

DIQQAT IMTIHON!

2- билет

1

$$\frac{79^3 - 21^3}{58} + 79 \cdot 21 =$$

$$= \frac{(79 - 21)(79^2 + 79 \cdot 21 + 21^2)}{79 - 21} + 79 \cdot 21$$

$$= \sqrt{79^2 + 2 \cdot 79 \cdot 21 + 21^2} - \sqrt{(79 - 21)^2} = 100$$

2) 126  $\rightarrow a:b=1(18p) \quad a=b+18$   
 $\rightarrow b:c=1(18p) \quad b=c+18$   
 $\rightarrow c$   
 $\Rightarrow a = b+18 = c+36$   
 $126 \Rightarrow b = c+18$   
 $a = c+36 = 24+36 = 60 \mid b = 42, \quad 3c = 24$

3

1)  $x^2 + 5x + 1 = 0$   
 $x_1 + x_2 = -(x_1 + x_2) - 2x_1 x_2 = (-5)^2 - 2 \cdot 1 = 23$  (F)  
 2)  $|x-3| \leq 2, \quad -2 \leq x-3 \leq 2, \quad 1 \leq x \leq 5$  (A)  
 3)  $\begin{cases} x-6y=17 \\ 5x+6y=13 \end{cases} \quad \begin{matrix} 6x=30 \\ x=5 \end{matrix} \quad \begin{matrix} 5-6y=17 \\ -6y=12 \\ y=-2 \end{matrix} \quad (5; -2)$  (C)

4



$\frac{h}{12} = \sin 60^\circ = \frac{\sqrt{3}}{2}$   
 $h = 6\sqrt{3}$   
 $6^2 + h^2 = 12^2$   
 $h^2 = 144 - 36$

5



$h_{15} = \frac{2}{15} \sqrt{13 \cdot 14 \cdot 15 - 13 \cdot 14 \cdot 15}$   
 $h_{15} = \frac{2}{15} \sqrt{21 \cdot 6 \cdot 7 \cdot 15} = \frac{2}{15} \cdot 21 \cdot \sqrt{14} = \frac{28\sqrt{14}}{5}$

DIQQAT IMTIHON!



# 3. билет

①  $|8\sqrt{75} - 4\sqrt{27}| : 4\sqrt{3} = (8 \cdot 5\sqrt{3} - 4 \cdot 3\sqrt{3}) : 4\sqrt{3} =$   
 $= (40\sqrt{3} - 12\sqrt{3}) : 4\sqrt{3} = 28\sqrt{3} : 4\sqrt{3} = 7$

