

БЛАНК ОТВЕТОВ

«Подготовка к ВсОШ по математике.2026» 9-10 класс

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$$A = \begin{pmatrix} -5 & 1 & 4 \\ 7 & -6 & -1 \\ 0 & -2 & 1 \end{pmatrix}_{3 \times 3} \quad A^{-1} = ?$$

$$A^{-1} = \frac{1}{|A|} \cdot \begin{pmatrix} a_{11}^* & a_{12}^* & a_{13}^* \\ a_{21}^* & a_{22}^* & a_{23}^* \\ a_{31}^* & a_{32}^* & a_{33}^* \end{pmatrix}^T$$

$$|A| = \begin{vmatrix} -5 & 1 & 4 \\ 7 & -6 & -1 \\ 0 & -2 & 1 \end{vmatrix} = -5 \cdot (-6) \cdot 1 + 1 \cdot (-1) \cdot 0 + 7 \cdot (-2) \cdot 4 = -56 - 28 = -84$$

$$a_{11}^* = (-1)^{1+1} \cdot \begin{vmatrix} -6 & -1 \\ -2 & 1 \end{vmatrix} = -8$$

$$A^{-1} = \frac{1}{-84} \cdot \begin{pmatrix} -8 & -7 & -19 \\ -9 & -5 & -10 \\ 25 & 23 & 23 \end{pmatrix}^T =$$

$$a_{12}^* = (-1)^{1+2} \cdot \begin{vmatrix} 7 & -1 \\ 0 & 1 \end{vmatrix} = -7$$

$$= \frac{1}{-84} \cdot \begin{pmatrix} -8 & -9 & 25 \\ -7 & -5 & 23 \\ -19 & -10 & 23 \end{pmatrix} =$$

$$a_{13}^* = (-1)^{1+3} \cdot \begin{vmatrix} 7 & -6 \\ 0 & -2 \end{vmatrix} = -14$$

$$= \begin{pmatrix} \frac{8}{84} & \frac{9}{84} & -\frac{25}{84} \\ \frac{7}{84} & \frac{5}{84} & -\frac{23}{84} \\ \frac{19}{84} & \frac{10}{84} & -\frac{23}{84} \end{pmatrix}$$

$$a_{21}^* = (-1)^{2+1} \cdot \begin{vmatrix} 1 & 4 \\ -2 & 1 \end{vmatrix} = -9$$

$$a_{22}^* = (-1)^{2+2} \cdot \begin{vmatrix} -5 & 4 \\ 0 & 1 \end{vmatrix} = -5$$

$$a_{23}^* = (-1)^{2+3} \cdot \begin{vmatrix} -5 & 1 \\ 0 & -2 \end{vmatrix} = -10$$

$$a_{31}^* = (-1)^{3+1} \cdot \begin{vmatrix} 1 & 4 \\ -6 & -1 \end{vmatrix} = 25$$

$$a_{32}^* = (-1)^{3+2} \cdot \begin{vmatrix} -5 & 4 \\ 7 & -1 \end{vmatrix} = 23$$

$$a_{33}^* = (-1)^{3+3} \cdot \begin{vmatrix} -5 & 1 \\ 7 & -6 \end{vmatrix} = 23$$

~2 Exponen

$$a) \frac{2 \cdot 4^{-2} + (3^{-2})^3 \cdot \left(\frac{1}{9}\right)^{-3}}{5^{-3} \cdot 25^2 + (0,7)^0 \cdot \left(\frac{1}{2}\right)^{-2}} = \frac{2^5 + 3^0}{5^1 + 2^2} = \frac{33}{9} = \frac{11}{3} = 3\frac{2}{3}$$

$$b) \sin\left(2 \arccos \frac{1}{3}\right) = \sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\alpha = \arccos \frac{1}{3}$$

