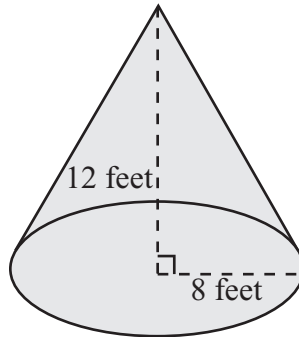


Session 1, Multiple-Choice Questions



- 1 The cone shown below has a radius of 8 feet and a height of 12 feet.



What is the volume of the cone?

- A.  $32\pi$  cubic feet
- B.  $256\pi$  cubic feet
- C.  $374\pi$  cubic feet
- D.  $768\pi$  cubic feet

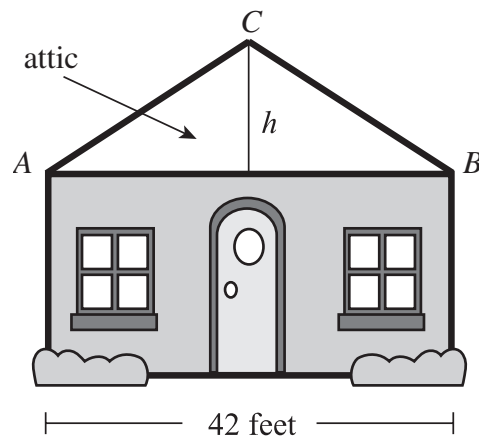
Reporting Category for Item 1: **Measurement**

- 2 Darlene went to the hardware store to purchase 581 feet of rope. The rope costs \$0.61 per yard. Which is **closest** to the amount of money Darlene needs to purchase the rope?
- A. \$100.00
  - B. \$120.00
  - C. \$360.00
  - D. \$1080.00

Reporting Category for Item 2: **Number Sense and Operations**

## Mathematics, Grade 10

- 3 The figure below shows a house with an attic, represented by  $\triangle ABC$  with  $AC = BC$ . The distance from  $A$  to  $B$  is 42 feet. The slope (commonly referred to as the pitch) of the roof is  $\frac{2}{3}$ .



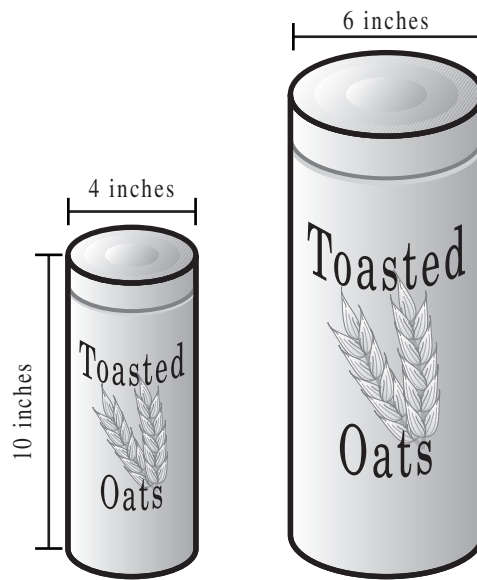
What is the height,  $h$ , of the attic?

- A. 14 feet
- B. 28 feet
- C. 32 feet
- D. 63 feet

Reporting Category for Item 3: *Number Sense and Operations*

## Mathematics, Grade 10

- 4 A company packages breakfast cereal in the two sizes of right cylindrical containers shown below. The containers are similar in shape.



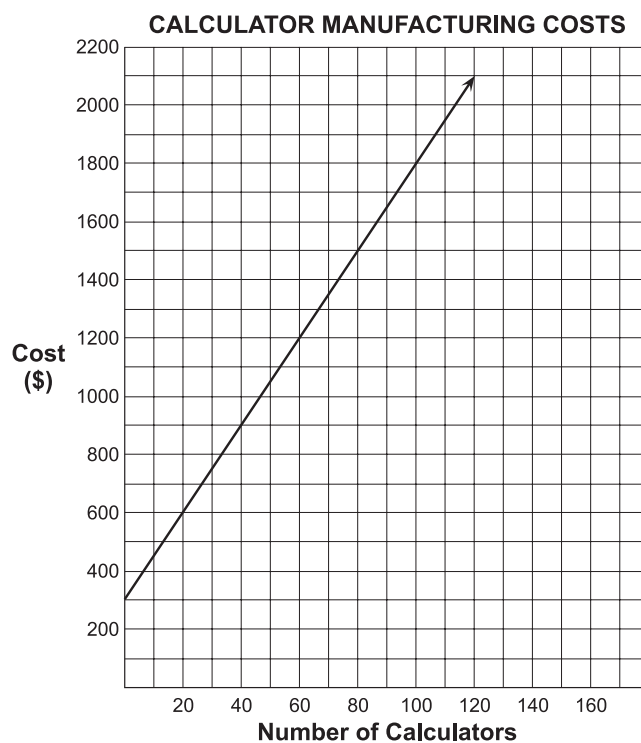
How many cubic inches does the large container hold?

