NAEP 2011
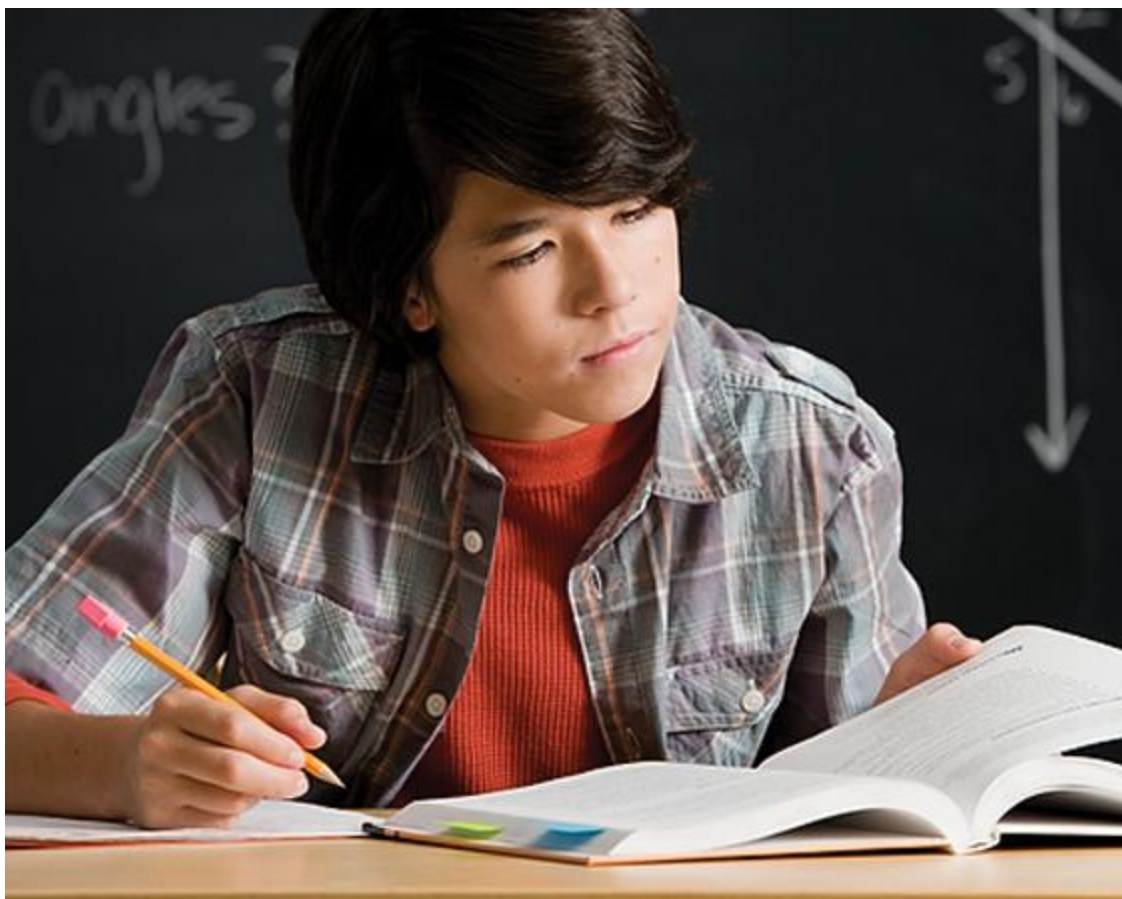
Released Mathematics Items
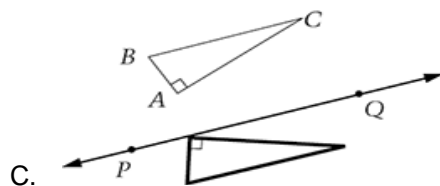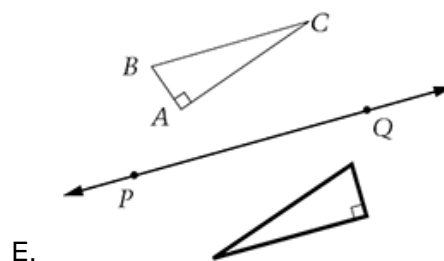## Grade 8

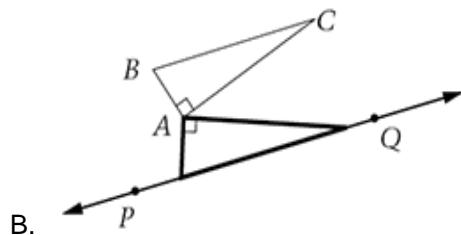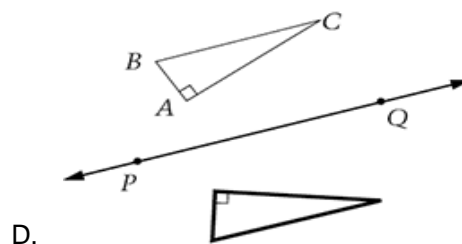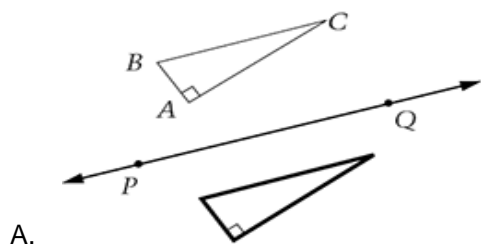# NAEP 2011 – Grade 8 Mathematics

1. Which of the following numbers is twenty-three and eight-thousandths?

    A. 230.8
    B. 23.8
    C. 23.08
    D. 23.008
    E. 23.0008

2. Which of the following figures shows the reflection of triangle ABC over line PQ?

A.