$$\cos \alpha = \frac{1}{3}$$

$$\uparrow \text{remb.} \quad \sin \alpha = \sqrt{1 - \left(\frac{1}{3}\right)^2} = \frac{2\sqrt{2}}{3}$$

$$\sin\left(2 \arccos \frac{1}{3}\right) = 2 \cdot \frac{2\sqrt{2}}{3} \cdot \frac{1}{3} = \frac{4}{9} \sqrt{2}$$

$$b) z^{12}, \text{ wenn } z + \bar{z} = 3 + i$$

$$z = x + iy$$

$$\bar{z} = x - iy$$

$$x + iy + x - iy = 3 + i$$

$$2x = 3 + i$$

$$\text{m.k. } x \in \mathbb{R} \Rightarrow \text{ } \emptyset$$

~3

$$a) x^3 - 2x^2 - 5x + 6 = 0$$

$\pm 1; \pm 2; \pm 3$

$$\boxed{x_1 = 1}$$

$$x^2 - x - 1 = 0$$

$$D = (-1)^2 - 4 \cdot 1 \cdot (-1) = 5$$

$$D = 5$$

$$x_2 = \frac{1 + \sqrt{5}}{2 - 1}$$

$$x_3 = \frac{1 - \sqrt{5}}{2 - 1}$$

$$\begin{aligned} x_2 &= \frac{1 + \sqrt{5}}{2} \\ x_3 &= \frac{1 - \sqrt{5}}{2} \end{aligned}$$

$$\begin{array}{r|l} x^3 - 2x^2 - 5x + 6 & x-1 \\ \hline x^3 - x^2 & \\ \hline -x^2 - 5x + 6 & \\ -x^2 + x & \\ \hline -6x + 6 & \\ -6x + 6 & \\ \hline 0 & \end{array}$$

$$6) \delta) 6^{2 \sin x} \cdot 4^{\sin x} = \frac{1}{12}$$

$$(6^2 \cdot 4)^{\sin x} = \frac{1}{12}$$

$$12^{2 \sin x} = 12^{-1}$$

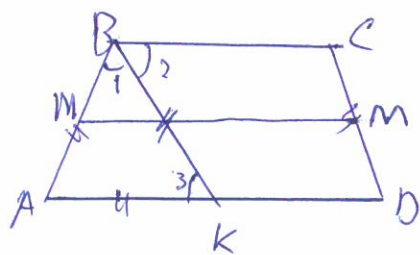
$$2 \sin x = -1$$

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

$$x = -\frac{5\pi}{6} + 2\pi n \quad n \in \mathbb{Z}$$

$$x = -\frac{\pi}{6} + 2\pi n \quad n \in \mathbb{Z}$$

~4



Замечание:

$$\angle 1 = \angle 2 \quad (\text{по уел.})$$

$$\angle 2 = \angle 3 \quad (\text{как кат. к } \angle 4) \Rightarrow \angle 1 = \angle 3 \Rightarrow \triangle ABK - \text{ис} \Rightarrow AB = AK$$

$$AB = CD \quad (\text{м.к. в т.р. } ABCD - \text{ис})$$

$$\text{з.м. } BECK - \text{пар-рам } (BK \parallel CD \text{ по уел. } BC \parallel KD \text{ м.к. } ABCD - \text{м.р.})$$

$$\Rightarrow BK = CD$$

по уел.

$\Rightarrow$

$$AK = AB = BK \Rightarrow \triangle ABK - \text{м.к.}$$

$$NM = \frac{AD + BC}{2} = \frac{AK + KD + BC}{2}; \quad KD = BC \quad \text{м.к. } BECK - \text{пар-рам}$$

$$NM = \frac{AK + 2BC}{2}$$

$$BC = NM - \frac{AK}{2} = NM - \frac{AB}{2}$$

$$P_{ABCD} = 2AB + AD + BC = 2AB + 2NM$$

$$AB = \frac{P_{ABCD}}{2} - NM$$

$$BC = NM - \frac{P_{ABCD}}{4} + \frac{NM}{2} = \frac{3}{2}NM - \frac{P_{ABCD}}{4}$$

$$BC = \frac{3}{2} \cdot 21,4 - \frac{71,8}{4} = 14,15$$

Дано: $ABCD - \text{ис}$

$$P_{ABCD} = 71,8$$

NM - ср. л.