- A.  $90\pi$  cubic inches
- B.  $135\pi$  cubic inches
- C.  $360\pi$  cubic inches
- D.  $540\pi$  cubic inches

Reporting Category for Item 4: **Measurement**

## Mathematics, Grade 10

- 5 The graph below models the cost of manufacturing calculators.



Which equation shows the relationship between the number of calculators,  $n$ , and the total cost,  $C$ ?

- A.  $C = 300 + n$
- B.  $C = 300 + 0.08n$
- C.  $C = 300 + 12.5n$
- D.  $C = 300 + 15n$

Reporting Category for Item 5: *Patterns, Relations, and Algebra*

## Mathematics, Grade 10

6 Lani had a box that contained

- 1 blue marble;
- 1 green marble;
- 1 purple marble;
- 1 yellow marble; and
- 2 red marbles.

Lani removed one marble without looking, and she recorded the result. She placed the marble back in the box and repeated the procedure one more time. What is the probability that Lani removed a red marble followed by a blue marble?

- A.  $\frac{1}{36}$
- B.  $\frac{1}{18}$
- C.  $\frac{1}{3}$
- D.  $\frac{1}{2}$

*Reporting Category for Item 6: Data Analysis, Statistics, and Probability*

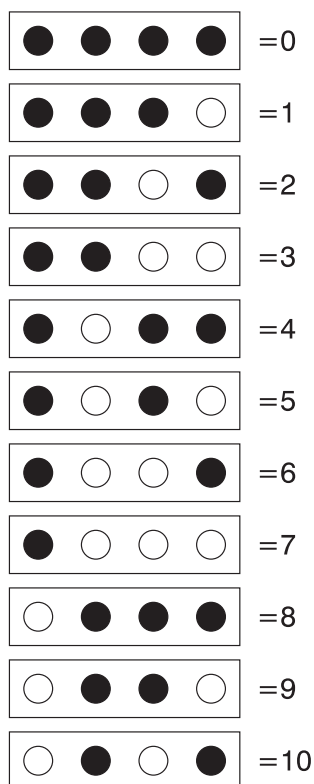
7 What is the value of the expression  $3|2 - 4| - 7$ ?

- A.  $-13$
- B.  $-1$
- C.  $1$
- D.  $13$

*Reporting Category for Item 7: Number Sense and Operations*

## Mathematics, Grade 10

- 8 Computers are designed around off/on switches that are used to represent numbers. In the following pattern, which represents the numbers from 0 to 10, ○ represents a switch that is on and ● represents a switch that is off.



Which of the following represents the number 11?

- A. 

○	○	○	●
---	---	---	---
- B. 

○	○	●	●
---	---	---	---
- C. 

○	●	○	○
---	---	---	---
- D. 

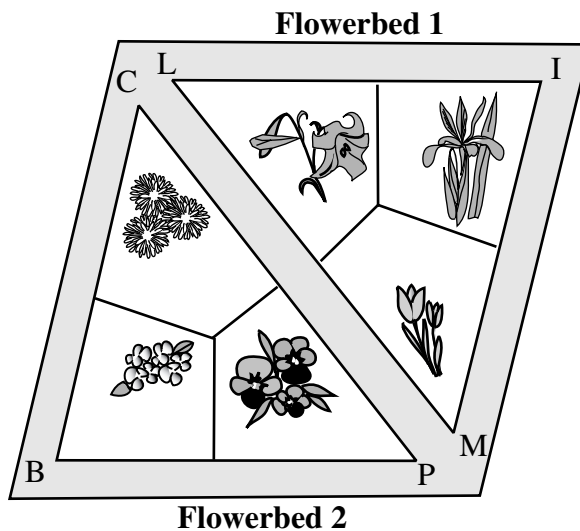
○	○	○	○
---	---	---	---

Reporting Category for Item 8: *Patterns, Relations, and Algebra*

## Mathematics, Grade 10

9 A landscape artist is designing two triangular flowerbeds so that:

- $\triangle LIM \cong \triangle PBC$ .
- $\triangle LIM$  encloses Flowerbed 1.
- $\triangle PBC$  encloses Flowerbed 2.
- The measure of  $\angle C$  is  $50^\circ$  and the measure of  $\angle B$  is  $75^\circ$ .