B.

C.

D.

E.

3. The admission price to a movie theater is $7.50 for each adult and $4.75 for each child. Which of the following equations can be used to determine T, the total admission price, in dollars, for x adults and y children?

A. T = (7.50 + 4.75)(x + y)
B. T = 7.50x + 4.75y
C. T = 7.50y + 4.75x
D. T = (7.50x)(4.75y)
E. T = (7.50 + 4.75) + (x + y)

4. Ken has a box that contains 12 marbles. The table below shows the number of marbles of each color that are in the box.

Color	Number of Marbles
Yellow	5
Green	3
Orange	2
Blue	2

Ken randomly selects 2 marbles from the box and keeps them. If Ken then randomly selects a third marble from the box, the probability that he will select a green marble is 2/10. Which of the following statements could be true about the first 2 marbles Ken selected?

A. One was yellow and one was green.
B. One was orange and one was yellow.
C. One was orange and one was blue.
D. Both were green.
E. Both were yellow.

5. Which of the following equations is NOT equivalent to the equation $n + 18 = 23$?

A. $23 = n - 18$
B. $23 = 18 + n$
C. $18 = 23 - n$
D. $18 + n = 23$
E. $n = 23 - 18$

6. On average, thunder is heard in Tororo, Uganda, 251 days each year. What is the probability that thunder will be heard in Tororo on any day? (1 year = 365 days)

Give your answer to the nearest percent.

Answer: _____ %

7. The figure below shows Jackson Pond.
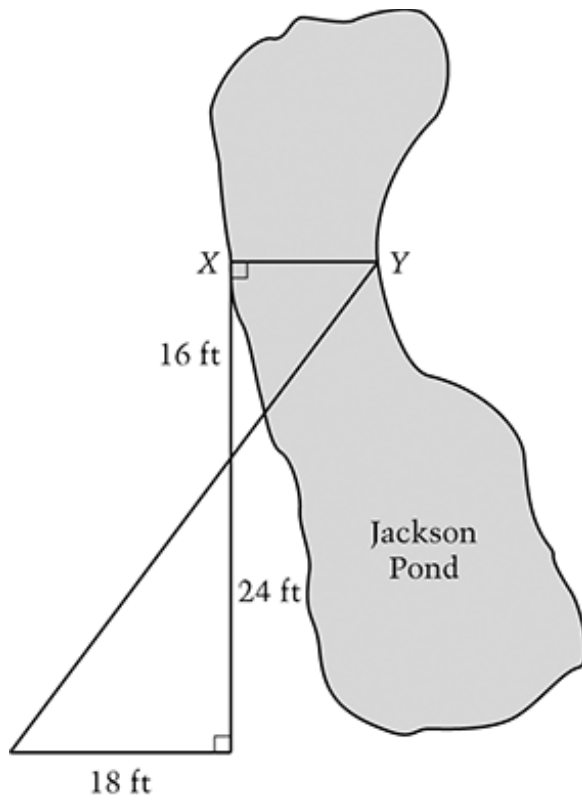
What is the distance across Jackson Pond from point X to point Y?

A.   8 feet
B. 10 feet
C. 12 feet
D. 14 feet
E. 22 feet

8.   If n is any integer, which of the following expressions must be an odd integer?

   A. *n + 1*
   B. *2n*
   C. 2n + 1
   D. *3n*
   E. *3n + 1*

9. Bags of Healthy Snack Mix are packed into small and large cartons. The small cartons contain 12 bags each. The large cartons contain 18 bags each.

   Meg claimed that she packed a total of 150 bags of Healthy Snack Mix into 2 small cartons and 7 large cartons.

   Could Meg have packed the cartons the way she claimed?

   ◯ Yes   ◯ No

   Show the computations you used to arrive at your answer.

10. A company from Japan was doing business in the United States. In 2007 it had an annual income of $1,000,000 and annual expenses of $800,000. The formula below shows the relationship between income, expenses, and profit.

   Income + Expenses + Profit

   About how much was this company's profit, in Japanese yen, in 2007?

   (In 2007, 1 United States dollar was approximately equal to 127 yen.)

   A. 1,600 yen
   B. 200,000 yen
   C. 2,500,000 yen
   D. 18,000,000 yen
   E. 25,000,000 yen

11. Sketch a four-sided polygon that has the following properties:

- One pair of opposite sides is parallel but not equal in length.
- The other pair of opposite sides is equal in length but not parallel.