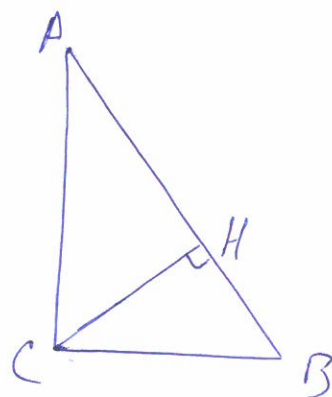
$$NM = 21,4$$

BK - бис-са

$BK \parallel CD$

$BC = ?$

$$\begin{array}{r} 32,7 \\ - 18,55 \\ \hline 14,15 \end{array}$$



Задание 5

Решение

$$AC^2 = AH \cdot AB$$

$$AC = \sqrt{AH \cdot AB} = \sqrt{AH(AH + BH)}$$

$$BC = \sqrt{BH \cdot AB} = \sqrt{BH(AH + BH)}$$

$$AB = AH + BH$$

$$\begin{cases} P_{ABC} = \sqrt{AH(AH + BH)} + \sqrt{BH(AH + BH)} + AH + BH \\ \sqrt{AH \cdot BH} = CH \end{cases}$$

$$\begin{cases} (\sqrt{AH(AH + BH)} + \sqrt{BH(AH + BH)})^2 = (P_{ABC} - (AH + BH))^2 \\ AH \cdot BH = CH^2 \end{cases}$$

$$AH(AH + BH) + 2\sqrt{AH \cdot BH(AH + BH)} + BH(AH + BH) = P_{ABC}^2 - 2P_{ABC}(AH + BH) + (AH + BH)^2$$

$$AB^2 + 2CH \cdot AB = P_{ABC}^2 - 2P_{ABC} \cdot AB + AB^2$$

$$(2CH + 2P_{ABC}) \cdot AB = P_{ABC}^2$$

$$AB = \frac{P_{ABC}^2}{2CH + 2P_{ABC}}$$

$$AB = \frac{60^2}{2 \cdot 12 + 2 \cdot 60} = \frac{22^2 \cdot 5^2}{294} = 25$$

$$\begin{cases} AC + CB = P_{ABC} - AB \\ \frac{AC \cdot CB}{2} = \frac{AB \cdot CH}{2} \end{cases}$$

$$\begin{cases} AC + CB = 35 \\ AC \cdot CB = 300 \end{cases}$$

$$AB = 25$$

$$AC = 20$$

$$BC = 15$$

По м. Бамена

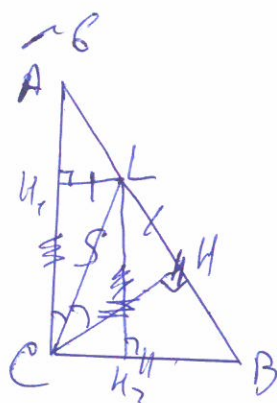
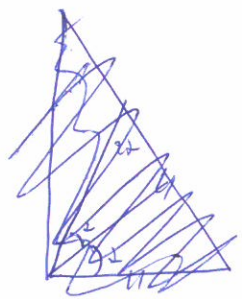
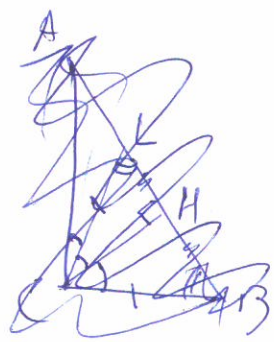
$$x^2 - 35x + 300 = 0$$

$$x_1 = 20$$

$$x_2 = 15$$

Доказ: $\triangle ABC$ - т.
 $P_{ABC} = 60$
 CH - вис.
 $CH = 12$
 AB, BC, CA - ?

