

2014 State Math Contest Level I Test

1. The Bluebird zip line starts 35 feet above the ground and ends 5 feet above the ground. The horizontal distance covered by the zip line is 50 yards. Which of the following is the slope of the Bluebird zip line?
a. 0.7 ft per yd b. 0.6 ft per ft c. 0.2 yd per yd d. 0.2 yd e. 0.6 ft
2. What is the positive difference of the roots of $16x^2 + ax + 7 = 0$ if their sum is 2?
a. 0 b. 1.5 c. 1 d. 1.75 e. 1.25
3. How many integers n , such that $2 \leq n \leq 210$, are divisible by neither 3 nor 7?
a. 109 b. 110 c. 115 d. 118 e. 119
4. Today one euro is worth \$1.20. If the value of the euro in dollars increases by 10% tomorrow, how many euros will \$2.31 be worth tomorrow?
a. 1.50 euro b. 1.55 euro c. 1.6 euro d. 1.75 euro e. 1.95 euro
5. The lines with equations $y = 2x - a$ and $y = x + b$ intersect in the point (p, q) . Determine the value of q .
a. $a + b$ b. $a + 2b$ c. $2a + b$ d. $a - b$ e. $a - 2b$
6. Let $3x - (x - 1) = 4$ and $2y - (3 - y) = 1$. Determine xy .
a. 2 b. $\frac{1}{2}$ c. $\frac{3}{2}$ d. 4 e. 0
7. How many integers are in the solution set of $3x^2 + 2 < 9x$?
a. 0 b. 1 c. 2 d. 3 e. 4

8. The final grade in a class is determined by the simple average of six tests. If the grades on the first five tests were 60, 62, 64, 66, and 68, what is the lowest grade the student can make on the last test to have a 70 average?
- a. 70 b. 80 c. 90 d. 94 e. 100
9. David wants to finance the purchase of a used car priced at \$10,000.00. The finance company insists that the actual value of the car is 12% less than that, and their policy is to lend only 80% of their estimated value of the car. How much money will they lend David for the car?
- a. \$7400 b. \$7440 c. \$8800 d. \$7500 e. \$7040
10. What is the area of the region in the first quadrant bounded by $y - 2x = 1$, $y - 4x = 1$, and $x = 3$?
- a. 12 b. 6 c. 8 d. 9 e. 4.5
11. What is the sum of the solutions of the equation $3x^2 - 7x - 2 = (x - 1)^2$?
- a. 0 b. 1.5 c. -1.5 d. 2.5 e. -2.5
12. A collection of coins is made from an equal number of pennies, nickels, dimes, and quarters. What is the largest possible value of the collection which is less than \$3.00?
- a. \$2.46 b. \$2.57 c. \$2.78 d. \$2.87 e. \$2.98
13. The algebraic expression $\frac{x^2 - 1}{x^2 + x} \div \frac{x^2 - 2x + 1}{2x^2}$ simplifies to which of the following expressions?
- a. $\frac{2x}{x - 1}$ b. $-2x$ c. $\frac{2x}{x + 1}$ d. $\frac{-2x}{x + 1}$ e. $2x$

14. What is the equation of the line that is the perpendicular bisector of the line segment from the point $(1,2)$ to the point $(7,5)$?
- a. $4x + 2y = 23$ b. $4x + 2y = 15$ c. $x + 2y = 15$ d. $x + 2y = 11$ e. $2y - x = 3$
15. Which of the following is NOT a factor of $12x^4y + 2x^3y^2 - 4x^2y^3$?
- a. $2x^2y$ b. $6x^2 + xy - 2y^2$ c. $2xy - y^2$ d. $3x^2 + 2xy$ e. $2x + y$
16. Given a right triangle with legs a and b and hypotenuse c ; what is the area of an equilateral triangle with side c ?
- a. $\sqrt{a^2 + b^2}$ b. $\frac{(a+b)\sqrt{3}}{4}$ c. $\frac{(a^2 + b^2)\sqrt{3}}{4}$ d. $(a+b)\sqrt{3}$ e. $a + b$
17. The numeral 65 in base x represents the same number as 56 in base y . Determine the smallest value of $x + y$.
- a. 13 b. 24 c. 22 d. 18 e. 16
18. A square and an equilateral triangle have the same perimeter. Compute the ratio of the area of the triangle to the area of the square.
- a. $\frac{4\sqrt{3}}{9}$ b. $\frac{4\sqrt{3}}{3}$ c. $\frac{2\sqrt{3}}{9}$ d. $\frac{\sqrt{3}}{4}$ e. $\sqrt{3}$
19. How many times in a 24-hour day are the minute hand and the hour hand perpendicular to each other?
- a. 40 b. 42 c. 44 d. 46 e. 48

20. In a class of 40 students, all of them play at least one of the following three sports: basketball, soccer, or volleyball. If 21 students play basketball, 18 students play soccer, 15 students play volleyball, and exactly 6 students play exactly two sports, then how many play all three sports?
- a. 4 b. 6 c. 3 d. 0 e. 2
21. Kaitlyn is making a snowman with three snowballs. The top one has a 2 foot diameter, the middle one has a 3 foot diameter, and the bottom one has a 6 foot diameter. If the weight of the middle one is 108 pounds, how much does the snowman weigh?
- a. 432 lbs b. 988 lbs c. 572 lbs d. 1004 lbs e. 588 lbs
22. Let $f(x) = x^2 + x - 1$ and $g(x) = x - 1$, then determine $f(g(x)) - g(f(x))$.
- a. $2x + 1$ b. $-2x + 1$ c. $2x - 1$ d. $x + 1$ e. $-x + 1$
23. Sue owes \$12,000 on a loan to her uncle. She makes monthly payments of \$200, and \$10 interest is added each month to her balance. In how many months is the loan paid off?
- a. 60 b. 61 c. 62 d. 63 e. 64
24. Ed and Em order sodas. After Ed drinks half of his and Em drinks a third of hers, they have the same number of ounces of soda left. If the two sodas originally totaled 28 ounces, how many total ounces do they have left?
- a. 12 b. 15 c. 16 d. 18 e. 20
25. Three friends joined a weight loss program. The oldest lost 10 pounds more than Kathy. The combined weight loss of Shirley and the youngest was 20 pounds more than Tim's loss. If Shirley is not the oldest, how many pounds did she lose?
- a. 20 b. 30 c. 0 d. 10 e. 25

SHORT ANSWER

Place the answer in the appropriate space.

66. When the digits of a two-digit number are reversed, the result is another two-digit number that is 62.5% smaller than the original number. What is the original number?
67. Which of the following numbers is the largest: 2^{33} , 3^{20} , 9^{11} , 27^7 ?
68. What digit is 2014 places to the right of the decimal point when $\frac{20}{14}$ is written in decimal form?
69. A fair coin is tossed five times. What is the probability of obtaining at least three consecutive heads?
70. How many ways are there to make change equivalent to one dollar using only nickels, dimes, and quarters? You do not need at least one coin of each denomination. For example, four quarters would be one way.

Answer Key

1. c
2. b
3. e
4. d
5. b
6. a
7. c
8. e
9. e
10. d
11. d
12. d
13. a
14. a
15. e
16. c
17. b
18. a
19. c
20. a
21. d
22. b
23. e
24. c
25. b

66. 72
67. 9^{11}
68. 5
69. $\frac{1}{4}$
70. 29