12. A reasonable prediction of the distance d, in feet, that a car travels after the driver has applied the brakes can be found by using the formula $d = 0.055r^2$, where r is the speed of the car in miles per hour.

If Mario is driving at 60 miles per hour and applies the brakes, then according to the formula, how many feet will Mario's car travel before it stops?

A. 330
B. 198
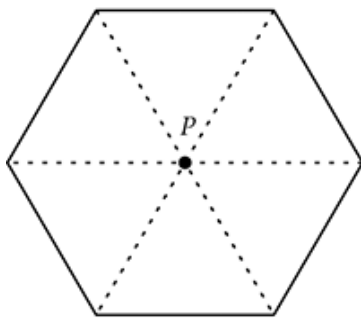C. 10.89
D. 6.6
E. 3.3

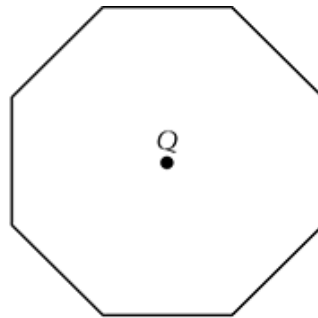Figure 1   Figure 2

13. Figure 1 is a regular hexagon with its center at point P. The dotted lines divide the hexagon completely into 6 congruent triangles sharing a vertex at point P.
Figure 2 is a regular octagon with its center at point Q. The octagon can be completely divided into congruent triangles sharing a vertex at point Q.

This division could produce

A. sixteen congruent equilateral triangles.
B. sixteen congruent isosceles triangles.
C. eight congruent right triangles.
D. eight congruent equilateral triangles.
E. eight congruent isosceles triangles.
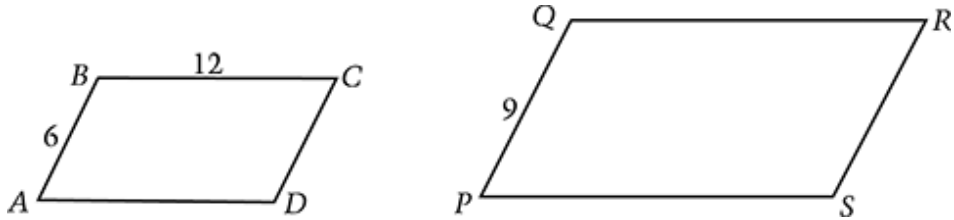
14. Parallelograms ABCD and PQRS above are similar. What is the length of side QR?

    A. 4.5
    B. 9
    C. 12
    D. 15
    E. 18

15. The linear graph below describes Josh's car trip from his grandmother's home directly to his home.


JOSH'S CAR TRIP

(a) Based on this graph, what is the distance from Josh's grandmother's home to his home?

(b) Based on this graph, how long did it take Josh to make the trip?

(c) What was Josh's average speed for the trip? Explain how you found your answer.

(d) Explain why the graph ends at the x-axis.

$\frac{1}{4}$ Cup $\frac{1}{3}$ Cup $\frac{1}{2}$ Cup

16. A recipe requires $1\frac{1}{3}$ cups of sugar. Which of the following ways describes how the measuring cups shown can be used to measure $1\frac{1}{3}$ cups of sugar accurately?

A. Use the $\frac{1}{2}$ cup three times.

B. Use the $\frac{1}{4}$ cup three times.

C. Use the $\frac{1}{2}$ cup twice and the $\frac{1}{3}$ cup once.

D. Use the $\frac{1}{3}$ cup twice and the $\frac{1}{2}$ cup once.

E. Use the $\frac{1}{4}$ cup once, the $\frac{1}{3}$ cup once, and the $\frac{1}{2}$ cup once.

17. Lines k, ℓ, and m are three different lines. If line k is parallel to line ℓ and line ℓ is parallel to line m, which of the following statements must be true?

A. Line k is perpendicular to line ℓ.
B. Line k is perpendicular to line m.
C. Line k is parallel to line m.

D. Line k intersects line ℓ.
E. Line k intersects line m.

18. For 2 minutes, Casey runs at a constant speed. Then she gradually increases her speed. Which of the following graphs could show how her speed changed over time?

A.

B.

C.

D.

E.

