

1. The mean distance from Venus to the Sun is  $1.08 \times 10^8$  kilometers. Which of the following quantities is equal to this distance?
  - a. 10,800,000 kilometers
  - b. 108,000,000 kilometers
  - c. 1,080,000,000 kilometers
  - d. 10,800,000,000 kilometers
  - e. 108,000,000,000 kilometers
  
2. A certain machine produces 300 nails per minute. Two hundred fifty nails are packaged in each box. How long will it take the machine to produce enough nails to fill 5 boxes of nails?
  - a. 4 minutes
  - b. 4 minutes 6 seconds
  - c. 4 minutes 10 seconds
  - d. 4 minutes 50 seconds
  - e. 5 minutes
  
3. A colony of bacteria doubles its population every 8 hours. At noon on Monday, the population of the colony is 2000. Which calculation would determine the number of bacteria at noon on Monday one week later.
  - a.  $2000 \cdot 2^{21}$
  - b.  $2000 \cdot 2 \cdot \frac{24 \cdot 7}{8}$
  - c.  $2000 \cdot 2^{168}$
  - d.  $2000^{2 \cdot 7 \cdot 24}$
  - e.  $2000 \cdot 8^{21}$
  
4. Jerry is preparing baked beans in a rectangular pan whose length is 15 inches, width is 9 inches and height is 2 inches. Each can of beans is 4.5 inches tall and 3 inches in diameter. He knows that if he fills the pan to a depth of more than 1.5 inches, the pan overflows when it cooks. What is the greatest number of cans of beans he can cook in this pan?
  - a. 3 cans
  - b. 4 cans
  - c. 6 cans
  - d. 7 cans
  - e. 9 cans

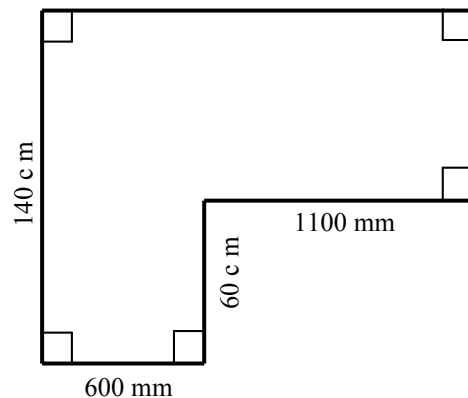
5. Secretariat won the 1973 Kentucky Derby in 1 minute and 59.4 seconds. Big Brown won the 2008 Kentucky Derby in two minutes and 1.92 seconds. The Kentucky Derby is  $1\frac{1}{4}$  miles long. Find the difference in these two horses average speeds in feet per second.
- 1.14 feet per second
  - 1.08 feet per second
  - 2.52 feet per second
  - 5.47 feet per second
  - 5.75 feet per second
6. A scuba diver often sends up a balloon-type marker. The marker starts out small and gets larger as it approaches the surface because of the change in pressure. The chart below shows the marker's volume at multiples of 33 feet below the surface of the water. Which of the following equations fits these data?

$d$	depth in feet	0	33	66	99	132
$v$	volume in liters	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$

- $v = \frac{33}{d + 33}$
  - $v = \frac{d - 33}{33}$
  - $v = -\frac{d}{66} + 1$
  - $v = \frac{132 - d}{d}$
  - $v = \frac{d - 33}{\frac{d}{33} + 1}$
7. 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 choices has the greatest value?

- $20! \div 2$
- $(10!)^2$
- $30! \div 10!$
- $15! \times 20$
- $15! \times 5!$

8. The coordinates of one endpoint of a line segment are  $(3, -3)$ . The coordinates of the midpoint are  $(7, 5)$ . What are the coordinates of the other endpoint?
- $(11, 13)$
  - $(13, 11)$
  - $(17, 7)$
  - $(7, 17)$
  - $(5, 1)$
9. A four-digit number--each of whose digits is 1, 5, or 9--is divisible by 37, and the sum of its digits is 16. What is the sum of the two rightmost digits of this number?
- 2
  - 6
  - 10
  - 12
  - 14
10. A collection of coins is made up of an equal number of pennies, nickels, dimes, and quarters. What is the largest possible value of the collection which is less than \$2?
- \$1.64
  - \$1.78
  - \$1.86
  - \$1.89
  - \$1.99
11. Find the area of the following figure.



