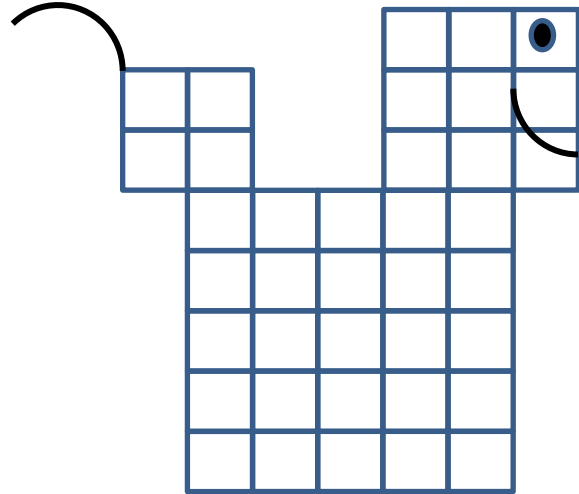


The 38th Contest



*Mathematics Educators of Greater St. Louis
and St. Louis Community College
at Florissant Valley present*

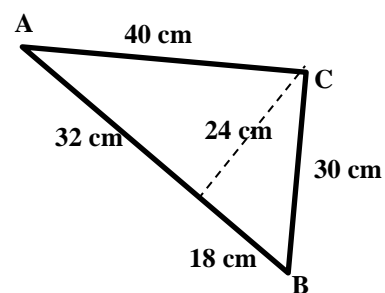
Excellence In Mathematics

**Sixth Grade Test
Thirty-Eighth Annual Mathematics Contest
March 19, 2016**

- I. Do not open the test booklet or begin work until instructed to do so by your proctor.**
- II. You have 75 minutes to take this test.**
- III. Listen carefully as the proctor explains where to write your name, the name of your school, your grade level, and how to mark your answers.
- IV. You may use a calculator. You only need a four-function calculator, but you may use any calculator approved for the SAT test, which includes most graphing calculators except the TI-92 and TI-Voyager. If you are unsure whether your calculator is allowed, check with your proctor
- V. Your score will be the number of questions you answer correctly. In the event of ties, Problem #40 will be used as a tie-breaker. If ties still remain, Problem #39 will be used as a tie-breaker and so on until all ties are broken.

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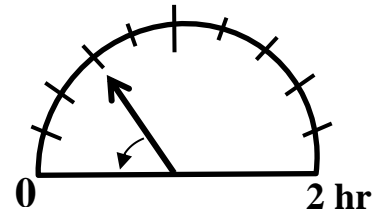
1. The perimeter of a rectangle is 36 cm. The length of one side of the rectangle is 12 cm. What is the area of the rectangle?
- A. 30 cm^2 B. 36 cm^2 C. 48 cm^2 D. 72 cm^2 E. 144 cm^2
2. Which one of the following five numbers can be written as the sum of three distinct non-zero square numbers?
- A. 38 B. 40 C. 44 D. 47 E. 55
3. With \$5.25 in nickels and quarters, you have twice as many nickels as quarters. What is the number of coins that you have?
- A. 15 B. 30 C. 36 D. 42 E. 45
4. Determine the smallest positive difference between any pair of these numbers.
- 0.9 0.79 1.12 1.043 0.9714**
- A. 0.11 B. 0.071 C. 0.077 D. 0.0714 E. 0.0716
5. On January 13, 2016, the NFL gave Stan Kroenke permission to move the St. Louis Rams to Inglewood, California, about 1860 miles away. Starting at 8 AM on January 13, St. Louis Rams fans ran Stan Kroenke out of town at an average rate of 9 miles per hour, 12 hours a day – from 8 AM to 8 PM. ☺ Using this data, on what day did Stan Kroenke arrive in Inglewood?
- A. Jan. 29 B. Jan. 30 C. Jan. 31 D. Feb. 1 E. Feb. 2
6. Which one of the following five numbers has the most factors?
- A. 10 B. 12 C. 16 D. 27 E. 35
7. In a room with 24 students, $\frac{5}{6}$ are boys. If 6 boys leave the room and 7 girls enter the room, what percent of the students now in the room are boys?
- A. 50% B. 52% C. 56% D. 58% E. 60%
8. On her first four math tests, Jenny's scores were: 84; 71; 47; and 75. On her fifth test she scored 84. What is the sum of the median and the (arithmetic) mean of Jenny's five test scores?
- A. 113.2 B. 119.2 C. 142.25 D. 147.2 E. 154.2
9. An altitude of length 24 cm is shown in right triangle ABC. What is the area of triangle ABC?
- A. 120 cm^2 B. 600 cm^2 C. 750 cm^2 D. 1000 cm^2 E. 1200 cm^2



