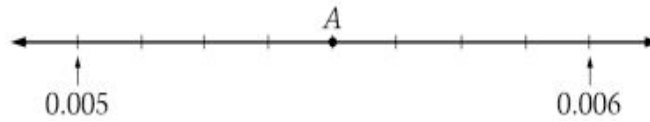
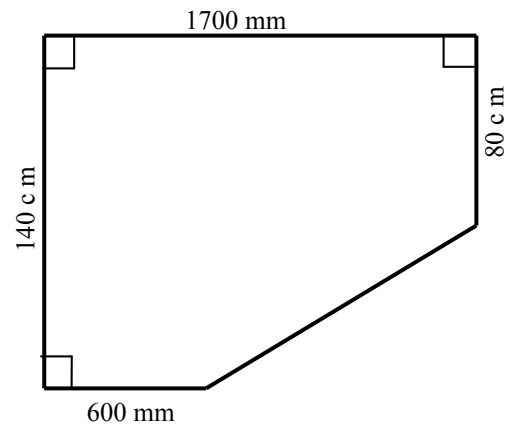


1. What number is represented by point A on the number line below?



- a. 0.0010
 - b. 0.0054
 - c. 0.0055
 - d. 0.006
 - e. 0.055
2. Find the perimeter of the pentagon shown here.

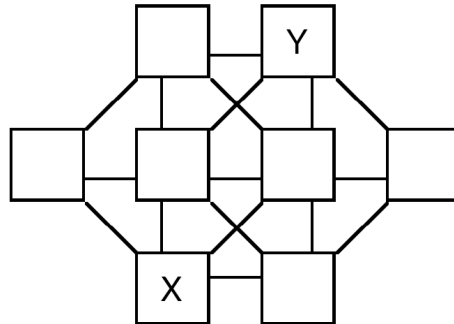


- a. 57.53 mm
 - b. 3.5496 m
 - c. 3549.6 mm
 - d. 575.3 cm
 - e. 16150 mm
3. Which statement is true about $5 \div 2$?
- a. The quotient is 2.5.
 - b. The quotient is 2 and the remainder is .5.
 - c. The quotient is 2 and the remainder is 10.
 - d. The quotient is 0.25.
 - e. The quotient is 25.
4. Which of the choices has an even number of proper factors?
- a. 38
 - b. 125
 - c. 121
 - d. 117
 - e. 200

5. If x is a real number greater than one million, which of the following fractions is the least in value?
- a. $\frac{5}{x+1}$
 - b. $\frac{5}{x-1}$
 - c. $\frac{x+1}{5}$
 - d. $\frac{5}{x}$
 - e. $\frac{x}{5}$
6. A non-square rectangle has dimensions a and b . Its perimeter is doubled by changing ONE dimension. Which of the following could be the area of the larger rectangle?
- a. $2ab$
 - b. $a(2b + a)$
 - c. $2(2ab)$
 - d. $4(2ab)$
 - e. $4(2a \cdot 2b)$
7. Suppose that $a + b = c$ and $b + c = d$. Which of the following equations is TRUE?
- a. $d - a = 2b$
 - b. $c = d - a$
 - c. $a = d - b$
 - d. $d + b = 2a + 2b$
 - e. $d - c = 2a$
8. Suppose $4r = 3s = 10t$, where r , s , and t are positive integers. What is the sum of the least values of r , s , and t for which this equality is true?
- a. 7
 - b. 17
 - c. 41
 - d. 82
 - e. 120

9. In the diagram shown, the boxes are to be filled with the digits 1 through 8 (each used exactly once). No two boxes connected directly by a line segment can contain consecutive digits. What is $X+Y$?