②  $A = N \cdot t$   
 $N = \frac{A}{t}$

$A = \frac{A}{t_1} \cdot 35 + \frac{A}{t_2} \cdot 6$

$1 = \frac{7}{2t_1} + \frac{6}{t_2} \quad t_2 = t_1 + 5$

$1 = \frac{7}{2t_1} + \frac{6}{t_1 + 5}$

$2t_1(t_1 + 5) = 7t_1 + 35 + 12t_1$

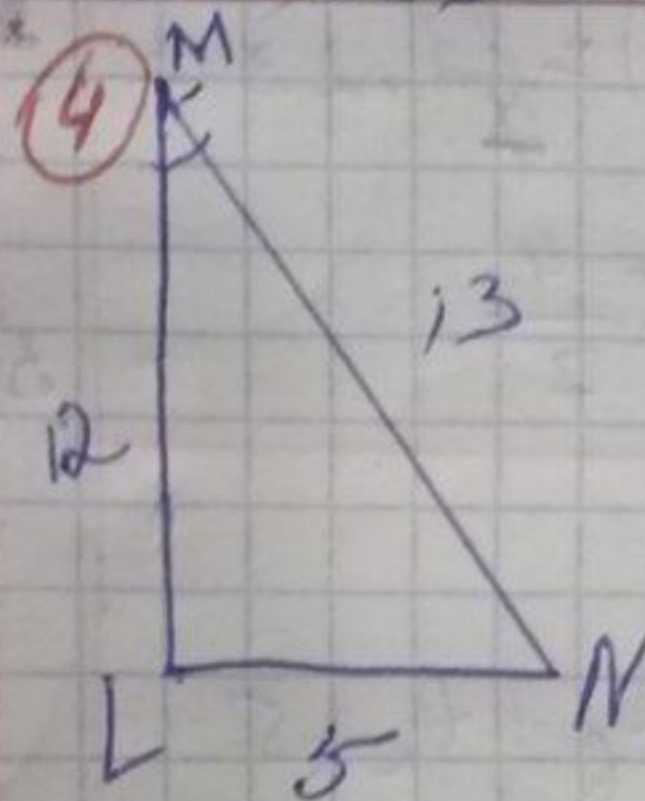
$2t_1^2 + 10t_1 = 19t_1 + 35$

$2t^2 - 9t - 35 = 0$

$D = 81 + 8 \cdot 35 = 361$

$t_1 = \frac{9 + 19}{4} = 7$

$t_2 = 7 + 5 = 12$

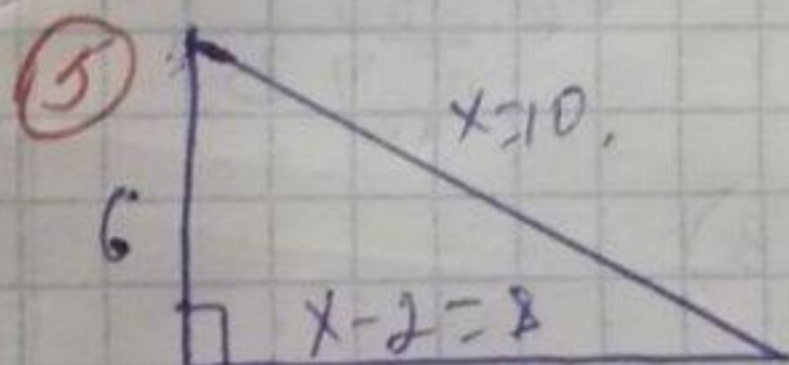


$\sin M = \frac{5}{13}$

$\cos M = \frac{12}{13}$

$\operatorname{tg} M = \frac{5}{12}$

$\operatorname{ctg} M = \frac{12}{5}$



$x^2 = 6^2 + (x-2)^2$

$x^2 = 36 + x^2 - 4x + 4$

$4x = 40$

$x = 10$

$S = \frac{ab}{2} = \frac{6 \cdot 8}{2} = 24$

③ 1)  $x^2 - 2x + p = 0$  (E)  
 $x_1 = 5 \quad x_2 = -3 \quad p = -15$

2)  $2x - 4 + x < 4x + 1$  (D)  
 $x > 5$

3)  $\begin{cases} x < 3 \\ x > -2 \end{cases}$  (A)



AT IMTIHON!

1)  $\frac{15}{7} + \frac{3}{19} + \frac{4-6}{7} + \frac{23}{7} + \frac{59}{8} + \frac{64}{59} = \frac{23}{7}(15+8)$   
 $= \frac{23}{7}, 23 = \frac{529}{7} = 45 \frac{4}{7}$



$t_c + t_k = 5$   
 $69 = t_c(v_k+3)$   
 $t_c = \frac{69}{v_k+3}$

$34 = t_k(v_k-3)$   
 $t_k = \frac{34}{v_k-3}$

$\frac{69}{v_k+3} + \frac{34}{v_k-3} = 5$

$v_k = \frac{103+197}{5 \cdot 2} = 20$

$69v_k - 207 + 34v_k + 102 = 5$

$v_k^2 - 9$

$5v_k^2 - 45 = 103v_k - 105$

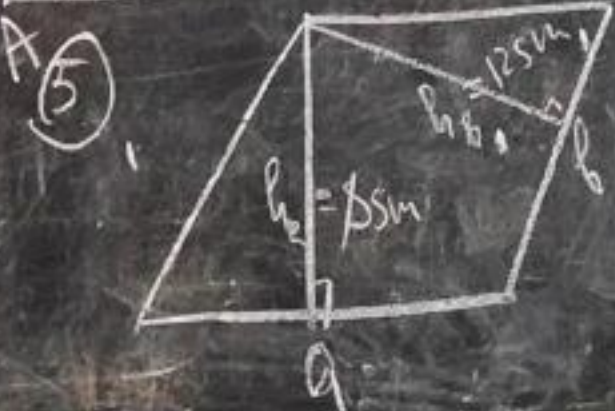
$5v_k^2 - 103v_k + 60 = 0$   
 $D = (103)^2 - 4 \cdot 5 \cdot 60 = 10609 - 1200 = 9409$

3) 1)  $x^2+x-2 = x+2$  (E)  
 2)  $5x-5 > 9x-9$ ,  $4x \leq 4$ ,  $x \leq 1$  (D)

3)  $\begin{cases} 4x-7y = -12 \\ -4x+3y = 12 \end{cases}$   
 $-4y = 0$ ,  $y = 0$   
 $4x - 7 \cdot 0 = -12$ ,  $4x = -12$ ,  $x = -3$  (A)



$3\alpha = 90^\circ$ ,  $\alpha = 30^\circ$   
 $\angle A = 2\alpha = 60^\circ$   
 $\angle B = 180^\circ - 60^\circ = 120^\circ$



$S = 144 \text{ cm}^2$   
 $p = 7$ ,  $a = 7$ ,  $b = 7$   
 $144 = a \cdot h_a$ ,  $144 = a \cdot h_a$ ,  $a = 18 \text{ cm}$   
 $144 = b \cdot h_b$ ,  $144 = b \cdot \frac{1}{2}$ ,  $b = 12$   
 $p = 2(18+12) = 60$



# 5-bilet

①  $\frac{9^2 \cdot 3^5}{27^2 \cdot 9} + \frac{27^3}{34,81} =$

$= \frac{(3^2)^2 \cdot 3^5}{(3 \cdot 3)^2 \cdot 3^2} + \frac{(3^3)^3}{3^4 \cdot 3^4} =$

$= \frac{3^4 \cdot 3^5}{3^6 \cdot 3^2} + \frac{3^9}{3^8} = \frac{3^9}{3^8} + \frac{3^9}{3^8} =$

$= 3 + 3 = 6$

- ② 1-guruh -  $t+10 \Rightarrow 10+10=20$   
 2-guruh -  $t+20 \Rightarrow 10+20=30$   
 3-guruh -  $6t \Rightarrow 6 \cdot 10=60$