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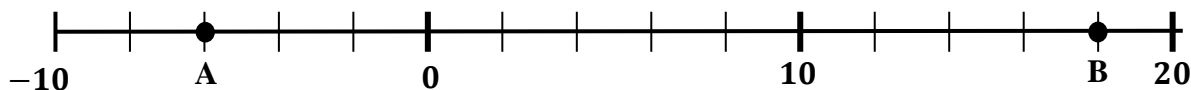
10. Ben receives a 5% discount on a \$60 item and a 15% discount on a \$120 item. Overall, what per cent discount did Ben receive? Round to nearest tenth of a per cent.
- A. 10.0% B. 11.7% C. 12.2% D. 12.5% E. 20%
11. What part of 5 hours is 40 seconds? Write your answer as a common fraction.
- A. $\frac{1}{8}$ B. $\frac{2}{15}$ C. $\frac{1}{150}$ D. $\frac{1}{200}$ E. $\frac{1}{450}$
12. What is the sum of all 2-digit prime numbers with units' digit "7"?
- A. 265 B. 272 C. 322 D. 342 E. 352
13. In a 48-minute basketball game, the Lakers had the ball $\frac{5}{8}$ of the time. When the Lakers had the ball, their point-guard Kobe had the ball $\frac{1}{3}$ of the time. For what per cent of the game did Kobe have the ball? Round to the nearest per cent.
- A. 20% B. 21% C. 22% D. 23% E. 25%
14. The Kansas City Federal Reserve Money Museum Bank has a display of 40 million dollars in stacks of \$100 bills. It costs the US Mint 6.2 cents to make one bill of any US denomination. How much did it cost to make the bills in this display of 40 million dollars?
- A. \$248 B. \$2,480 C. \$24,800 D. \$248,000 E. \$2,480,000

15. A parking meter "runs out of time" when its needle arrives at **0**. Assume that the marks on the meter are equally spaced. In approximately how many minutes will this parking meter "run out of time"?



- A. 9 B. 18 C. 30 D. 36 E. 84
16. For Valentine's Day, Chari's Berries offered a half-dozen Fancy Chocolate Dipped Strawberries for \$20 or one dozen for 50% more. Greg buys the half-dozen box for Breanna and the larger box for Nicole. [Unfortunately for Greg, Breanna and Nicole text each other! ☺] What was the average price per strawberry that Greg paid? Round to the nearest cent.
- A. \$1.67 B. \$1.75 C. \$2.08 D. \$2.78 E. \$2.83

17. This number line from -10 to 20 has been divided into equal parts. What is the sum $A + B$?



- A. 8 B. 10 C. 11 D. 12 E. 24

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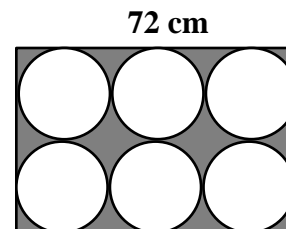
18. Horse races are measured in furlongs. A furlong is $\frac{1}{8}$ of a mile. How much longer is a 1.5 mile horse race than a 7 furlong race?

- A. $\frac{5}{8}$ mile B. $\frac{1}{8}$ mile C. $\frac{3}{8}$ mile D. $\frac{1}{2}$ mile E. $\frac{1}{4}$ mile

19. ABC is an equilateral triangle of side-length 8 cm. An irregular hexagon is formed by cutting equilateral triangles of side-length 1 cm from vertex A, of side-length 2 cm from vertex B, and of side-length 3 cm from vertex C. What is the perimeter of the hexagon?

- A. 12 cm B. 15 cm C. 18 cm D. 21 cm E. 24 cm

20. Six circles fit snugly in a rectangle with length 72 cm. What is the total area of all of the shaded regions? Round to the nearest square centimeter.



- A. 742 cm^2 B. 1208 cm^2 C. 2470 cm^2
 D. 3004 cm^2 E. 7401 cm^2

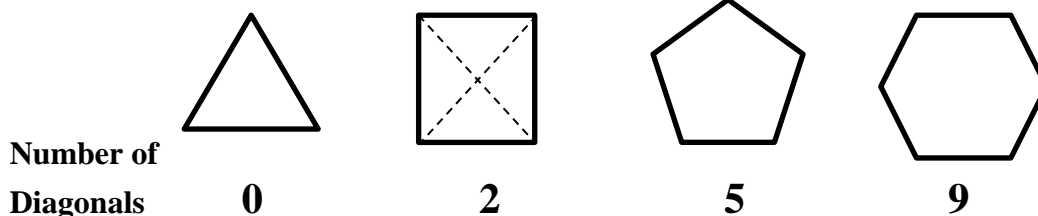
21. During the US Civil War, all states were part of the Union or of the Confederacy. Here is some data about the Civil War.