- a. 7
- b. 8
- c. 9
- d. 10
- e. 11

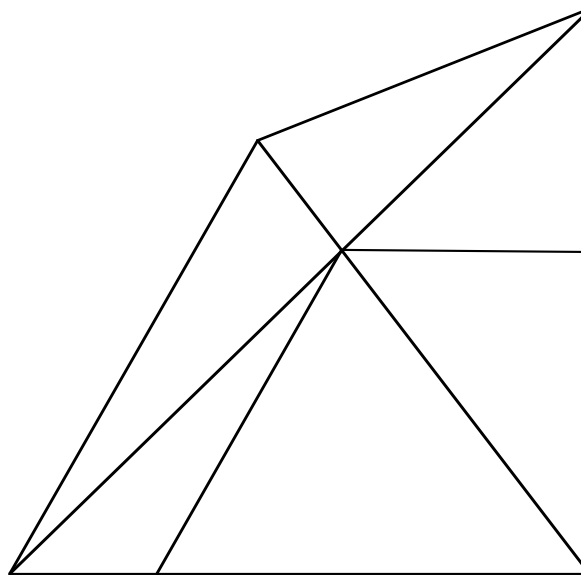


10. As Elena climbs a ladder, she finds that the number of rungs above the one that she is on is twice the number of rungs below the one she is on. After climbing 5 more rungs, she finds that the number of rungs above the one she is on is equal to the number of rungs and below the one she is on. How many more rungs must she climb to have the number below her be four times the number above her?

- a. 5
- b. 6
- c. 7
- d. 8
- e. 9

11. How many triangles of any size are shown in the figure below?

- a. 8
- b. 9
- c. 10
- d. 11
- e. 12

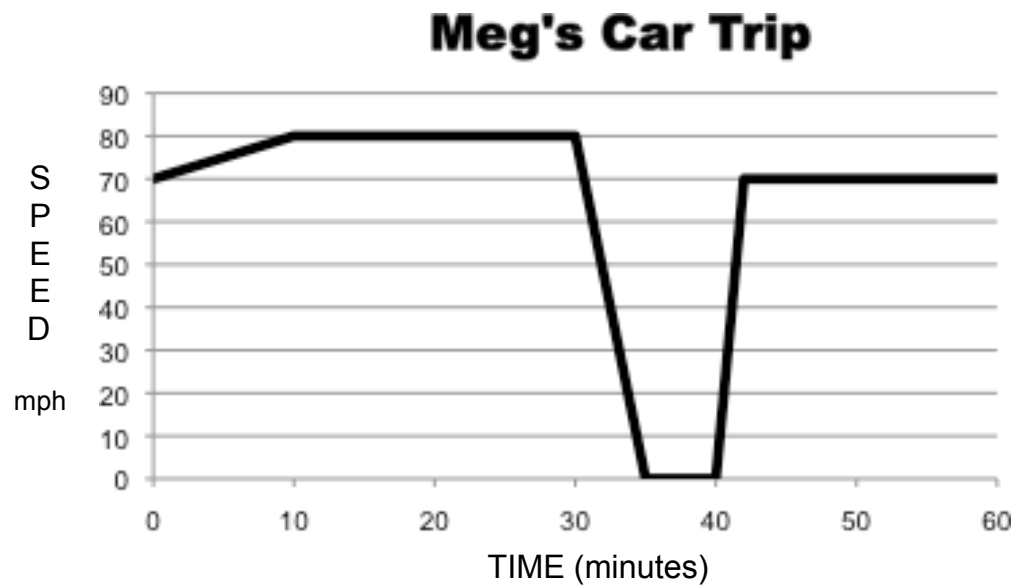


12. In mathematics the exclamation point has a special meaning. Here are two examples:

$$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$
$$8! = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 40,320$$

Which of the following situations would have $18!$ possibilities?

- The number of arrangements of 18 people standing in a line
 - The number of access codes with 18 digits
 - The number of results of choosing one block from a set of 18 blocks
 - The number of arrangements of the letters in the word anthropomorphology
 - The number of 18-member groups chosen from a group of 100 people
13. The graph below shows Meg's speed over time as she traveled along the interstate between Clarksville and Paducah. Which statement about Meg's trip is FALSE?



