Level I
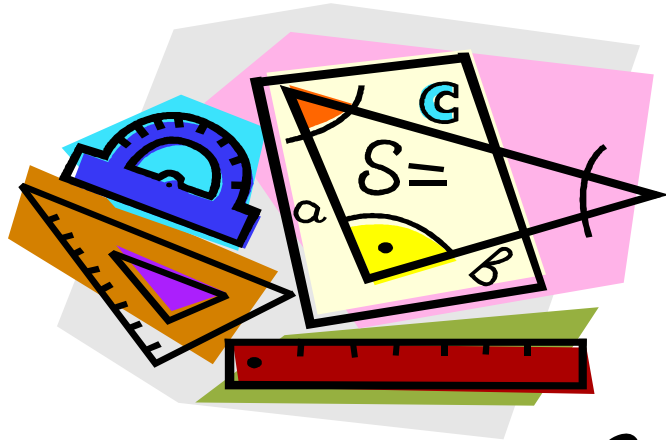
Do NOT open until you are told to do so.

1. In 2005 the state of Florida enacted the "Stand Your Ground Law". Which of the following statements are true based on the graph from the Florida Department of Law Enforcement?

   Gun deaths in Florida
   Number of murders committed using firearms

   i. There were fewer murders committed using firearms in 2006 than in the previous year.

   ii. The lowest number of murders committed using firearms occurred in the late 1990s.

   iii. There were 873 murders committed using firearms in 1990.
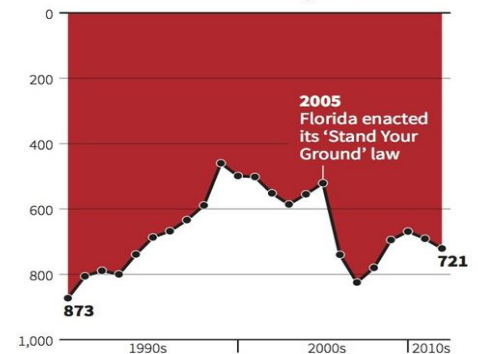
   Source: Florida Department of Law Enforcement
   C. Chan 16/02/2014   REUTERS

   a. i and iii   b. i   c. ii and iii   d. iii   e. i, ii, and iii

2. A stock dropped 20% in value. By what percentage must the stock increase to regain its value?

   a. 20%   b. 25%   c. 22.5%   d. 24%   e. 26.5%

3. Let $x = 4$, $y = -6$, $z = -3$, and $w = \sqrt{5}$; compute $\dfrac{2^x w^4 \sqrt{z^2}}{15 y^3}$.

   a. $\dfrac{10}{27}$ b. $-\dfrac{20}{27}$ c. $-\dfrac{10}{9}$ d. $\dfrac{10}{9}$ e. $-\dfrac{10}{27}$

4. Benjamin started a weight loss program. After a week his weight was 200.4 pounds. After four weeks he weighed 196.8 pounds. If he continues to lose weight at the same linear rate what will his weight be 364 days after starting the program?

   a. 154.5   b. 152.7   c. 153.6   d. 138   e. 139.2

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5. The beach at Lake Balaton has a sign indicating the water depth to be 160 cm. If 1 meter is
    approximately 39.4 inches, what is the water's depth in yards to the nearest ¼ of a yard?

    a. 1.25 yd   b. 2 yd   c. 1.75 yd   d. 1.5 yd   e. 2.25 yd

6. A pair of pants cost 50% more than a tie. A shirt costs 25% more than the same tie. By what
    percentage is the cost of the pair of pants greater than the cost of the shirt?

    a. 20%   b. 25%   c. 10%   d. 75%   e. 12.5%

7. The mean of three numbers is 8, and their mode is 5. What is their range?

    a. 12   b. 10   c. 8   d. 9   e. 14

8. The point $(-2,5)$ is translated four units right, then six units down, and then reflected about the line
    $x = y$. What are the coordinates of the new point?

    a. $(-1,2)$ b. $(0,1)$ c. $(0,2)$ d. $(2,5)$ e. $(-2,1)$

9. The speed of light is approximately 186,000 miles per second. A nanosecond is one billionth of a
    second. Which of the following most closely approximates the distance traveled by light in a
    nanosecond?

    a. 6 in   b. 1 ft   c. 2 ft   d. 1.5 ft   e. 8 in

10. Let a and b be positive integers such that $f(g(x))=g(f(x))$, where $f(x)=ax+5$ and $g(x)=bx-3$. What is $a+b$?

   a. 0   b. 1   c. 2   d. 8   e. 10

11. Ed filled two-thirds of his radiator with antifreeze and then added 4 more quarts of antifreeze. After draining half the antifreeze, he needed 11 quarts of antifreeze to fill the radiator to capacity. What is the radiator's capacity in quarts?