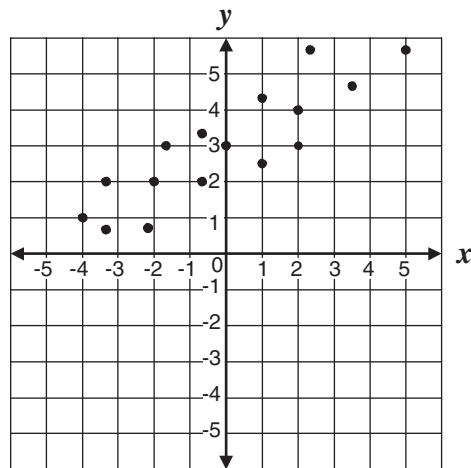
What is the measure of  $\angle L$ ?

- A.  $50^\circ$
- B.  $55^\circ$
- C.  $75^\circ$
- D.  $105^\circ$

Reporting Category for Item 9: **Geometry**

## Mathematics, Grade 10

Use the graph below to answer question 10.



- 10 Which of the following equations **best** represents the data in the graph?
- A.  $y = 2x + 3$
  - B.  $y = \frac{1}{2}x + 3$
  - C.  $y = 2x - 3$
  - D.  $y = \frac{1}{2}x - 3$

Reporting Category for Item 10: *Data Analysis, Statistics, and Probability*



## Mathematics, Grade 10

11 Which of the following equations **does not** represent a linear relationship?

A.  $xy = 12$

B.  $x + y = 12$

C.  $y = 12x$

D.  $x - y = 12$

*Reporting Category for Item 11: Patterns, Relations, and Algebra*

12 Solve the inequality  $|x - 7| \leq 8$  for  $x$ .

A.  $0 \leq x \leq 15$

B.  $-1 \leq x \leq 15$

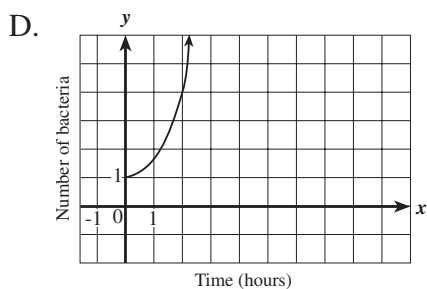
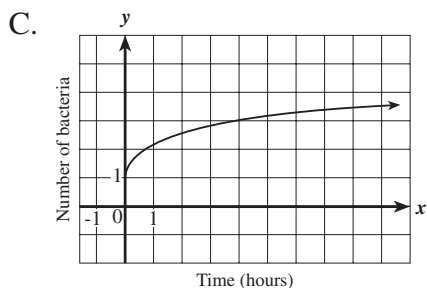
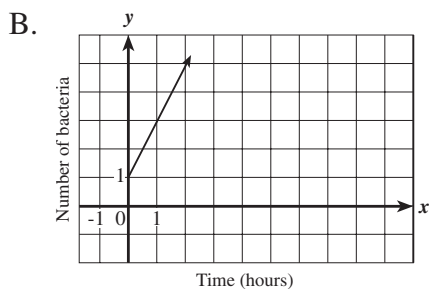
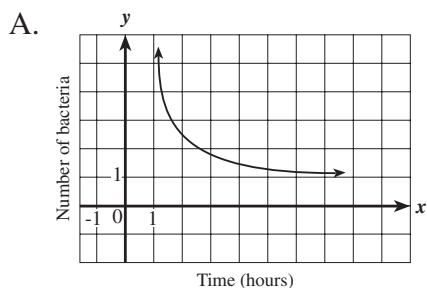
C.  $-1 \leq x \leq 16$

D.  $-7 \leq x \leq 8$

*Reporting Category for Item 12: Patterns, Relations, and Algebra*

# Mathematics, Grade 10

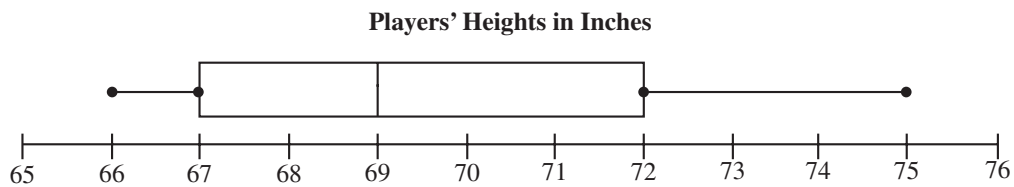
- 13** The number of bacteria in a culture doubles each hour. Which graph below **best** represents this situation?



Reporting Category for Item 13: *Patterns, Relations, and Algebra*

## Mathematics, Grade 10

- 14 The heights of the 20 players on a school soccer team are recorded in the box-and-whisker plot shown below.



Based on the information given in the box-and-whisker plot, which of the following statements is true?

- A. The mean height of the team is 69 inches.
- B. Half the players' heights are between 67 and 72 inches.
- C. The shortest player on the team is 67 inches.
- D. The range of heights of players on the team is 5 inches.

