

MATHEMATICS

Instruction: You are offered the test items with one correct answer from four proposed ones.

1. Rationalize the denominator of the fraction: $\frac{a-b}{\sqrt{b}+\sqrt{a}}$

- A) $\sqrt{a} - \sqrt{b}$
- B) $b + a$
- C) $\sqrt{a} + \sqrt{b}$
- D) $\sqrt[4]{a} - \sqrt[4]{b}$

2. Calculate: $9.5 \cdot 10^{-4} + 0.2 \cdot 10^{-3}$

- A) $9.7 \cdot 10^{-3}$
- B) $9.7 \cdot 10^{-4}$
- C) $11.5 \cdot 10^{-4}$
- D) $29.5 \cdot 10^{-4}$

3. Find: $2\sin 165^\circ \cos 165^\circ = ?$

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

4. Write the monomial in standard form:

$$\frac{4}{5}a^2b^2 \cdot 30b^2 \cdot c^6a^{10}$$

- A) $20a^8b^4c^6$
- B) $25a^8b^4c^6$
- C) $24a^{12}b^4c^6$
- D) $20a^2b^4c^6$

5. Factorize the given expression: $\left(\frac{x}{x-y} - \frac{x}{x+y}\right) : \frac{xy}{x+y}$

- A) $\frac{x+y}{x-y}$
- B) $\frac{x-y}{x+y}$
- C) $\frac{2}{xy}$
- D) $\frac{2}{x-y}$

6. Solve the system of equations:

$$\begin{cases} 3x + 4y = 16 \\ 3y + 4x = 26 \end{cases}$$

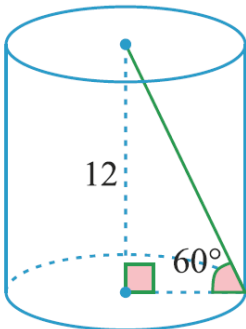
- A) $(-2; 8)$
- B) $(2; 4)$
- C) $(8; -2)$
- D) $(4; 2)$

7. Calculate:

$$4 \cos \frac{\pi}{6} + \operatorname{tg} \frac{\pi}{3} + 9 \operatorname{ctg} \frac{2\pi}{3}$$

- A) $6\sqrt{3}$
- B) 1
- C) 0
- D) $-6\sqrt{3}$

8. Calculate the volume of the cylinder, shown on the picture



- A) 480π
- B) $96\sqrt{3}\pi$
- C) 576π
- D) $144\sqrt{3}\pi$

9. Solve the system of inequalities:

$$\begin{cases} x^2 + 2 > 3 \\ \frac{x - 6}{2} + 7 \leq \frac{2 - 3x}{5} + 2x \end{cases}$$

- A) $(-1; 1)$
- B) $(-\infty; 1) \cup [1; 4]$
- C) $[4; +\infty)$
- D) $[-4; -1) \cup (1; +\infty)$

10. Solve the equation:

$$\sin^2 3x + 3 \cos 3x = 3$$

A) $\frac{2\pi n}{3}, n \in \mathbb{Z}$

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

C) $\frac{2\pi n}{3}, \arccos 2 + 2\pi k; k, n \in \mathbb{Z}$

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

11. Find the range of the function: $f(x) = -x^2 + 6x - 14$

A) $[5; +\infty)$

B) $[-5; +\infty)$

C) $(-\infty; -5]$

D) $(-\infty; 5]$

12. Solve the logarithmic inequality: $\log_2 x + \log_x 8 - 4 < 0$

A) $(1; 2) \cup (8; +\infty)$

B) $(2; 8)$

C) $(-\infty; 1) \cup (2; 8)$

D) $(0; 1) \cup (2; 8)$

13. Determine the number of sides of a regular polygon, if one interior angle measures 140°

A) 12

B) 8

C) 9

D) 10

14. Given functions: $f(x) = \sqrt{3x - 1}, g(x) = \frac{x^2}{4} + 5x - 6$. Find $f(g(x))$.

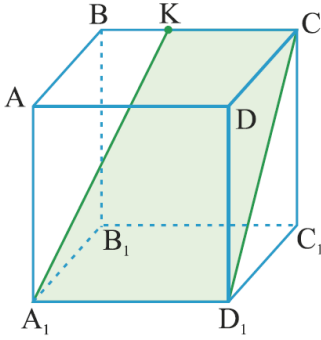
A) $f(g(x)) = \sqrt{\frac{1}{4}x^2 + 15x - 19}$