   a. 17.4   b. 18   c. 18.6   d. 19.5   e. 21

12. Seventy-five percent of the children in a sixth-grade class had a cell phone at the beginning of the school year in September. Now 80% have a cell phone. What percentage of children without a cell phone at the beginning of the year have a cell phone now?

   a. 10%   b. 25%   c. 15%   d. 20%   e. 5%

13. What is the x-coordinate of the point on the line $4x+2y=8$ that is closest to the origin?

   a. 2   b. 1.6   c. 1   d. 1.4   e. 1.8

14. For real numbers x and y, define $x\oplus y=xy-x-y$. What is $\big(\big((4\oplus3)\oplus2\big)\oplus2\big)$?

   a. 0   b. 3   c. 8   d. 4   e. 1

15. A bakery owner sold her last two cakes for $36 each. She made a profit of 25% on one, but had a 4% loss on the other. What was the total profit on the two sales?

    a. $5.70   b. $5.65   c. $5.60   d. $5.75   e. $5.80

16. The graph of the rational function $f(x) = \dfrac{-2x-9}{x+5}$ is a hyperbola. What is the equation of the line that passes through the vertices of the hyperbola?

    a. $y = x+3$ b. $y = -x+3$ c. $y = -2x-9$ d. $y = x+4$ e. $y = 2x-1$

17. If $a^2 + b^2 + 2ab + 16a + 16b = 36$, what is the smallest possible average of a and b?

    a. -18 b. -9 c. -2 d. 1   e. 9

18. How many two digit numbers are exactly 7 times the sum of their digits?

    a. 0   b. 1   c. 2   d. 3   e. 4

19. Joseph can make x boxes in y days. How many boxes can he make in z days?

    a. yz b. xz c. xyz d. $\dfrac{xz}{y}$ e. $\dfrac{yz}{x}$

20. Susan made a round trip between two cities 270 miles apart. On the return trip, her average velocity was 5 miles per hour less than her average velocity to the city. Hence, her travel time on the return trip was 45 minutes longer than her travel time to the city. What was her average velocity on the trip to the city?

    a. 35 mph   b. 45 mph   c. 40 mph   d. 50 mph   e. 55 mph

21. Kenny paints a fence in 3 hours. Kyle can paint the same fence in 4 hours. If Cartman, Kenny, and Kyle working together to paint the fence take 1.5 hours, how long would it take Cartman working alone to paint the fence?

    a.   4 hrs   b. 6 hrs   c. 8 hrs   d. 9 hrs   e. 12 hrs

22. A bowl contains 2 red marbles, 4 blue marbles, and 3 yellow marbles. Three marbles are removed at random without replacement. What is the probability that exactly one yellow marble is removed?

    a. $\dfrac{9}{14}$ b. $\dfrac{5}{14}$ c. $\dfrac{5}{7}$ d. $\dfrac{15}{28}$ e. $\dfrac{3}{7}$

23. How many integers are in the solution set of $6x^2 - 40 \le 43x$?

    a. 5   b. 8   c. 9   d. 10   e. infinite number

24. Recall the following Roman Numeral values: VII = 7: IX = 9; XXV = 25; XLVI = 46; XCII = 92; and MDCLXI = 1661. Compute XXIX + CCXXXV + DCCCXLII + MMCLIV.

    a. MMMCCLX   b. MMMDLVII   c. MMMCLIX   d. MMMCCLIX   e. MMMCCXL

25. Five sentences were written on the board in a logic class as a quiz, but someone erased the last two statements to keep the instructor from giving the quiz. Instead the instructor said you still have to take the quiz. It consists of one question – "How many of the original five statements were true?"

    Statement 1: Statement 2 is true.

    Statement 2: At most, one of these five statements is true.

    Statement 3: All five statements are true.

    Statement 4:

    Statement 5:

    a. 0   b. 1   c. 2   d. 3   e. 4

SHORT ANSWER
Place the answer in the appropriate space.

66. A cake shaped as a cube is coated with sugar on all six faces. The cake is then cut into smaller cubes such that the number of pieces having sugar on three faces is $\dfrac{8}{27}$ the number of pieces having no coating at all. Into how many cubes was the cake cut?

67. If $x + \dfrac{1}{x} = \sqrt{22}$, what is the value of $x^2 + \dfrac{1}{x^2}$?

68. What is the largest prime less than 100 that is the sum of three consecutive squares?

69. A *Sophie Germaine prime* is a prime number such that both p and $2p+1$ are prime. For example, 5 is a Sophie Germaine prime because both 5 and 11 are prime. What is the sixth Sophie Germaine prime?

70. How many ways are there to write 20 as the sum of three distinct positive integers? Assume order is not important; that is, $3+8+9$ is the same "way" as $9+8+3$.

Answer Key

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

66. 125
67. 20
68. 29
69. 29
70. 24