*Reporting Category for Item 14: Data Analysis, Statistics, and Probability*

Session 1, Short-Answer Questions



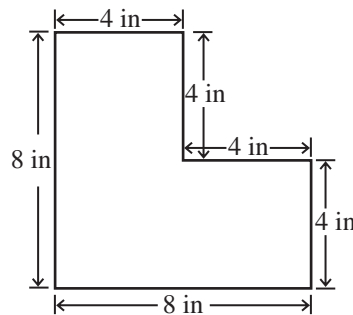
- 15 Solve the following equation for  $x$ .

$$3x - (2x - 3) = 2x + 9$$

Reporting Category for Item 15: *Patterns, Relations, and Algebra*

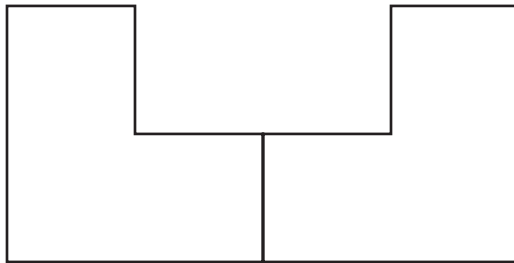
- 16 Geoffrey is building a patio. The floor of his patio will be made of bricks. The diagram below shows the shape of each brick.

One Brick



Geoffrey can combine two bricks side-by-side to make different shapes. An example of one combination of two bricks is shown below.

Two Bricks



What combination of two bricks would have the **smallest** base perimeter?  
Draw this combination in your Student Answer Booklet.

Reporting Category for Item 16: *Measurement*

## Mathematics, Grade 10

### Session 1, Open-Response Question



- 17** Casey placed six identical cards in a box. Each card was marked with one integer using each of the integers 0, 1, 2, 3, 4, and 5 once. Casey drew two cards at random, one at a time, without replacing the first card.
- Make a list, chart, or diagram of the possible outcomes when choosing two cards in this manner.
  - What is the probability that the sum of the integers on the two cards is greater than 9?
  - Based on your response to part a., what is the most frequently occurring sum of the integers? What is the probability that this sum will occur?

*Reporting Category for Item 17: Data Analysis, Statistics, and Probability*

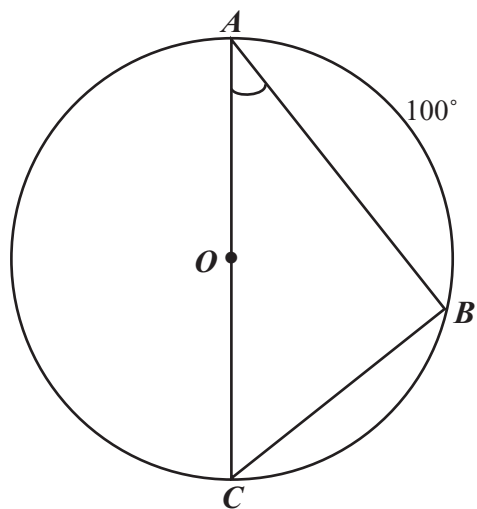
Session 1, Short-Answer Questions



- 18 What is the simplest form of the expression  $\frac{2x^4y^2}{x^2y^2}$ ,  $x \neq 0$ ,  $y \neq 0$ ?

Reporting Category for Item 18: *Patterns, Relations, and Algebra*

Use the figure below to answer question 19.



- 19 Triangle  $ABC$  is inscribed in a circle  $O$ . What is the measure of  $\angle A$ ?

Reporting Category for Item 19: *Geometry*

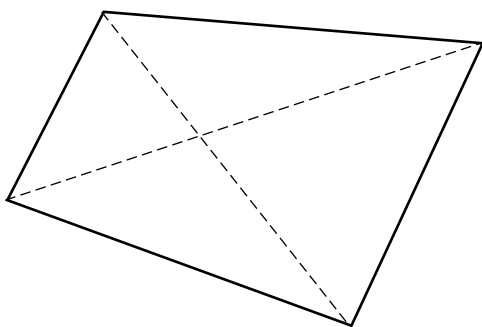
### Session 1, Open-Response Questions

- 20** Theresa took a test that had a total of 50 questions. There were 20 open-response questions and 30 short-answer questions on the test.
- There was a total of 100 points on the test; each question on the test was worth the same number of points. How many points was each question worth? Show your work or explain how you obtained your answer.
  - Suppose that 90% was the minimum score required in order to earn an A on this test. How many questions could Theresa answer incorrectly and still earn an A? Show your work or explain how you obtained your answer.
  - If Theresa answered all of the short-answer questions correctly, what is the minimum percent of open-response questions that Theresa must answer correctly in order to receive a score of 90% on the test? Show your work or explain how you obtained your answer.