$\frac{1}{t} = \frac{1}{t+10} + \frac{1}{t+20} + \frac{1}{6t}$

$\frac{5}{6t} = \frac{2t+30}{t^2+30t+200}$

$5t^2+150t+1000=12t^2+180t$

$7t^2+30t-1000=0$

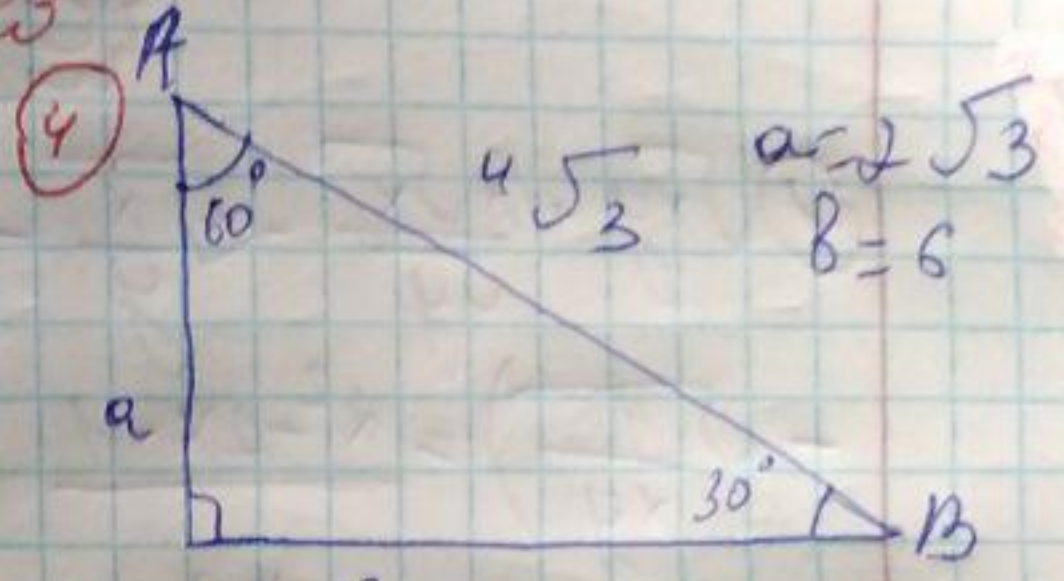
④  $= 500 + 28000 = 28500$

$t = \frac{-30 + 170}{14} = 10$

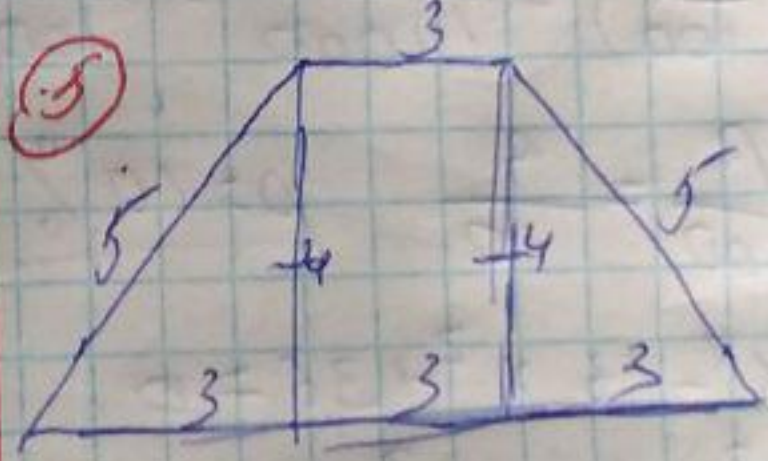
③ 1)  $x^2 - 5x - 14 = (x+2)(x-7)$  (E)

2)  $\frac{3}{2x-4} > 0$       $2x-4 > 0$   
 $x > 2$  (C)

3)  $\begin{cases} x \leq -2 \\ x \geq -4 \end{cases} [-4; -2]$  (F)



$\frac{a}{4\sqrt{3}} = \frac{1}{2}$   
 $a = 2\sqrt{3}$       $\frac{b}{4\sqrt{3}} = \frac{\sqrt{3}}{2}$   
 $b = 6$



$MN = \frac{a+b}{2} = \frac{3+9}{2} = 6$



6. билет,

$$\textcircled{1} \sqrt{xy} \cdot \left( \frac{x\sqrt{x}}{y} - 2\sqrt{\frac{x}{y}} - \sqrt{\frac{1}{xy}} \right) =$$

$$= \frac{x^2 - 2x - 1}{x}$$

$$\textcircled{2} 12000 \cdot \left(1 - \frac{p}{100}\right)^2 = 9720, \quad \frac{972}{36} \mid \frac{12}{21}$$

$$\left(1 - \frac{p}{100}\right)^2 = \frac{81}{100} = \frac{81}{100}$$

$$1 - \frac{p}{100} = \frac{9}{10} \quad p = 10\%$$

$$\textcircled{3} x^4 - 13x^2 + 36 = 0$$

$$x^2 = 4 \quad x^2 = 9$$

$$x_{1,2} = \pm 2 \quad x_{3,4} = \pm 3$$

$$x_1 + x_2 + x_3 + x_4 = 0$$

(E)

$$\textcircled{4} |2x+6| \leq 2$$

$$-2 \leq 2x+6 \leq 2$$

$$-1 \leq x+3 \leq 1$$

$$-4 \leq x \leq -2$$

(D)

