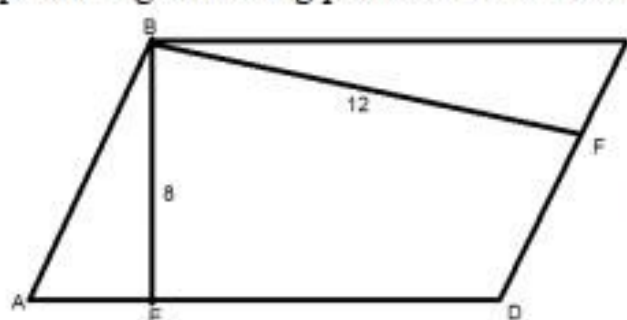
$y=x+2$ o'rniga qo'yib: $y_1 = x_1 + 2 = 1 + 2 = 3$, $y_2 = x_2 + 2 = -\frac{2}{3} + 2 = \frac{4}{3}$

Javob: $(1;3)$ va $(-\frac{2}{3}; \frac{4}{3})$

3. $\frac{\sin 3\alpha}{\sin \alpha} - \frac{\cos 3\alpha}{\cos \alpha} = 2$ ayniyatni isbotlang.

$$\begin{aligned} \frac{\sin 3\alpha}{\sin \alpha} - \frac{\cos 3\alpha}{\cos \alpha} &= \frac{\sin 3\alpha \cos \alpha - \cos 3\alpha \sin \alpha}{\sin \alpha \cos \alpha} = \frac{\sin(3\alpha - \alpha)}{\sin \alpha \cos \alpha} = \frac{\sin 2\alpha}{\sin \alpha \cos \alpha} \\ &= \frac{2\sin \alpha \cos \alpha}{\sin \alpha \cos \alpha} = 2 \end{aligned}$$

5. Parallelogrammning balandliklari 8 sm va 12 sm bo'lib, yuzasi 144 sm^2 bo'lsa, parallelogrammning perimetrini hisoblang.



$$S = BE \cdot AD = 8 \cdot AD = 144,$$

$$AD = 144 : 8 = 18 \text{ sm}$$

$$S = BF \cdot DC = 144, 12 \cdot DC = 144,$$

$$DC = 144 : 12 = 12 \text{ sm}$$

$$P = 2(AD + DC) = 2(18 + 12) = 60 \text{ sm}$$

7-BILET

1. $3^9 + 3^8 + 3^7 + 2 \cdot 3^6$ ifodaning qiymatini 41 ga qoldiqsiz bo'linishini isbotlang.

Yechish. Umumiy ko'paytuvchini qavsdan tashqariga chiqaramiz:

$$3^9 + 3^8 + 3^7 + 2 \cdot 3^6 = 3^6(3^3 + 3^2 + 3 + 2) = 3^6(27 + 9 + 3 + 2) = 41 \cdot 3^6$$

2. $|8 - 4x| < 32$ tengsizlikning nechta butun yechimlari bor?

$|8 - 4x| < 32$ da moduldan umumiy ko'paytuvchini chiqaramiz:

$$4 \cdot |2 - x| < 32, |2 - x| < 8$$

$$\begin{cases} 2 - x < 8 \\ 2 - x > -8 \end{cases} \Rightarrow \begin{cases} -x < 8 - 2 \\ -x > -8 - 2 \end{cases} \Rightarrow \begin{cases} -x < 6 \\ -x > -10 \end{cases} \Rightarrow \begin{cases} x > -6 \\ x < 10 \end{cases} \Rightarrow (-6 < x < 10)$$

Butun yechimlari soni $9 - (-5) + 1 = 15$ ta

3. Agar $\cos \alpha = -\frac{12}{13}$, $\pi < \alpha < \frac{3\pi}{2}$ bo'lsa, $\operatorname{tg} \alpha$ ni toping.

$$1 + \operatorname{tg}^2 \alpha = \frac{1}{\cos^2 \alpha} \text{ asosiy trigonometrik ayniyatdan foydalanamiz:}$$

$$\operatorname{tg}^2 \alpha = \frac{1}{\cos^2 \alpha} - 1, \operatorname{tg} \alpha = \pm \sqrt{\frac{1}{\cos^2 \alpha} - 1}$$

$$\alpha \text{ III chorakda bo'lganligidan } \operatorname{tg} \alpha = \sqrt{\frac{1}{\cos^2 \alpha} - 1} = \sqrt{\frac{1}{(-\frac{12}{13})^2} - 1} = \sqrt{\frac{1}{144} - 1} =$$

$$\sqrt{\frac{169}{144} - 1} = \sqrt{\frac{25}{144}} = \frac{5}{12}$$

5. Agar $\vec{a}(-4;0)$ va $\vec{b}(0;5)$ bo'lsa, $\vec{c} = 3\vec{a} + \vec{b}$ vektorning uzunligini hisoblang.

$$\vec{c} = 3\vec{a} + \vec{b} = (-12;0) + (0;5) = (12+0;0+5) = (12;5)$$

$$|\vec{c}| = \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$$

8-BILET

1. Soddashtiring: $2\sqrt{3} - 5 - \frac{11}{\sqrt{12}-1}$.

$$2\sqrt{3} - 5 - \frac{11}{\sqrt{12}-1} = 2\sqrt{3} - 5 - \frac{11(\sqrt{12}+1)}{(\sqrt{12}-1)(\sqrt{12}+1)} =$$

$$2\sqrt{3} - 5 - \frac{11(\sqrt{12}+1)}{11} = 2\sqrt{3} - 5 - \sqrt{12} - 1 = 2\sqrt{3} - 5 - 2\sqrt{3} - 1 = -6$$

2. $12 \leq 6-3x < 18$ qo'sh tengsizlikning eng kichik va eng katta butun yechimlari ko'paytmasini toping.

$$\begin{cases} 6-3x < 18 \\ 6-3x \geq 12 \end{cases} \Rightarrow \begin{cases} -3x < 12 \\ -3x \geq 6 \end{cases} \Rightarrow \begin{cases} x > -4 \\ x \leq -2 \end{cases} \Rightarrow (-4 < x \leq -2)$$

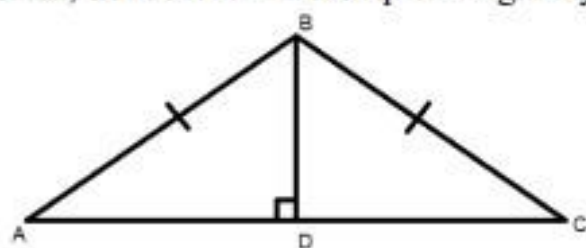
Eng kichik butun yechimi -3 va eng katta butun yechimi -2 ularning ko'paytmasi $-3 \cdot (-2) = 6$

3. Soddashtiring: $\sin^4 x - \cos^4 x + \cos^2 x$

$$\sin^4 x - \cos^4 x + \cos^2 x = (\sin^2 x - \cos^2 x)(\sin^2 x + \cos^2 x) + \cos^2 x =$$

$$\sin^2 x - \cos^2 x + \cos^2 x = \sin^2 x$$

5. Teng yonli uchburchakning asosi 16 sm, asosiga tushirilgan balandlik esa 4 sm bo'lsa, uchburchakka tashqi chizilgan aylana radiusini toping.



$$AC = 16 \text{ sm}, BD = 4 \text{ sm}, AB = BC.$$

$$AD = DC = 16 : 2 = 8 \text{ sm}$$

Pifagor teoremasiga ko'ra:

$$AB^2 = BD^2 + AD^2 = 4^2 + 8^2 = 16 + 64 = 80 \text{ sm}^2$$

$$AB = \sqrt{80 \text{ sm}^2} = 4\sqrt{5} \text{ sm}$$

$$S = \frac{1}{2} BD \cdot AC = \frac{1}{2} \cdot 4 \cdot 16 = 32 \text{ sm}^2$$

$$R = \frac{abc}{4S} = \frac{4\sqrt{5} \cdot 4\sqrt{5} \cdot 16}{4 \cdot 32} = 10 \text{ sm}$$

9-BILET

1. Hisoblang: $\left(\frac{1}{7}\right)^0 + 6 \cdot 2^{-3} + \left(\frac{2}{5}\right)^{-2}$

$$\left(\frac{1}{7}\right)^0 + 6 \cdot 2^{-3} + \left(\frac{2}{5}\right)^{-2} = 1 + \frac{6}{2^3} + \left(\frac{5}{2}\right)^2 = 1 + \frac{6}{8} + \frac{25}{4} = 1 + \frac{3}{4} + \frac{25}{4} = 1 + \frac{28}{4}$$

$$= 1 + 7 = 8$$

2. $y = -5 + 6x - x^2$ funksiyaning qiymatlar sohasini toping.

$y = ax^2 + bx + c$ kvadrat funksiya $a < 0$ bo'lsa x_0 nuqtada o'zining eng katta y_0 qiymatiga erishadi

$$y_0 = c - \frac{b^2}{4a} = -5 - \frac{6^2}{4 \cdot (-1)} = -5 + \frac{36}{4} = -5 + 9 = 4$$

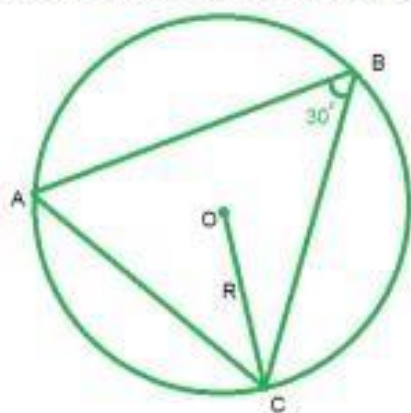
Demak qiymatlar to'plami $(-\infty; 4]$

3. Soddashtiring $\frac{x^2 - 3x + 9}{x^3 + 27} + \frac{x-3}{x^2 - 9} - \frac{x+5}{x+3}$

$$\frac{x^2 - 3x + 9}{x^3 + 27} + \frac{x-3}{x^2 - 9} - \frac{x+5}{x+3} = \frac{x^2 - 3x + 9}{(x+3)(x^2 - 3x + 9)} + \frac{x-3}{(x-3)(x+3)} - \frac{x+5}{x+3} =$$

$$\frac{1}{x+3} + \frac{1}{x+3} - \frac{x+5}{x+3} = \frac{1+1-x-5}{x+3} = \frac{-x-3}{x+3} = -1$$

5. Uchburchakning bir burchagi 30° ga teng uning qarshisidagi tomon 4,8dm uchburchakka tashqi chizilgan aylana radiusini toping.



