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Algebra 1 Individual

Palm Harbor University High School Invitational Competition March 18, 2000

Mark the best answer. NOTA stands for None of the Above. Good luck!

1. Which of the following is an example of an irrational number?

a. $\sqrt{-81}$ b. -108 c. $\sqrt{3}$ d. 5 e. NOTA

2. Solve for x: $2x - 10 = 4x + \sqrt{144}$

a. -11 b. -10.5 c. -6 d. 24 e. NOTA

3. The ⌘ operation is defined as: $x \text{ ⌘ } y = \frac{x^2 - y^2}{x + y}$

If $k \text{ ⌘ } 9 = 2$, then which of the following is a possible value of k?

a. -11 b. -9 c. 5 d. 11 e. NOTA

4. If Ben is 3 years younger than 3 times Callie's age, and Callie's age multiplied by 5 is 9 years younger than twice Ben's age, then what is the product of their ages?

a. 630 b. 644 c. 656 d. 680 e. NOTA

5. How many integers are there such that $7x + 2 \leq 23$ and $3x - 5 \geq 1$?

a. 0 b. 1 c. 2 d. 3 e. NOTA

6. $(3x + 5y)^2$

a. $30xy$ b. $64x^2y^2$ c. $9x^2 + 25y^2$ d. $9x^2 + 30xy + 25y^2$
e. NOTA

7. If a and b are positive integers, c and d are negative integers, and if $a > b$ and $c > d$, which of the following must be less than zero?

I. $b - a$
II. bd
III. $a + c$

a. I only b. III only c. I and II only d. II and III only e. NOTA

8. Simplify $\dfrac{3x^2 - x - 2}{4x^2 + 3x - 7}$

a. $\dfrac{4x+7}{3x+2}$ b. $\dfrac{(3x^2+2)(x+1)}{4x^2+3x-7}$ c. $\dfrac{4x^2+3x-7}{3x^2-x-2}$ d. $\dfrac{3x+2}{4x+7}$ e. NOTA

9. The following instructions to a computer are carried out in the order specified:

1. LET Q = 0
2. LET W = 6
3. LET THE NEW VALUE OF Q EQUAL THE PREVIOUS VALUE OF Q PLUS THE VALUE OF W
4. INCREASE THE VALUE OF W BY 3
5. IF W < 10, GO BACK TO INSTRUCTION 3. OTHERWISE GO ON TO INSTRUCTION 6
6. WRITE THE FINAL VALUE OF Q

What value of Q should be written in instruction 6?

a. 6 b. 9 c. 12 d. 15 e. NOTA

10. Given that $b \neq 0$ and $b = 5x = 7h$, find the value of $b - x$ in terms of h.

a. $\dfrac{h}{7}$ b. $\dfrac{7h}{5}$ c. 3h d. $\dfrac{28h}{5}$ e. NOTA

11. If the sum of 5 consecutive positive integers is f, in terms of f, which of the following represents the sum of the next 5 consecutive positive integers?

a. $f + 5$ b. $5f + 5$ c. $5f + 25$ d. $f + 25$ e. NOTA

12. Factor this polynomial completely: $10x^3 + 23x^2 - 58x - 56$

a. $(2x + 7)(2x - 7)(x - 2)$ b. $(5x + 4)(2x + 7)(x - 2)$ c. $(5x - 4)(2x - 7)(2x + 7)$

d. $(5x + 3)(2x - 7)(x + 2)$ e. NOTA

13. Of the following statements, choose the one that is false:

a. The set of integers is closed under multiplication.
b. The set of natural numbers is closed under addition.
c. The set of irrational numbers is closed under multiplication.
d. The set of rational numbers is closed under subtraction.
e. NOTA

14. For all positive integers x, let ✌x be defined as the sum of the integers from 1 to x, inclusive. Which of the following equals ✌8 - ✌5?

a. ✌1 b. ✌3 c. ✌6 d. ✌7 e. NOTA

15. Arum's English grade is determined by three tests. Her highest test score will count for 50% of her grade and her lowest score for 20%; the middle test score will count for 30%. Arum must have a weighted average of 65 in order to pass the class. If she has already earned scores of 50 and 60 on her first two tests, what is the lowest score she can earn on the third test in order to pass English class?