E.
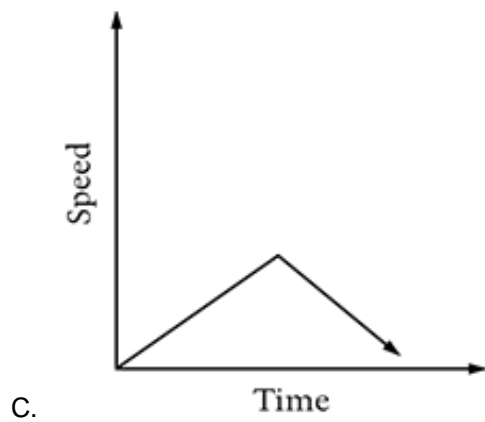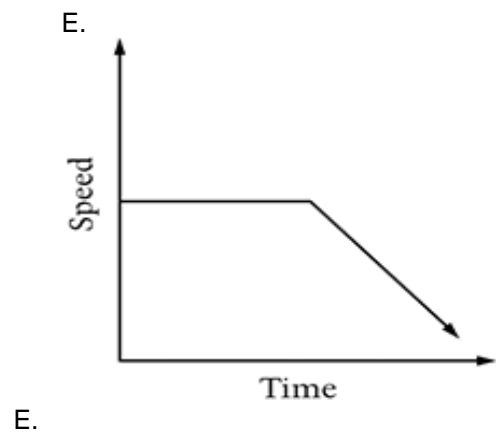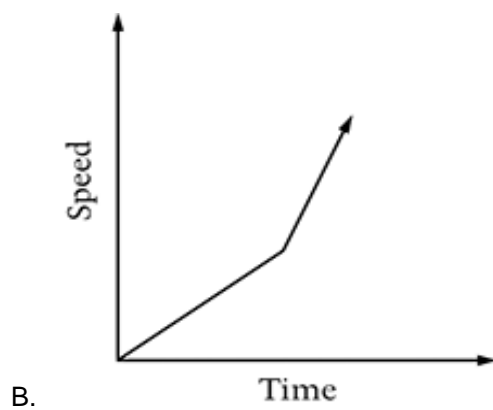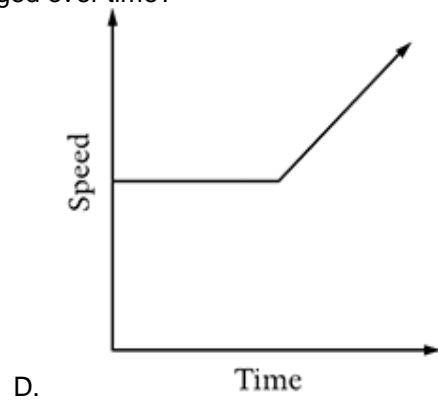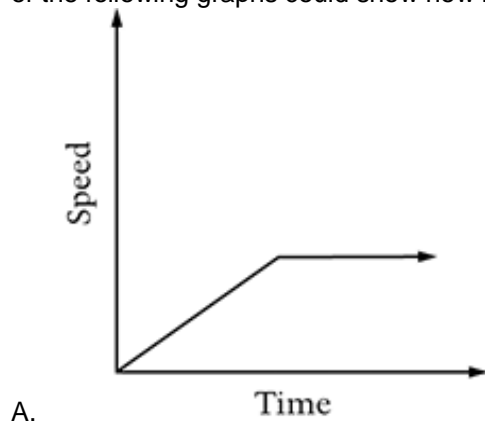
19. Last week Maureen earned $288.00 (before taxes) for working 40 hours. This week Maureen worked 29 hours at the same rate of pay. How much did Maureen earn (before taxes) this week?

    A. $72.00
    B. $72.50
    C. $203.00
    D. $208.80
    E. $397.24

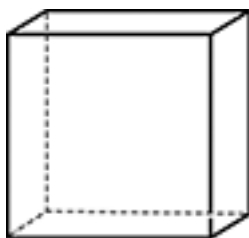20. The circular spinner shown below is divided into 6 congruent sectors. The sectors are yellow or blue.
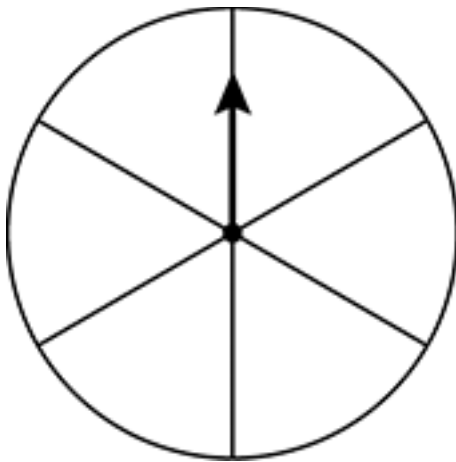
   Label each of the sectors either yellow (Y) or blue (B) so that the probability of spinning the arrow once and landing on yellow is $\frac{1}{3}$.

21. How many different three-digit whole numbers can be written using each of the digits 4, 5, and 6 exactly once?
    A.   3
    B.   6
    C.   9
    D. 24
    E. 27

22. The box pictured above has six faces that do not overlap. The box will unfold into one of the figures below. Which figure is it?

A.

E.

B.

C.