$$AC = 4.8 \text{ dm} = 48 \text{ sm}$$

$$\frac{AC}{\sin 30^\circ} = 2R,$$

$$R = \frac{AC}{2 \sin 30^\circ} = \frac{48}{2 \cdot \frac{1}{2}} = 48 \text{ sm} = 4,8 \text{ dm}$$

10-BILET

1. Ifodani soddalashtiring: $(2a+3b)^2 - (2a-3b)^2$

$$(2a+3b)^2 - (2a-3b)^2 = ((2a+3b) - (2a-3b))((2a+3b) + (2a-3b)) \\ = (2a+3b-2a+3b)(2a+3b+2a-3b) = 6b(4a) = 24ab$$

2. $\begin{cases} x+8 < 12 \\ -3x < 15 \end{cases}$ Ushbu tengsizliklar sistemasining eng kichik butun yechimini toping.

$$\begin{cases} x+8 < 12 \\ -3x < 15 \end{cases} \Rightarrow \begin{cases} x < 12-8 \\ x > \frac{15}{-3} \end{cases} \Rightarrow \begin{cases} x < 4 \\ x > -5 \end{cases} \Rightarrow (-5; 4)$$

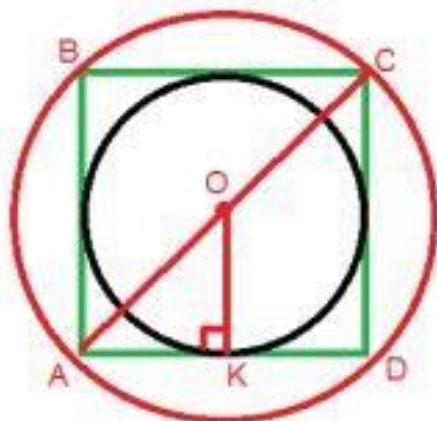
tengsizliklar sistemasining eng kichik butun yechimi -4

3. Agar $\text{tg} \alpha = 1/2$ bo'lsa $\text{tg} 2\alpha$ ni toping.

$$\text{tg} 2\alpha = \frac{2 \text{tg} \alpha}{1 - \text{tg}^2 \alpha} = \frac{2 \cdot \frac{1}{2}}{1 - (\frac{1}{2})^2} = \frac{1}{1 - \frac{1}{4}} = \frac{1}{\frac{3}{4}} = \frac{4}{3}$$

5. Tomoni 6 sm bo'lgan kvadratga ichki va tashqi chizilgan aylana radiusini toping

Kvadratning tomonini a deb olsak ,
 $a=6\text{sm}$.



$$OK = r = \frac{a}{2} = \frac{6}{2} = 3 \text{ sm}$$

Pifagor teoremasiga ko'ra:

$$AC^2 = CD^2 + AD^2 = 6^2 + 6^2 = 2 \cdot 6^2$$

$$AC = 2\sqrt{6} \text{ sm}$$

$$AO = OC = R = \frac{AC}{2} = \frac{2\sqrt{6}}{2} = \sqrt{6} \text{ sm}$$

11-BILET

1. Soddashtiring: $\frac{a-a\sqrt{a}}{\sqrt[3]{a^2+\sqrt[6]{a^5}+a}} - \frac{\sqrt[3]{a^2}-a}{\sqrt[3]{a}+\sqrt{a}} - 2\sqrt[3]{a}$.

$$\frac{a-a\sqrt{a}}{\sqrt[3]{a^2+\sqrt[6]{a^5}+a}} - \frac{\sqrt[3]{a^2}-a}{\sqrt[3]{a}+\sqrt{a}} - 2\sqrt[3]{a} = \frac{\sqrt[3]{a^3}-\sqrt{a^3}}{\sqrt[3]{a^2+\sqrt[6]{a^5}+a}} - \frac{\sqrt[3]{a^2}-a}{\sqrt[3]{a}+\sqrt{a}} - 2\sqrt[3]{a} =$$

$$\frac{(\sqrt[3]{a}-\sqrt{a})(\sqrt[3]{a^2}+\sqrt[6]{a^5}+a)}{\sqrt[3]{a^2}+\sqrt[6]{a^5}+a} - \frac{(\sqrt[3]{a}+\sqrt{a})(\sqrt[3]{a}-\sqrt{a})}{\sqrt[3]{a}+\sqrt{a}} - 2\sqrt[3]{a} =$$

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

2. Tenglamani yeching: $|x^2 - 5x| = 5x - x^2$

$|f(x)| = -f(x)$ tenglama yechimi $f(x) \leq 0$ ko'rinishida bo'lishini bilamiz

$|x^2 - 5x| = 5x - x^2$ tenglama yechimini $x^2 - 5x \leq 0$ ko'rinishida

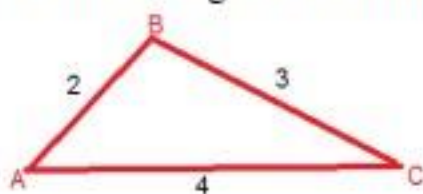
Izlaymiz: $x(x-5) \leq 0$ Javob: $x \leq 0$ va $x \geq 5$

3. Agar $\operatorname{tg} \alpha = -1,2$ va $\frac{\pi}{2} < \alpha < \pi$ bo'lsa, $\operatorname{ctg} 2\alpha$ ni toping.

$$\operatorname{tg} 2\alpha = \frac{2\operatorname{tg} \alpha}{1 - \operatorname{tg}^2 \alpha} = \frac{2 \cdot (-1,2)}{1 - (-1,2)^2} = \frac{-2,4}{1 - 1,44} = \frac{-2,4}{-0,44} = \frac{240}{44} = \frac{60}{11}$$

$$\operatorname{ctg} 2\alpha = \frac{1}{\operatorname{tg} 2\alpha} = \frac{11}{60}$$

5. Uchburchakning tomonlari mos ravishda 2 sm, 3 sm va 4 sm. Bu uchburchakning burchaklarini kosinusini toping.



$$\cos A = \frac{AB^2 + AC^2 - BC^2}{2AB \cdot AC} = \frac{2^2 + 4^2 - 3^2}{2 \cdot 2 \cdot 4} = \frac{11}{16}$$

$$\cos B = \frac{AB^2 + BC^2 - AC^2}{2AB \cdot BC} = \frac{2^2 + 3^2 - 4^2}{2 \cdot 2 \cdot 3} = \frac{-3}{12} = -\frac{1}{4}$$

$$\cos C = \frac{BC^2 + AC^2 - AB^2}{2BC \cdot AC} = \frac{3^2 + 4^2 - 2^2}{2 \cdot 3 \cdot 4} = \frac{21}{24} = \frac{7}{8}$$

12-BILET

1. Ifodani soddashtiring: $\frac{x^{0,5}}{\sqrt{x}-5} - \frac{5}{x^{0,5}+5} + \frac{x}{25-x}$

$$\frac{x^{0,5}}{\sqrt{x}-5} - \frac{5}{x^{0,5}+5} + \frac{x}{25-x} = \frac{\sqrt{x}}{\sqrt{x}-5} - \frac{5}{\sqrt{x}+5} + \frac{x}{(5-\sqrt{x})(5+\sqrt{x})} =$$

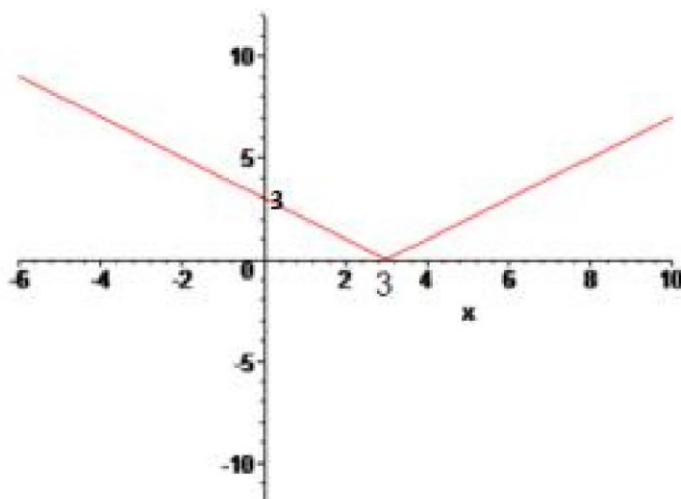
$$\frac{\sqrt{x}(\sqrt{x}+5) - 5(\sqrt{x}-5) - x}{(\sqrt{x}-5)(\sqrt{x}+5)} = \frac{x+5\sqrt{x}-5\sqrt{x}+25-x}{(\sqrt{x}-5)(\sqrt{x}+5)} = \frac{25}{x-25}$$

2. $y = |3-x|$ funksiya grafigini yasang.

$$y = |3-x| = \begin{cases} 3-x, & \text{agar } x \leq 3 \\ x-3, & \text{agar } x > 3 \end{cases}$$

Demak x ga qiymat berganda $x \leq 3$ qiymatlarni $y=3-x$ funksiyaga va $x > 3$ qiymatlarni esa $y=x-3$ funksiyaga qo'yamiz:

x	0	2	3	4	6
y	3	1	0	1	3



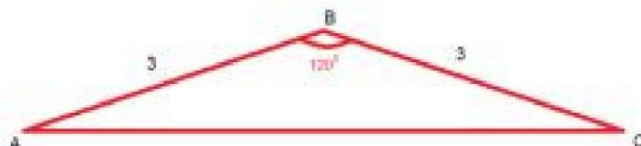
3. $\cos \alpha = -0,8$, $\frac{\pi}{2} < \alpha < \pi$ bo'lsa, tangensi va kotangensini aniqlang.

$$\sin \alpha = \pm \sqrt{1 - \cos^2 \alpha} \quad \alpha - II \text{ chorakda bo'lganidan}$$

$$\sin \alpha = \sqrt{1 - \cos^2 \alpha} = \sqrt{1 - (-0,8)^2} = \sqrt{1 - 0,64} = \sqrt{0,36} = 0,6$$

$$\operatorname{tg} \alpha = \frac{\sin \alpha}{\cos \alpha} = \frac{0,6}{-0,8} = -\frac{6}{8} = -\frac{3}{4}, \quad \operatorname{ctg} \alpha = \frac{1}{\operatorname{tg} \alpha} = -\frac{4}{3}$$

5. Teng yonli uchburchakning uchidagi burchagi 120° ga, yon tomoni 3ga teng. Shu uchburchakka tashqi chizilgan aylana radiusini toping.



$$AB = BC = 3$$

$$\begin{aligned} AC^2 &= 3^2 + 3^2 - 2 \cdot 3 \cdot 3 \cos 120^\circ \\ &= 9 + 9 - 18 \cdot \left(-\frac{1}{2}\right) \\ &= 18 + 9 = 27 \end{aligned}$$

$$AC = 3\sqrt{3}$$

$$\frac{AC}{\sin 120^\circ} = 2R, \quad R = \frac{AC}{2 \sin 120^\circ} = \frac{3\sqrt{3}}{2 \cdot \frac{\sqrt{3}}{2}} = 3$$

13-BILET

1. $\sqrt[3]{2001 \cdot 1997 - 1998 \cdot 2000 + 9}$ ni hisoblang

2000=a deb belgilash kiritaylik,

$$\sqrt{(a+1)(a-3) - (a-2)a + 9} = \sqrt{a^2 - 3a + a - 3 - a^2 + 2a + 9} = \sqrt{6}$$

2. $\{a_n\}$ arifmetik progressiyada $a_1 + a_9 = 20$ bo'lsa, S_{10} ni hisoblang.