- 172 square m
- 124,000 square cm
- 12.4 square m
- 36.8 m
- 1,720,000 square mm

12. The counting numbers are written in the pattern at the right. Find the middle number of the 40<sup>th</sup> row.

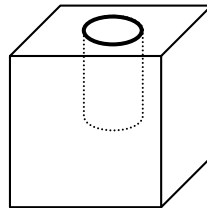
			1			
		2	3	4		
	5	6	7	8	9	
10	11	12	13	14	15	16

- a. 1561  
 b. 1641  
 c. 1559  
 d. 1639  
 e. 1483
13. What number is exactly halfway between  $\frac{3}{8}$  and 0.065?

- a. 0.155  
 b. 0.1825  
 c. 0.22  
 d. 0.375  
 e. 0.5125

14. This figure shows a solid cube (with edge length of 3 inches). A cylindrical hole has been drilled halfway through the cube. The cylindrical hole has diameter 1 inch. The cube is dipped in paint. How many square inches of the object were covered with paint?

- a. 53.2 square inches  
 b. 54 square inches  
 c. 58.7 square inches  
 d. 57.9 square inches  
 e. 63.4 square inches

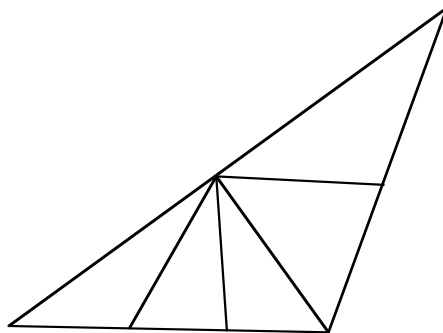


15. Jack bought three notebooks and four markers for \$25.41. Jill bought two notebooks and six markers for \$21.24. Jon needs to buy one notebook and one marker. How much money does he need? (Assume that all notebooks are the same price. Assume all markers are the same price. Assume there is no sales tax.)

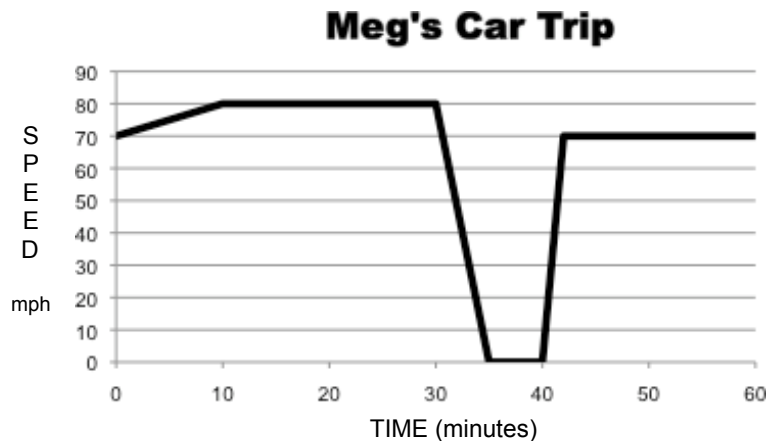
- a. \$8.04  
 b. \$7.78  
 c. \$6.29  
 d. \$23.33  
 e. \$11.66

16. One ounce of baked potato chips has 80% 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?
- 20 ounces
  - 8 ounces
  - 80 ounces
  - 5 ounces
  - 10 ounces
17. 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 area of the flower bed in the front yard?
- 81 square feet
  - 25 square feet
  - 64 square feet
  - 49 square feet
  - 121 square feet
18. How many multiples of 6 between 1 and 1000 do NOT have any of the digits 5, 6, 7, 8, 9, or 0?
- 10
  - 14
  - 83
  - 56
  - 28
19. How many different triangles of any size are there in the figure shown below?

- 8
- 10
- 12
- 15
- 17



20. 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 TRUE?