D.
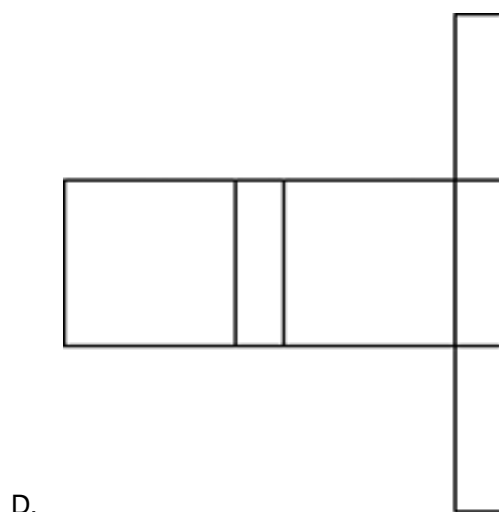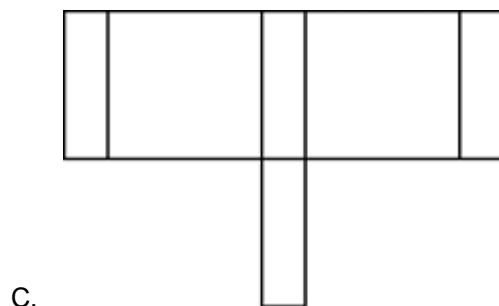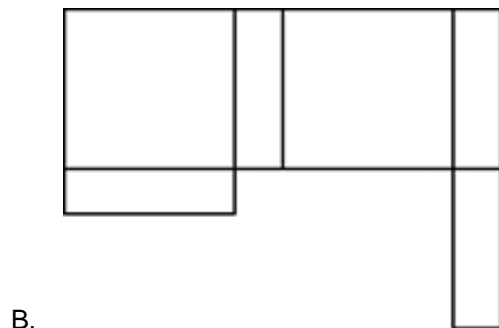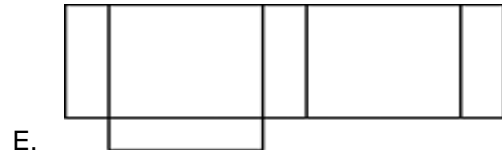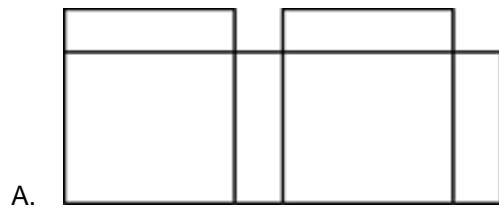
Item	Cost
Yogurt	$0.95 each
Pretzels	$2.50 per bag
Cheese cubes	$2.19 per bag
Bagel	$0.89 each
Fruit drink	$1.85 each
Peanuts	$2.55 per bag

23. Robert has $30 and wants to buy as many bags of peanuts as possible. He does not have to pay any sales tax on the food that he buys.

(a) Based on the prices given in the chart above, how many bags of peanuts can Robert buy?
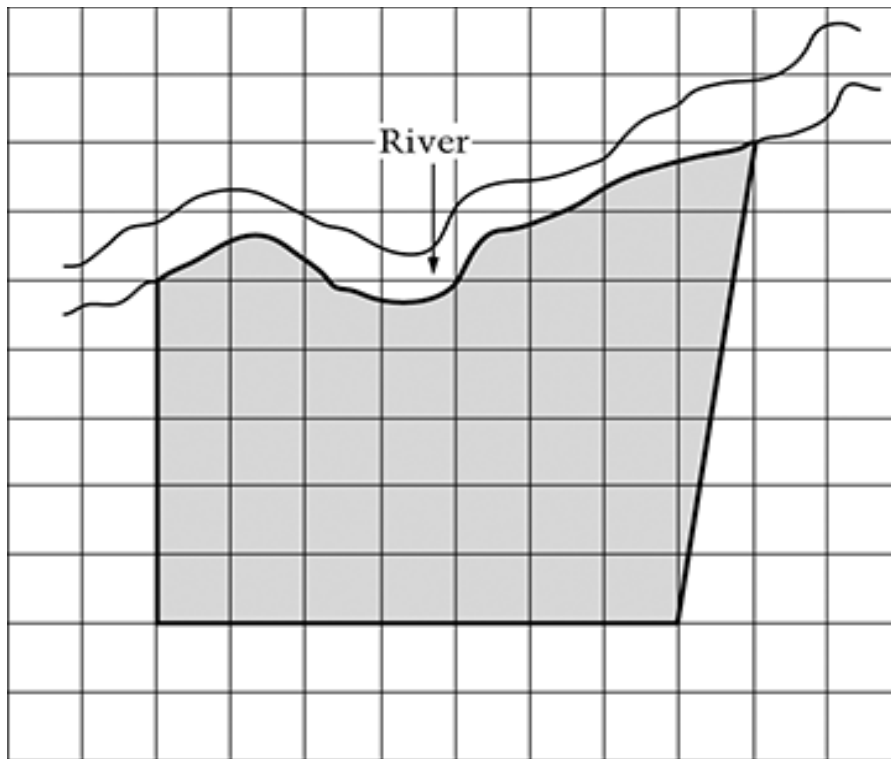
Answer: _____

(b) Robert buys all the bags of peanuts that he can. What is the most expensive single item on the chart that he can buy with the money he has left?

Answer: _____

represents 25 square meters

24. On the scale drawing above, the shaded area represents a piece of property along the river. Which of the following measurements is the best estimate of the area of the property?