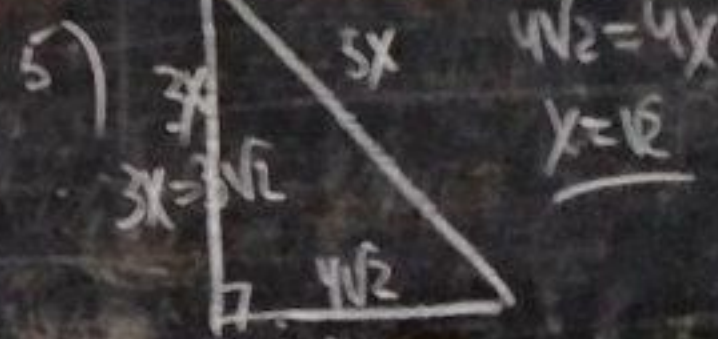
$$\textcircled{3} \begin{cases} 2x+5 \leq 0 \\ 9x+18 \leq 0 \end{cases} \begin{cases} x \leq -2.5 \\ x \leq -2 \end{cases} \quad (-\infty; -2.5]$$

(F)



$$P_{APK} = x + y + z = 11$$

$$P_{ABCD} = x + y + z + z + y = x + y + 2z + y = x + y + 2z + y = 19$$



$$S = \frac{a \cdot b}{2} = \frac{3x \cdot 4x}{2} = 12$$



DIQQAT IMTIHON!

7-bilet,

$$\textcircled{1} \frac{1}{15} + \frac{1}{35} + \frac{1}{63} + \frac{1}{99} + \dots + \frac{1}{255} =$$

$$= \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \frac{1}{9 \cdot 11} + \dots + \frac{1}{15 \cdot 17} =$$

$$= \frac{1}{5-3} \left( \frac{1}{3} - \frac{1}{17} \right) = \frac{1}{2} \times \frac{14}{51} = \frac{7}{51}$$

$\textcircled{2}$

2 000 000	—	100%
2 205 000	—	x%

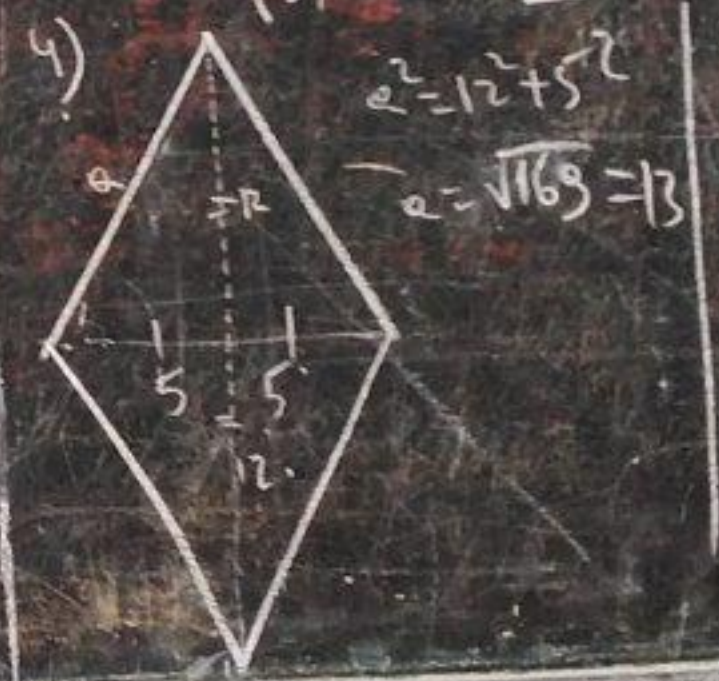
$$\frac{x}{100} = 1,1025 \quad x = 110,25\%$$

$$\frac{110,25 - 100}{2} = \frac{10,25}{2} = 5,125\% \quad \text{yillik}$$

$\textcircled{3}$  1)  $\frac{(x+6)(x-2)}{\sqrt{2}} = x+6, \quad \textcircled{F}$

2)  $-9 \leq x - 3 \leq 8, \quad -5 \leq x \leq 11, \quad \textcircled{17/10}$

3)  $\begin{cases} x \leq -1 \\ 5x < 10, x < 2 \end{cases} \rightarrow \begin{cases} x \leq -1 \\ x_{\min} = -1 \end{cases} \quad \textcircled{B}$