B) $f(g(x)) = \sqrt{\frac{1}{4}x^2 + 15x + 19}$

C) $f(g(x)) = \sqrt{\frac{3}{4}x^2 + 15x - 19}$

D) $f(g(x)) = \sqrt{\frac{3}{4}x^2 + 15x + 19}$

15. The edge of cube $ABCD A_1 B_1 C_1 D_1$ is $6\sqrt{2}$ cm. Find the area of the quadrilateral $A_1 K C D_1$ with $|CK| = 2 \cdot |BK|$



- A) $72\sqrt{2}$ cm²
- B) 60 cm²
- C) $54\sqrt{3}$ cm²
- D) $60\sqrt{2}$ cm²

16. Solve the equation:

$$\cos^2 9x + \sin^2 7x + \cos^2 5x + \sin^2 3x = 2$$

- A) $\frac{\pi}{4} + \frac{\pi n}{8}, \frac{\pi k}{12}; k, n \in \mathbb{Z}$
- B) $\frac{\pi}{4} + \frac{\pi n}{2}, \frac{\pi k}{12}; k, n \in \mathbb{Z}$
- C) $\frac{\pi}{8} + \frac{\pi n}{4}, \frac{\pi k}{2}; k, n \in \mathbb{Z}$
- D) $\frac{\pi}{8} + \frac{\pi n}{4}, \frac{\pi k}{12}; k, n \in \mathbb{Z}$

17. Calculate the value of the expression $(-x_0 + 2y_0)$ with $x_0 > y_0$, where $(x_0; y_0)$

is the solution of the system of equations:
$$\begin{cases} \log_2 x - \log_4 y = 1\frac{1}{2} \\ 2x - y = 6 \end{cases}$$

- A) 0
- B) -4
- C) 6
- D) 24

18. The area of a rectangle is 16. Which values of the sides will make a minimum perimeter of a rectangle?

- A) $2,5 \times 6,4$
- B) 4×4
- C) $3,2 \times 5$
- D) 2×8

19. Find the radius of the circle which is inscribed in triangle. Sides of triangle are equal to 8, 10 and 16.

- A) $\frac{5\sqrt{19}}{17}$
- B) $\frac{3\sqrt{119}}{17}$
- C) $\frac{57\sqrt{7}}{17}$
- D) $\frac{5\sqrt{117}}{17}$

20. 16; 8; 4; 2; ... find the sum of infinite geometric sequence.

- A) 32
- B) 14
- C) -16
- D) 16

21. Find the angle between vectors $\vec{a}(0; -4; -2)$, $\vec{b}(3; 0; -6)$.

- A) $\arccos \frac{2}{5}$
- B) $\arccos \frac{3}{5}$
- C) $\pi - \arccos \frac{2}{5}$
- D) $\arcsin \frac{2}{5}$

22. Simplify the trigonometric expression: $\sin\left(\frac{3\pi}{2} - \alpha\right) + \cos(\pi + \alpha)$

- A) $2\cos\alpha$
- B) $\sin\alpha - \cos\alpha$
- C) $-2\cos\alpha$
- D) 0

23. Solve the equation:

$$\left(\sqrt{5 - 2\sqrt{6}}\right)^x = 2 - \left(\sqrt{5 + 2\sqrt{6}}\right)^x$$

- A) $\sqrt{5 - 2\sqrt{6}}$
- B) 1
- C) 0
- D) $5 - 2\sqrt{6}$

24. Simplify the expression: $(x - 2y)^2 - 2y(2y - x)$

A) $x^2 + 4xy$

B) $x^2 + 2xy$

C) $x^2 - 2xy$

D) $x^2 - 6xy$

25. Solve the system of equations and find the values of x and y:

$$\begin{cases} 36^x - 6^{x+1} \cdot 5^y - 25^y - 191 = 0 \\ 6^x + 5^y - 41 = 0 \end{cases}$$