    A. 750 square meters
    B. 850 square meters
    C. 900 square meters
    D. 1,050 square meters
    E. 1,200 square meters

25. A rectangle has a width of m inches and a length of k inches. If the perimeter of the rectangle is 1,523 inches, which of the following equations is true?

    A. $2(m + k) = 1{,}523$

    B. $2m + k = 1{,}523$

    C. $m + k = 1{,}523$

    D. $mk = 1{,}523$

    E. $m^2 k^2 = 1{,}523$

26. Graph the solution set for $3 \leq x \leq 5$ on the number line below.
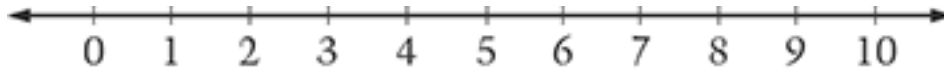
27. What is the radius of the largest circle that can be drawn on a 36-by-36-inch square piece of poster board?

A. 3 inches
B. 6 inches
C. 9 inches
D. 18 inches
E. 36 inches

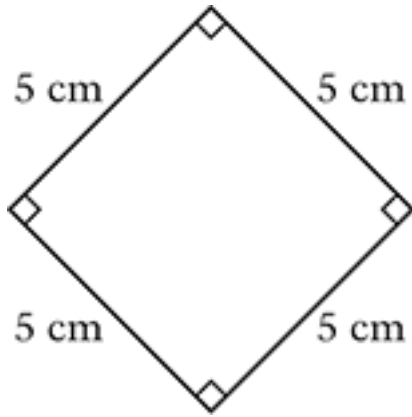28. The Music Palace is having a sale.

Music Palace Sale

$12 for the first CD

$6 for each additional CD

(Prices include tax.)

Write an expression that shows how to calculate the cost of buying n CD's at the sale.

Answer: _____

5 cm   5 cm

5 cm   5 cm

29. When asked to classify the figure above, here is what four students said.
    Ken: "It's a parallelogram."

    Lynn: "It's a square or a rhombus."

    Marianne: "It's a polygon."

    Rosa: "I think that it's both a quadrilateral and a rectangle."

    Which student or students correctly classified the figure?

    A. Lynn only
    B. Ken and Marianne only
    C. Lynn and Rosa only
    D. Ken, Lynn, and Rosa only
    E. Ken, Lynn, Marianne, and Rosa

30. In order to prepare a piece of ground for building a brick patio, a rectangle measuring 8 feet by 10 feet must be marked off. Then the dirt within the rectangle must be dug out to a depth of 6 inches. Finally, the resulting space must be filled with sand.

(a) What is the volume of sand needed, in cubic feet, to fill the space?
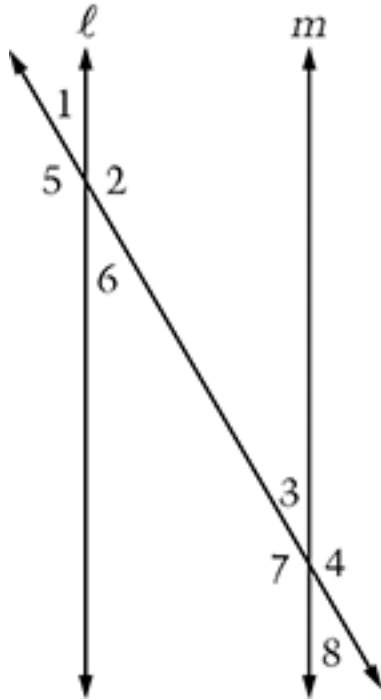
Answer: _____ cubic feet

Show your work. If you used your calculator, show the numbers and operations that you used to get your answer.

(b) Sand costs $4 per cubic foot. What is the total cost of the sand needed to fill this space, including a $35 delivery charge?

Answer: $_____

Show your work. If you used your calculator, show the numbers and operations that you used to get your answer.

31. In the figure above, line ℓ is parallel to line m. Which of the following pairs of angles must have the same measure?

    A. Angles 1 and 2
    B. Angles 1 and 5
    C. Angles 2 and 3
    D. Angles 4 and 5
    E. Angles 4 and 8

32. Which of the following is a unit of volume?
    A. Acre
    B. Gram
    C. Liter
    D. Meter
    E. Ton

33. Which of the following true statements proves that 119 is not a prime number?

A. $17 \times 7 = 119$

B. $119 \times 1 = 119$

C. 119 is greater than 100.

D. 119 is an odd number.

E. 119 is not divisible by 3.
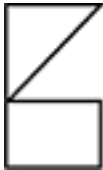
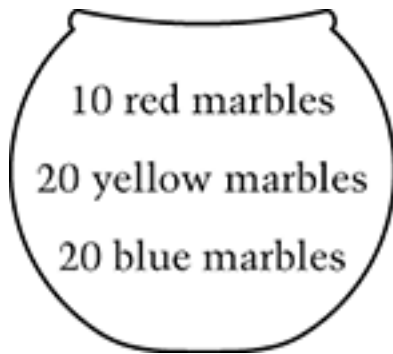34. When the figure above is rotated 90 degrees clockwise, which of the following is the resulting figure?