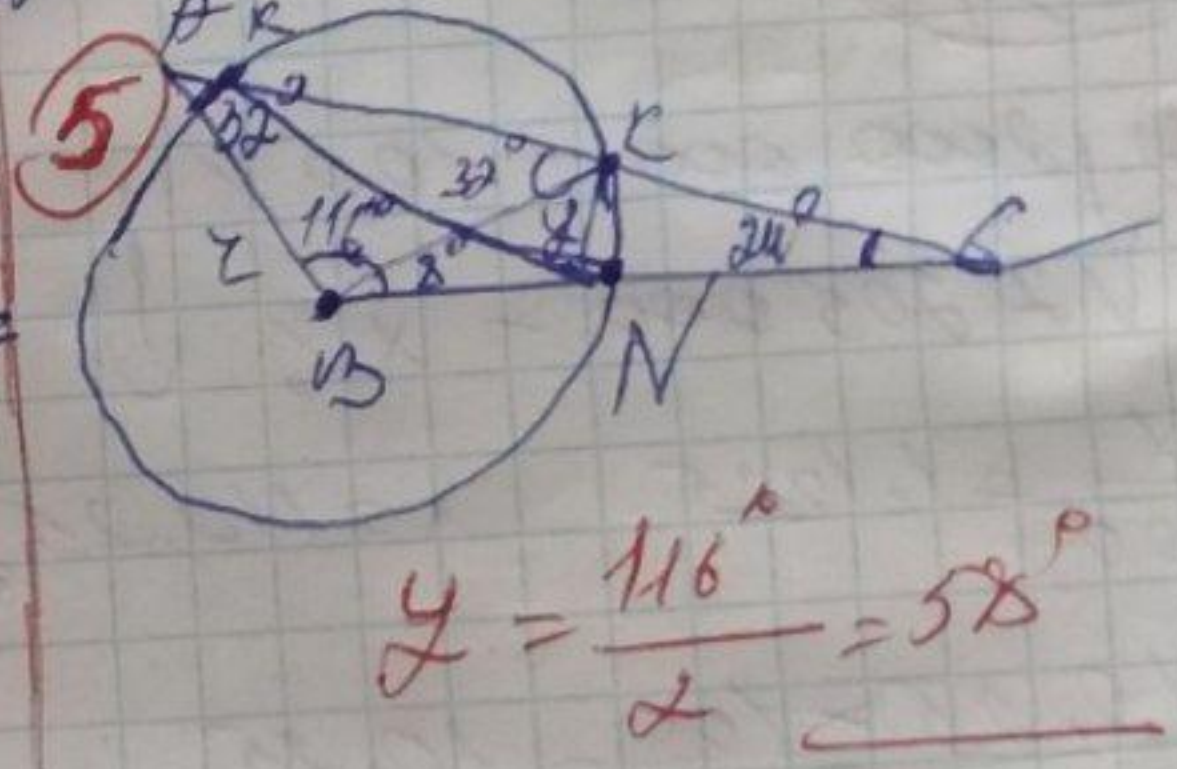
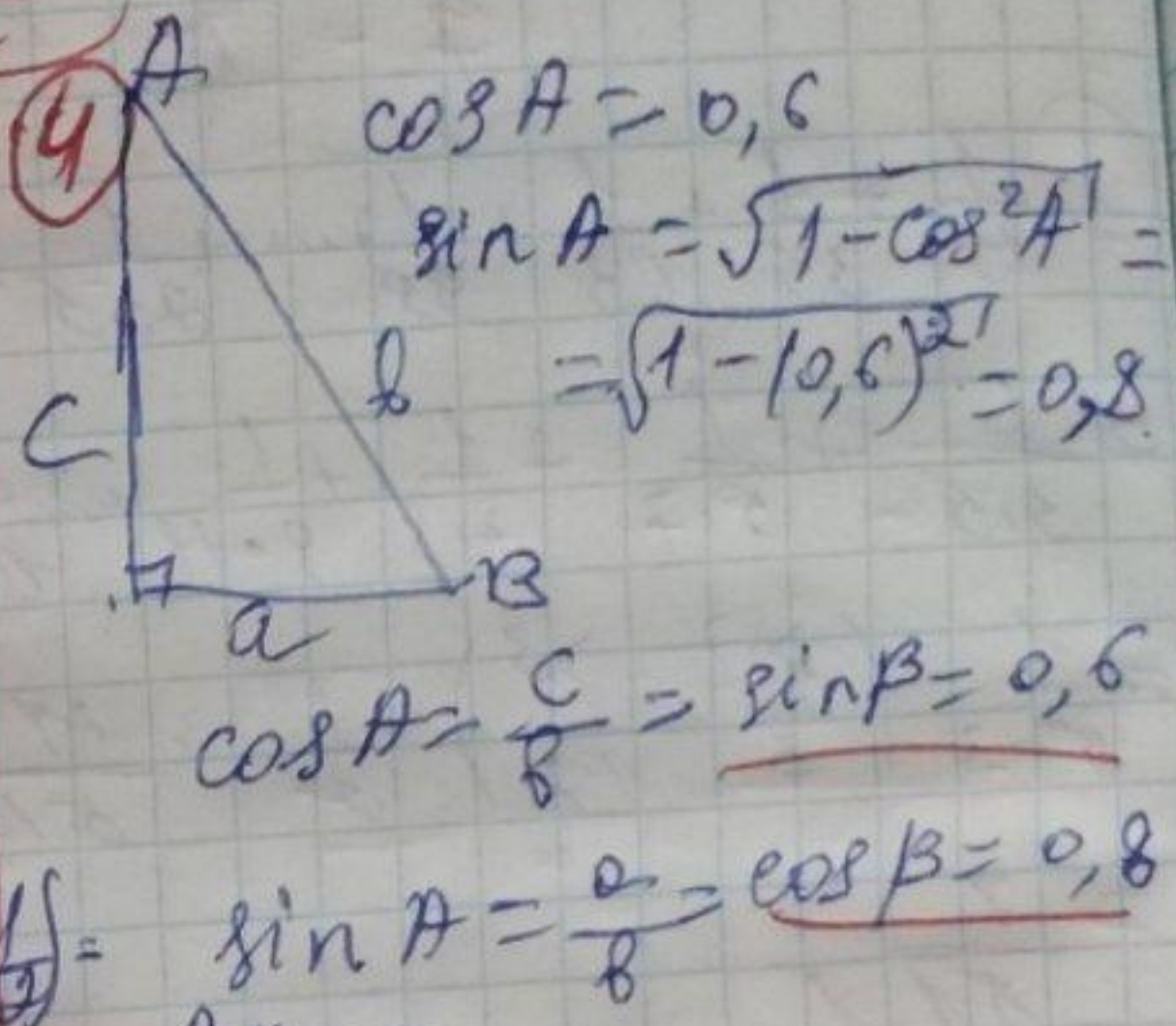