A) (2, -1)

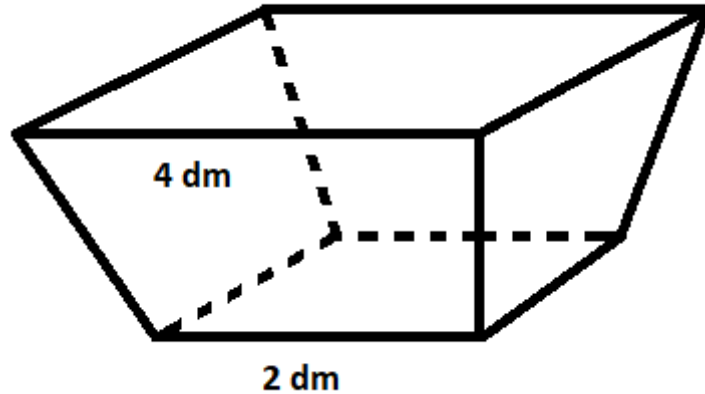
B) (3, 2)

C) (2, 1)

D) (-2, 1)

Instruction: You are offered the test items on the base of text with one correct answer from four proposed ones. Read the text attentively and do the items.

FRUSTUM OF PYRAMID BOX



Aidina has a box. It is an inverted frustum of regular pyramid with 2 dm and 4 dm bases. Height of pyramid is $\sqrt{2}$ dm

26. Find sine of angle between the lateral edge and base.

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

27. Find the lateral edge of the pyramid.

- A) 2 dm
- B) 4 dm
- C) $\sqrt{3}$ dm
- D) $2\sqrt{2}$ dm

28. Find the volume of the box.

- A) $\frac{24\sqrt{2}}{3} dm^3$
- B) $\frac{28\sqrt{2}}{3} dm^3$
- C) $\frac{20\sqrt{2}}{3} dm^3$
- D) $\frac{32\sqrt{2}}{3} dm^3$