a. 70 b. 74 c. 75 d. 81 e. NOTA

16. Solve for x: $|3 - 2x| > 5$

a. $x < -1$ or $x > 4$ b. $x < 4$ c. $x > 1$ d. $1 < x < 4$ e. NOTA

17. The ¿ operation is defined so that $1¿4 = 6$, $7¿8 = 22$, and $9¿3 = 21$. The value of $12¿19$ is:

a. 31 b. 43 c. 45 d. 51 e. NOTA

18. If d is an element of {3,6} and p is an element of {-1, 2}, the largest value of $3d - p$ is:

a. 7 b. 10 c. 16 d. 19 e. NOTA

19. Which of the following is equivalent to $(2x)^{-3}$?

a. $\frac{1}{8x^3}$ b. $-8x^{-3}$ c. $8x^3$ d. $-6x^3$ e. NOTA

20. Willy Wonka's Wonkavator flies from the Chocolate Factory to Charlie Bucket's house at an average speed of 75 mph. His average speed from the house to the factory is 90 mph. What is his average speed for the round trip?

a. 75 mph b. 82.5 mph c. $\frac{900}{11}$ mph d. 100 mph e. NOTA

21. Simplify: $\frac{5\sqrt{12}-\sqrt{3}+3\sqrt{2}}{\sqrt{3}}$

a. $9-2\sqrt{3}$ b. $9+3\sqrt{2}$ c. $9-6\sqrt{2}$ d. $9+\sqrt{6}$ e. NOTA

22. Find an x-intercept of the quadratic equation $y = 2x^2 - 3x - 5$

a. (0 , 2.5) b. (2.5 , 0) c. (1 , 0) d. (0 , 1) e. NOTA

23. A square has an area of Q^2. An equilateral triangle has a perimeter of G. If q is the perimeter of the square and g is a side of the triangle, then, in terms of Q and G, $g + q =$

a. $\frac{G+Q}{7}$ b. $\frac{12G+Q}{3}$ c. $\frac{3G+4Q}{12}$ d. $\frac{G+12Q}{3}$ e. NOTA

24. Arum has a front yard that is 30 meters by 36 meters. Centered inside this yard is a garden that takes up 720 square meters; the rest of the yard is a walkway of uniform width that borders the garden. How wide is the walkway?

a. 3m b. 7m c. 12m d. 30m e. NOTA

25. The amount of sleep an IB student gets varies inversely with the number of assignments he or she is given. If Grayce, an IB student, has 12 homework assignments, she gets 6 hours of sleep. On an average night, when Grayce has 50 homework assignments, how many minutes of sleep does she get?

a. 1.44 b. 25 c. 86.4 d. 1500 e. NOTA

26. If e and f are different prime numbers greater than 9, which of the following must always be true?

I. $\frac{e}{f}$ is less than 1.
II. e + f is not prime.
III. e · f has three different positive integer factors greater than 1.

a. none b. I only c. III only d. I and II only
e. NOTA

27. If $x^3 - 4x + 5$ is divided by $x^2 + 3x + 2$, the remainder is:

a. $7x - 14$ b. $3x + 11$ c. $24x - 14$ d. $7x + 11$ e. NOTA

28. A line contains (3 , -6) and (-4 , 2). Which statement is not true?

a. The line is parallel to $8x + 7y = 12$
b. The line is perpendicular to $y = \frac{7}{8}x + 3$
c. The line has y-intercept –15
d. The line contains $(1 , \frac{-26}{7})$
e. NOTA

29. What is the absolute value of $(3x - 5x)$ when $x \geq 0$?

a. –2x b. 2x c. 8x d. –2 e. NOTA

30. Which of the following equations is true if x = 15?

a. $2x + 5 \geq 3x$ b. $10x^2 \geq 2x^3$ c. $3x - 29 \geq x + 1$ d. $5x + 8 \geq x^2$
e. NOTA