A.

B.

C.

D.

E.

35. Robert has x books. Marie has twice as many books as Robert has. Together they have 18 books. Which of the following equations can be used to find the number of books that Robert has?

A. $x + 2 = 18$

B. $x + x + 2 = 18$

C. $x + 2x = 18$

D. $2x = 18$

E. $2x + 2x = 18$

10 red marbles

20 yellow marbles

20 blue marbles

36. The bowl above contains the indicated number of marbles. The marbles are well mixed in this bowl. Juan will randomly pick a marble from the bowl. Juan believes that his chance of picking a blue marble is the same as his chance of picking a yellow marble. Is Juan correct?

Fill in the correct oval below.

◯ Yes   ◯ No

Explain your answer.

37. Which of the following is an equation of a line that passes through the point (0, 5) and has a negative slope?

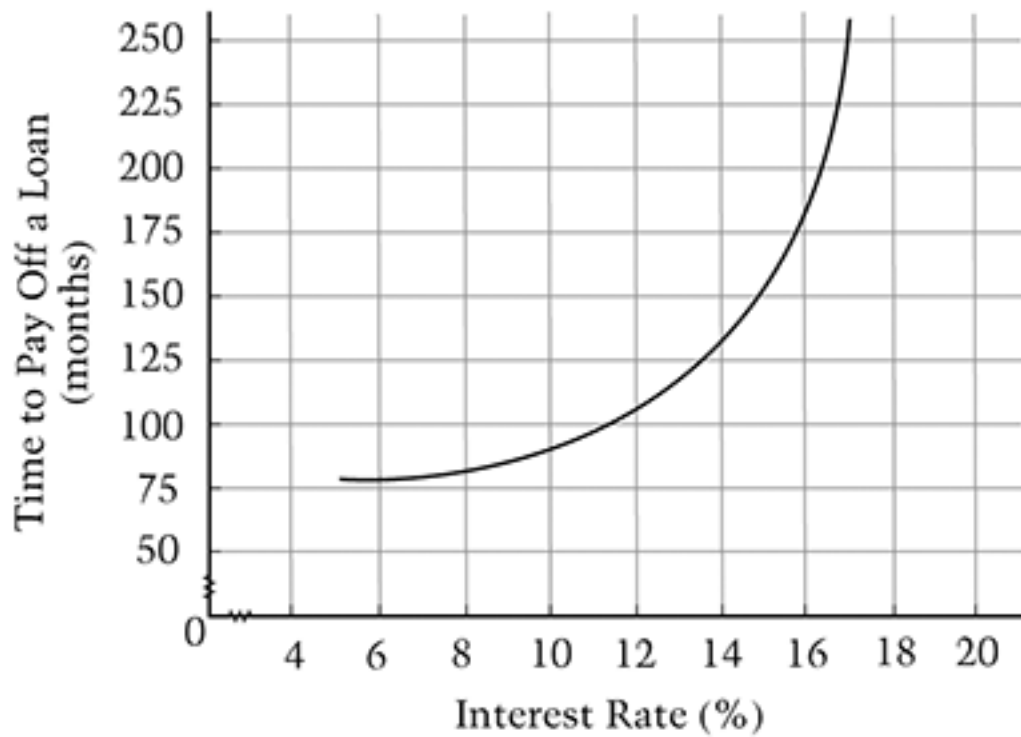38.

A. $y = 5x$

B. $y = 5x - 5$

C. $y = 5x + 5$

D. $y = -5x - 5$

E. $y = -5x + 5$

39. The point $(3, 7)$ is a vertex of a triangle. When the triangle is reflected over the y -axis, what are the coordinates of the image of the vertex?

A. $(-3, -7)$

B. $(-3, 7)$

C. $(3, -7)$

D. $(3, 7)$

E. $(7, 3)$

TIME TO PAY OFF A LOAN

Time to Pay Off a Loan (months) vs Interest Rate (%)

40. According to the graph, between which of the following pairs of interest rates will the increase in the number of months to pay off a loan be greatest?

