

2022 Grissom Math Tournament Algebra I Test

1. If $x = 5$ and $y = -3$, evaluate $y^3 - x^2 - xy$.
A. 17 B. -10 C. -67 D. -37 E. 10
2. What is the smallest value of x that satisfies the equation $x^2 - x - 12 = 0$?
A. -4 B. -3 C. 0 D. 3 E. 4
3. Write in scientific notation: 0.000765
A. 7.65×10^{-3} B. 7.65×10^{-4} C. 7.65×10^{-5}
D. 0.765×10^{-3} E. 765×10^{-6}
4. Find $x + y$ in the following system of equations: $\begin{cases} 3x + y = 11 \\ 4x - 7y = -2 \end{cases}$
A. 0 B. 3 C. 5 D. 2 E. None of the above
5. Given the first 4 terms in an arithmetic sequence are 1, 4, 7, and 10. Find the 2022nd term.
A. 6064 B. 6065 C. 6066 D. 6067 E. 6068
6. Simplify: $\frac{8a^3+27b^3}{2a+3b}$
A. $4a^2 + 9b^2$ B. $2a^2 + ab + 3b^2$ C. $4a^2 - 6ab + 9b^2$
D. $4a^2 - 9b^2$ E. Cannot be simplified
7. If $a \diamond B = 3a(4B - a)$, find $7 \diamond 5$.
A. 172 B. 273 C. 210 D. 63 E. None of the above
8. If Ms. A uses 3 pieces of chalk per regular class day but only one stick of chalk on test days, how many pieces of chalk does she use in a three-week period if school is out one day for Memorial Day, and she give tests on two other days?
A. 12 B. 23 C. 38 D. 42 E. 44
9. If the following numbers are written as decimals, how many of their decimal forms are repeating? $\frac{1}{2}, \frac{2}{12}, \frac{26}{39}, \frac{28}{7}, \sqrt{2}, \pi$
A. None B. One C. Two D. Three E. Four

10. Simplify: $\sqrt[4]{256} + \sqrt[5]{243}$

- A. 4 B. 5 C. 6 D. 7 E. 8

11. In a local election the winning candidate defeated his opponent by a margin of 8 to 5. If the loser's share of the votes was 7425, how many people voted altogether?

- A. 7,425 B. 11,808 C. 11,880 D. 12,820 E. 19,305

12. Find the sum of the coefficients in the expansion of $(x + 3)^3$.

- A. 64 B. 63 C. 37 D. 54 E. 27

13. Circle O has a diameter with endpoints (2, -4) and (8, 4). What is the length of the radius of the circle?

- A. 5 B. 6 C. 8 D. 10 E. 14

14. Evaluate $f(g(2))$ if $f(x) = 3x + 2$ and $g(x) = \frac{1}{2}x^2 - 1$.

- A. 4 B. 5 C. 6 D. 6 E. 8

15. $f(x) = 2x + 1$, $g(x) = 3x + 2$; find $\frac{g(2)}{f(3)} - g(2)$.

- A. 3 B. 7 C. 4 D. $\frac{5}{2}$ E. None of the above

16. The sum of the squares of three consecutive positive integers is 77. Find the sum of the integers.

- A. 17 B. 21 C. 19 D. 15 E. 23

17. If $A = \{1, 2, 3, \dots, 10\}$, $B = \{2, 4, 6, 8, 10\}$, and $C = \{1, 2, 5, 6, 9, 10\}$, then $(A \cap B) \cup C =$

- A. $\{2, 6, 10\}$ B. $\{3, 7\}$ C. $\{1, 2, 3, \dots, 10\}$
D. $\{1, 2, 5, 6, 9, 10\}$ E. $\{1, 2, 4, 5, 6, 8, 9, 10\}$

18. Arrange the following numbers in increasing order: $\sqrt[4]{16}$, $\sqrt{15}$, $\frac{9}{2}$, and $\frac{8}{3}$.

- A. $\frac{8}{3}, \frac{9}{2}, \sqrt{15}, \sqrt[4]{16}$ B. $\frac{9}{2}, \sqrt{15}, \frac{8}{3}, \sqrt[4]{16}$ C. $\sqrt[4]{16}, \frac{8}{3}, \sqrt{15}, \frac{9}{2}$
D. $\sqrt[4]{16}, \sqrt{15}, \frac{8}{3}, \frac{9}{2}$ E. $\sqrt{15}, \sqrt[4]{16}, \frac{8}{3}, \frac{9}{2}$

19. Write as a common fraction: $0.\overline{687}$

- A. $\frac{687}{1000}$ B. $\frac{227}{330}$ C. $\frac{622}{999}$ D. $\frac{688}{1000}$ E. $\frac{687}{999}$

20. There are 10 marbles in a bag: 5 are blue, 2 are orange, and 3 are white. If you draw three marbles, one at a time from the bag without replacing them. What is the probability you choose a blue, then an orange, then a white?

- A. $\frac{1}{100}$ B. $\frac{3}{100}$ C. $\frac{1}{27}$ D. $\frac{1}{24}$ E. $\frac{1}{4}$

21. If $x^2 + xy + y^2 = 50$, and $xy = 14$, then find $x + y$.

- A. 4 B. 4 or -4 C. 8 D. 8 or -8 E. 16

22. Find the equation of the line that is perpendicular to the line $x + 3y = 2$ at its x-intercept.

- A. $3x + y = -6$ B. $x + 3y = -2$ C. $3x - y = 6$
D. $x - 3y = 2$ E. $3x - y = -6$

23. If $a > 0$ and $b > 0$, then which of the following statements are always true?

- I. $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
II. $\sqrt{a^2 b^2} = ab$
III. $a^{-1} \cdot b^{-1} = \frac{b}{a}$
IV. $(a + b)^0 = 1$

- A. I and II B. I, II, and IV C. II, III, and IV D. III and IV E. I, II, III, and IV

24. Find the product of the real roots of the equation $7^{2y} - 56(7^y) + 300 = -43$.

- A. 2 B. 3 C. 56 D. 49 E. 343

25. In the parabola $y = x^2 - 8x + 12$, let the vertex be (a, b) . The two x-intercepts are represented by $(c, 0)$ and $(d, 0)$ and the y-intercept is $(0, e)$. Find the value of $a + b + c + d + e$.

- A. -2 B. 10 C. 12 D. 18 E. 20

TB1. Jill drives 30 miles per hour to Jack's house and 40 miles per hour along the same path back home. What was her average speed, in miles per hour, for the trip?

TB2. Find the distance between the point $(1, 2)$ and the midpoint of the line segment with endpoints $(4, 0)$ and $(2, 2)$.

TB3. Evaluate $\sqrt[3]{15625} + \sqrt{15625}$