

XPERTSTEM Mathematics Competition – Sample Test for Grade 9 and 10

1) Simplify $\sqrt{50} + \sqrt{18} - \sqrt{8}$

- A) $5\sqrt{2}$
- B) $7\sqrt{2}$
- C) $6\sqrt{2}$
- D) $4\sqrt{2}$

2) Which of the following is an irrational number?

- A) $\sqrt{25}$
- B) 0.3333...
- C) $\sqrt{2}$
- D) 4

3) Simplify $(2^3)^2 \times 2^{-4}$

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

4) If $x = 3$ and $y = 2$, calculate

$$\frac{x^2y}{y^3x}$$

- A) 3
- B) $3/16$
- C) $3/4$
- D) $9/4$

5) Solve the equation if

$$x^2 - 5x + 6 = 0.$$

- A) $x = 2$ or 3
- B) $x = 1$ or 6
- C) $x = -2$ or -3
- D) $x = 0$ or 5

6) Find the vertex of the parabola $y = x^2 - 4x + 3$.

- A) $(2; -1)$
- B) $(-2; -1)$
- C) $(4; 3)$
- D) $(3; -2)$

7) Factorize: $x^3 - 3x^2 - 4x + 12$

- A) $(x - 3)(x^2 + 4)$
- B) $(x + 2)(x - 2)(x - 3)$
- C) $(x - 3)(x^2 - 3x - 6)$
- D) $(x - 1)(x - 2)(x - 3)$

8) What is the degree of the polynomial $3x^4 + 2x^3 - x$?

- A) 1
- B) 2
- C) 3
- D) 4

9) Simplify $\log_2 32 - \log_2 4$.

- A) 3
- B) 4
- C) 5
- D) 6

10) If $\log_b 81 = 4$, find b .

- A) 3
- B) 4
- C) 9
- D) 5

11) What is the slope of the line passing through points $(1; 2)$ and $(3; 6)$?

- A) 1
- B) 2
- C) 3
- D) 4

12) If a graph represents a function $y = f(x)$, which point indicates a maximum?

- A) $(2; -3)$
- B) $(-1; 4)$
- C) $(0; 0)$
- D) $(3; -2)$

13) Find the mean of the data set: $\{1, 4, 5, 10, 10\}$.

- A) 5
- B) 6
- C) 7
- D) 10

14) What is the mode of the data set: $\{1, 2, 2, 3, 4, 5\}$?

- A) 2
- B) 3
- C) 4
- D) 5

15) Find the missing angle in a triangle with sides 7, 24, and 25.

- A) 30°
- B) 60°
- C) 90°
- D) 120°

16) In a triangle, find side b using the law of cosines if $a = 5$, $c = 8$, and angle $B = 60^\circ$.

- A) 6
- B) 7
- C) 8
- D) 9

17) Which of the following represents a rational number?

- A) $\sqrt{3}$
- B) π
- C) $7/8$
- D) e

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18) Simplify $(3^2 \times 3^3) / 3^4$

- A) 3
- B) 9
- C) 27
- D) 81

19) What is the y-intercept of the line $y = 3x + 7$?

- A) 3
- B) 7
- C) -7
- D) 0

20) Find the median of the data set: {5, 7, 3, 8, 9}.

- A) 5
- B) 7
- C) 8
- D) 9

21) Calculate the volume of a pyramid with a base area of 20 cm^2 and a height of 9 cm.

- A) 60 cm^3
- B) 90 cm^3
- C) 120 cm^3
- D) 180 cm^3

22) Find the midpoint of the line segment joining (2; 3) and (6; 7).

- A) (4; 5)
- B) (3; 4)
- C) (5; 6)
- D) (6; 5)

23) Find the greatest common divisor (GCD) of 36 and 48.

- A) 6
- B) 12
- C) 18
- D) 24

24) Simplify: $(x^3 \times y^2)^2$.

- A) x^6y^4
- B) x^3y^4
- C) x^5y^6
- D) x^6y^2

25) What is the axis of symmetry for the quadratic function $y = x^2 - 4x + 3$?

- A) $x = -2$
- B) $x = 2$
- C) $x = 3$
- D) $x = 4$

26) Find the length of an arc with radius 10 cm and angle 60° (use $\pi \approx 3.14$).

- A) 10,47 cm
- B) 12,56 cm
- C) 15,70 cm
- D) 18,85 cm

27) Find the surface area of a cone with radius 5 cm and slant height 12 cm (use $\pi \approx 3.14$).

- A) $266,9 \text{ cm}^2$
- B) 314 cm^2
- C) $314,15 \text{ cm}^2$
- D) $376,8 \text{ cm}^2$

28) Determine the equation of a line parallel to $y = 2x + 3$ passing through (4; 5).

- A) $y = 2x + 1$
- B) $y = 2x - 3$
- C) $y = 2x + 5$
- D) $y = 2x - 4$

29) In a triangle, find angle C using the law of sines if side $b = 5 \text{ cm}$, angle $B = 60^\circ$, and side $c = 5 \text{ cm}$.

- A) 80°
- B) 100°
- C) 120°
- D) 60°

30) A set of data consists of the numbers {3, 5, 7, 5, 9, 9, 5}. What is the mode?

- A) 5
- B) 7
- C) 9
- D) 11