Oklahoma Math Day

November 7, 2019

Algebra I

INSTRUCTIONS:

1. Do not begin the test until told to do so.
2. Calculators are not permitted.
3. Be sure to enter your name and high school code on the answer sheet.
4. Use a number 2 pencil to fill out your answer sheet.
5. Please remain in your seat until time is called.

OU Math Day 2019

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Algebra I Test

(with answers on the last page)

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1. A factorization of $2x^2 - 13x + 15$ is

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

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2. If $\dfrac{x+7}{6} + \dfrac{2x-8}{2} = -4$ then x equals

   (A) -14 (B) -1 (C) $15/7$ (D) any real number (E) None of the above

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3. Carpenter A charges \$55 per hour for the first 2 hours of work and \$45 per hour beyond 2 hours. Carpenter B charges \$60 per hour for the first 3 hours and \$40 per hour beyond 3 hours. For what number of hours is it cheaper to use Carpenter A?

   (A) more than 8 (B) less than 8 (C) more than 14 (D) less than 14 (E) None of the above

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4. Which of these five numbers is largest?

   (A) $\dfrac{1}{\frac{2019}{2020}}$ (B) $\dfrac{1}{\frac{2020}{2018}}$ (C) $\dfrac{2018}{2019}$ (D) $\dfrac{2019}{2018}$ (E) $\dfrac{2019}{2020}$

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5. How many digits does the integer 2019^5 have?

(A) 16 (B) 15 (C) 17 (D) 10 (E) None of the above

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6. If it is 10 AM now, what time of day will it be after 2019 hours?

(A) 7 AM (B) 1 PM (C) 3 PM (D) 11 AM (E) None of the above

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7. The sum of the squares of two consecutive positive odd integers equals 202. What is the value of the smaller integer?

(A) 3 (B) 5 (C) 7 (D) 9 (E) None of the above

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8. What is the value of $4^{2^3} - 2^{4^2}$?

(A) 0 (B) -512 (C) 512 (D) 1024 (E) None of the above

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9. Find the sum of all of the integer solutions of the inequality $|x - 1| < 5$.

(A) 0 (B) 7 (C) 9 (D) 13 (E) None of the above

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10. Simplify $\frac{1}{2}\left(\frac{1}{4}-\frac{1}{3}\right)$

(A) $\frac{1}{2}$ (B) $-\frac{1}{24}$ (C) $\frac{7}{24}$ (D) $\frac{1}{24}$ (E) None of the above

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11. Determine all values for c which the quadratic equation $3x^2+18x+c=0$ has no real solutions.

(A) $c>0$ (B) $c>6$ (C) $c>18$ (D) $c>21$ (E) $c>27$

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12. If the price of a stock increased by 32% in 2017 then decreased by 25% in 2018, what was the overall effect on the price?

(A) -7% (B) -1% (C) $+7\%$ (D) $+8\%$ (E) None of the above

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13. If $A(t)=-(-t-t^t)^{-t}$ then what is the value of $A(-2)$?

(A) -36 (B) 4 (C) $-49/16$ (D) $9/16$ (E) None of the above

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14. A horse trots at a pace of 2019 feet per minute. Which of the following is closest to its speed in miles per hour? (*Note:* there are 5280 feet in a mile.)

(A) 14 mph (B) 17 mph (C) 23 mph (D) 28 mph (E) 32 mph

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15. Find the numerator of the fraction obtained by writing the rational number $\frac{1}{2019} + \frac{1}{2022}$ in reduced form.

(A) 449 (B) $4,082,418$ (C) 3 (D) 1347 (E) None of the above

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16. Concerning a product of three consecutive positive integers, which is true:

(A) It is always divisible by 2 but may not be divisible by 3
(B) It is always divisible by 3 but may not be divisible by 2
(C) It is never divisible by 3
(D) It is always divisible by 6 but may not be divisible by 12
(E) It is always divisible by 12

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17. A classroom has one tenth of its seats occupied. After 30 additional students enter and sit down, half of the seats are occupied. How many seats does the classroom have?

(A) 150 (B) 75 (C) 33 (D) 66 (E) None of the above

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18. If 4 and 6 are solutions to $ax^2 + bx + c = 0$, what are the solutions to $ax^2 - bx - c = 0$?

(A) -2 and 12 (B) -4 and -6 (C) -12 and 2 (D) -12 and -2 (E) -4 and 6

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19. How many integers between 100 and 999 inclusive have exactly one digit equal to 5 but none equal to 6?

(A) 192 (B) 64 (C) 206 (D) 176 (E) None of the above

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20. The number of different solutions of $2^{3m} - 2^{2n} = 63$ in which both m and n are integers is

(A) 0 (B) 1 (C) 2 (D) 3 (E) More than 3

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21. How many integers between $-2,019$ and $2,019$ are perfect squares? ‘

(A) 92 (B) 45 (C) 91 (D) 46 (E) None of the above

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22. What is the smallest possible size of a class if the percent of male students is smaller than 50 but more than 47?

(A) 17 (B) 21 (C) 25 (D) 100 (E) None of the above

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23. Determine the coefficient of the x^3y^2z term when $(x + y + z)^6$ is expanded as a degree 6 polynomial.

(A) 60 (B) 30 (C) 90 (D) 15 (E) None of the above

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24. Determine the smallest positive integer which has a remainder of 1 when divided by 5, a remainder of 2 when divided by 6 and a remainder of 3 when divided by 7.

(A) 101 (B) 416 (C) 116 (D) 206 (E) None of the above

Answers for the 2019 Algebra I Test:

1-5: ABBDC

6-10: BDACB

11-15: EBCCA

16-20: D(E or B)*ADB

21-24: BAAD

* On problem # 17: Technically the answer is "E" because one tenth of 75 is not a whole number.