A. 7% and 9%
B. 9% and 11%
C. 11% and 13%
D. 13% and 15%
E. 15% and 17%

TIME TO PAY OFF A LOAN
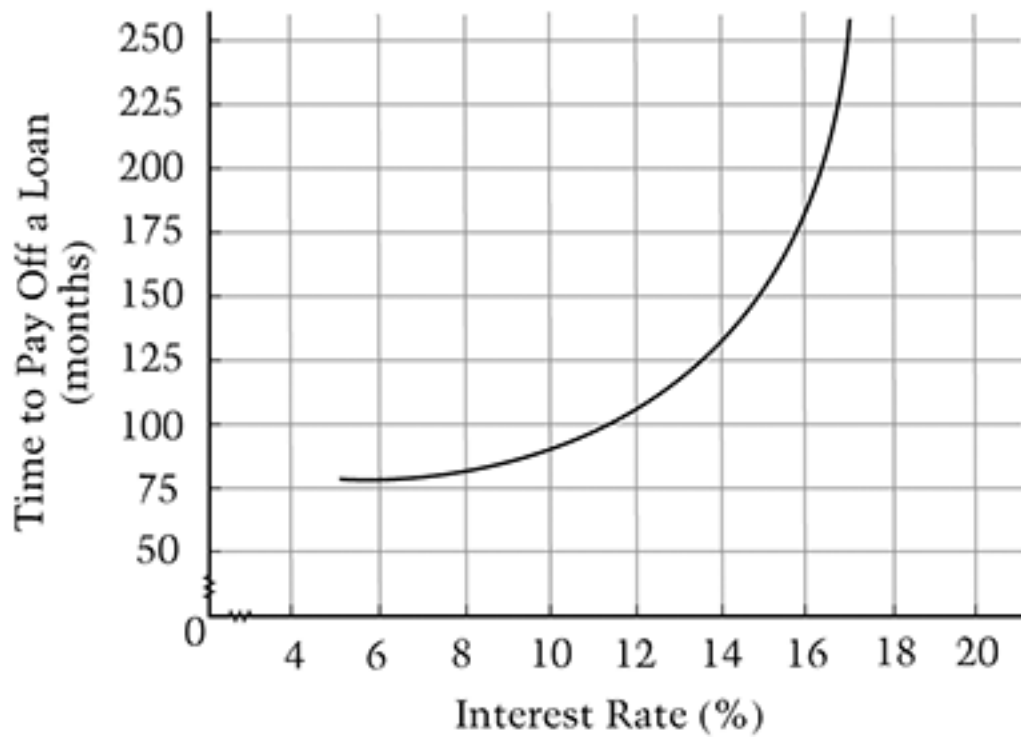
41. Mrs. Brown would like to pay off a loan in 180 months. According to the graph, what should be the approximate percent of the interest rate on her loan?

Answer: _____

42. The table below shows the distance of each planet from the Sun, to the nearest million kilometers.

| Planet	Distance from Sun (in millions of kilometers)
Mercury	58
Venus	108
Earth	150
Mars	228
Jupiter	778
Saturn	1,427
Uranus	2,871
Neptune	4,497
Pluto	5,914

One astronomical unit (AU) is defined as the distance between Earth and the Sun (1 AU $\approx$ 150 million kilometers). To the nearest whole number, how many astronomical units is Pluto from the Sun?

A. 6,064 AU
B. 5,914 AU
C. 5,764 AU
D. 150 AU
E. 39 AU

43. The point $(4, k)$ is a solution to the equation $3x + 2y = 12$. What is the value of k ?

A. -3
B. 0
C. 2
D. 3
E. 4

Dianne found the torn piece of paper shown below.

2434
310
1

7232
2059
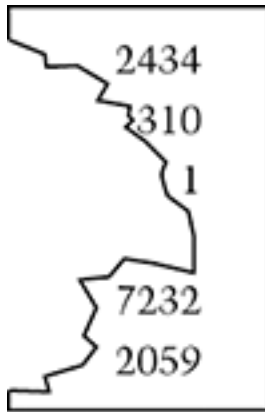
44. Six numbers originally appeared in a column on this paper. The fourth number from the top of the column had been completely torn away. Dianne wondered whether the sum of the six numbers was odd or even.

Give an example of a number that could be the fourth number in the column if the sum of the six numbers is an odd number.

Answer:_____

Explain why you chose that number.
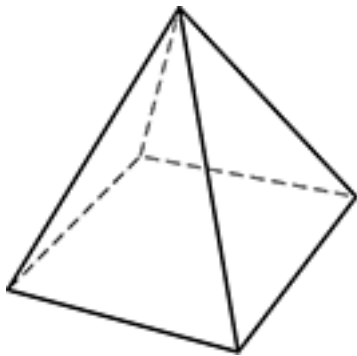
45. The figure above shows a pyramid with a square base. How many edges does the pyramid have?

A. Three
B. Four
C. Five
D. Seven
E. Eight

46. The number of gallons of water, y , in a tank after x hours may be modeled by the linear equation
$y = 800 - 50x$.
Which of the following statements about the tank is true?

A. It is filling at a rate of 800 gallons per hour.
B. It is filling at a rate of 50 gallons per hour.
C. It is emptying at a rate of 16 gallons per hour.
D. It is emptying at a rate of 50 gallons per hour.
E. It is emptying at a rate of 800 gallons per hour.

47. Each of the 6 faces of a fair cube is painted red, yellow, or blue. This cube is rolled 500 times. The table below shows the number of times each color landed faced up.

Color	Red	Yellow	Blue
Total	100	340	60

Based on these results, what is the most likely number of yellow faces on the cube?

A. One
B. Two
C. Three
D. Four
E. Six

48. If $a > 0$ and $b < 0$, which of the following must be true?

A. $ab > 0$

B. $a - b > 0$

C. $b - a > 0$

D. $a + b > 0$

E. $a + b < 0$