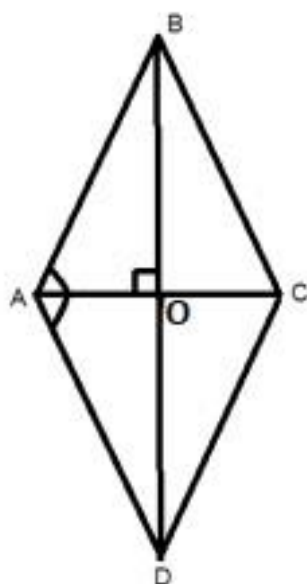
$$a_9 + a_9 = a_1 + a_{10} = 20$$

$$S_{10} = \frac{a_1 + a_{10}}{2} \cdot 10 = 5(a_1 + a_{10}) = 5 \cdot 20 = 100$$

3. Agar $\operatorname{ctg}(\frac{\pi}{4} + \alpha) = 2$ bo'lsa, $\operatorname{ctg} \alpha$ ni toping.

$$\operatorname{ctg}(\frac{\pi}{4} + \alpha) = \frac{\operatorname{ctg} \frac{\pi}{4} \cdot \operatorname{ctg} \alpha - 1}{\operatorname{ctg} \frac{\pi}{4} + \operatorname{ctg} \alpha} = \frac{\operatorname{ctg} \alpha - 1}{1 + \operatorname{ctg} \alpha} = 2 \quad \operatorname{ctg} \alpha - 1 = 2 + 2 \operatorname{ctg} \alpha \quad \operatorname{ctg} \alpha = -3$$

5. Rombning katta dioganali 18 sm va bir burchagi 120° bo'lsa, uning yuzini toping.



Katta diagonali o'tmas burchak qarshisida yotadi. $BD=18\text{sm}$. $\angle DAC=120^\circ$ u hoda $\angle ABC=60^\circ$
 Rombning dioganallari burchak bissektrisasi ham bo'ladi shuning uchun $\angle ABO=\angle OBC=30^\circ$
 $BO=OD=18:2=9\text{sm}$

$$\frac{AO}{BO} = \operatorname{tg} 30^\circ \quad AO = 9 \cdot \frac{\sqrt{3}}{3} = 3\sqrt{3}$$

$$AC=2AO=6\sqrt{3}$$

$$S = \frac{AC \cdot BD}{2} = \frac{6\sqrt{3} \cdot 18}{2} = 54\sqrt{3}\text{sm}^2$$

14-BILET

1. Hisoblang. $\frac{4^{\frac{2}{3}} \cdot 40^{\frac{1}{3}}}{10^{-\frac{2}{3}}}$

$$\frac{4^{\frac{2}{3}} \cdot 40^{\frac{1}{3}}}{10^{-\frac{2}{3}}} = 4^{\frac{2}{3}} \cdot 40^{\frac{1}{3}} \cdot 10^{\frac{2}{3}} = \left(4^{\frac{2}{3}} \cdot 10^{\frac{2}{3}}\right) \cdot 40^{\frac{1}{3}} = 40^{\frac{2}{3}} \cdot 40^{\frac{1}{3}} = 40$$

2. $\{b_n\}$ geometrik progressiyada $b_1=2$, $q=3$, $S_n=242$ ekani ma'lum bo'lsa, n ni toping.

$$S_n = \frac{b_1(q^n - 1)}{q - 1} = 242 \quad \frac{2(3^n - 1)}{3 - 1} = 242 \quad 3^n - 1 = 242$$

$$3^n = 243, \quad n = 5$$

3. Hisoblang: $(\cos 15^\circ + \sin 15^\circ)^2$

$$(\cos 15^\circ + \sin 15^\circ)^2 = \cos^2 15^\circ + 2\cos 15^\circ \sin 15^\circ + \sin^2 15^\circ = 1 + \sin 30^\circ = 1 + 0,5 = 1,5$$

5. $\vec{a}(4;5)$ va $\vec{b}(x; 6)$ vektorlar berilgan. x ning qanday qiymatlarida vektorlar o'zaro *perpendikulyar* bo'ladi?

Yechish. vektorlar perpendikular bo'lishi uchun ularning skalyar ko'paytmasi 0 ga teng bo'lishi kerak

$$\vec{a} \cdot \vec{b} = 4x + 30 = 0 \quad 4x = -30 \quad x = -7,5$$

15-BILET

1. b ning qanday qiymatida: $\overline{3b32576}$ yetti xonali son 4 ga qoldiqsiz bo'linadi?

Yechish. $4=2^2$ bo'lganligidan son 4 ga bo'linishi uchun uning oxirgi ikki raqami 4 ga bo'linishi kerak. 76 soni 4 ga karrali. Demak, b ning istalgan qiymatida bo'linadi

2. Agar arifmetik progressiyada $a_7=21$, $S_7=205$ bo'lsa a_1 va d ni toping.

$$S_7 = \frac{a_1 + a_7}{2} \cdot 7 = 205, \quad \frac{a_1 + 21}{2} = \frac{205}{7}, \quad a_1 + 21 = \frac{410}{7},$$

$$a_1 = \frac{410}{7} - 21 = \frac{410 - 147}{7} = \frac{263}{7}$$

$$a_7 = a_1 + 6d = 21, \quad \frac{263}{7} + 6d = 21, \quad 263 + 42d = 147, \quad 42d = -116, \quad d = -\frac{116}{42}$$

$$d = -\frac{107}{21}$$

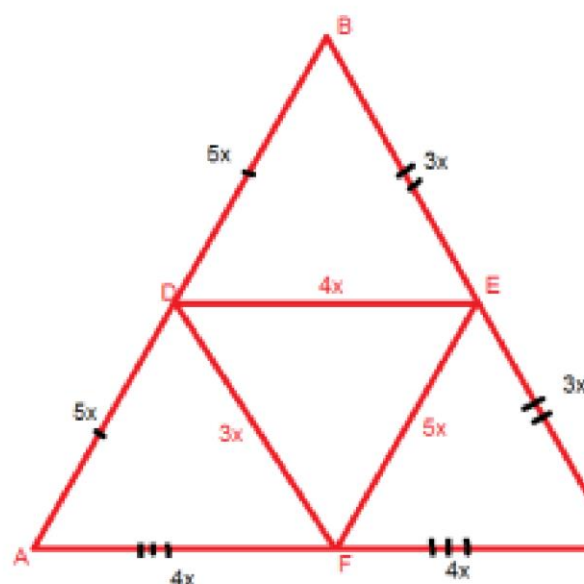
3. Agar $\sin \alpha = 4/5$ va $\frac{\pi}{2} < \alpha < \pi$ bo'lsa, $\cos \alpha$ va $\sin 2\alpha$ ni hisoblang

$\cos \alpha = \pm \sqrt{1 - \sin^2 \alpha}$ formuladan $\cos \alpha$ ni topamiz. α II chorakka tegishli

bo'lganligidan $\cos \alpha = \sqrt{1 - \sin^2 \alpha} = \sqrt{1 - \left(\frac{4}{5}\right)^2} = \sqrt{1 - \frac{16}{25}} = \sqrt{\frac{9}{25}} = \frac{3}{5}$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha = 2 \cdot \frac{4}{5} \cdot \frac{3}{5} = \frac{24}{25}$$

5. Uchburchakning o'rta chiziqlari 3:4:5 nisbatda, uchburchak perimetri esa 144 sm bo'lsa, uchburchak tomonlarini aniqlang. (**chizma umumiy holda chizilgan**)



$$DF=3x, DE=4x, EF=5x,$$

$$P_{ABC} = 144 \text{ sm}$$

Uchburchakning o'rta chizig'i xossasi bo'yicha

$$AD=DB=5x, AB=10x$$

$$BE=EC=3x, BC=6x$$

$$AF=FC=4x, AC=8x$$

$$P_{ABC} = 10x + 6x + 8x = 144$$

$$24x = 144$$

$$x=6 \text{ sm}$$

$$AB=10x=10 \cdot 6=60 \text{ sm}$$

$$BC=6x=6 \cdot 6=36 \text{ sm}$$

$$AC=8x=8 \cdot 6=48 \text{ sm}$$

16-BILET

1. n ning barcha natural qiymatlarida $25n^2 - (5n-4)^2$ ifoda 8 ga qoldiqsiz bo'linishini isbotlang.

$$25n^2 - (5n - 4)^2 = (5n - 5n + 4)(5n + 5n - 4) = 4(10n - 4) = 8(5n - 2)$$

2. Agar geometrik progressiyada $b_3=135$ va $S_3=195$ ekani ma'lum bo'lsa, geometrik progressiyaning dastlabki oltita hadining yig'indisini aniqlang.

$$S = b_1 + b_2 + b_3 = 195, \quad b_3 = 135.$$

$$b_1 + b_2 + 135 = 195, \quad b_1 + b_2 = 195 - 135 = 60$$

$$\begin{cases} b_3 = 135 \\ b_1 + b_2 = 60 \end{cases} \Rightarrow \begin{cases} b_1 q^2 = 135 \\ b_1(1 + q) = 60 \end{cases} \text{ sistemani bo'lib yuboramiz:}$$

$$\frac{q^2}{1 + q} = \frac{135}{60} = \frac{9}{4}, \quad 4q^2 = 9q + 9, \quad 4q^2 - 9q - 9 = 0$$

$$q_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{9 \pm \sqrt{(-9)^2 - 4 \cdot 4 \cdot (-9)}}{2 \cdot 4} = \frac{9 \pm \sqrt{225}}{8} = \frac{9 \pm 15}{8}$$

$$q_1 = 3, \quad q_2 = -\frac{3}{4}$$

$$\begin{cases} q = 3 \\ b_1(1 + q) = 60 \end{cases} \Rightarrow \begin{cases} q = 3 \\ b_1 = 15 \end{cases} \Rightarrow S_6 = \frac{15(3^6 - 1)}{3 - 1} = 5460$$

