

## MATHEMATICS

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

1. Find the amount of all divisors of 128

- A) 8
- B) 6
- C) 4
- D) 10

2. If  $z = 12 - 3i$ , find  $|\bar{z}|$

- A)  $3\sqrt{17}$
- B) 9
- C) 15
- D)  $\sqrt{154}$

3. Express the value in grams and write it in standard form:

$$16200 \cdot 10^{18} \text{ kg}$$

- A)  $1,62 \cdot 10^{24} \text{ g}$
- B)  $1,62 \cdot 10^{25} \text{ g}$
- C)  $16,2 \cdot 10^{25} \text{ g}$
- D)  $162 \cdot 10^{28} \text{ g}$

4. Calculate:

$$4 \sin \frac{\pi}{3} + \operatorname{ctg} \frac{\pi}{6} + 9 \operatorname{tg} \frac{5\pi}{6}$$

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

5. Marlen wrote three digit number which ends 5. If the last digit wrote first, then the new number is more on 12 than the given number multiplied by 4. Find the unknown number.

- A) 215
- B) 125
- C) 135
- D) 115

6. What are the roots of the equation:

$$\sqrt{2x} = |x - 4|$$

- A) -8
- B) -8; 2
- C) 2; 8
- D) 4; 6

7. Solve the system of equations, find the values of  $x$  and  $y$ ?

$$\begin{cases} 3x - y = 1 \\ x + y = 3 \end{cases}$$

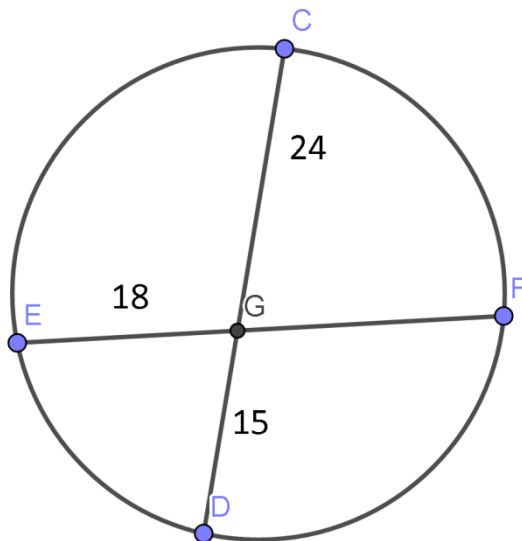
- A) (1;3)
- B) (1;2)
- C) (3;1)
- D) (2;1)

8. Simplify:

$$\lim_{x \rightarrow 2} \frac{x^3 - 2x^2 - x + 2}{x^3 - 4x^2 + x + 6}$$

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

9. The chords  $EF$  and  $CD$  are intersected. Find  $GF$ .



- A) 24
- B) 21
- C) 20
- D) 12

10. What is the diameter of a sphere, if it is known that the diameter is  $65\text{cm}$  greater than radius?

- A)  $95\text{ cm}$
- B)  $120\text{ cm}$
- C)  $60\text{ cm}$
- D)  $130\text{ cm}$