DIQQAT IMTIHON!



# 8 - билет

①  $(1 - \frac{1}{4^2}) \cdot (1 - \frac{1}{5^2}) \cdot (1 - \frac{1}{6^2}) \cdot \dots$   
 $\dots \cdot (1 - \frac{1}{12^2}) =$   
 $= (1 - \frac{1}{4}) \cdot (1 + \frac{1}{4}) \cdot (1 - \frac{1}{5}) \cdot (1 + \frac{1}{5}) \cdot (1 - \frac{1}{6}) \cdot (1 + \frac{1}{6}) \cdot \dots$   
 $\dots \cdot (1 - \frac{1}{11}) \cdot (1 + \frac{1}{11}) \cdot (1 - \frac{1}{12}) \cdot (1 + \frac{1}{12}) =$   
 $= \frac{3}{4} \cdot \frac{5}{4} \cdot \frac{4}{5} \cdot \frac{6}{5} \cdot \frac{5}{6} \cdot \frac{7}{6} \cdot \dots$   
 $\dots \cdot \frac{10}{11} \cdot \frac{11}{11} \cdot \frac{11}{12} \cdot \frac{12}{12} \cdot \frac{13}{12} =$   
 $= \frac{3}{4} \cdot \frac{13}{12} = \frac{13}{16}$



②  $\frac{n(n-1)}{2} = 120$   
 $n^2 - n = 240$   
 $n^2 - n - 240 = 0$   
 $n_1 = 16 \quad n_2 = -15$

③ 1)  $x^4 - x^2 - 12 = 0$   
 $x^2 = -3 \quad x^2 = 4$   
 $\emptyset \quad x \pm 2$  (A)

2)  $\frac{1}{3x+6} < 0 \quad x < -2$  (D)  
 3)  $\begin{cases} y - 2x = 4 \\ 7x - y = 1 \end{cases} \quad \begin{matrix} y - 2 = 4 \\ y = 6 \\ 5x = 5 \quad x = 1 \end{matrix}$

(E)



# 9-bilet

1)  $\frac{3,7^2 - 6,3^2}{4,2^2 - 5,8^2} =$   
 $= \frac{(3,7 - 6,3)(3,7 + 6,3)}{(4,2 + 5,8)(4,2 - 5,8)} =$   
 $= \frac{2,6 \cdot 10}{10 \cdot (-1,6)} = \frac{26}{-16} = -\frac{13}{8}$

2)  $n(n-1) = 1180$   
 $n^2 - n - 1180 = 0$

$D = 1 + 4 \cdot 1180 = 4761$

$n = \frac{1 + 69}{2} = \underline{35 \text{ ta}}$

3) 1)  $9x^2 - 6x + 1 = 0$   
 $x_0 = \frac{1}{3}$  (B)

2)  $\frac{3x}{2} - \frac{3}{5} < 4x + 3 \mid \cdot 10$

$15x - 6 < 40x + 30$

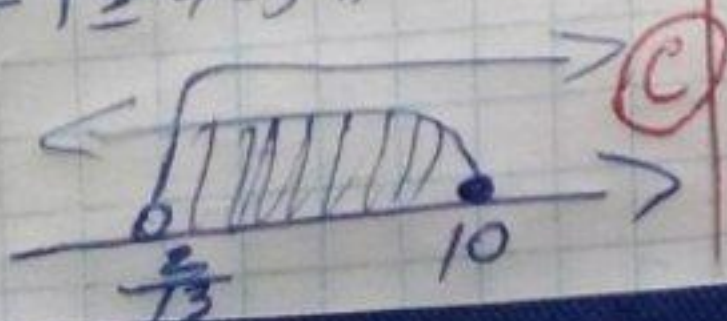
$25 > -36$

$x > -\frac{36}{25}$

(-1) (A)

3)  $\begin{cases} 7x + 2 + 2x < 9 - 4x \\ 15 - 6x - 1 \geq 4 - 5x \end{cases}$

$\begin{cases} 13x > 2 \\ x \leq 10 \end{cases}$

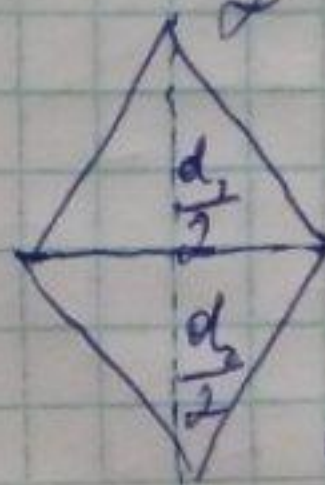


4)  $A(-3; 3)$   $C(\frac{-3+5}{2}; \frac{3-1}{2})$   
 $C(1; 1)$

$B(5; -1)$

$D(\frac{5+1}{2}; \frac{-1+1}{2}) = \underline{D(3; 0)}$

5)