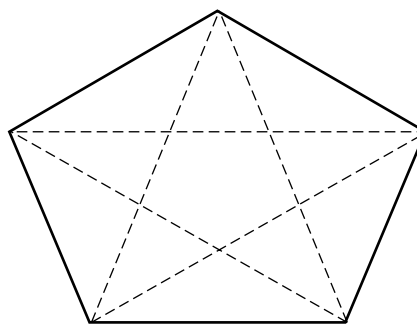
*Reporting Category for Item 20: **Number Sense and Operations***

## Mathematics, Grade 10

- 21** Alex wanted to find a pattern to predict the total number of diagonals in a convex polygon. He used each of the figures below to determine the number of diagonals in the 4-sided convex polygon and the 5-sided convex polygon shown below.



**4-sided convex polygon**



**5-sided convex polygon**

- a. Create a table like the one shown below in your Student Answer Booklet. Complete the table to show the relationship between the number of sides, the number of diagonals drawn from each vertex, and the total number of diagonals in each of the convex polygons listed.

Number of sides	4	5	6	7	8
Number of diagonals from each vertex	1	2	3		
Total number of diagonals	2	5	9		

- b. What is the total number of diagonals that a convex polygon of 12 sides has?
- c. Write an expression which represents the number of diagonals that a convex polygon of  $n$  sides has.

*Reporting Category for Item 21: **Geometry***



Session 2, Multiple-Choice Questions



- 22 The rectangle shown below has a width of 2.5 feet and a perimeter of 13 feet.



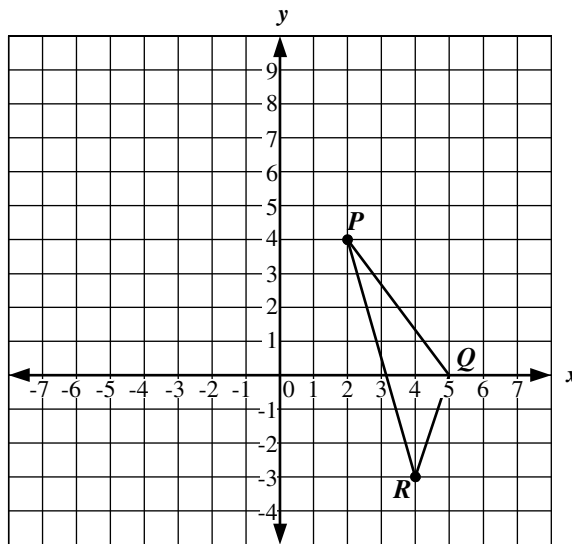
What is the area of the rectangle?

- A. 4 square feet
- B. 8 square feet
- C. 10 square feet
- D. 10.5 square feet

Reporting Category for Item 22: *Measurement*

## Mathematics, Grade 10

- 23 Isaac is going to draw  $\triangle STU$  on the grid shown below so that it is congruent to  $\triangle PQR$ .



He located point  $S$  at  $(-1, 0)$  and point  $T$  at  $(-4, 4)$ . Which of the following coordinates represents a possible location for point  $U$ ?

- A.  $(-3, 6)$
- B.  $(-3, 7)$
- C.  $(-4, 3)$
- D.  $(-4, 7)$

Reporting Category for Item 23: **Geometry**

## Mathematics, Grade 10

24 An important formula in statistics is  $z = \frac{(x - \mu)}{\sigma}$ . Which of the following represents this equation solved for  $x$  in terms of  $z$ ,  $\mu$ , and  $\sigma$ ?

A.  $x = z\sigma + \mu$

B.  $x = z\sigma - \mu$

C.  $x = \frac{z + \mu}{\sigma}$

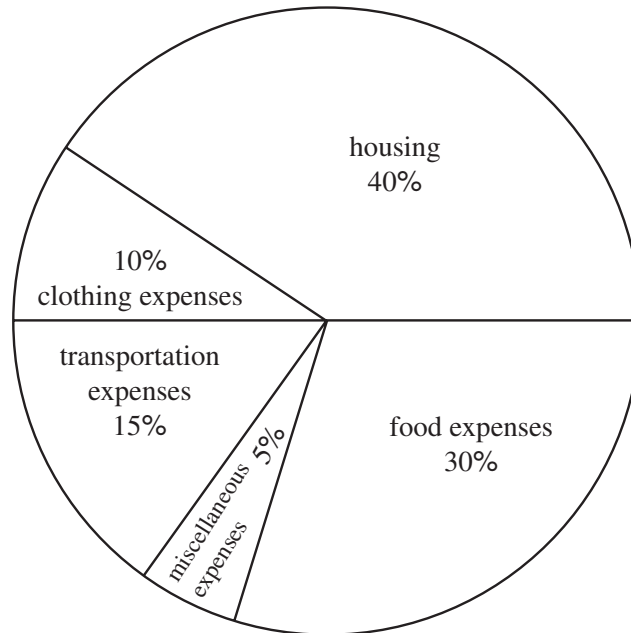
D.  $x = \frac{z - \mu}{\sigma}$

*Reporting Category for Item 24: Patterns, Relations, and Algebra*

## Mathematics, Grade 10

- 25 The circle graph below shows the Corbett family's monthly budget. The Corbett family has a total monthly income of \$2,000.