11. Solve the equation:

$$\cos^2 2x - \sin^2 2x = -\frac{\sqrt{3}}{2}$$

A)  $x = \pm \frac{\pi}{12} + \pi k; k \in Z$

B)  $x = \pm \frac{3\pi}{4} + \frac{\pi k}{2}; k \in Z$

C)  $x = \pm \frac{5\pi}{12} + \pi k; k \in Z$

D)  $x = \pm \frac{5\pi}{24} + \frac{\pi k}{2}; k \in Z$

12. Solve the inequality:

$$-\sqrt{(5-x)(x-2)} \leq 0$$

A)  $[2; 5]$

B)  $(-\infty; 2] \cup [5; +\infty)$

C)  $(-\infty; 2) \cup (5; +\infty)$

D)  $(2; 5)$

13. Calculate:

$$\int_1^4 \left( -\frac{x^2}{2} + \frac{5x}{2} - \frac{3}{x} \right) dx =$$

A)  $\frac{33}{4} - 3\ln 4$

B)  $\frac{38}{4} - 3\ln 4 - 3\ln 2$

C)  $\frac{15}{2} - 3\ln 4 - 3\ln 2$

D)  $\frac{38}{2} - 3\ln 4$

14. Find  $n$  in given below absolute frequency table, if mean is equal to 2,8.

$X_i$	-5	1,2	7,3	2,35	1,5
$n_i$	2	5	7	$n$	4

A) 4

B) 6

C) 3

D) 2

15. Write the equation of the line by given two points:  $A(-2; 6), B(3; -1)$

A)  $7x + 5y - 16 = 0$

B)  $-7x + 5y - 16 = 0$

C)  $7x + 5y + 16 = 0$

D)  $5x + 7y - 16 = 0$

16. Point D divides a line segment AB in a ratio 3:5.

If A(-1; 3; 2) and B(4; 7; 12) are given, then find the coordinates of point D.

A)  $\left(\frac{7}{8}, \frac{13}{2}, \frac{66}{4}\right)$

B)  $\left(\frac{7}{8}, \frac{9}{2}, \frac{23}{4}\right)$

C)  $\left(\frac{21}{8}, \frac{11}{6}, \frac{33}{4}\right)$

D)  $\left(\frac{7}{8}, \frac{11}{2}, \frac{66}{4}\right)$

17. Solve the equation:

$$\sqrt[3]{2x + 13} - \sqrt[3]{2x - 13} = 2$$

A) -1; 3

B) -3; 1

C) 7

D) -7; 7

18. Solve the system of equations:

$$\begin{cases} \sin 2x \cdot \cos 3y = 0,75 \\ \cos 2x \cdot \sin 3y = 0,25 \end{cases}$$

A)

$$\left( (-1)^k \frac{\pi}{24} - \frac{\pi}{8} - \frac{\pi k}{4} + \frac{\pi n}{2}; \frac{\pi}{12} + (-1)^k \frac{\pi}{36} + \frac{\pi k}{6} + \frac{\pi n}{3} \right), k, n \in \mathbb{Z}$$

B)

$$\left( (-1)^k \frac{\pi}{24} + \frac{\pi k}{4} + \frac{\pi n}{2}; -(-1)^k \frac{\pi}{36} - \frac{\pi k}{6} + \frac{\pi n}{3} \right), k, n \in \mathbb{Z}$$

C)

$$\left( (-1)^k \frac{\pi}{24} - \frac{\pi}{8} + \frac{\pi k}{4} + \frac{\pi n}{2}; \frac{\pi}{12} - (-1)^k \frac{\pi}{36} - \frac{\pi k}{6} + \frac{\pi n}{3} \right), k, n \in \mathbb{Z}$$

D)

$$\left( (-1)^k \frac{\pi}{24} + \frac{\pi}{8} + \frac{\pi k}{4} + \frac{\pi n}{2}; \frac{\pi}{12} - (-1)^k \frac{\pi}{36} - \frac{\pi k}{6} + \frac{\pi n}{3} \right), k, n \in \mathbb{Z}$$

19. Solve the system of inequalities:

$$\begin{cases} \frac{x + x^2}{3} > 1\frac{1}{3} + \frac{x}{3} \\ \log_2(x - 3) - 2 \leq 0 \end{cases}$$

- A)  $(2; 7]$
- B)  $(3; 7]$
- C)  $(-\infty; -2) \cup (2; 7]$
- D)  $(-\infty; -3)$

20. A regular hexagonal pyramid have a base side equal to 1 cm. The angle between a lateral side and base is  $45^\circ$ . Find the volume of the pyramid.

- A)  $\frac{3}{4} \text{ cm}^3$
- B)  $\frac{1}{3} \text{ cm}^3$
- C)  $\frac{1}{4} \text{ cm}^3$
- D)  $\frac{2}{5} \text{ cm}^3$

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

### NUMBERS

Look at this set of numbers:

3, -2, 0, 1, 9, 15, 4, 5, -7, 10, 32, -32, 21, 23, 25, 27, 29, 12.

