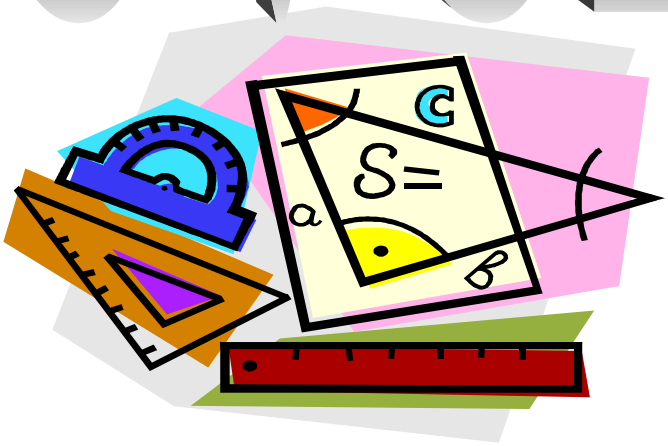
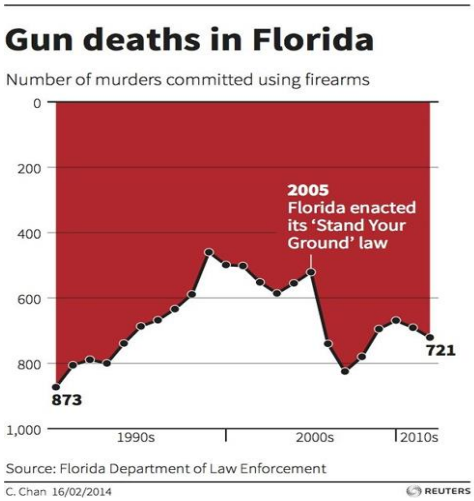
Level II



Do NOT open until you are told to do so.

March 23, 2017

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?



   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.

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

2. A square is inscribed in a circle of radius 10 inches. What is the area of the square?

   a. 100 sq in b. 200 sq in c. 50π sq in d. 100π sq in e. 400 sq in

3. 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. $(-2,1)$

4. A regular dodecahedron has 12 faces and 20 vertices. How many edges does it have?

   a. 28 b. 30 c. 32 d. 12 e. 10

5. 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%

6. For real numbers *m* and *n*, compute mn, given that the graphs of $mx+2y=7$ and $8x+my=n$ intersect in more than one place.

   a. 56 b. -28 c. 28 d. 14 e. -56

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

8. 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

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. In a right triangle ΔABC, $m\angle A = 90°$ and $m\angle C = 30°$. Point D lies on $\overline{AC}$ such that $\overline{BD}$ bisects $\angle ABC$. What is $\frac{DC}{BC}$?

a. $\sqrt{3}$ b. $\frac{1}{2}$ c. $\frac{\sqrt{3}}{2}$ d. $2\sqrt{3}$ e. $\frac{\sqrt{3}}{3}$

11. What is the area of the region in the fourth quadrant bounded by the coordinate axes and the lines $y = x - 5$ and $x - 2y = 12$

a. 25 b. 30 c. 24.5 d. 23.5 e. 36

12. What is the graph of $x^2 + xy + x + 3y = 6$?

a. an ellipse b. a parabola c. a hyperbola d. 2 parallel lines e. 2 intersecting lines

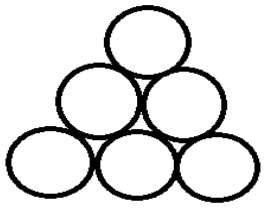
13. Copiers A, B, and C are used to produce 3*n* copies, *n* on each copier. Copier A makes 18 copies per minute and copier B makes 9 copies per minute. If the average copy speed is 15 copies per minute, what is the rate in copies per minute at which copier C makes copies?

a. 21 b. 24 c. 25 d. 30 e. 36

14. What is the *y*-intercept of the perpendicular bisector of the segment whose endpoints are $(1,1)$ and $(7,9)$?

a. $(0,8)$ b. $(0,7.5)$ c. $(0,6)$ d. $(0,6.5)$ e. $(0,8.5)$

15. Six cylinders of radius 1 foot are stacked in a pile with three on the bottom, then two, and topped by one as seen in the diagram. What is the height of the pile?



a. $2+2\sqrt{3}$ ft b. $\frac{3+\sqrt{2}}{2}$ ft c. $1+\sqrt{3}$ ft d. $\frac{2+\sqrt{3}}{2}$ ft e. $3+2\sqrt{3}$ ft

16. A square is inscribed in a circle which is inscribed in a square which is inscribed in a circle which is inscribed in a square! What is the ratio of the area of smallest square to the area of the largest square?

a. $\frac{\pi}{9}$ b. $\frac{\pi}{6}$ c. $\frac{1}{8}$ d. $\frac{1}{4}$ e. $\frac{1}{2\sqrt{2}}$

17. What is the ratio of the area of a regular octagon to the area of a square if their perimeters are equal?

a. $\frac{1+\sqrt{2}}{3}$ b. $\frac{1+\sqrt{6}}{2}$ c. $\frac{1+\sqrt{2}}{2}$ d. $\frac{\sqrt{3}-1}{2}$ e. $\frac{1+3\sqrt{2}}{4}$

18. 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 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. 45 mph b. 40 mph c. 35 mph d. 50 mph e. 55 mph

19. 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

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

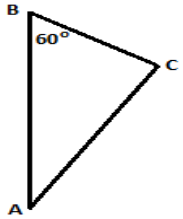
21. How many integers are in the solution set of $6x^2 - 40 \le 43x$?

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

22. The degree measure of one angle of a regular polygon is 140. How many sides does the polygon have?

a. 7 b. 8 c. 12 d. 10 e. 9

23. A bicyclist rides 8 miles on a straight road from point A to point B. She then makes a sharp 60 degree right turn (as indicated in the diagram) onto another straight road and rides 5 miles to point C. At point C she gets a flat tire. Dreading the 13 mile hike home, she is delighted when she realizes that there is a straight path back home to point A. How far would she have to hike on the path to get home?



a. $6\sqrt{3}$ mi b. 7 mi c. 8.5 mi d. $5\sqrt{3}$ mi e. $4\sqrt{3}$ mi

24. Recall the following Roman Numeral values: VII = 7: IX = 9; XXV = 25; XLVI = 46; XCII = 92; and MDCLXI = 1661. Compute the volume of a rectangular prism of sides XVII, XV, and XII.

a. MMLX b. MMDXC c. MMMXC d. MMDCL e. MMMLX

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 triangle with integer length sides is scalene. What is its shortest possible perimeter?

67. Exactly two four digit perfect squares end with the digits 29. What is the positive difference of the two numbers?

68. Triangle ΔABC has vertices $A(18,-4)$, $B(13,6)$, and $C(x,12)$. What is the largest value of x such that area of ΔABC is 50 square units?

69. What is the area of the largest quadrilateral given the side lengths 39, 52, 25, and 60.

70. A cube has a volume of 432 cubic units. What is the volume of the triangular pyramid formed by slicing the cube with a plane passing through the midpoints of three intersecting edges?

Answer Key

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

66. 9
67. 600
68. 20
69. 1764
70. 9