

Essex County Math League
May 24, 2018
Algebra 1

Directions: You may write on this test. Be sure that your name, subject, and school (including town name) are on the answer sheet. Mark the answer sheet with dark, careful marks using a #2 pencil. Your score will be determined by your number of correct answers, incorrect answers will NOT lower your score. You MAY only use a calculator on this test that is approved for use on the SAT's. The answer to the tie-breaker should be placed on the answer sheet in the place indicated by the proctors. The tie-breaker will be scored only in the case of a tie between the top scorers, and will not count as part of the team score. The fifth choice for each question is, NG, which means, "not given" and is a valid answer that indicates that the correct answer is not among the answers given.

1. Given $abc \neq 0$ then $\frac{a^2bc + ab^2c + abc^2}{abc} =$
a) $3abc$ b) $a^2b^2c^2$ c) $a+b+c$ d) $a^2+b^2+c^2$ e) NG

2. In the repeating decimal: $\frac{1}{7} = .\overline{142857}$, what is the 138th digit to the right of the decimal point?
a) 1 b) 4 c) 2 d) 8 e) NG

3. The number of real values of x that satisfy the equation $2^{2x^2-7x+5} = 1$ is?
a) 0 b) 1 c) 2 d) 4 e) NG

4. Which of the following points is not on the graph of $y = \frac{x}{x-1}$
a) $(0, 0)$ b) $(1, 1)$ c) $(\frac{1}{2}, -1)$ d) $(-\frac{1}{2}, \frac{1}{3})$ e) NG

5. Given: $2^x = 8^{y+1}$ and $9^y = 3^{x-9}$, find the value of $x + y =$
a) 18 b) 21 c) 24 d) 27 e) NG

6. If the average of a , b , and 8 is 15 , what is the average of $a+6$, $b-8$, and 13 ?
- a) $14\frac{1}{3}$ b) 16 c) 21 d) $22\frac{2}{3}$ e) NG
7. A number which is increased by one-fifth of its additive inverse is equal to 8 . Find the value of the number.
- a) $\frac{20}{3}$ b) $\frac{32}{5}$ c) 10 d) $\frac{39}{5}$ e) NG
8. Find the smaller of two consecutive integers whose sum is n .
- a) n b) $n+1$ c) $\frac{1}{2}(n-1)$ d) $\frac{1}{2}(n+1)$ e) NG
9. Rationalize: $\frac{x-y}{\sqrt{x}+\sqrt{y}}$, $x \neq y$. $x > 0$ and $y > 0$.
- a) $\frac{\sqrt{x}-\sqrt{y}}{x-y}$ b) $\frac{\sqrt{x}+\sqrt{y}}{x-y}$ c) $\sqrt{x}+\sqrt{y}$ d) $\sqrt{x}-\sqrt{y}$ e) NG
- 10) Find a solution of the following equation: $(x^2-3)^2-3(x^2-3)=18$
- a) 3 b) 6 c) 9 d) 12 e) NG
- 11) Solve for x : $\frac{x-2}{2} > \frac{4x-3}{4}$
- a) $x < -\frac{1}{2}$ b) $x < \frac{1}{2}$ c) $x \leq \frac{1}{2}$ d) $x < 2$ e) NG
- 12) Find the LCM of $x^2-15x+36$ and x^3-3x^2-2x+6
- a) $x-3$ b) $(x-3)(x-12)(x^2+2)$ c) $(x-3)(x-12)(x^2-2)$
- d) $(x-3)(x-12)(x-2)(x+2)$ e) NG

- 13) Express the product as a single radical (or surd): $\sqrt[3]{a^2} \times \sqrt{a^3}$
- a) a b) $\sqrt[5]{a^6}$ c) $\sqrt[6]{a^5}$ d) $\sqrt[3]{a^5} \sqrt[3]{a^5}$ e) NG
- 14) The equation $3x + 4y = 5$ has an infinite number of integral solutions. Find the least positive integral sum of x and y , when x and y are both integers.
- a) 1 b) 2 c) 3 d) 4 e) NG
- 15) Jack can paint a house, by himself, in 24 days. Jill can paint the same house, by herself, in 18 days. To the nearest day, how long will it take to paint the house if they work together?
- a) 8 b) 9 c) 10 d) 11 e) NG
- 16) Find the sum of the coordinates of the vertex, (h, k) of the parabola: $y = x^2 - 4x - 5$
- a) -11 b) -7 c) 7 d) 11 e) NG
- 17) Solve for the value of x : $|x+1| = |x-1|$
- a) -1 b) 0 c) 1 d) -1, 0, and 1 e) NG
- 18) If $f(x) = 3x - 1$ and $g(x) = x^2 - 4$, find $f(g(a+1)) =$
- a) $(a+1)^2 - 4$ b) $3(a+1) - 1$ c) $3a^2 - 9a + 10$ d) $3a^2 + 9a - 10$ e) NG
- 19) A man rides a distance of "p" miles and walks back along the same route at a rate of "q" mph. If the entire trip took "t" hours, find his rate, in mph, while riding.
- a) $\frac{pq}{qt-p}$ b) pq c) $\frac{pq}{t-1}$ d) $\frac{p}{t-1}$ e) NG
- 20) Solve the following system of equations:
- $$\frac{1}{x} + \frac{1}{y} = 3 \quad \text{and} \quad \frac{1}{x} - \frac{1}{y} = 2$$
- a) $(\frac{2}{5}, 2)$ b) $(\frac{2}{5}, 0)$ c) $(\frac{1}{2}, 0)$ d) lines are parallel e) NG

Tie breaker: This question will be scored only if there is a tie amongst the highest scorers.
Please write your answer in the area described by the proctors.

The center of a circle can be found as the intersection point of two of the perpendicular bisectors of the segments formed by 3 points on the circle. The points $(-3, 5)$, $(5, 11)$ and $(4, 4)$ lie on a circle. What is the center (h, k) of the circle?

| ECML Answers 2018 | | | | | | | |
|-------------------|--------|----------|--------|-----------|--------|---------------|------------|
| Algebra 1 | | Geometry | | Algebra 2 | | Advanced Math | |
| Quest. # | Answer | Quest. # | Answer | Quest. # | Answer | Quest. # | Answer |
| 1) | C | 1) | B | 1) | C | 1) | D |
| 2) | E | 2) | A | 2) | D | 2) | A |
| 3) | C | 3) | C | 3) | C | 3) | A |
| 4) | B | 4) | B | 4) | E | 4) | B |
| 5) | D | 5) | A | 5) | A | 5) | D |
| 6) | B | 6) | C | 6) | A | 6) | D |
| 7) | C | 7) | C | 7) | B | 7) | C |
| 8) | C | 8) | B | 8) | A | 8) | C |
| 9) | D | 9) | D | 9) | A | 9) | A |
| 10) | A | 10) | C | 10) | D | 10) | A |
| 11) | A | 11) | C | 11) | C | 11) | A |
| 12) | C | 12) | D | 12) | C | 12) | B |
| 13) | E | 13) | D | 13) | C | 13) | B |
| 14) | A | 14) | A | 14) | B | 14) | C |
| 15) | D | 15) | B | 15) | C | 15) | E |
| 16) | B | 16) | B | 16) | C | TB | $2+(1-)=1$ |
| 17) | B | 17) | B | 17) | D | | |
| 18) | E | 18) | A | 18) | E | | |
| 19) | A | 19) | C | 19) | C | | |
| 20) | A | 20) | C | 20) | D | | |
| TB | (1, 8) | TB | "8 | TB | "1/16" | n | |