**Corbett Family's Monthly Budget**



Mr. Corbett received a \$100 per month raise. He increased the transportation expense portion of the monthly budget by \$100. To the nearest percent, what portion of the Corbetts' income is now being spent on transportation expenses?

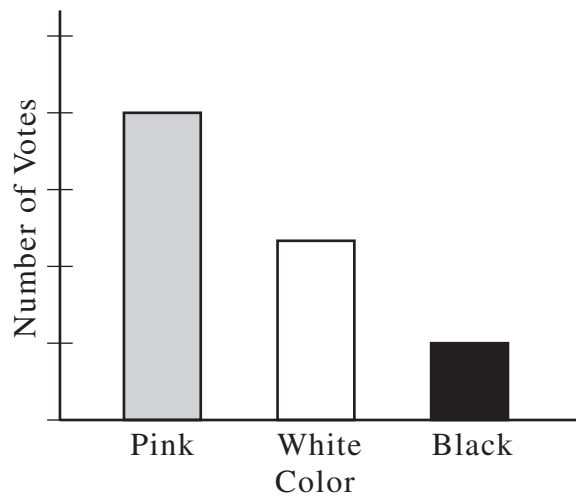
- A. 14 percent
- B. 19 percent
- C. 20 percent
- D. 21 percent

Reporting Category for Item 25: *Data Analysis, Statistics, and Probability*

## Mathematics, Grade 10

- 26 A company that makes ballet shoes surveyed 200 customers. Each customer voted for one favorite color of ballet shoe. The bar graph shows the results.

**Ballet Shoe Color Preferences  
(200 Total Votes)**



Based on the data in the graph, which of the following is the **best** estimate of the number of customers who voted for “Pink”?

- A. 80
- B. 110
- C. 140
- D. 170

Reporting Category for Item 26: *Number Sense and Operations*

## Mathematics, Grade 10

- 27 If the graphs of  $y = 5x + 40$  and  $y = 10x + 20$  are drawn on the same axes, they will
- A. not intersect.
  - B. intersect at (5, 10).
  - C. intersect at (4, 60).
  - D. intersect at (12, 100).

*Reporting Category for Item 27: Patterns, Relations, and Algebra*

- 28 Let  $x$  and  $y$  be real numbers with  $x < y < 1$ . Which of the following is **always** a real number that lies between  $x$  and  $y$ ?
- A.  $x - y$
  - B.  $x + y$
  - C.  $\frac{x - y}{2}$
  - D.  $\frac{x + y}{2}$

*Reporting Category for Item 28: Number Sense and Operations*

## Mathematics, Grade 10

- 29 The average life spans of some animals are shown in the chart below.

**Animal Life Spans**

Animal	Average Life Span (in years)
Bear	22
Chicken	7
Deer	12
Dog	11
Duck	10
Elephant	35
Fox	9
Horse	22
Hippopotamus	30
Wolf	11

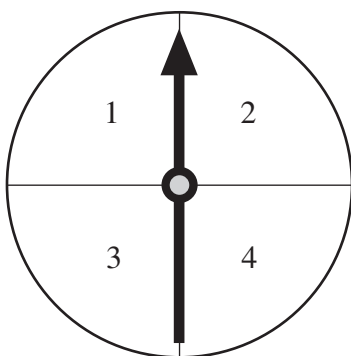
Source: Farmer's Almanac 2000.

Based on the information given in the chart, which of the following statistics yields the greatest numerical value?

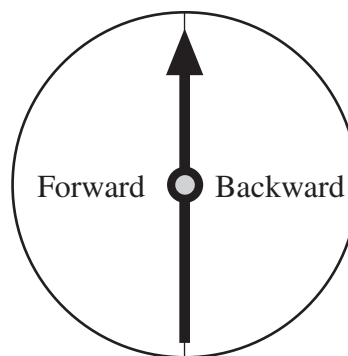
- A. mean
- B. median
- C. mode
- D. range

Reporting Category for Item 29: *Data Analysis, Statistics, and Probability*

- 30 Janet is playing a game using the two spinners shown below. She will spin the arrow on each spinner once and will move a specified number of steps forward or backward according to the results of the spins.



Spinner 1



Spinner 2

What is the probability that Janet will have to move backward **less than** 4 steps?

