OU Math Day 2009

Algebra 1 Test

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1. In simplest form $4(x^3 - x^2 + 2) + 2(x^2 - x - 6) - (3x^3 + 2x^2 - x)$ equals

   (A) $7x^3 - 3x - 4$ (B) $x^3 - 4x^2 - x - 6$ (C) $x^3 - 3x - 4$
   (D) $x^3 - 4x^2 - 9$ (E) None of the above

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2. Which of the following is **NOT** equal to $\frac{2}{3} + \frac{1}{4}$?

   (A) $\frac{4}{6} + \frac{1}{4}$ (B) $\frac{7}{12} + \frac{4}{12}$ (C) $\frac{1}{7} + \frac{2}{7}$ (D) $1 - \frac{1}{12}$ (E) $\frac{1}{6} + \frac{3}{4}$

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3. A 200 yard piece of rope is cut into four pieces. The second piece is 12 yards shorter than the first piece. The third piece is twice as long as the second piece, and the fourth piece is 8 yards more than half the size of the second. How many yards long is the longest of the four pieces of rope?

   (A) 80 (B) 200/3 (C) 52 (D) 40 (E) None of the above

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4. If $5 + 3y = 7 - 2y$ then what does y equal?

   (A) 2 (B) 12/5 (C) $-2/3$ (D) 2/5 (E) None of the above

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5. How many integers between 0 and 100 have a remainder of 2 when divided by 6?

   (A) 8 (B) 16 (C) 17 (D) 18 (E) None of the above

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6. If $8x = 5y$ then $x/y =$

(A) 8/5 (B) 5/8 (C) 1/40 (D) 40 (E) None of the above

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7. The rule of arithmetic that asserts that $a(b+c) = ab + ac$ for all numbers a, b and c is called the

(A) law of the additive inverse (B) associative law for multiplication
(C) commutative law for addition (D) distributive law (E) None of the above

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8. The expansion of $(1+2x)^3$ is

(A) $1 + 6x + 6x^2 + 2x^3$ (B) $1 + 3x + 3x^2 + 8x^3$ (C) $1 + 6x + 12x^3 + 8x^3$
(D) $1 + 5x + 8x^2 + 4x^3$ (E) None of the above

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9. The reciprocal of $\frac{1}{5} + \frac{1}{9} + \frac{1}{2}$ is

(A) 90/73 (B) 16 (C) 5/4 (D) 37/45 (E) None of the above

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10. What is the remainder when

$$1! + 2! + 3! + 4! + \cdots + 2008! + 2009!$$

is divided by 10? (The factorial $n!$ of a positive integer n is the product of all positive integers less than or equal to n, that is $n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdots (n-1) \cdot n$.)

(A) 0 (B) 1 (C) 3 (D) 9 (E) None of the above

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11. All of the solutions to the equation $x + 1 = \dfrac{4 + x}{x}$ are

(A) $x = 2$ (B) $x = 0$ (C) $x = 2$ and $x = -2$
(D) $x = -4$ and $x = 2$ (E) None of the above

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12. If $x = -1$, $y = 3$ and $z = 5$ then $\dfrac{(x + y)^2 - (x - y + z)^3}{x + yz}$ equals

(A) $-2/7$ (B) $3/16$ (C) $3/14$ (D) $9/14$ (E) None of the above

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13. The equation $x^5(x + 3)(x^2 - 25)^2(x^2 - 9)^3(x - 8)^2 = 0$ has seven distinct real solutions. What is the sum of all seven of these solutions?

(A) 0 (B) 13 (C) 8 (D) 5 (E) None of the above

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14. Find the least common multiple of 60 and 172

(A) 10320 (B) 4 (C) 2580 (D) 5160 (E) None of the above

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15. Let $p(x) = 1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7$. Which of the following is a solution of $p(x) = 0$?

(A) 6 (B) -2 (C) 1 (D) -1 (E) None of the above

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16. What is the value of $1 - (2 - (3 - (4 - (5 - (6 - (7 - (8 - 9)))))))$?

(A) -4 (B) -3 (C) 0 (D) 5 (E) None of the above

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17. If $N = 2009$ then what is the largest integer smaller than $\sqrt{N^2 - 1}$?

(A) 4028050 (B) 2008 (C) 2009 (D) 44 (E) None of the above

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18. Which of the following is a prime number?

(A) 49 (B) 50 (C) 51 (D) 52 (E) 53

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19. The solutions to the equation $x^3 + 2x^2 - x - 2$ are

I. $x = -1$

III. $x = 1$

III. $x = 2$

(A) I only (B) I and II only (C) I and III only (D) I, II and III (E) None of the above

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20. Three standard six-sided dice with faces numbered 1 through 6 are rolled. List the following three outcomes in order from least likely to most likely to occur.

I. At least one of the dice is odd.

II. The sum of the three dice is odd.

III. At least one dice is a 5.

(A) I-II-III (B) II-III-I (C) III-I-II (D) II-III-I (E) None of the above

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21. The grade in a certain course is determined by averaging a student's score on four exams. If a student scores 85, 86 and 93 on the first three exams, what must she score on the last exam in order to earn a course grade of 90?

(A) 91 (B) 93 (C) 96 (D) 97 (E) None of the above