$d_1, d_2 = 80$

$h = 5$

$\frac{d_1 \cdot d_2}{4} = \frac{h \cdot a}{2}$

$20 = 2,5 \cdot a$

$\underline{a = 8}$



# 10 - билет

$$\textcircled{1} \frac{(73^2 - 37^2)(73^2 - 73 \cdot 37 + 37^2)}{73^3 + 37^3} =$$

$$= \frac{(73-37)(73+37)(73^2 - 73 \cdot 37 + 37^2)}{(73+37)(73^2 - 73 \cdot 37 + 37^2)}$$

$$= (73-37) = 36.$$

$\textcircled{2}$

220 km                      v, t

v, t = S, (v+5)(t -  $\frac{1}{6}$ )

S<sub>2</sub> = v, t

S<sub>2</sub> = (v+5)(t -  $\frac{1}{6}$ )

$$v, t = vt + 5t - \frac{v}{6} - \frac{5}{6}$$

$$30t = v + 5$$

$$t = \frac{v+5}{30}$$

$$220 = v \cdot (t+2)$$

$$220 = v \cdot \left( \frac{v+5}{30} + 2 \right)$$

$$220 = v \cdot \left( \frac{v+65}{30} \right)$$

$$v^2 + 65v - 6600 = 0.$$

$$D = 65^2 + 4 \cdot 6600 =$$

$$= 4225 + 26400 = 30625$$

$$v = \frac{-65 + 175}{2} = 55 \text{ km/h.}$$

$$\textcircled{3} 4x^4 - 17x^2 + 4 = 0$$

$$x^2 = 4$$

$$x = \pm 2$$

$$x^2 = \frac{1}{4}$$

$$x = \pm \frac{1}{2}$$

$\textcircled{F}$

$$\textcircled{2} \frac{x}{5} - 5 > \frac{7}{4} - \frac{5x}{2} \quad | \cdot 20$$

$$4x - 100 > 35 - 50x$$

$$54x > 135$$

$$x > \frac{135}{54} = 2,5$$

$\textcircled{C}$

$$\textcircled{3} \begin{cases} 2x - 10 \leq 9x - 3 \\ 5x + 10 \leq 3x + 9 \end{cases} \begin{cases} x \geq -1 \\ x \leq -0,5 \end{cases}$$

$\textcircled{B}$

$$\textcircled{4} AB = \sqrt{(-1-2)^2 + (2-6)^2} =$$

$$= \sqrt{9+16} = 5$$

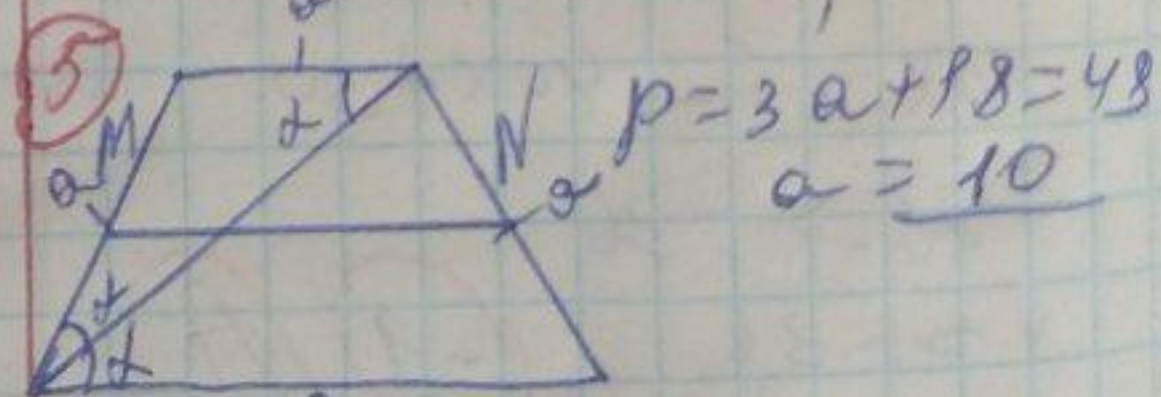
$$BC = \sqrt{(2-5)^2 + (6-2)^2} =$$

$$= \sqrt{9+16} = 5$$

$$AC = \sqrt{(-1-5)^2 + (2-2)^2} =$$

$$= \sqrt{36} = 6$$

perimeter = 16.