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

*Reporting Category for Item 30: Data Analysis, Statistics, and Probability*



## Session 2, Open-Response Question



- 31** When a diver goes underwater, the weight of the water exerts pressure on the diver. The table below shows how the water pressure on the diver increases as the diver's depth increases.

**Water Pressure on a Diver**

Diver's Depth (in feet)	Water Pressure (in pounds per square inch)
10	4.4
20	8.8
30	13.2
40	17.6
50	22.0

- a. Based on the table above, what will be the water pressure on a diver at a depth of 60 feet? Show your work or explain how you obtained your answer.
- b. Based on the table above, what will be the water pressure on a diver at a depth of 100 feet? Show your work or explain how you obtained your answer.
- c. Write an equation that describes the relationship between the depth,  $D$ , and the pressure,  $P$ , based on the pattern shown in the table.
- d. Use your equation from part c to determine the depth of the diver, assuming the water pressure on the diver is 46.2 pounds per square inch. Show your work or explain how you obtained your answer.

*Reporting Category for Item 31: Patterns, Relations, and Algebra*

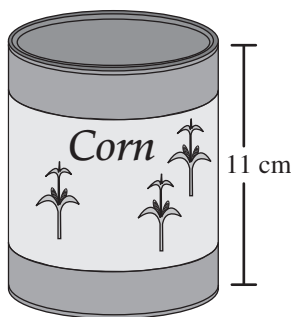
## Session 2, Multiple-Choice Questions



- 32 In her closet, Megan has 6 different T-shirts, 5 different pairs of shorts, and 2 different hats. She pulls out 1 T-shirt, 1 pair of shorts, and 1 hat without looking. How many different combinations of 1 T-shirt, 1 pair of shorts, and 1 hat are possible?
- A. 11
  - B. 16
  - C. 32
  - D. 60

Reporting Category for Item 32: *Data Analysis, Statistics, and Probability*

- 33 The can of corn shown below is a right circular cylinder with a height of 11 cm. The volume of the can is 486 cubic centimeters.



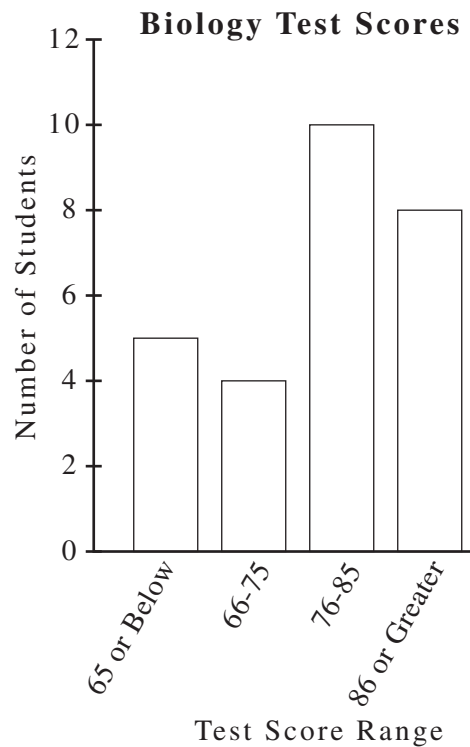
What is the approximate radius of the can of corn?

- A. 1.3 cm
- B. 3.8 cm
- C. 7.0 cm
- D. 14.1 cm

Reporting Category for Item 33: *Number Sense and Operations*

## Mathematics, Grade 10

- 34 The bar graph below shows the distribution of scores on a biology test.



Based on the graph, which of the following is **not** a valid conclusion?

- A. The total number of students tested was 27.
- B. At least 5 students scored fewer than 60 points.
- C. A total of 9 students scored 75 points or fewer.
- D. At least 8 students scored more than 80 points.

Reporting Category for Item 34: **Data Analysis, Statistics, and Probability**

## Mathematics, Grade 10

- 35 The lengths of three sides of a triangle are 5, 9, and  $x$ , all measured in centimeters. What are all possible values of  $x$ ?

- A.  $4 < x < 14$
- B.  $0 < x < 14$
- C.  $5 < x < 15$
- D.  $3 < x < 9$

*Reporting Category for Item 35: Geometry*

- 36 A set contains the numbers

$$\frac{8}{2}, -2.3, 0, \frac{2}{7}, \sqrt{9}, 0.\overline{31}, \sqrt{15}, -12, 2\pi.$$

Which of the following statements is true?

- A. The set contains 8 irrational numbers.
- B. The set contains 7 irrational numbers.
- C. The set contains 3 irrational numbers.
- D. The set contains 2 irrational numbers.