Yoki

$$\begin{cases} q = -\frac{3}{4} \\ b_1(1+q) = 60 \end{cases} \Rightarrow \begin{cases} q = -\frac{3}{4} \\ b_1 = 240 \end{cases} \Rightarrow S_6 = \frac{240 \left(\left(-\frac{3}{4} \right)^6 - 1 \right)}{-\frac{3}{4} - 1} =$$

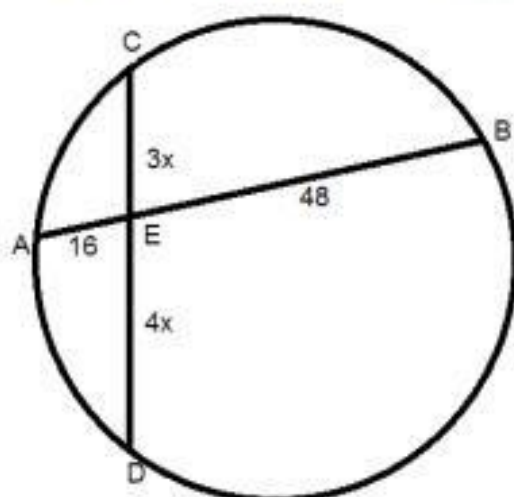
$$\frac{240 \left(\frac{729}{4096} - 1 \right)}{-\frac{7}{4}} = \frac{240 \left(1 - \frac{729}{4096} \right)}{\frac{7}{4}} = \frac{240 \cdot \frac{3367}{4096}}{\frac{7}{4}} = \frac{240 \cdot 3367}{1024 \cdot 7} = \frac{15 \cdot 481}{64}$$

$$= \frac{7215}{64}$$

3. Agar $\operatorname{ctg} \alpha = 3$ bo'lsa, $\frac{\sin^2 \alpha + \sin \alpha \cdot \cos \alpha}{\cos^2 \alpha + \sin \alpha \cdot \cos \alpha}$ ifodaning qiymatini toping.

$$\frac{\sin^2 \alpha + \sin \alpha \cdot \cos \alpha}{\cos^2 \alpha + \sin \alpha \cdot \cos \alpha} = \frac{\sin \alpha (\sin \alpha + \cos \alpha)}{\cos \alpha (\cos \alpha + \sin \alpha)} = \frac{\sin \alpha}{\cos \alpha} = \operatorname{tg} \alpha = \frac{1}{\operatorname{ctg} \alpha} = \frac{1}{3}$$

5. AB va CD vatarlar E nuqtada kesishadi. Agar $AE=16$ sm, $BE=48$ sm, $CE:DE=3:4$ bo'lsa, CE va DE ni aniqlang.



Bizga ma'lumki, $AE \cdot EB = CE \cdot DE$

$$16 \cdot 48 = 3x \cdot 4x$$

$$12x^2 = 16 \cdot 48, \quad x^2 = 64, \quad x = 8 \text{ sm}$$

$$CE = 3x = 3 \cdot 8 = 24 \text{ sm}$$

$$DE = 4x = 4 \cdot 8 = 32 \text{ sm}$$

17-BILET

1. Kitob va daftar birgalikda 5800 so'm turadi. Kitob narxining 10%i daftar narxining 35%idan 220 so'm qimmat. Kitob va daftar alohida necha so'm turadi? Yechish. Kitob narxini x , daftar narxini y deb belgilash kiritamiz:

$$\begin{cases} x + y = 5800 \\ 0,1x = 0,35y + 220 \end{cases} \Rightarrow \begin{cases} x + y = 5800 \\ x = 3,5y + 2200 \end{cases} \Rightarrow \begin{cases} x + y = 5800 \\ 3,5y + 2200 + y = 5800 \end{cases} \Rightarrow$$

$$\begin{cases} x + y = 5800 \\ 4,5y = 3600 \end{cases} \Rightarrow \begin{cases} x + y = 5800 \\ y = 800 \end{cases} \Rightarrow x = 5000 \text{ va } y = 800$$

2. Agar cheksiz kamayuvchi geometrik progressiyaning yig'indisi 150 ga teng. $b_1=15$ bo'lsa, q ni toping.

$$S = \frac{b_1}{1-q} = 150, \quad \frac{15}{1-q} = 150, \quad 1-q = \frac{15}{150}, \quad 1-q = 0,4 \quad q = 0,6$$

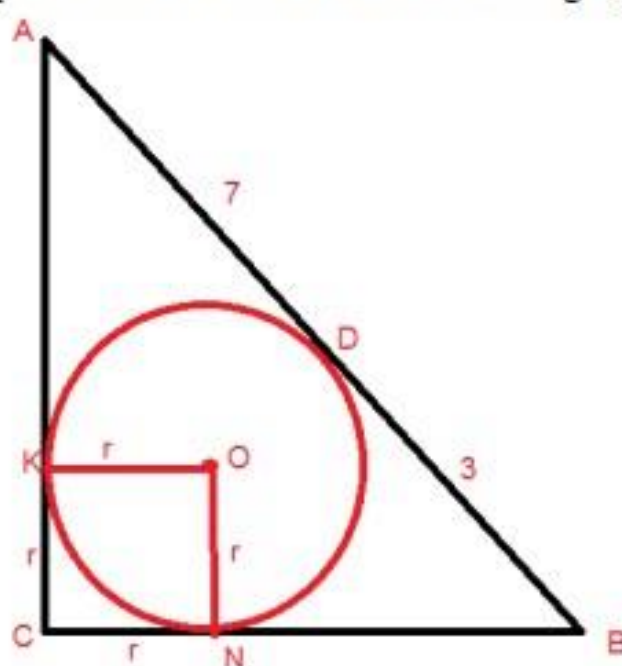
3. Teng yonli uchburchakning uchidagi burchagining tangensi $2\sqrt{2}$ ga teng, shu burchakning kosinusini toping.

Yechish. Uchidagi burchagi α bo'lsin. U holda $\operatorname{tg} \alpha = 2\sqrt{2} > 0$ demak, $\alpha < 90^\circ$. U holda $\cos \alpha > 0$ bo'ladi.

$$1 + \operatorname{tg}^2 \alpha = \frac{1}{\cos^2 \alpha} \Rightarrow \cos^2 \alpha = \frac{1}{1 + \operatorname{tg}^2 \alpha} \Rightarrow \cos \alpha = \sqrt{\frac{1}{1 + \operatorname{tg}^2 \alpha}}$$

$$= \sqrt{\frac{1}{1 + (2\sqrt{2})^2}} = \sqrt{\frac{1}{1 + 8}} = \sqrt{\frac{1}{9}} = \frac{1}{3}$$

5. To'g'ri burchakli uchburchakka aylana ichki chizilgan, urinish nuqtasi gipotenuzani 7 sm va 3 sm li kesmalarga ajratadi. Uchburchakning yuzini toping.



$$AD=7 \text{ sm}, \quad DB=3 \text{ sm},$$

$$KO=ON=NC=CK=r$$

$$AD=AK=7 \text{ sm}, \quad BD=BN=3 \text{ sm}$$

$$AC=7+r, \quad BC=3+r, \quad AB=7+3=10 \text{ sm}$$

Pifagor teoremasiga ko'ra

$$AC^2 + BC^2 = AB^2$$

$$(7+r)^2 + (3+r)^2 = 10^2$$

$$49 + 14r + r^2 + 9 + 6r + r^2 = 100$$

$$2r^2 + 20r - 42 = 0$$

$$r^2 + 10r - 21 = 0$$

$$r_{1,2} = \frac{-10 \pm \sqrt{10^2 + 4 \cdot 21}}{2}$$

$$= \frac{-10 \pm \sqrt{184}}{2}$$

$r > 0$ bo'lganligidan

$$r = \frac{\sqrt{184} - 10}{2} = \sqrt{46} - 5$$

$$AC = 7 + \sqrt{46} - 5 = \sqrt{46} + 2, \quad BC = 3 + r = 3 + \sqrt{46} - 5 = \sqrt{46} - 2$$

$$S = \frac{AC \cdot BC}{2} = \frac{(\sqrt{46} + 2)(\sqrt{46} - 2)}{2} = \frac{46 - 4}{2} = \frac{42}{2} = 21$$

2-Usuli bor. $S=7 \cdot 3=21$ ammo o'sha formulani isbotlash ekrak

18-BILET

1. Sinfda 21 ta qiz bola va 14 ta o'g'il bola bor. Qiz bolalar butun sinfning necha foizini tashkil qiladi?

Yechish: Jami o'quvchilar $21+14=35$ o'quvchi. Qiz bolalar jami sinfning $\frac{21}{35} = \frac{3}{5}$ qismini tashkil etadi. Foizga aylantirish uchun 100% ga ko'paytirish yetarli:

$$\frac{3}{5} \cdot 100\% = 60\%$$

2. Arifmetik progressiyada uchinchi va to'qqizinchi hadlar yig'indisi 8 ga teng. Progressiyaning dastlabki 11 ta hadi yig'indisini toping.

$$a_3 + a_9 = 8$$

$$S_{11} = \frac{a_1 + a_{11}}{2} \cdot 11 \text{ ga teng va } a_3 + a_9 = a_1 + a_{11} = 8 \text{ ekanligidan}$$

$$S_{11} = \frac{8}{2} \cdot 11 = 4 \cdot 11 = 44$$

3. Agar $\alpha=52^\circ$ va $\beta=22^\circ$ ekanligi ma'lum bo'lsa, $\sin(\alpha+\beta)-2\sin\beta\cdot\cos\alpha$ ifoda 12,5 dan qanchaga kichik ekanini toping.

$$\sin(\alpha + \beta) - 2\sin\beta \cdot \cos\alpha = \sin\alpha\cos\beta + \cos\alpha\sin\beta - 2\sin\beta \cdot \cos\alpha =$$

$$\sin\alpha\cos\beta - \cos\alpha\sin\beta = \sin(\alpha - \beta) = \sin(52^\circ - 22^\circ) = \sin 30^\circ = \frac{1}{2}$$

5. Parallelogrammning ikkita burchagi yig'indisi 156° ga teng. Parallelogramm burchaklarini toping.



$$\begin{aligned}\angle A + \angle C &= 156^\circ \\ \angle A &= \angle C \text{ u holda } 2 \cdot \angle A = 156^\circ \\ \angle A &= 156^\circ : 2 = 78^\circ \\ \angle A + \angle B &= 180^\circ \\ \angle B &= 180^\circ - \angle C = 180^\circ - 78^\circ \\ &= 102^\circ\end{aligned}$$

Burchaklari 102° va 78°

19-BILET

1. a; 4,6; -3,4 sonlarning o'rta arifmetigi 4,8 ga teng. a ni toping.

$$\frac{a + 4,6 + (-3,4)}{3} = 4,8 \quad a + 4,6 + (-3,4) = 14,4 \quad a + 1,2 = 14,4$$

$$a = 14,4 - 1,2 = 0,24$$

2. Ikkita natural sonning ko'paytmasi 266 ga teng. Agar ulardan biri ikkinchisidan 5 ga ortiq bo'lsa, bu sonlarni toping.