- For the first 10 minutes, the rate of change of her speed was 1 mile per hour per minute.
- The rate of change of her speed for the time between the 50th and 60th minutes was the same as the rate of change of her speed for the time between the 15th and 25th minutes.
- When the graph is horizontal, Meg is traveling at a constant speed.
- Meg traveled the same distance between the 50th and 60th minutes as she did between the 15th and 25th minutes.
- At the 38th minute Meg's car was not moving.

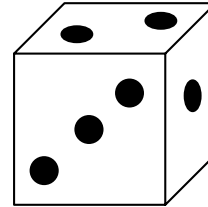
14. The table below shows an expression entered into a calculator and the result displayed by the calculator.

Expression Entered	Calculator Result Displayed
0.2^{10}	1.024 E -7
0.2^{30}	1.07374182 E -21

Which statement about the displayed calculator results is TRUE?

- The results for both calculations are exact.
 - The result for 0.2^{10} is exact, but the result for 0.2^{30} is approximate.
 - The E means that the calculator could not perform this calculation and that there is an error.
 - The E stands for “exponent” and it means that the result of 0.2^{10} is really 1.024^{-7} .
 - The results for both calculations are approximations written in scientific notation.
15. For an art project, George used a cube with edge length 12 inches to make a wooden die. To form the pips (the dots), he drilled cylindrical holes one inch in diameter to a depth of $\frac{1}{2}$ inch. On the three faces not shown there are 4, 5, and 6 pips, respectively. He submerged the die in paint. Find the painted surface area of wooden die. (Round to the nearest square inch.)

- 847 square inches
- 864 square inches
- 873 square inches
- 897 square inches
- 930 square inches

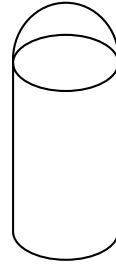


16. “There are $12\frac{5}{6}$ pounds of birdseed. Each feeder can hold $\frac{3}{4}$ pound of birdseed. After filling as many feeders as possible, how much birdseed will be left over?” Tim solved this problem by calculating $12\frac{5}{6} \div \frac{3}{4} = 17\frac{1}{9}$ using “invert and multiply.” The teacher marked his answer of $\frac{1}{9}$ pound left over wrong. Which statement is true?

- The key was wrong. Tim’s answer is correct.
- Tim performed “invert and multiply” incorrectly.
- Tim should have calculated $12\frac{5}{6} \times \frac{3}{4}$ instead of dividing.
- “Invert and multiply” does not work on this type problem.
- Tim misinterpreted the $\frac{1}{9}$. It meant the leftover amount would fill $\frac{1}{9}$ of a birdfeeder.

17. A silo is in the shape of a cylinder topped by a hemisphere. It has an overall height of 44 feet and diameter of 28 feet. The outside of the silo needs to be painted (not the bottom). One gallon of paint will cover 250 square feet. How many gallons of paint should be bought?

- a. 10 gallons
- b. 12 gallons
- c. 13 gallons
- d. 16 gallons
- e. 21 gallons



18. In an experiment a person draws one bill from a bag containing five \$1-bills, three \$10-bills, and two \$20-bills. When the experiment was repeated 100 times, a \$1-bill was drawn 52 times, a \$10-bill was drawn 29 times, and a \$20-bill was drawn 19 times. Which statement is true?