Доказ: $\triangle ABC$ - т.
 CH - вис.
 $H \in AB$
 CH - вис. с $\angle ACH$
 $BC =$



Дано:

$$\text{Дано: } LH_1 \perp AC, LH_2 \perp BC$$

$$LH_1 = LH_2 \text{ по св. бис-ца}$$

$$\angle CH = CH_1 \text{ (м.к. } \triangle CLK_1 = \triangle CLK_2 \text{ (} K_1L = K_2L \text{); } \angle CLK_1 = \angle CLK_2 = 90^\circ \text{; } CL - \text{общ.})$$

$$CH = LK_2 \text{ по св. пр. тр.}$$

по ком. и
алгеб.

$$\triangle CLK_1 = \triangle CLK_2 \text{ (} \angle CLK_1 = \angle CLK_2 = 90^\circ \text{; } CL - \text{общ.}; LK_2 = CH \text{) по}$$

$$CK_1L \text{ и } K_2L - \text{паралл. } (\angle CK_1L = \angle K_2L; K_1L = LK_2) \text{ ком. и алгеб.}$$

$$\text{м.к. } \angle CK_2L = 90^\circ; CK_1L \text{ (} K_2L - \text{паралл.} \Rightarrow CK_1L \text{ (} K_2L - \text{прям.} \Rightarrow$$

$$\Rightarrow \angle ACB = 90^\circ \Rightarrow \triangle ABC - \text{прям.}$$

$$BC = BL = 6$$

$$\begin{cases} CK_2^2 + CL^2 = BK_2^2 + BL^2 \\ CK_2 + BK_2 = CB \end{cases}$$

$$\begin{cases} CK_2^2 - BK_2^2 = -BL^2 + CL^2 \\ CK_2 + BK_2 = CB \end{cases}$$

$$\begin{cases} CK_2^2 - BK_2^2 = -BL^2 + CL^2 \\ CK_2 + BK_2 = CB \end{cases}$$

$$\begin{cases} CK_2^2 - BK_2^2 = -BL^2 + CL^2 \\ CK_2 + BK_2 = CB \end{cases}$$

$$CK_2^2 - (CB - CK_2)^2 = -BL^2 + CL^2$$

$$CK_2^2 - CB^2 + 2CBCK_2 - CBCK_2^2 = -BL^2 + CL^2$$

$$CK_2 = \frac{BL^2 + CL^2 + CB^2}{2CB}$$

$$CK_2 = \frac{4^2 + 3^2 + 5^2}{2 \cdot 5} = \frac{34}{10} = \frac{17}{5}$$

$$BK_2 = \frac{14}{5}$$

$$BK_2 = BL - LK_2 =$$

$$= BL - CK_2 =$$

$$= BK_2$$

$$AB = \frac{6^2}{21} + \frac{14^2}{21} = \frac{162}{21} = \frac{54}{7}$$

$$S_{ABC} = \frac{1}{2} CH \cdot AB =$$

$$= \frac{1}{2} \cdot \sqrt{\frac{64 \cdot 247}{21 \cdot 3}} \cdot \frac{54}{7} = \frac{8\sqrt{2}}{6} \cdot \frac{54}{7} =$$

$$= \frac{72\sqrt{2}}{7}$$

$$CH = \sqrt{BC^2 - BK_2^2}$$

$$CH^2 = BC^2 - BK_2^2$$

$$CH^2 = AB \cdot BH$$

$$AH = \frac{BC^2 - BK_2^2}{AB}$$

$$AH = \frac{108}{24} - \frac{14}{3} = \frac{379}{42} - \frac{106}{42} = \frac{273}{42} = \frac{69}{11}$$