1-son	2-son
$x+5$	x

$$x(x+5)=266 \quad x^2+5x-266=0$$

$$x_{1,2} = \frac{-5 \pm \sqrt{5^2 - 4 \cdot (-266)}}{2} = \frac{-5 \pm \sqrt{1089}}{2} = \frac{-5 \pm 33}{2}$$

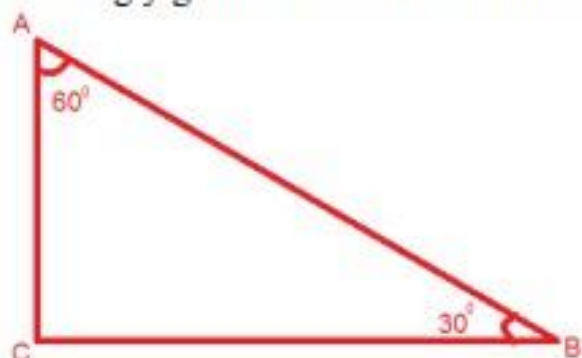
$$x_1 = 14 \text{ va } x_2 = -19$$

X natural sonligidan $x_2 = -19$ chet ildiz. 1-son $x+5=14+5=19$, 2-son 14

3. Agar $\sin\alpha=0,8$ va $\frac{\pi}{2} < \alpha < \pi$ bo'lsa, $\cos 2\alpha$ ning qiymatini toping.

$$\begin{aligned}\cos 2\alpha &= \cos^2\alpha - \sin^2\alpha = 1 - \sin^2\alpha - \sin^2\alpha = 1 - 2\sin^2\alpha = 1 - 2 \cdot (0,8)^2 \\ &= 1 - 1,28 = -0,28\end{aligned}$$

5. To'g'ri burchakli uchburchakning burchaklardan biri 60° , gipotenuza va kichik katetining yig'indisi esa 57 sm. Uchburchakning yuzini toping.



$$\angle A=60^\circ, \text{ U holda } \angle B=90^\circ-60^\circ=30^\circ$$

Kichik burchak qarshisida kichik tomon yotishini hisobga olsak, kichik kateti 30° li burchak qarshisidagi katet AC bo'ladi

$$AC+AB=57$$

30° li burchak qarshisidagi katet gipotenuzaning yarmiga tengligidan:

$$AC = \frac{AB}{2} \Rightarrow AB = 2AC$$

$$AC + AB = AC + 2AC = 3AC = 57, \quad AC = 19 \text{ sm}, AB = 38 \text{ sm}$$

$$S_{ABC} = \frac{1}{2} AC \cdot AB \cdot \sin 60^\circ = \frac{1}{2} \cdot 19 \cdot 38 \cdot \frac{\sqrt{3}}{2} = \frac{361\sqrt{3}}{2}$$

20-BILET

1. 639 sonni 2:3:4 nisbatdagi uchta sonning yig'indisi shaklida ifodalang. Katta va kichik qo'shiluvchilar ayirmasini toping.

Yechish: 1-son $2x$, 2-son $3x$, 3-son $4x$ ga teng. $2x+3x+4x=639$ $9x=639$ $x=71$
Katta qo'shiluvchi $4x$, kichik qo'shiluvchi $2x$ ular ayirmasi $4x-2x=2x=2 \cdot 71=142$

2. Tenglamaning ildizlarini yig'indisini toping: $x^4 - 10x^2 + 9 = 0$

$$x^2 = t \text{ belgilash kiritamiz: } t^2 - 10t + 9 = 0$$

$$(t - 1)(t - 9) = 0 \quad t_1 = 1 \text{ va } t_2 = 9$$

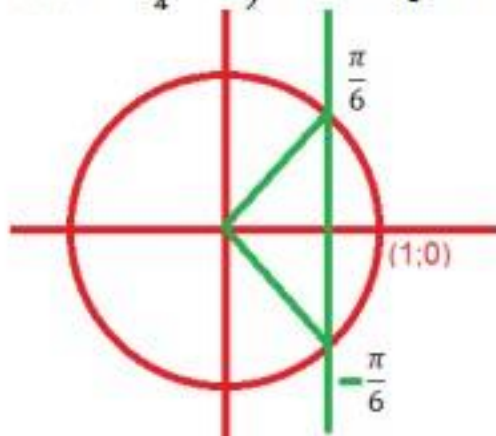
$$x^2 = 1 \quad x_{1,2} = \pm\sqrt{1} = \pm 1$$

$$x^2 = 9 \quad x_{1,2} = \pm\sqrt{9} = \pm 3$$

3. $4\cos x = 2\sqrt{3}$ tenglik to'g'ri bo'ladigan x ning ikkita qiymatini aniqlang.

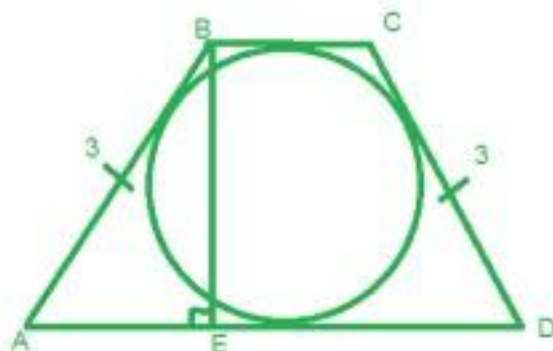
$4\cos x = 2\sqrt{3}$ ikkala qismini 4 ga bo'lamiz:

$$\cos x = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2} \text{ ni hosil qilamiz}$$



x quyidagi qiymatlarni qabul qiladi: $\frac{\pi}{6}$ va $-\frac{\pi}{6}$

5. Yon tomoni 3 ga teng bo'lgan teng yonli trapetsiyaga doira ichki chizilgan. Agar trapetsiyaning yuzi 6 ga teng bo'lsa, bu doiraning yuzini toping.



$AB=CD=3$. To'rtburchakka ichki chizilgan $AB+CD=BC+AD$ tengligi bajariladi: $BC+AD=6$

$$S_{ABCD} = \frac{BC + AD}{2} \cdot BE = 6$$

$$\frac{6}{2} \cdot BE = 6 \quad BE = 2$$

$$BE=2r=2, \quad r=1$$

$$S_{doira} = \pi r^2 = \pi \cdot 1^2 = \pi$$

21-BILET

1. Mahsulot narxi 10% ga orttirildi. Ma'lum muddat o'tgach talab kam bo'lgani uchun uning narxi 10 % ga pasaytirildi. So'nggi narx dastlabki narxdan necha foiz kam?

Yechish: dastlabki narxni x deb olaylik. 10% oshsa $1,1x$ bo'ladi. Ma'lum muddat o'tgach talab kam bo'lgani uchun uning narxi 10 % ga pasaytirilgach

$1,1x \cdot 0,9 = 0,99x$ bo'ladi. $0,99 \cdot 100\% = 99\%$. Demak, $100\% - 99\% = 1\%$ kam ekan.

2. Tenglamani yeching: $(1,7 : (1\frac{2}{3}x - 3,75)) : \frac{8}{25} = 1\frac{5}{12}$

$$(1,7 : (1\frac{2}{3}x - 3,75)) : \frac{8}{25} = 1\frac{5}{12}$$

$$1,7 : (1\frac{2}{3}x - 3,75) = \frac{17}{12} \cdot \frac{8}{25}$$

$$1\frac{2}{3}x - 3,75 = \frac{17}{10} \cdot \frac{12 \cdot 25}{17 \cdot 8} \quad 1\frac{2}{3}x - 3,75 = \frac{15}{4} \quad 1\frac{2}{3}x - 3,75 = 3,75$$

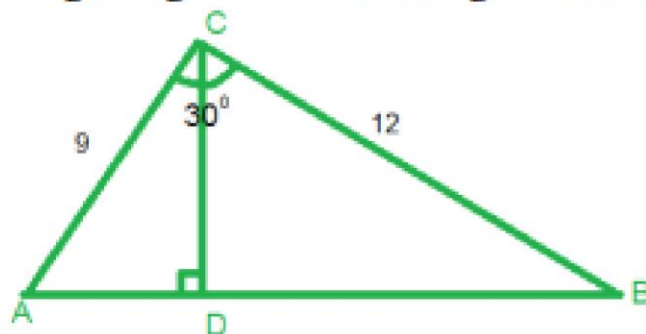
$$1\frac{2}{3}x = 7,5 \quad x = \frac{15}{2} : \frac{5}{3} = \frac{15}{2} \cdot \frac{3}{5} = 4,5$$

3. Ifodani soddalashtiring: $\frac{\cos(\alpha - \beta) - \cos \alpha \cdot \cos \beta}{\cos(\alpha + \beta) + \sin \alpha \cdot \sin \beta}$

$$\frac{\cos(\alpha - \beta) - \cos \alpha \cdot \cos \beta}{\cos(\alpha + \beta) + \sin \alpha \cdot \sin \beta} = \frac{\cos \alpha \cos \beta + \sin \alpha \sin \beta - \cos \alpha \cos \beta}{\cos \alpha \cos \beta - \sin \alpha \sin \beta + \sin \alpha \sin \beta} = \frac{\sin \alpha \sin \beta}{\cos \alpha \cos \beta} = \operatorname{tg} \alpha \cdot \operatorname{tg} \beta$$

5. Uchburchakning ikki tomonlari 9 sm va 12 sm, ular orasidagi burchak

30° ga teng. Uchburchakning uchunchi tomoniga tushirilgan balandlikni toping.



