



VARIANT-I

Date: _____

Name: _____

Date of birth: _____

Cell number: _____

School/Town: _____

Total number of questions: 25
(Instructor use only)

Correct answers: _____

Incorrect answers: _____

Interview date: _____



KAZAKHSTAN MARITIME ACADEMY ENTRY TEST
Mathematics Exam

1. Calculate: $(6.25 \div 5 + 1.25) \times 0.6$

- A) 7,5
- B) 1,5
- C) 15
- D) 75
- E) 0,15

2. Reduce fraction: $\frac{6b^4 - 24x^2}{b^2 - 2x}$

- A) $6b^2 + 18x$
- B) $6b^2 + 12x$
- C) $6b^2 + 16x$
- D) $6b^2 - 8x$
- E) $3b^2 - 6x$

3. For fabrication of 6 tents it is needed 120 m of tarpaulin with 1.2 m width. How many meters of tarpaulin with width 1.5 m is necessary for fabrication of these 4 tents?

- A) 62 m
- B) 64 m
- C) 60 m
- D) 63 m
- E) 61 m

4. Find in which value of variable the value of binominal $11x+3$ is less than value of binominal $5x-6$.

- A) $x < 1,5$
- B) $x \leq 1,5$
- C) $x < -1,5$
- D) $x > 1,5$
- E) $x > -1,5$

5. Solve the inequation: $0,6^{x^2+3x} > 0,6^\circ$

- A) $[-3;0]$
- B) $(-3;0)$
- C) $[-3;0)$
- D) $(-3;0]$
- E) 0



6. Calculate: $\sin \frac{\pi}{3} \cos \frac{\pi}{4} \operatorname{tg} \frac{\pi}{6}$

A) $\frac{\sqrt{2}}{2}$

B) $\frac{\sqrt{3}}{2}$

C) $\frac{\sqrt{2}}{4}$

D) $\sqrt{3}$

E) 1

7. Solve the equation: $\sin 4x - 1 = 0$

A) $(-1)^k \frac{\pi}{2} + \frac{\pi}{2} k, k \in Z$

B) $-\frac{\pi}{8} + \frac{\pi}{2} k, k \in Z$

C) $\pm \frac{\pi}{8} + \frac{\pi}{2} k, k \in Z$

D) $(-1)^k \frac{\pi}{4} + \pi k, k \in Z$

E) $\frac{\pi}{8} + \frac{\pi}{2} k, k \in Z$

8. Given triangle ABC. $\angle A = 45^\circ$, $\angle C = 15^\circ$, $BC = 4\sqrt{6}$. Find AC.

A) 10

B) $6\sqrt{6}$

C) $2\sqrt{6}$

D) 14

E) 12

9. Find the scalar product $\vec{a} \times \vec{b}$, если $|\vec{a}| = 6\sqrt{3}$, $|\vec{b}| = 8$.

And the angle between them is equal to 30°

A) 74

B) 48

C) $24\sqrt{3}$

D) 72

E) 76



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10. Calculate in which x the expression $2 - |x - 1|$ has the greatest value.

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

11. Solve the equation: $\frac{x\sqrt{3} + \sqrt{2}}{x\sqrt{3} - \sqrt{2}} + \frac{x\sqrt{3} - \sqrt{2}}{x\sqrt{3} + \sqrt{2}} = \frac{10x}{3x^2 - 2}$

- A) 0; 4
- B) $\frac{2}{3}$; 1
- C) $-\frac{2}{3}$; -1
- D) 2; 3
- E) 5; 6

12. Solve the equation: $\left(\cos \frac{\pi}{6}\right)^{2x-2} = 1\frac{7}{9}$

- A) $x=1$
- B) $x=-1$
- C) $x=-2$
- D) $x=0,1$
- E) $x=2$

13. Solve the system of equations: $\begin{cases} \log_2(x+y)=3 \\ \log_{15} x=1-\log_{15} y \end{cases}$

- A) (2;6); (1;2)
- B) (2;6); (5;3)
- C) (1;2)
- D) (3;5); (5;3)
- E) (1;2); (3;5)

14. Find the roots of the equation: $\sqrt{3x-5} = x-3$

- A) $\sqrt{3}$
- B) 7
- C) -3
- D) $\sqrt{7}$
- E) 3



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15. In a geometric progression the sum of first and fifth terms are equal to 51, and the sum of second and sixth are equal to 102. It was combined the few first terms of the progression and got a number equal to 3069. Please indicate the number of terms of this progression which was combined:

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

16. Find the domain of the function $y = \log_{\frac{1}{3}}(3x + 4)$

- A) $(-\infty; \infty)$
- B) $(-\infty; \frac{4}{3})$
- C) $(-\frac{4}{3}; \infty)$
- D) $(\frac{4}{3}; \infty)$
- E) $(-\infty; -\frac{4}{3})$

17. Find the derived function. $f(x) = x^5 - \frac{1}{5x^5}$

- A) $7x^4 - \frac{1}{x^6}$
- B) $3x^4 - \frac{7}{2x^6}$
- C) $5x^4 + \frac{1}{x^6}$
- D) $x^4 + \frac{5}{5x^5}$
- E) $11x^4 - \frac{1}{2}x^5$

18. Find the speed of a point moving in a straight line according to the law: $x(t) = 2t^3 + t^2 - 4$ (cm) when $t = 4$ s.

- A) 144 cm/s
- B) 104 cm/s
- C) 108 cm/s
- D) 156 cm/s
- E) 56 cm/s



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19. In a parallelogram from the intersection point of the diagonals is drawn an interval of 2 cm to the side equal to 5 cm so that divides it in half. Find the perimeter of parallelogram.

- A) 25 cm
- B) 14 cm
- C) 20 cm
- D) 12 cm
- E) 18 cm

20. Reduce fraction: $\frac{6a^2 + 11a + 3}{3 + 5a - 12a^2}$

- A) $\frac{2a + 3}{3 - 4a}$
- B) $\frac{a - 5}{a + 2}$
- C) $\frac{a}{3 - 4a}$
- D) $\frac{4a - 3}{3 + 2a}$
- E) $\frac{3 - 4a}{2a + 3}$

21. Simplify. $2(\sin^4 x + \sin^2 x \cos^2 x + \cos^4 x)^2 - \sin^8 x - \cos^8 x$

- A) 2
- B) $\frac{1}{2}$
- C) 1
- D) $\frac{1}{4}$
- E) -1

22. Solve the system of inequalities: $\begin{cases} \operatorname{tg} x > 0,23 \\ \operatorname{ctg} x \leq 0,3 \end{cases}$

- A) $\operatorname{arcc} \operatorname{tg} 0,3 + 2\pi n < x < \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$
- B) $\operatorname{arcc} \operatorname{tg} 0,3 + \pi n < x < \operatorname{arcc} \operatorname{tg} 0,23 + \pi n, n \in \mathbb{Z}$
- C) $\operatorname{arcc} \operatorname{tg} 0,23 + \pi n < x < \pi + 2\pi n, n \in \mathbb{Z}$
- D) $\operatorname{arcc} \operatorname{tg} 0,3 + \pi n \leq x \leq \pi + \pi n, n \in \mathbb{Z}$
- E) $\operatorname{arcc} \operatorname{tg} 0,3 + \pi n \leq x < \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$



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23. Calculate the area of the figure bounded by the lines: $y = \sqrt{x}$, $y = 1$, $x = 4$

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

24. The volume of a regular triangular pyramid is equal to $300\sqrt{3}\text{cm}^3$. Determine the area of the circle inscribed in the base of pyramid if the height of the pyramid is 12 cm.

- A) $27\pi\text{cm}^2$
- B) $25\pi\text{cm}^2$
- C) $12,5\pi\text{cm}^2$
- D) $36\pi\text{cm}^2$
- E) $49\pi\text{cm}^2$

25. Determine the volume of a rectangular parallelepiped which diagonal is equal to n and it composes corner 30° with one edge and corner 45° with other edge.

- A) $\frac{3n^3}{18}$
- B) $\frac{3n^3}{8}$
- C) $\frac{n^3\sqrt{2}}{8}$
- D) $\frac{n^3}{8}$
- E) $\frac{n^3\sqrt{3}}{4}$



Solve the problems and give your solutions on the answer sheets

1) Determine the definition domain of the function (2 points):

$$y = \sqrt{\log_{0,3} \frac{x-1}{x+5}}$$

2) Solve the trigonometric expression:

$$\frac{2 \sin 2\alpha - 3 \cos 2\alpha}{4 \sin 2\alpha + 5 \cos 2\alpha}, \text{ if } \operatorname{tg} \alpha = 3$$

3) Solve the equation:

$$\lg(x^3 + 8) - 0,5 \lg(x^2 + 4x + 4) = \lg 7$$

4) The product of the first three terms of the geometric progression is 1728, and their sum is 63. Find the first term and ratio of this progression.

5) A rhombus is inscribed in a circle of radius r . Determine the area of a rhombus, if its large diagonal is 4 times the radius of the inscribed circle.