- Population: Union --- 23 million; Confederacy --- 9 million
- Number of soldiers: Union --- 2.9 million; Confederacy --- 1 million
- Amount spent on the war: Union --- \$3.2 billion; Confederacy --- \$2 billion

What per cent of the US population served either in the Union army or in the Confederate army? Round to the nearest tenth of a per cent.

- A. 11.9% B. 12.2% C. 16.9% D. 23.7% E. 39.1%

22. Sequences of four regular polygons and the number of diagonals of each polygon are given. [The two diagonals of the square are shown.]



How many diagonals does a regular decagon (a 10-sided polygon) have?

- A. 35 B. 36 C. 44 D. 45 E. 54

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23. One of the unplanned effects of China's *one-child policy* was that in 2015 there were 33 million more males than females in China. With a 2015 population of China of 1.375 billion, what per cent of Chinese were male? Round to the nearest tenth of a per cent.

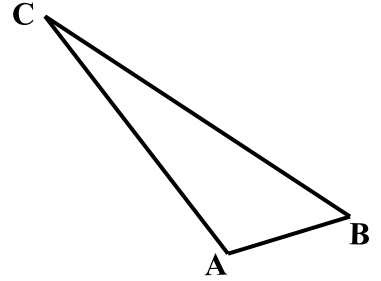
A. 50.8% B. 51.2% C. 51.6% D. 51.8% E. 52.4%

24. Three-fourths of a block of cheese weighs 2.4 kg. What would the whole block of cheese weigh?

A. 1.8 kg B. 3.0 kg C. 3.2 kg D. 3.6 kg E. 4.2 kg

25. For the given triangle ABC, select the best estimate of the sum of the measures of angles B and C.

A. 45° B. 75° C. 90° D. 100° E. 120°



26. A waiter serves Fran black coffee in a cup which is a cylinder of diameter 7.6 cm and height 9 cm. This cup is 90% full of coffee but Fran intends to add a LOT of half-and-half and asks for a larger cup. The waiter pours all of Fran's coffee into a larger cup which is a cylinder of diameter 8.8 cm and height 10.4 cm.

Before Fran adds half-and-half, what per cent full is the second cup? Round to the nearest per cent.

Note: The volume formula for a cylinder of height H and radius R is $V = \pi R^2 H$

A. 58% B. 65% C. 67% D. 74% E. 78%

27. For how many whole numbers N is the number $\frac{N}{2016}$ between 0.7 and 0.8?

A. 200 B. 201 C. 202 D. 203 E. 204

28. If $N = -3$, what is the sum of these four expressions?

$$N^2; \quad N^3; \quad -2 * N; \quad -5 - N$$

A. -14 B. -20 C. -26 D. -32 E. 4

29. Consider a pizza to be a cylinder of height **a** and radius **z**. What is the volume of this pizza?

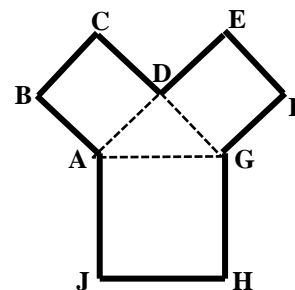
A. $2 \cdot \text{Pi} \cdot z \cdot a$ B. $\text{Pi} \cdot a^2 \cdot z$ C. $4 \cdot \text{Pi} \cdot z^2 \cdot a$
D. $\text{Pi} \cdot z \cdot a \cdot z \cdot z$ E. $\text{Pi} \cdot z \cdot z \cdot a$

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30. While visiting grandma and grandpa for Christmas in the Upper Peninsula, grandma would call her son, daughter-in-law, and granddaughter for dinner by calling the three of them in any sequence. She called: her son *Rick*, *Rich*, or *Richard*; her daughter-in-law *Fran* or *Francine*; and her granddaughter *Suzanne* or *Zan*. In how many different ways could grandma call the three of them to dinner?

A. 12 B. 24 C. 36 D. 54 E. 72

31. As shown, squares are mounted on the three sides of an isosceles right triangle ADG. The area of square ABCD is 15 square centimeters. What is the area of the polygon ABCDEFGHJ? Round to the nearest tenth of a square centimeter.



A. 52.5 cm² B. 58.7 cm² C. 62.3 cm² D. 67.5 cm² E. 75.0 cm²

32. Using any number of non-overlapping 1x1 and 1x2 tiles, in how many different ways can a 1x6 rectangle be covered? Note: Solutions with all 1x1 or all 1x2 tiles are allowed.