$AC = 9 \text{ sm}$, $BC = 12 \text{ sm}$, $\angle ACB = 90^\circ$

Kosinuslar teoremasidan AB ni topamiz:

$$\begin{aligned} AB^2 &= 9^2 + 12^2 - 2 \cdot 9 \cdot 12 \cdot \cos 30^\circ \\ &= 81 + 144 - 216 \cdot \frac{\sqrt{3}}{2} = \\ &= 225 - 108\sqrt{3} \end{aligned}$$

$$AB = \sqrt{225 - 108\sqrt{3}} = 3\sqrt{25 - 12\sqrt{3}}$$

$$S_{ABC} = \frac{1}{2} \cdot 9 \cdot 12 \cdot \sin 30^\circ = \frac{1}{2} \cdot 9 \cdot 12 \cdot \frac{1}{2} = 27 \text{ sm}^2$$

$$S_{ABC} = \frac{1}{2} \cdot AB \cdot CD = 27 \quad CD = \frac{54}{AB} = \frac{54}{3\sqrt{25-12\sqrt{3}}} = \frac{18}{\sqrt{25-12\sqrt{3}}} =$$

22-BILET

1. Kater va teploxod bir-biriga qarab harakatlanmoqda. Ular orasidagi masofa 120 km. Teploxodning tezligi 50 km/soat. Katerning tezligi 60% kam. Ular necha soatdan keyin uchrashadi?

Yechish: Teploxod tezligi 50km/soat. Katerniki $50 \cdot 0,4 = 20$ km/soat. Ular t vaqtda uchrashdi deylik, u holda $50t + 20t = 120$ km, $70t = 120$ km $t = \frac{12}{7}$ soat

2. Agar $B(-2; -7)$ nuqta $y = kx^2 + 8x + m$ parabolaning uchi bo'lsa, k va m ning qiymatlarini toping.

$$x_0 = -\frac{8}{2k} = -2 \quad 2k = 4 \quad k = 2$$

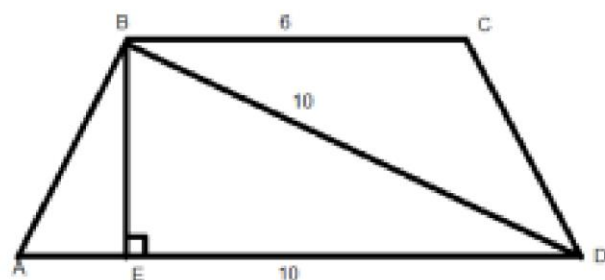
$$y_0 = m - \frac{8^2}{4k} = -7, \quad m - \frac{8^2}{4 \cdot 2} = -7, \quad m - 8 = -7, \quad m = 1$$

3. Hisoblang: $\frac{tg \frac{9\pi}{16} - tg \frac{5\pi}{16}}{1 + tg \frac{9\pi}{16} \cdot tg \frac{5\pi}{16}}$.

$$tg(\alpha - \beta) = \frac{tg\alpha - tg\beta}{1 + tg\alpha \cdot tg\beta}$$

$$\frac{tg \frac{9\pi}{16} - tg \frac{5\pi}{16}}{1 + tg \frac{9\pi}{16} \cdot tg \frac{5\pi}{16}} = tg \left(\frac{9\pi}{16} - \frac{5\pi}{16} \right) = tg \frac{\pi}{4} = 1$$

5 Teng yonli trapetsiya asoslari 6 va 10, diagonali 10 ga teng. Trapetsiyaning yuzini toping.



$$AB=DC, BC=6, AD=10, BD=10$$

Teng yonli trapetsiya xossasiga ko'ra

$$ED = \frac{BC + AD}{2} = \frac{6 + 10}{2} = 8$$

$$BE = \sqrt{10^2 - 8^2} = \sqrt{36} = 6$$

$$S_{Tr} = \frac{BC + AD}{2} \cdot BE = \frac{6 + 10}{2} \cdot 6 = 48$$

23-BILET

1. Yig'indisi 99 ga teng bo'lgan uchta ketma-ket kelgan toq sonlarni toping.

Yechish: Uchta ketma-ket kelgan toq sonlar $2n-1, 2n+1, 2n+3$ bo'lsin.

$$2n-1+2n+1+2n+3=99 \quad 6n+3=99 \quad 6n=96 \quad n=16$$

$$2n-1=2 \cdot 16-1=31 \quad 2n+1=2 \cdot 16+1=33 \quad 2n+3=2 \cdot 16+3=35$$

2. Tenglama ildizlari ko'paytmasini toping: $(x+\frac{1}{x})^2 - 2 \cdot (x+\frac{1}{x}) - 3 = 0$

$$x + \frac{1}{x} = t \text{ deb belgilash kiritamiz}$$

$$t^2 - 2t - 3 = 0 \quad (t-3)(t+1) = 0 \quad t_1 = 3 \text{ va } t_2 = -1$$

$$x + \frac{1}{x} = 3 \quad x^2 - 3x + 1 = 0 \quad x_1 \cdot x_2 = 1$$

$$x + \frac{1}{x} = -1 \quad x^2 + x + 1 = 0 \quad x_3 \cdot x_4 = 1$$

$$(x_1 \cdot x_2) \cdot (x_3 \cdot x_4) = 1 \cdot 1 = 1$$

3. Hisoblang: $\frac{2 \sin \frac{\pi}{8} \cos \frac{\pi}{8}}{\cos^2 \frac{\pi}{8} - \sin^2 \frac{\pi}{8}}$

$$\frac{2 \sin \alpha \cos \alpha}{\cos^2 \alpha - \sin^2 \alpha} = \frac{\sin 2\alpha}{\cos 2\alpha} = \operatorname{tg} 2\alpha \text{ formuladan foydalanamiz:}$$

$$\frac{2 \sin \frac{\pi}{8} \cos \frac{\pi}{8}}{\cos^2 \frac{\pi}{8} - \sin^2 \frac{\pi}{8}} = \operatorname{tg} 2 \cdot \frac{\pi}{8} = \operatorname{tg} \frac{\pi}{4} = 1$$

5. $\vec{a}(4; 4\sqrt{3})$ va $\vec{b}(8\sqrt{3}; 8)$ vektorlar orasidagi burchak sinusini toping.

$$\cos \alpha = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{4 \cdot 8\sqrt{3} + 4\sqrt{3} \cdot 8}{\sqrt{4^2 + (4\sqrt{3})^2} \cdot \sqrt{(8\sqrt{3})^2 + 8^2}} = \frac{64\sqrt{3}}{\sqrt{64} \cdot \sqrt{256}} = \frac{64\sqrt{3}}{8 \cdot 16} = \frac{\sqrt{3}}{2}$$

$\alpha = \frac{\pi}{6}$ ekan. Demak $\sin \frac{\pi}{6} = 0,5$

24-BILET

1. To'rtta ketma-ket natural sonlar berilgan. Chetki hadlar yig'indisining ikkilanganidan o'rta hadlar musbat ayirmasi ayrilsa, 57 hosil bo'ladi. Shu sonlarni toping.

Yechish: To'rtta ketma-ket natural sonni $n, n+1, n+2, n+3$ deb olaylik.

$$(n + (n+3)) \cdot 2 - ((n+2) - (n+1)) = 57$$

$$(2n+3) \cdot 2 - (n+2-n-1) = 57$$

$$4n+6-1=57 \quad 4n+5=57 \quad 4n=52 \quad n=\frac{52}{4}=13$$

Javob: 13, 14, 15, 16

2. $x^2-8x+3=0$. Tenglamani yechmasdan $x_1^2 + x_2^2$ ifodaning qiymatini toping.

Viyet teoremasiga ko'ra $\begin{cases} x_1 + x_2 = 8 \\ x_1 \cdot x_2 = 3 \end{cases}$

$$x_1 + x_2 = 8 \text{ ni kvadratga ko'taramiz: } x_1^2 + 2x_1 \cdot x_2 + x_2^2 = 8^2$$

$$x_1^2 + 2 \cdot 3 + x_2^2 = 64 \quad x_1^2 + x_2^2 = 64 - 6 = 58$$

3. Agar $\cos \frac{\alpha}{2} + \sin \frac{\alpha}{2} = \frac{1}{2}$ bo'lsa, $\sin \alpha$ ni toping.

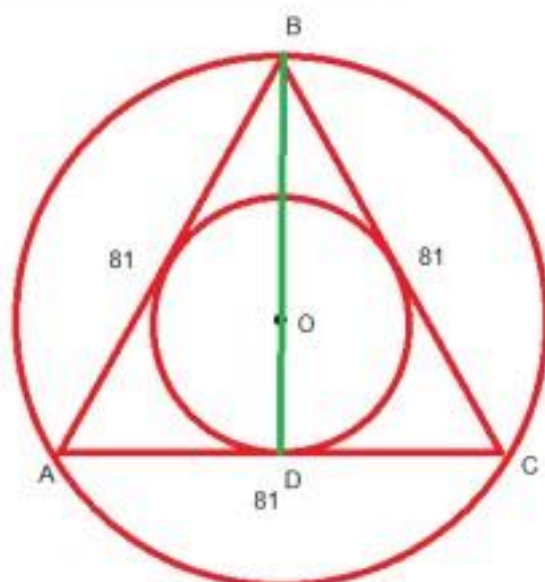
$\cos \frac{\alpha}{2} + \sin \frac{\alpha}{2} = \frac{1}{2}$ ifodaning ikkala qismini kvadratga ko'taramiz:

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

$$1 + \sin \alpha = \frac{1}{4} \quad \sin \alpha = -\frac{3}{4}$$

5. Tomoni 81 ga teng bo'lgan teng tomonli uchburchakka tashqi va ichki chizilgan aylanalar radiuslarini toping.

$$a=81;$$



$$S_{ABC} = \frac{a^2 \sqrt{3}}{4},$$

$$R = \frac{abc}{4S} = \frac{a^3}{4 \cdot \frac{a^2 \sqrt{3}}{4}} = \frac{a}{\sqrt{3}} = \frac{81}{\sqrt{3}}$$

$$= 27\sqrt{3},$$

$$r = \frac{2S}{a+b+c} = \frac{2 \cdot \frac{a^2 \sqrt{3}}{4}}{3a} = \frac{a}{2\sqrt{3}} = \frac{27\sqrt{3}}{2}$$

25-BILET

1. Tengsizlikni yeching: $4(x-2)-5(x-3) \leq 0$

Yechish: Qavslarni ochib o'xshash hadlarni soddalashtiramiz:

$$4x-8-5x+15 \leq 0 \quad -x+7 \leq 0 \quad x \geq 7$$

2. Tenglamani yeching: $\sqrt{6-5x}=x$.

Bunda aniqlanish soha $x \geq 0$ bo'ladi. Tenglikning ikki tomonini kvadratga ko'taramiz:

$$(\sqrt{6-5x})^2 = x^2 \quad 6-5x = x^2 \quad x^2 + 5x - 6 = 0 \quad (x-1)(x+6) = 0$$

$$x_1 = 1 \text{ va } x_2 = -6$$

Aniqlanish soha bo'yicha $x \geq 0$ bo'lishi kerak edi. Demak -6 soni chet ildiz

Javob: $x=1$

3. $\sin 15^\circ$ ni hisoblang.