29. Find the slant height.

A) $\sqrt{3} dm$

B) $2\sqrt{3} dm$

C) $\frac{\sqrt{3}}{2} dm$

D) $\frac{\sqrt{3}}{3} dm$

30. Find the lateral area of the box.

A) $9\sqrt{3} dm^2$

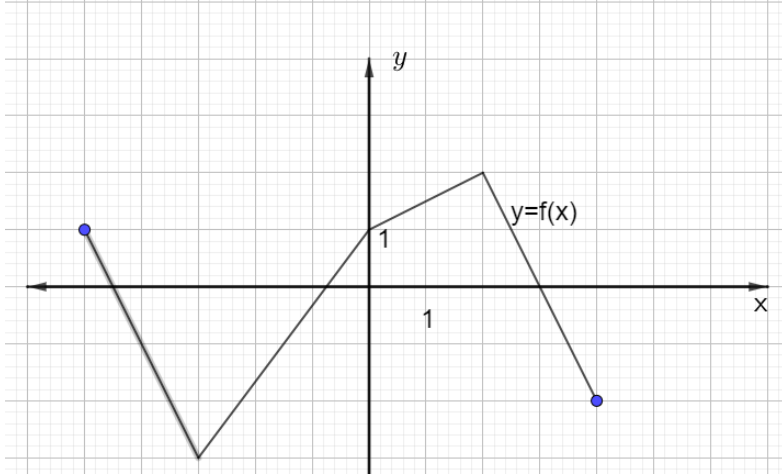
B) $12\sqrt{3} dm^2$

C) $3\sqrt{3} dm^2$

D) $6\sqrt{3} dm^2$

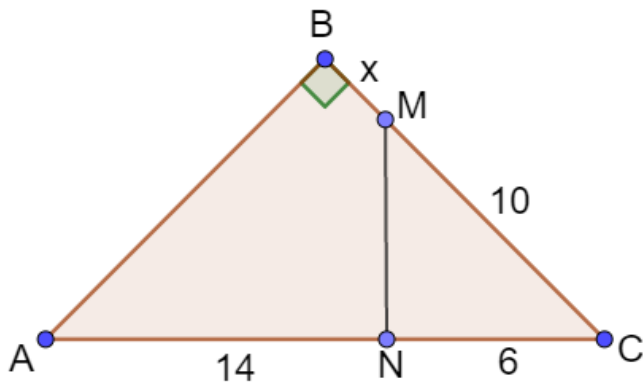
Instruction: You are offered test items to matching.

31. Given the graph of function. Match the following



A) find $f(0)+f(2)$	3
	2
	-2
	-3
B) find x if $f(x)=-3$	3
	2
	-2
	-3

32. In the figure below $AB \perp BC$, $MN \perp AC$. Match the following



A) find the length BM	4
	5
	3
	2
B) find the 10% of perimeter ABMN	4
	5
	3
	2

33. Given the expression. Match the following

$$C = 494^3 - 494^2 - 494 \cdot 493 - 493^2 - 493^3$$

A)	calculate value of $(5C-1)$	-6
		-32
		-1
		0
B)	calculate value of C	-6
		-32
		-1
		0

34. Given the equation. Match the following

$$x^4 + 2x^3 + x^2 - 14(x^2 + x) + 24 = 0$$

A)	find the sum of odd roots of the equation	4
		-6
		24
		26
B)	find the product of all roots of the equation	4
		-6
		24
		26

35. (a_n) is an arithmetic sequence, the sum of the first n terms of the sequence is given by the formula $S_n = n^2 - 2n$. Match the following

A)	find the 12nd term of the sequence	2
		6
		12
		21
B)	find the common difference of an arithmetic sequence	2
		6
		12
		21

Instruction: You are offered the test items with one or more correct answers.

36. Nursultan wrote the expression $\frac{-x + 4y}{5y + x}$ and asked his brothers to find its mean,

when $\frac{x}{y} = 4$ and when $\frac{x}{y} = -\frac{1}{7}$. What answers will they find?

A) 0

B) $\frac{3}{4}$

C) $-\frac{14}{17}$

D) 0,6

E) $\frac{29}{34}$

F) -1,5

37. Convert the given expression into the degree: $\frac{4\pi}{3}$

A) 30°

B) 240°

C) 210°

D) 60°

E) 430°

F) 270°

38. Expressions $x - 1$, $x + 2$ and $3x$ form three consecutive elements of the geometric progression in the given order. Find the all values of x

A) $\frac{1}{4}$

B) $-\frac{1}{2}$

C) 1

D) -4

E) 4

F) -2

39. Solve the exponential equation: $3 \cdot 2^x + 5 = 2^{2x+1}$

A) -2

B) $\log_2 2.5$

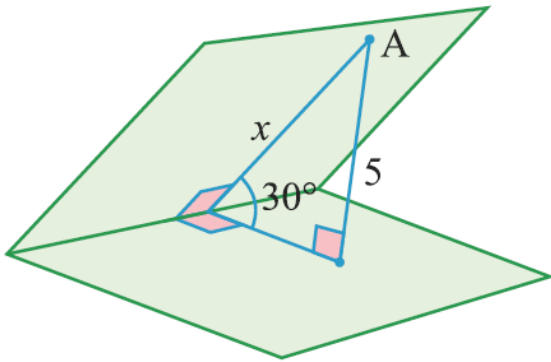
C) -1

D) $\log_2 5 - 1$

E) 0

F) 2.5

40. Point A lies in one edge of the dihedral angle. The distance from point A to the other edge is 5 cm. Find the lengths of x and its projection on the second edge, as shown in the figure



- A) 2.5 cm
- B) $10\sqrt{2}$ cm
- C) $5\sqrt{2}$ cm
- D) 10 cm
- E) $5\sqrt{3}$ cm
- F) 1.25 cm

MATHEMATICS TEST IS COMPLETED