21. What is the sum of prime numbers given above?
  - A) 66
  - B) 54
  - C) 60
  - D) 52
22. What is the sum of negative even numbers?
  - A) -7
  - B) -41
  - C) -12
  - D) -34
23. Find the GCD (the greatest common divisor) of the numbers 4, 12 and 32.
  - A) 24
  - B) 4
  - C) 12
  - D) 32
24. Find the LCM (the lowest common multiple) of the 9, 10 and 15.
  - A) 90
  - B) 15
  - C) 3
  - D) 45
25. What is the percentage of odd numbers in the number set given above, round up the answer to the nearest 2 decimal places.
  - A) 47.53%
  - B) 61.11%
  - C) 78.32%
  - D) 64.98%

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

26. Find reverse number:  $-2\frac{1}{3}$

A)  $-\frac{7}{3}$

B) 6

C)  $2\frac{1}{3}$

D) -6

E)  $-\frac{3}{7}$

F)  $\frac{3}{7}$

27. Calculate:

$$\left(\frac{\sin 80^\circ + \sin 40^\circ}{\sin 70^\circ}\right)^2$$

A) 6

B)  $\sqrt{3}$

C) 3

D)  $\sqrt{9}$

E) 9

F)  $\sqrt{6}$

28. Write polynomial in standard form:

$$\frac{1}{2}a^2bc + 0,2baz + (-0,6ba^2c) - 1, (8)zab$$

A)  $-0,1a^2bc + 2\frac{4}{45}abz$

B)  $-0,1a^2bc - 1\frac{31}{45}abz$

C)  $-0,1a^2bc + 1\frac{31}{45}abz$

D)  $0,1a^2bc - 1\frac{31}{45}abz$

E)  $\frac{1}{10}a^2bc - 1\frac{31}{45}abz$

F)  $-\frac{1}{10}a^2bc - 1\frac{31}{45}abz$

29. Solve the differential equation:  $y' = e^{2021x} - \sqrt{2021x}$

A)  $y = \frac{e^{2021x}}{2021} - \frac{2\sqrt{2021}}{3}x\sqrt{x} + C$

B)  $y = \frac{e^{2021x}}{2021} - \frac{2\sqrt{2021}}{5}x\sqrt{x} + C$

C)  $y = \frac{e^{2021x}}{2021} - \frac{2\sqrt{2021}}{3}x\sqrt{3x} + C$

D)  $y = \frac{e^{2021x}}{2021} - \frac{2\sqrt{2021}}{3}x\sqrt{2021} + C$

E)  $y = \frac{e^{2020x}}{2020} - \frac{2\sqrt{2021}}{3}x\sqrt{x} + C$

F)  $y = \frac{e^{2021x}}{2021} - \frac{5\sqrt{2021}}{3}x\sqrt{x} + C$

30. Given the right parallelepiped  $ABCD A_1 B_1 C_1 D_1$ .  $AB = 6$ ,  $BC = 15$ ,  $AA_1 = 8$ . Find the cosine of angle between  $BC_1$  and  $CD_1$ .

A)  $\frac{32}{85}$

B)  $\frac{21}{85}$

C)  $\frac{23}{85}$

D)  $\frac{16}{85}$

E)  $\frac{63}{85}$

F)  $\frac{32}{75}$

31. Which product of the conjugate numbers will be real number:

A)  $5 + 3i$

B)  $-3 - 2i$

C)  $i$

D)  $5 - 3i$

E)  $4 + 2i$

F)  $3$



32. Solve the equation:  $\log_x(x^4 - x^2 + 16) = 4$
- A) 4
  - B) 16
  - C) -4
  - D) -16
  - E) -8
  - F) 2
33. A square based prism is inscribed into the cylinder with radius 2 cm and height 2 cm. Find the volume of a prism.
- A)  $8\sqrt{2} \text{ cm}^3$
  - B)  $4\sqrt{16} \text{ cm}^3$
  - C)  $16\sqrt{2} \text{ cm}^3$
  - D)  $16 \text{ cm}^3$
  - E)  $9 \text{ cm}^3$
  - F)  $8 \text{ cm}^3$
34. Identify the term(s) of the arithmetic sequence, if  $a_5 = 10, S_{10} = 40$ .
- A) 10
  - B) -1
  - C) 11
  - D) 19
  - E) 46
  - F) -14
35. In an isosceles triangle  $ABC$  the base is 1 unit long. The line segment  $MN$  is parallel to the base  $AC$  divides  $BA$  into two equal parts. Calculate the scalar product of  $\overrightarrow{MN} \cdot \overrightarrow{CA}$
- A)  $-\frac{1}{4}$
  - B)  $-\frac{1}{2}$
  - C) -0.5
  - D) -0.25
  - E)  $-\frac{1}{3}$
  - F) -0.3