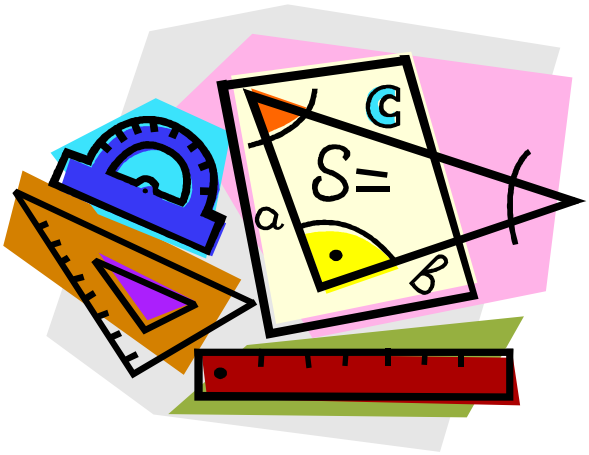
# Level I



**Do NOT open until you are told to do so.**

March 21, 2019

1. Zantac can relieve acid reflux. The recommended dosage for a child is 5 mg/kg/day. Zantac comes in liquid form where the concentration of the medicine is 15 mg per mL. If a child with acid reflux weighs 44 pounds, how many milliliters of Zantac should be taken each day? Assume 1 kg = 2.2 lb.

   a. 1500 mL b. 60 mL c. $6\frac{2}{3}$ mL d. $5\frac{1}{3}$ mL e. 6 mL

2. What is the number of hours from 7 pm Monday until 4 am Wednesday of the same week?

   a. 15 b. 33 c. 29 d. 35 e. 34

3. There are two girls and six boys playing a game. How many additional girls must join the game so that $\frac{5}{8}$ of the players are girls?

   a. 6 b. 3 c. 5 d. 8 e. 7

4. Carly takes 3 steps to walk the same distance as Jim walks in four steps. Each of Carly's steps covers 0.5 yard. How many feet does Jim travel in 24 steps?

   a. 9 b. 27 c. 36 d. 18 e. 12

5. The average of $\frac{1}{5}$ and $\frac{1}{10}$ is $\frac{1}{x}$. What is $x$?

   a. $\frac{3}{20}$ b. $\frac{20}{3}$ c. 8 d. $\frac{10}{3}$ e. $\frac{2}{15}$

6. The product of the digits of a four-digit number is 810. If none of the digits is repeated, what is the sum of the digits?

   a. 23 b. 19 c. 18 d. 25 e. 22

7. How many integers satisfy the statement: "The square of the integer is less than five more than four times the integer."?

   a. 4 b. 8 c. 0 d. 5 e. an infinite number

8. What shape is the graph of the equation $x^2 + y = xy + x$?

   a. two lines b. line c. hyperbola and line d. parabola e. hyperbola

9. The line $Ax + By = 1$ passes through the point $(-9,10)$, has negative slope, and has intercepts $(p,0)$ and $(0,q)$. If $p + q = 14$, what is $A + B$?

   a. $-\frac{1}{28}$ b. $-\frac{14}{45}$ c. $\frac{1}{28}$ d. $\frac{5}{17}$ e. $\frac{14}{45}$

10. Emily drives to school at a speed of 60 miles per hour. On the return trip, she runs into traffic and travels at 20 miles per hour. What is her average speed for the entire trip?

    a. 24 mph b. 30 mph c. 36 mph d. 40 mph e. 42 mph

11. A customer orders 15 Pantry Fudgesicles. Fudgesicles are placed in packages of four, three, or one. In how many different ways can the order be filled? (For example: One way to fill the order is with 15 packages of one and another way is 5 packages of three.)

a. 12 b. 13 c. 14 d. 15 e. 16

12. If a pup is worth a pooch and a mutt, and a pup and a pooch are worth one bird dog, and two bird dogs are worth three mutts, how many pooches is a pup worth?

a. 3 b. 2 c. 6 d. 4 e. 5

13. The degree measure of one of two complementary angles is 30 degrees less than twice the other. What is the degree measure of the larger angle?

a. 60° b. 70° c. 65° d. 75° e. 50°

14. The length of a rectangular picture is three times its width. The picture is surrounded by a frame which 4 cm wide. If the perimeter of the outside of the frame is 96 cm, how many centimeters long is the picture?

a. 24 cm b. 16 cm c. 20 cm d. 48 cm e. 32 cm

15. If $x + y = 6$ and $x^2 - y^2 = 24$, what is $2^{x-y}$?

a. 4 b. 8 c. 16 d. 32 e. 64

16. Assume $x$ varies directly as $y^2$ and inversely as $z$. What is the effect on $x$, if $y$ is tripled and $z$ is halved?

a. stays the same b. 4.5 times as large c. twice as large

d. 9 times as large e. 18 times as large

17. The solution of $\begin{cases} 3x + 4y > 12 \\ 5x - 6y \geq -30 \end{cases}$ intersects more than one quadrant. Which quadrant does NOT include some part of the solution set of $\begin{cases} 3x + 4y > 12 \\ 5x - 6y \geq -30 \end{cases}$?

a. I b. II c. III d. IV e. all quadrants are included

18. A wall has been built in such a way that the top row contains one block, the next lower row contains 3 blocks, the next lower has 5 blocks, and so on, increasing by 2 blocks in each row. How many rows high is the wall if there are a total of 900 blocks used?

a. 450 b. 50 c. 45 d. 30 e. 15

19. What is the sum of all real solutions to the equation $|2x^2 - 8x + 6| = 6$?

a. 4 b. 8 c. 6 d. 12 e. 16

20. Morse code involves transmitting dots "•" and dashes "▬". An agent attempted to send a five-character code five different times, but only one of the five transmissions was correct. However, it is known that each erroneous transmission had a different number of errors than the others, and no transmission had five errors. The five transmissions sent are shown below, which is the correct one?

a. • • • • • b. ▬ ▬ • • ▬ c. • ▬ ▬ ▬ • d. • ▬ • ▬ • e. • ▬ ▬ • ▬

**SHORT ANSWER**
Place the answer in the appropriate space.

66. Let *A* = {1, 2, 3, 4}. Let *M* be the number of distinct proper subsets of *A*. Let *N* be the number of distinct nonzero differences of two elements of *A*. What is *M* + *N*?

67. What is the largest prime divisor of $59! + 60!$?

68. The first three terms of an arithmetic sequence are represented by $8x - 1, 4x + 2, \text{and } 2x - 6$. What is the sum of these three terms?

69. How many different ways can a cashier break (return an equivalent dollar amount in smaller denominations) a $50 bill if there are an unlimited number of $20, $10, $5, and $1 bills available to the cashier? Assume bills of the same denomination are indistinguishable.

70. Let A, B, and C be positive integers such that $\frac{A}{4} + \frac{B}{6} + \frac{C}{15} = \frac{71}{60}$, where the three fractions on the left side of the equation are all proper fractions in lowest terms. What is $A + B + C$?

1. C
2. B
3. D
4. B
5. B
6. A
7. D
8. A
9. E
10. B
11. D
12. E
13. E
14. A
15. C
16. E
17. C
18. D
19. A
20. C

66. 21
67. 61
68. 72
69. 56
70. 8