- Meg drove up a slight incline during the first five minutes of this trip.
  - A steep slope of the graph indicates a fast speed; a flatter slope indicates a slower speed.
  - Meg did not stop during any part of the trip represented by the graph.
  - Meg traveled farther between the 15<sup>th</sup> and 25<sup>th</sup> minutes than she did between the 50<sup>th</sup> and 60<sup>th</sup> minutes.
  - Meg's average speed for the whole trip was 75 miles per hour.
21. Each year a particular car is worth 5% less than it was the year before. After three years the car is worth \$19,205.20. What was the original value of the car?
- \$20,165.46
  - \$22,085.98
  - \$22,400.00
  - \$20,216.00
  - \$21,280.00

22. Which of the following equations shows an application of the distributive property?

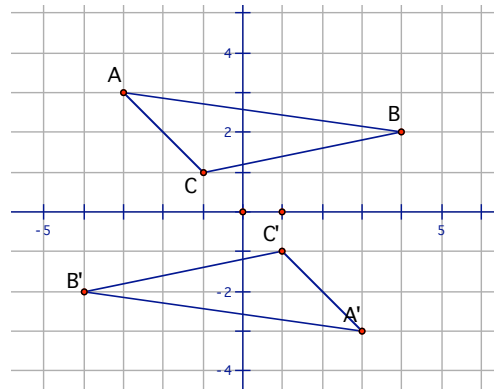
- $5 \cdot (2 - 6) = 5 \cdot 2 - 5 \cdot 6$
- $5 \cdot (8 \cdot 3) = (5 \cdot 8) \cdot (5 \cdot 3)$
- $5 \cdot (8 \cdot 6) = (5 \cdot 8) \cdot 6$
- $5 \cdot (6 + 1) = 5 \cdot (1 + 6)$
- $5 \cdot \frac{6}{9} = \frac{5 \cdot 6}{5 \cdot 9}$

23. Suppose that  $a + b = c$  and  $b + c = d$ . Which of the following is a true equation?

- a.  $d = a + 2b$
- b.  $c = d - a$
- c.  $a = d - b$
- d.  $d + b = 2a + 2b$
- e.  $d - c = 2a$

24. Triangle ABC and Triangle A'B'C' are shown on a Cartesian graph. Triangle A'B'C' is the image of Triangle ABC under a  $180^\circ$  rotation about the origin. Suppose that point P with coordinates  $(a, b)$  is a point on Triangle ABC. Which of the following would be the coordinates of the image of point P on Triangle A'B'C'?

- a.  $(-a, -b)$
- b.  $(a, -b)$
- c.  $(b, a)$
- d.  $(-b, -a)$
- e.  $(-a, b)$



25. Which of the following statements is true about  $5 \div 2$ ?

- a. The quotient is 2 and the remainder is 0.5.
- b. The quotient is 2.5 and there is no remainder.
- c. The quotient is 0.25 and there is no remainder.
- d. The quotient is 25 and there is no remainder.
- e. The quotient is 2.1 and there is no remainder.

26. There are 25 vehicles at the playground—cars, bicycles and tricycles. There are twice as many cars as bikes. There are 81 wheels. (None of the bikes has training wheels.) How many of the vehicles at the playground are NOT tricycles?

- a. 20
- b. 18
- c. 16
- d. 14
- e. 12

27. Define a new operation  $*$  as follows:  $a * b = 3a - 2b$ . What is the value of  $6*(8*9)$ ?

- a. -12
- b. -6
- c. 6
- d. 12
- e. 18

28. A non-square rectangle has dimensions  $a$  and  $b$ . One dimension is changed so that the area is doubled. Which of the following could be the perimeter of the larger rectangle?

- a.  $4(a + b)$
- b.  $4ab$
- c.  $8ab$
- d.  $2(2a + b)$
- e.  $(2a + b)(2a + b)$

29. 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 is true about the displayed calculator results?

- a. The results for both calculations are exact.
- b. The result for  $0.2^{10}$  is exact, but the result for  $0.2^{30}$  is approximate.
- c. The E means that the calculator could not perform this calculation and that there is an error.
- d. The E stands for “exponent” and it means that the result of  $0.2^{10}$  is really  $1.024^{-7}$ .
- e. The results for both calculations are approximations written in scientific notation.

30. Which of the choices is prime?

- a. 1001
- b. 1003
- c. 1007
- d. 1009
- e. 1011