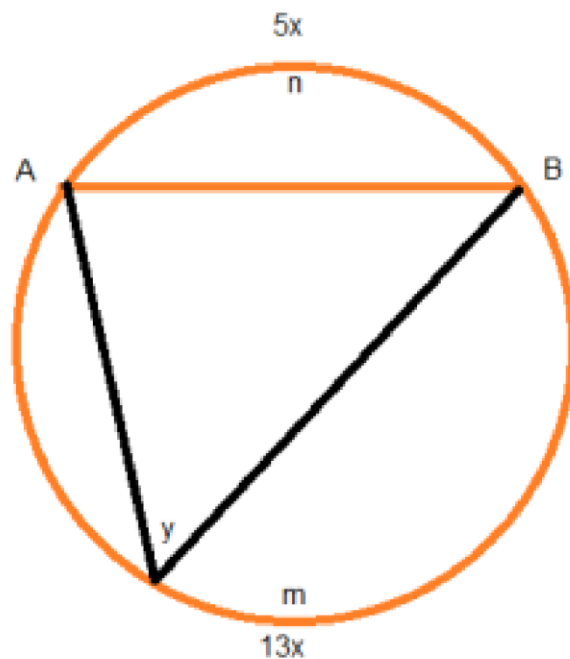
I usul. $\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1-\cos \alpha}{2}}$ formuladan foydalanamiz: 15° I chorakda bo'lganidan

$$\begin{aligned} \sin \frac{30^\circ}{2} &= \sqrt{\frac{1-\cos 30^\circ}{2}} = \sqrt{\frac{1-\frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{2-\sqrt{3}}{4}} = \frac{\sqrt{2-\sqrt{3}}}{2} = \frac{\sqrt{4-2\sqrt{3}}}{2\sqrt{2}} = \\ &= \frac{\sqrt{(\sqrt{3}-1)^2}}{2\sqrt{2}} = \frac{\sqrt{3}-1}{2\sqrt{2}} = \frac{\sqrt{6}-\sqrt{2}}{4} \end{aligned}$$

II usul. $\sin 15^\circ = \sin(45^\circ - 30^\circ) = \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ =$

$$= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6} - \sqrt{2}}{4}$$

5. Vatar aylanani 13:5 nisbatda bo'ladi. Shu vatarda tiralgan ichki chizilgan burchaklardan kichigining gradus o'lchovini toping



AB vatar o'tkazilgan va u aylana yoyini $\widehat{AnB} = 5x$ va $\widehat{AmB} = 13x$

$$5x + 13x = 360^\circ \quad 18x = 360^\circ$$

$$x = 20^\circ$$

Shu vatarda tiralgan ichki chizilgan burchaklardan kichigi kichik yoyga tiraladi va uning yarmiga teng:

$$\frac{5x}{2} = \frac{5 \cdot 20^\circ}{2} = 50^\circ$$

26-BILET

1. Kumush va misdan iborat qotishmaning og'irligi 2 kg. Kumushning og'irligi mis og'irligining $\frac{1}{7}$ qismini tashkil etadi. Qotishmada necha gramm mis va necha gramm kumush bor?

Yechish: Kumushni x va misni y deb belgilab olaymiz:

$$\begin{cases} x + y = 2 \\ y = \frac{x}{7} \end{cases} \Rightarrow x + \frac{x}{7} = 2 \Rightarrow 7x + x = 14 \Rightarrow 8x = 14 \Rightarrow \begin{cases} x = 1,75 \\ y = 0,25 \end{cases}$$

2. Tengsizlikni yeching. $\frac{x-5}{3} + \frac{x-4}{4} + 2,5 \geq \frac{x+3}{6}$

Yechish: Umumiy maxraj 12 ga tengsizlikning ikkala qismi ko'paytiramiz:

$$4(x-5) + 3(x-4) + 30 \geq 2(x+3)$$

Qavslarni ochib soddalashtiramiz:

$$4x - 20 + 3x - 12 + 30 \geq 2x + 6 \quad 7x - 2 \geq 2x + 6 \quad 7x - 2x \geq 6 + 2 \quad 5x \geq 8 \quad x \geq 1,6$$

3. Agar $\cos \alpha = -\frac{\sqrt{2}}{2}$, $\frac{\pi}{2} < \alpha < \pi$ bo'lsa $\cos(\frac{\pi}{4} - \alpha)$ ni hisoblang.

I usul. Dastlab $\sin \alpha$ ni topamiz. α II chorakda $\sin \alpha > 0$ shuning uchun:

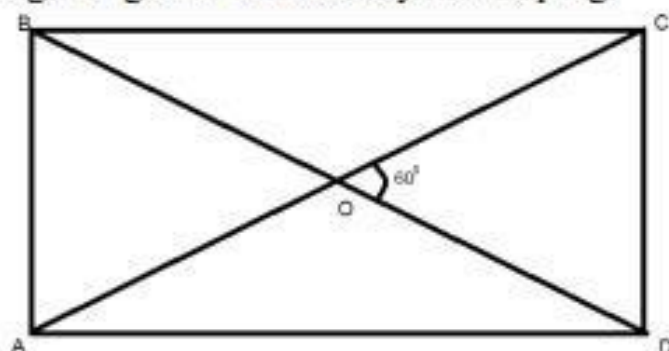
$$\sin \alpha = \sqrt{1 - \cos^2 \alpha} = \sqrt{1 - \left(-\frac{\sqrt{2}}{2}\right)^2} = \sqrt{1 - \frac{1}{2}} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\begin{aligned} \cos\left(\frac{\pi}{4} - \alpha\right) &= \cos \frac{\pi}{4} \cos \alpha + \sin \frac{\pi}{4} \sin \alpha = \frac{\sqrt{2}}{2} \cos \alpha + \frac{\sqrt{2}}{2} \sin \alpha = \\ &= \frac{\sqrt{2}}{2} (\cos \alpha + \sin \alpha) = \frac{\sqrt{2}}{2} \left(-\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\right) = 0 \end{aligned}$$

II usul. $\alpha = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$

$$\cos\left(\frac{\pi}{4} - \alpha\right) = \cos\left(\frac{\pi}{4} - \frac{3\pi}{4}\right) = \cos\left(-\frac{\pi}{2}\right) = \cos\frac{\pi}{2} = 0$$

5. To'g'ri to'rtburchakning diagonallar orasidagi burchak 60° va dioganali $4\sqrt{2}$ ga teng. To'g'ri to'rtburchak yuzini toping.



$$AC=BD=4\sqrt{2}$$

$$S_{ABCD} = \frac{1}{2} AC \cdot BD \cdot \sin 60^\circ = \frac{1}{2} \cdot 4\sqrt{2} \cdot 4\sqrt{2} \cdot \frac{\sqrt{3}}{2} = 8\sqrt{3}$$

27-BILET

1. 480 sonini a) 3, 4, 5 sonlariga proporsional; b) sonlariga teskari proporsional qismlarga bo'ling.

$$a) 3x + 4x + 5x = 480 \quad 12x = 480 \quad x = 40$$

$$3x=3 \cdot 40=120 \quad 4x=4 \cdot 40=160 \quad 5x=5 \cdot 40=200$$

$$b) \frac{x}{3} + \frac{x}{4} + \frac{x}{5} = 480 \quad 20x + 15x + 12x = 480 \cdot 60$$

$$47x = 28800 \quad x = \frac{28800}{47}$$

$$\frac{x}{3} = \frac{28800}{3 \cdot 47} = \frac{9600}{47} \quad \frac{x}{4} = \frac{28800}{4 \cdot 47} = \frac{7200}{47} \quad \frac{x}{5} = \frac{28800}{5 \cdot 47} = \frac{5760}{47}$$

2. Proporsiyaning noma'lum hadini toping: $(12,5-x):5=(3,6+x):6$

O'rta hadlari ko'paytmasi chetki hadlari ko'paytmasiga teng

$$6 \cdot (12,5 - x) = 5 \cdot (3,6 + x)$$

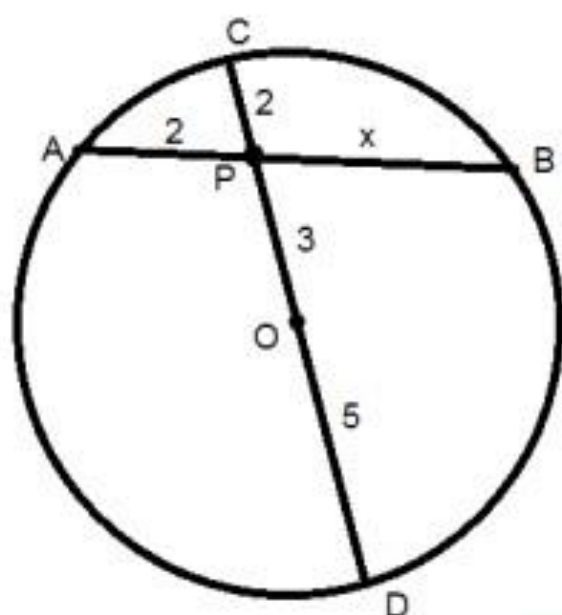
$$75 - 6x = 18 + 5x \quad 11x = 57 \quad x = \frac{57}{11}$$

3. Hisoblang: $\sin 75^\circ \cos 15^\circ - \cos 75^\circ \sin 15^\circ$

$\sin \alpha \cos \beta - \cos \alpha \sin \beta = \sin(\alpha - \beta)$ formuladan foydalanamiz:

$$\sin 75^\circ \cos 15^\circ - \cos 75^\circ \sin 15^\circ = \sin(75^\circ - 15^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

5. Radiusi 5 sm bo'lgan aylana markazidan 3 sm uzoqlikda P nuqta olingan. AB vatar P nuqta orqali o'tadi. Agar $PA=2$ sm bo'lsa, AB vatar uzunligini toping.



$$\begin{aligned} AP &= 2, OD = OC = 5 \quad OP = 3 \\ CP &= 5 - 3 = 2, PB = x, \\ AP \cdot PB &= CP \cdot PD \\ 2 \cdot x &= 2 \cdot 8 \\ 2x &= 16 \\ x &= 8 \end{aligned}$$

28-BILET

1. $x^2 - 7x + 12 = 0$ tenglamaning ildizlari $\operatorname{tg} \alpha$ va $\operatorname{tg} \beta$ bo'lsa $\operatorname{tg}(\alpha + \beta)$ ni toping.