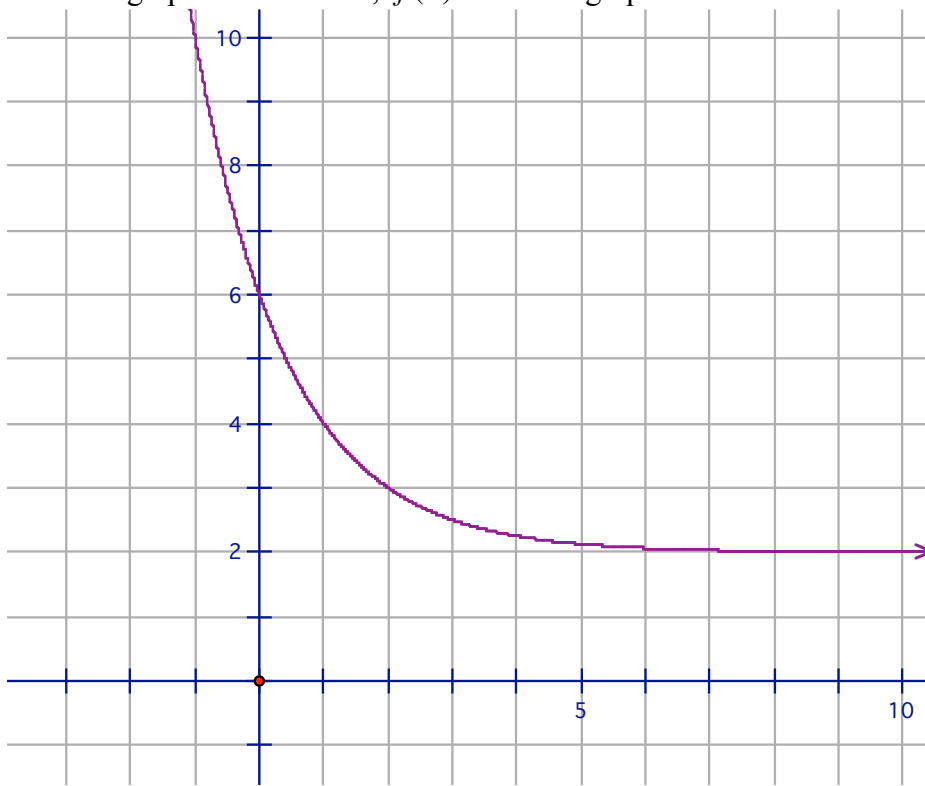
- a. In this situation, the experimental probability of drawing a \$10-bill is equal to the theoretical probability of drawing a \$10-bill.
- b. In this situation, the experimental probability of drawing a \$10-bill is $\frac{3}{10}$.
- c. The theoretical probability of NOT drawing a \$20-bill is $\frac{81}{100}$.
- d. In this situation, the experimental probability of NOT drawing a \$1-bill is $\frac{12}{25}$.
- e. The theoretical probability of NOT drawing a \$1-bill is impossible to calculate.

19. Two cyclists met at the intersection of two straight roads that were perpendicular to each other. Cyclist A left the intersection headed north at the constant rate of 21 miles per hour. At the same time, Cyclist B left the intersection headed east. Twenty minutes later they were 12.2 miles apart. (This is the shortest distance between them--not the distance along the roads.) How fast was Cyclist B going? (Round to the nearest mile per hour.)

- a. 17 miles per hour
- b. 6 miles per hour
- c. 10 miles per hour
- d. 15 miles per hour
- e. 30 miles per hour

20. A projectile is launched into the air from the ground with an initial velocity of 80 feet per second. Its height above the ground, h , is a function of the number of seconds, t , since it was launched. This function can be represented by $h = -16t^2 + 80t$. The maximum height is reached 2 minutes and 30 seconds after it is launched. What is the maximum height?
- 220 feet
 - 180 feet
 - 96 feet
 - 100 feet
 - 230 feet
21. The federal debt in March, 2009, was \$11 trillion. That is a 96.5% increase over the federal debt in March, 1999. What was the federal debt in March, 1999. (Round to the nearest tenth of a trillion.)
- \$10.7 trillion
 - \$10.6 trillion
 - \$5.6 trillion
 - \$5.5 trillion
 - \$1.1 trillion
22. Which of the following measurements could be the volume of a shoe box that holds one pair of running shoes?
- 100 cubic centimeters
 - 10 cubic decimeters
 - 0.5 cubic meter
 - 1000 cubic millimeters
 - 500 cubic centimeters
23. Each year a car is worth 8% less than it was the year before. After three years the car is worth \$19,311.46. What was the original value of the car? (Round to the nearest penny.)
- \$24,800.00
 - \$20,856.38
 - \$34,760.63
 - \$23,946.21
 - \$25,300.00