*Reporting Category for Item 36: Number Sense and Operations*

## Mathematics, Grade 10

- 37 Aircraft design engineers use the formula  $V = \sqrt{\frac{841L}{CS}}$  to determine the safe landing speed of aircraft where

$V$  = safe landing speed in feet per second  
 $L$  = gross weight of the aircraft in pounds  
 $C$  = coefficient of lift  
 $S$  = wing surface area in square feet.

What is the approximate safe landing speed for an aircraft with a gross weight of 9000 pounds and a wing surface area of 225 square feet, when the coefficient of lift is 2.8?

- A. 4 feet per second
- B. 110 feet per second
- C. 414 feet per second
- D. 22,000 feet per second

*Reporting Category for Item 37: Number Sense and Operations*

- 38 On January 1, 2000, a car had a value of \$15,000. Each year after that, the car's value will decrease by 20 percent of the previous year's value. Which expression represents the car's value on January 1, 2003?

- A.  $15,000(0.8)^3$
- B.  $15,000(0.8)^4$
- C.  $15,000(0.2)^3$
- D.  $15,000(0.2)^4$

*Reporting Category for Item 38: Patterns, Relations, and Algebra*

## Mathematics, Grade 10

- 39 Which of the following equations represents a line that is parallel to the line  $4x - 2y = 8$  and passes through the point  $(0, -8)$ ?
- A.  $2x + y = -4$
  - B.  $2x - y = 8$
  - C.  $x - 2y = 8$
  - D.  $x - 2y = 16$

*Reporting Category for Item 39: **Geometry***

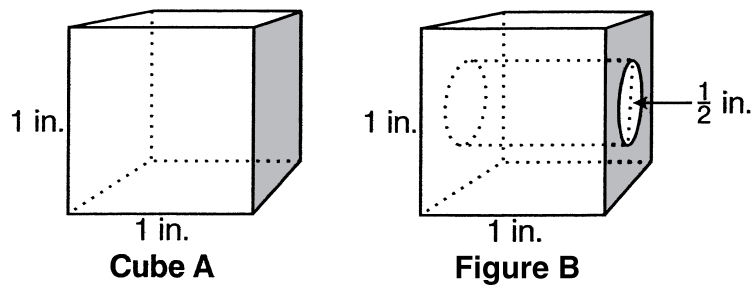
- 40 What is the effect on the circumference of a circle if the circle's radius is doubled?
- A. The circumference is multiplied by 2.
  - B. The circumference is multiplied by 4.
  - C. The circumference is multiplied by 8.
  - D. The circumference stays the same.

*Reporting Category for Item 40: **Measurement***

Session 2, Open-Response Questions



- 41 Cube A is a 1-inch solid cube. Figure B shows a 1-inch solid cube after a cylindrical hole has been drilled through its center. The diameter of the cylindrical hole is  $\frac{1}{2}$  inch, and its height is perpendicular to two opposite faces of the original cube, as shown in the diagram.

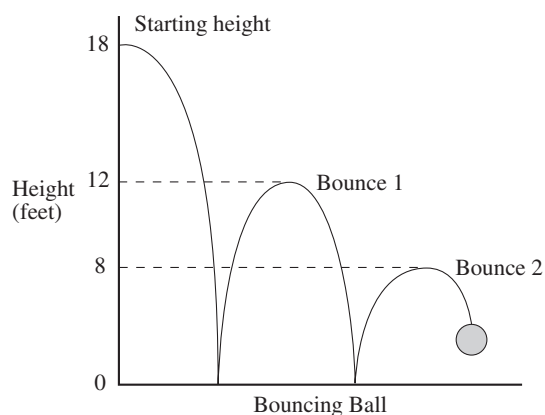


- What is the total surface area of Cube A?
- What is the total surface area of Figure B? Show your work or explain how you obtained your answer.

Reporting Category for Item 41: *Measurement*

## Mathematics, Grade 10

- 42 The diagram shown below represents the path of a ball that is dropped from a height of 18 feet. On its first bounce, the ball rebounds to a height of 12 feet; on its second bounce, it rebounds to a height of 8 feet.



- Show that the ratio of the height of Bounce 1 to the starting height is equal to the ratio of the height of Bounce 2 to the height of Bounce 1. Show your work or explain how you obtained your answer.
- Create a table like the one shown below in your Student Answer Booklet.

Bounce, $b$	Height, $h$ (in feet)
0 (Starting height)	18
1	12
2	8
3	
4	
5	

If the pattern in the table continues, complete your table to show the height of bounces 3, 4, and 5.

- Based on the pattern shown in the table, if  $h$  is the height of a certain bounce, write an expression that represents the height of the next bounce in terms of  $h$ .
- Based on the pattern shown in the table, write an equation that represents the relationship between height,  $h$ , and bounce,  $b$ .

*Reporting Category for Item 42: Patterns, Relations, and Algebra*