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \cdot \operatorname{tg} \beta} \text{ ga tengligini bilamiz.}$$

Viyet teoremasiga ko'ra

$$\begin{cases} \operatorname{tg} \alpha + \operatorname{tg} \beta = 7 \\ \operatorname{tg} \alpha \cdot \operatorname{tg} \beta = 12 \end{cases} \text{ tanlash yo'li bilan } \operatorname{tg} \alpha = 3 \text{ va } \operatorname{tg} \beta = 4$$

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \cdot \operatorname{tg} \beta} = \frac{3 + 4}{1 - 3 \cdot 4} = \frac{7}{-11} = -\frac{7}{11}$$

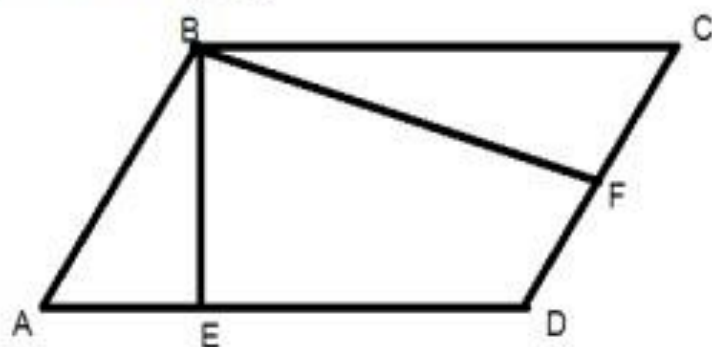
2. Geometrik progressiyada $b_1 = 2$ $q = 3$ bo'lsa, S_6 ni toping?

$$S_6 = \frac{b_1(q^6 - 1)}{q - 1} = \frac{2(3^6 - 1)}{3 - 1} = 728$$

3. Ifodani soddalashtiring: $\cos(\alpha - \beta) - \sin(\frac{\pi}{2} - \alpha) \cdot \cos \beta$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta - \cos \alpha \cdot \cos \beta = \sin \alpha \sin \beta$$

5. Parallelogrammning yuzi 30, balandliklari 4 va 6 ga teng. Parallelogrammning perimetrini toping.



$$BE = 4 \text{ va } BF = 6, S = 30$$

$$S_{\text{par}} = BE \cdot AD = 30$$

$$4AD = 30, AD = \frac{30}{4} = 7,5$$

$$S_{\text{par}} = BF \cdot CD = 30$$

$$6CD = 30, CD = \frac{30}{6} = 5$$

$$P = 2(a + b) = 2(5 + 7,5) = 2 \cdot 12,5 = 25$$

29-BILET

1. Ko'paytuvchilarga ajrating: $a^5 + a^4 - 2a^3 - 2a^2 + a + 1$

Yechish: Dastlab guruhlab olamiz va umumiy ko'paytuvchini qavsdan tashqariga chiqaramiz:

$$\begin{aligned} a^5 + a^4 - 2a^3 - 2a^2 + a + 1 &= (a^5 + a^4) - (2a^3 + 2a^2) + (a + 1) = \\ a^4(a + 1) - 2a^2(a + 1) + (a + 1) &= (a + 1)(a^4 - 2a^2 + 1) = \\ (a + 1)(a^2 - 1)^2 &= (a - 1)^2(a + 1)^3 \end{aligned}$$

2. Funksiyaning aniqlanish sohasini toping: $y = \sqrt{9 - x^2}$

$$9 - x^2 \geq 0 \quad x^2 \leq 9 \quad |x| \leq 3 \quad -3 \leq x \leq 3$$

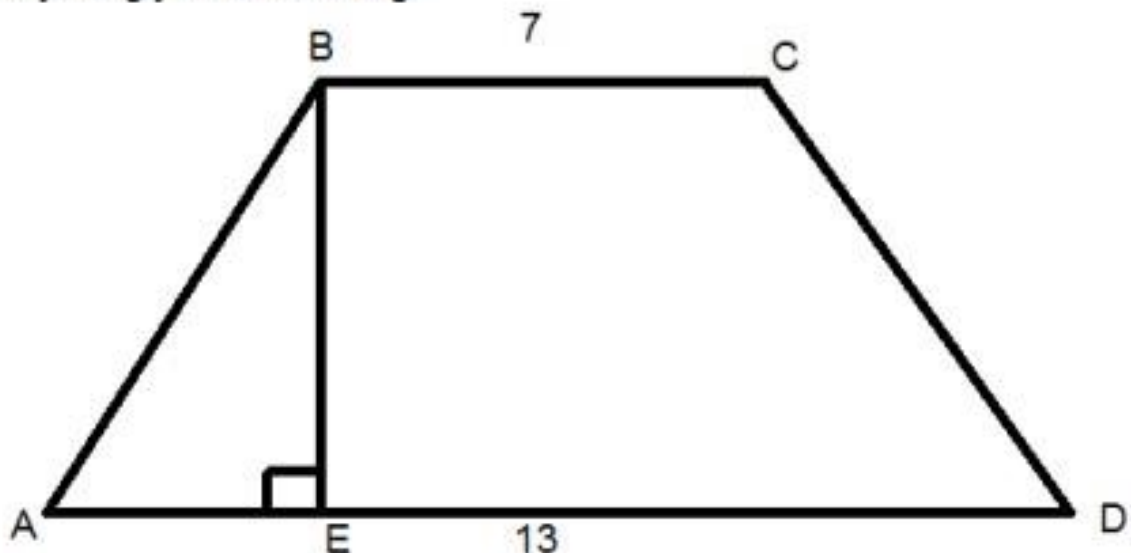
3. Agar $\sin \alpha = -\frac{3}{4}$; $\pi < \alpha < \frac{3\pi}{2}$ va $\cos \beta = \frac{4}{5}$; $0 < \beta < \frac{\pi}{2}$ bo'lsa, $\sin(\alpha - \beta)$ ni hisoblang.

$$\cos \alpha = -\sqrt{1 - \sin^2 \alpha} = -\sqrt{1 - \left(-\frac{3}{4}\right)^2} = -\sqrt{1 - \frac{9}{16}} = -\sqrt{\frac{7}{16}} = -\frac{\sqrt{7}}{4}$$

$$\sin \beta = \sqrt{1 - \cos^2 \beta} = \sqrt{1 - \left(\frac{4}{5}\right)^2} = \sqrt{1 - \frac{16}{25}} = \sqrt{\frac{9}{25}} = \frac{3}{5}$$

$$\begin{aligned} \sin(\alpha - \beta) &= \sin \alpha \cos \beta - \cos \alpha \sin \beta = -\frac{3}{4} \cdot \frac{4}{5} - \left(-\frac{\sqrt{7}}{4}\right) \cdot \frac{3}{5} = -\frac{3}{5} + \frac{3\sqrt{7}}{20} = \\ &= \frac{-12 + 3\sqrt{7}}{20} \end{aligned}$$

5. Teng yonli trapetsiyaning asoslari 7 va 13 ga, o'tmas burchagi 135° ga teng. Shu trapetsiyaning yuzini hisoblang.



$\angle ABC = \angle BCD = 135^\circ$ bo'lsa $\angle EAB = \angle EDC = 45^\circ$ bo'ladi. U holda ABE uchburchakda $\angle EAB = \angle ABE = 45^\circ$ bo'ladi va $AE = BE$

Teng yonli trapetsiyada

$$\begin{aligned} AE &= \frac{AD - BC}{2} = \frac{13 - 7}{2} = \frac{6}{2} = 3 \\ S &= \frac{BC + AD}{2} \cdot BE = \frac{7 + 13}{2} \cdot 3 = 30 \end{aligned}$$

30-BILET

1. 520 sonini shunday ikki bo'lakka bo'lingki, ulardan birining 80%i ikkinchisining 24%ini tashkil qilsin. Shu bo'laklarning kattasini toping.

1-bo'lak x , 2-bo'lak esa $520-x$ bo'lsin.

$$\frac{x}{100} \cdot 80 = \frac{520-x}{100} \cdot 24$$

$$80x = (520-x) \cdot 24 \quad 10x = (520-x) \cdot 3 \quad 10x = 1560 - 3x$$

$$13x = 1560 \quad x = 120$$

1-bo'lak 120, 2-bo'lak $520-120=400$. Javob: kattasi 400

2. Tenglamani yeching: $x^2-3|x|-40=0$

$|x| = t$ belgilash kiritamiz:

$$t^2 - 3t - 40 = 0 \quad (t-8)(t+5) = 0$$

$$t_1 = 8 \text{ va } t_2 = -5$$

$$|x| = -5 \text{ yechimi yo'q}$$

$$|x| = 8 \quad x = \pm 8$$

3. Agar $\begin{cases} \operatorname{tg}(\alpha + \beta) = 5 \\ \operatorname{tg}(\alpha - \beta) = 3 \end{cases}$ bo'lsa, $\operatorname{tg} 2\beta$ ni hisoblang.

$$\operatorname{tg} 2\beta = \operatorname{tg}((\alpha + \beta) - (\alpha - \beta)) = \frac{\operatorname{tg}(\alpha + \beta) - \operatorname{tg}(\alpha - \beta)}{1 + \operatorname{tg}(\alpha + \beta) \cdot \operatorname{tg}(\alpha - \beta)} = \frac{5 - 3}{1 + 5 \cdot 3} = \frac{2}{9}$$

5. Rombning tomoni 4 sm, yuzi esa 9 sm^2 bo'lsa, uning diagonallari yig'indisini toping.

Yechish:

Berilgan: $a=4 \text{ sm}$. $S=9 \text{ sm}^2$; Topish kerak $d_1 + d_2 = ?$

$$S = \frac{d_1 \cdot d_2}{2} = 9 \quad d_1 \cdot d_2 = 18$$

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

$$(d_1 + d_2)^2 - 2 d_1 \cdot d_2 = 4 \cdot 4^2$$

$$(d_1 + d_2)^2 = 64 + 2 \cdot 18 = 100$$

$$d_1 + d_2 = 10$$