24. Below is the graph of a function, $f(x)$. Use the graph to estimate the value of $f(3)$.



- a. $f(3) \approx 2$
b. $f(3) \approx 3$
c. $f(3) \approx 2.5$
d. $f(3) \approx 6$
e. $f(3) \approx 5$
25. Jack bought three notebooks and four markers for \$25.41. Jill bought two notebooks and six markers for \$21.24. Jon needs to buy 4 notebooks and three markers. How much money does he need? (Assume that all notebooks are the same price. Assume all markers are the same price. Assume there is no sales tax.)
- a. \$30.87
b. \$46.65
c. \$23.33
d. \$28.57
e. \$31.15

26. Tina bought 72 1-foot sections of border to go around two flower beds. Each flower bed is a square region. The length of each side of the flower bed in the front yard is 4 feet longer than the length of each side of the flower bed in the back yard. What is the total area of the two flower beds?

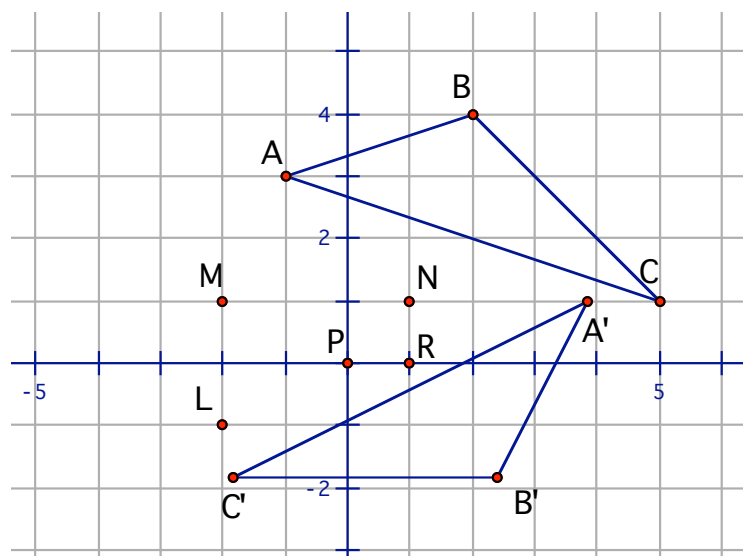
- 162 square feet
- 324 square feet
- 81 square feet
- 170 square feet
- 72 square feet

27. Integer addition can be considered as a function from the set of all ordered pairs of integers onto the set of all integers such that $f(a,b) = a + b$ for all integers a and b . Which of the following equations is true about this function?

- $f(-6, 8) = -2$
- $f(-6, -8) = 14$
- $f(-6, -8) = -2$
- $f(-6, -8) = -14$
- $f(-6, -8) = 2$

28. Triangle ABC and its image, Triangle A'B'C', are shown on a Cartesian graph. Triangle A'B'C' is the image of Triangle ABC under a rotation about one of the points not on the triangle. Which point is the center of the rotation?

- Point L
- Point M
- Point N
- Point P
- Point R



29. One ounce of baked potato chips has 92% less fat than one ounce of “classic” potato chips. How many ounces of baked potato chips would you have to eat to get the same amount of fat as in two ounces of “classic” chips?
- a. 16 ounces
 - b. 8 ounces
 - c. 80 ounces
 - d. 12.5 ounces
 - e. 25 ounces
30. In a group of 30 students, 25 are taking mathematics, 22 English, and 19 history. Every student is taking at least one of the courses. The greatest number of students who COULD be taking all three courses is x . The least number of students who COULD be taking all three courses is y . What is the value of $x + y$?
- a. 17
 - b. 19
 - c. 22
 - d. 23
 - e. 24