$$MN = \frac{a+b}{2} = \frac{10+18}{2} = 14.$$

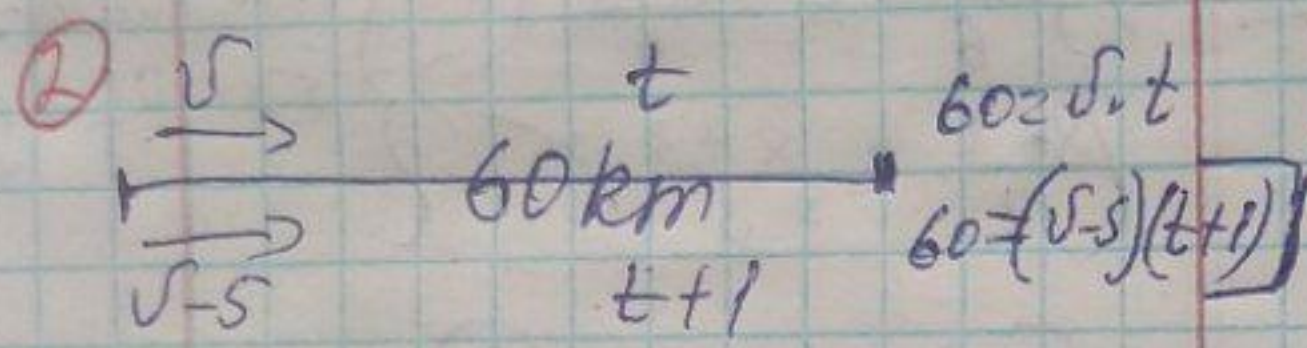


# 11 - билет

1)  $\frac{2020}{2021} \cdot 2021 - \frac{2020}{2021} = 2019 \frac{2020}{2021}$

$\frac{2022}{2021} = \frac{2020}{2021} = a$

$(a+1)(a+2) - a(a+3) = a^2 + 3a + 2 - a^2 - 3a = 2$



$vt = vt + v - 5t - 5$   
 $v = 5t + 5$

$60 = (5t + 5)t$   
 $60 = 5t^2 + 5t$   
 $t^2 + t - 12 = 0$   
 $t = 3$

$20 - 5 = 15 \text{ km/h}$   
 (2-сини)

$v = 20 \text{ km/h}$   
 (1-сини)

3)  $|x+3| = |x-5| = x^2 + 6x + 9 = x^2 - 10x + 25$   
 $16x = 16 \quad x = 1$  (D)

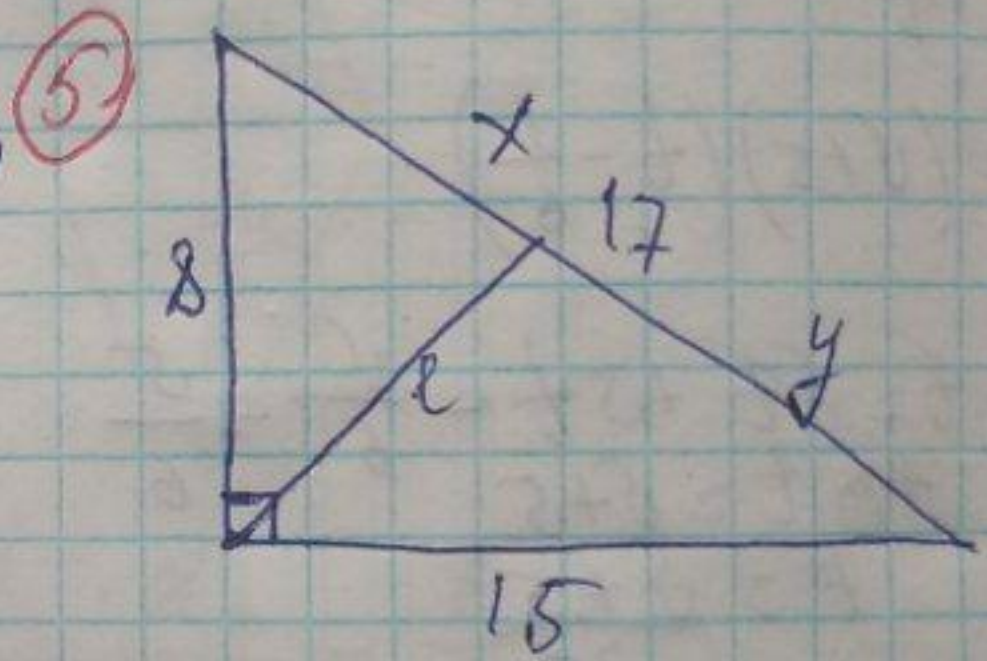
4)  $x^2 - 6x + y^2 + 2y - 6 = 0$   
 $x^2 - 6x + 9 + y^2 + 2y + 1 - 6 - 9 - 1 = 0$

$(x-3)^2 + (y+1)^2 = 16$

$(x-x_0)^2 + (y-y_0)^2 = R^2$

$(x-3)^2 + (y+1)^2 = 4^2$

$x_0 = 3 \quad y_0 = -1 \quad R = 4$



$\frac{8}{15} = \frac{x}{y} \quad x + y = 17$

$x = \frac{8}{15}y$

$\frac{8}{15}y + y = 17$

$\frac{23}{15}y = 17 \quad y = \frac{255}{23}$

$x = \frac{8}{15} \cdot \frac{255}{23} = \frac{126}{23}$

2)  $\frac{-1,7}{0,5x-2} > 0 \quad \frac{1,7}{0,5x-2} < 0 \quad x < 4$  (A)

3)  $\begin{cases} 2x + 11y = 15 \\ 10x - 11y = 8 \end{cases} \quad \begin{matrix} 12x = 24 \\ x = 2 \end{matrix}$

$4 + 11y = 15 \quad 11y = 11 \quad y = 1$  (2:1) (E)