A. 8 B. 9 C. 11 D. 12 E. 13

33. A three-dimensional shape is formed by placing a pyramid ABCDP on top of a cube on face ABCD. What is the total number of faces, edges, and vertices of this shape?

A. 30 B. 34 C. 35 D. 36 E. 44

34. The distance from the center of a clock to the tip of its minute hand is 10 cm. From 3:40 PM to 6:10 PM of the same day, how many centimeters does the tip of the minute hand move? Round to the nearest centimeter.

A. 12 cm B. 13 cm C. 79 cm D. 145 cm E. 157 cm

35. B and C are digits, possibly the same digit, in the 7-digit number: **1,68B,53C** .

For how many ordered pairs (B, C) is **1,68B,53C** a multiple of 15?

A. 3 B. 4 C. 5 D. 6 E. 7

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36. A **completed** 5x5 Numbrix Puzzle is shown to the right.

Notice that the numbers 1 through 25 are positioned so that it is possible to draw a continuous path from 1 to 25. All segments of the path must connect squares horizontally or vertically, not diagonally.

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

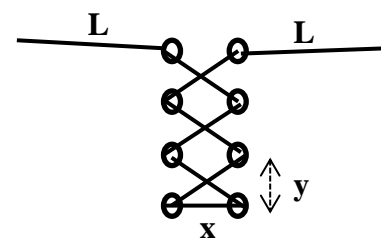
Complete this 6x6 Numbrix Puzzle so that the 36 cells contain the numbers 1 through 36 and so that it is possible to draw one continuous path from 1 to 36 which connect squares horizontally or vertically, not diagonally.

When finished, what is the sum of the numbers in the four cells marked A, B, C, and D?

- A. 70 B. 72 C. 74
D. 76 E. 78

5		7		11	
	A				13
1		B			
			C		17
31				D	
	29		25		23

37. The diagram depicts a shoe-lace pattern for a shoe with **four pairs** of eyelets. x and y are the horizontal and vertical distances between eyelets, as shown. The same amount L of lace is left at each end for tying.



Austin uses the same pattern for his shoes with **six pairs** of eyelets. When the lace is tightened, $x = 3$ cm and $y = 2$ cm. If Austin buys a shoelace of length 60 cm, calculate L , the length of each end left for tying. Round to the nearest tenth of a centimeter.

- A. 6.9 cm B. 10.5 cm C. 13.1 cm D. 16.5 cm E. 18.5 cm

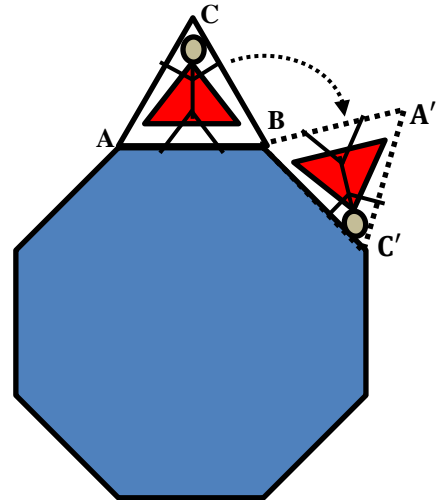
38. In this multiplication problem, each letter represents a digit 0 through 9. Neither **A** nor **E** represent 0. Two different letters may represent the same digit. What does the sum $A + B + C + D + E$ equal?

$$\begin{array}{r}
 \mathbf{A\ B\ C\ D\ E} \\
 \times \mathbf{4} \\
 \hline
 \mathbf{E\ D\ C\ B\ A}
 \end{array}$$

- A. 22 B. 23 C. 25 D. 27 E. 29

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39. Supergirl is trapped motionless in an equilateral triangle as it revolves clockwise around a regular octagon of the same side length. The first “step” is shown. As the triangle pivots at point B: Vertex C rotates to C' and vertex A rotates to A'. After 8 “steps”, the triangle is again on top of the octagon.



- A. $2\frac{1}{3}$ B. $2\frac{2}{3}$ C. $3\frac{1}{3}$
 D. $3\frac{2}{3}$ E. 4

40. See Problem #36 for instructions for completing a *Numbrix Puzzle*.

Complete this 7×7 *Numbrix Puzzle* so that the 49 cells contain the numbers 1 through 49 and so that it is possible to draw one continuous path from 1 to 49 which connect squares horizontally or vertically, not diagonally.

When finished, what is the sum of the numbers in the four cells marked A, B, C, and D?

- A. 104 B. 108 C. 112
 D. 114 E. 116

A						
	11	16	B	20	27	
	10				28	
	6				32	
	43	44	C	48	49	
						D