Mathematics
SESSION 1

You may use your reference sheet during this session.
*You may **not** use a calculator during this session.*

DIRECTIONS
This session contains fourteen multiple-choice questions, four short-answer questions, and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

1 A class of students took a mathematics test. The table below shows their scores and the number of students who received each score.

Number of Students Who Received Each Score

Score	Number of Students
23	3
26	5
27	5
28	2
30	7
33	2
34	1

What is the median of the scores for the entire class of students?

A. 26

B. 27

C. 29

D. 30

2 Jonathan rents an office for his craft business. The rent is $1.85 per square foot per month.

If Jonathan rents an office with an area of 320 square feet, which of the following estimates is closest to the cost of renting the office for 6 months?
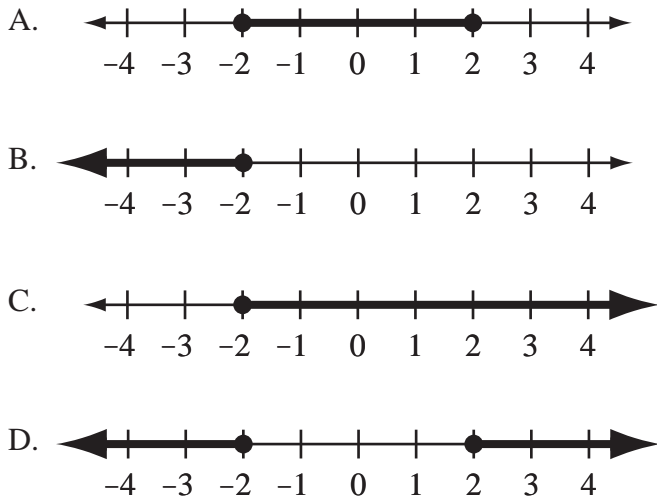
A. $600

B. $800

C. $3600

D. $4200

3 Which of the following is equivalent to the expression below?

$$x^2 + 3x - 28$$

A. $(x - 4)(x + 7)$

B. $(x + 4)(x - 7)$

C. $(x - 14)(x + 2)$

D. $(x + 14)(x - 2)$

4 Which of the following graphs represents the solution of the inequality below?

$$|x| \le 2$$

A.

```
←--+--+--●--+--+--+--●--+--+→
  -4 -3 -2 -1  0  1  2  3  4
```

B.

```
←●--+--+--●--+--+--+--+--+→
  -4 -3 -2 -1  0  1  2  3  4
```

C.

```
←--+--+--●--+--+--+--+--+--→
  -4 -3 -2 -1  0  1  2  3  4
```

D.

```
←●--+--+--●--+--+--+--●--+--→
  -4 -3 -2 -1  0  1  2  3  4
```

---

5 Ms. Burke correctly weighed a tomato to the nearest ounce and recorded the weight. The weight she recorded was 13 ounces.

What is the **least** possible actual weight of the tomato?

A. 12.0 ounces

B. 12.5 ounces

C. 13.0 ounces

D. 13.4 ounces

6 The solutions of a quadratic equation are shown below.

$$4 \pm \sqrt{60}$$

Which of the following pairs of numbers is closest to the solutions of the equation?

A. 11 and −3

B. 12 and −4

C. 19 and −11

D. 34 and −26

7 Based on the equation below, what is the value of y when $x = 5$?

$$y = 4(8 - x)^2$$

A. 12

B. 36

C. 144

D. 156

8 Exactly three diagonals can be drawn from **each** vertex of a given polygon. What is the total number of sides of the polygon?

A. 3

B. 4

C. 5

D. 6

9 The numbers of pages that Millie read on each of the first seven days after she got a new book are shown in the box below.

15, 20, 15, 45, 30, 35, 15

What is the median number of pages Millie read per day for the seven days?

A. 15

B. 20

C. 25

D. 45

10 Which of the following is equivalent to the expression below?

$$(3x^2 + 2x - 8) - (2x^2 - 4x + 7)$$

A. $x^2 + 6x - 15$

B. $x^2 - 2x - 15$

C. $x^2 + 6x - 1$

D. $x^2 - 2x - 1$

11 What is the value of the expression below?

$$\left(\sqrt{7}\right)^4$$

A. 7

B. 28

C. 49

D. 98

12 What is the slope of the line represented by the equation below?
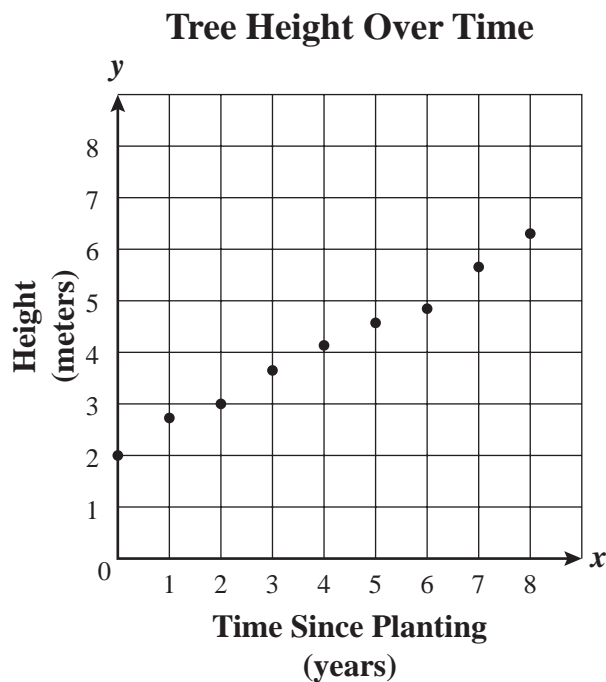
$$3x + 2y = -8$$

A. -3

B. $-\dfrac{3}{2}$

C. $\dfrac{3}{2}$

D. 3

13 What is the value of the expression below?

$$2\left|9 - 27\right|$$

A. -72

B. -36

C. 36

D. 72

14 Cynthia and her father planted a tree in their front yard 8 years ago. The tree was 2 meters in height when it was planted. The scatterplot below shows how the height of the tree increased each year.

Tree Height Over Time

Which of the following most closely approximates the equation of the line of best fit for the data points in the scatterplot?

A. $y = -2x + 2$

B. $y = 2x + 2$

C. $y = -\frac{1}{2}x + 2$

D. $y = \frac{1}{2}x + 2$

Questions 15 and 16 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

15   The diagram below shows parallelogram *MNPQ* and one of its dimensions.
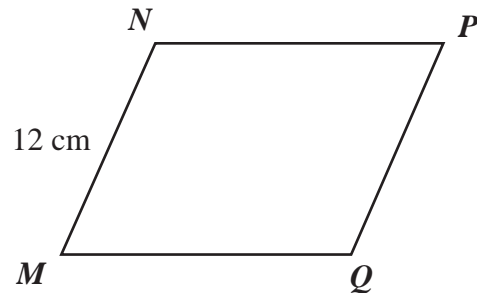
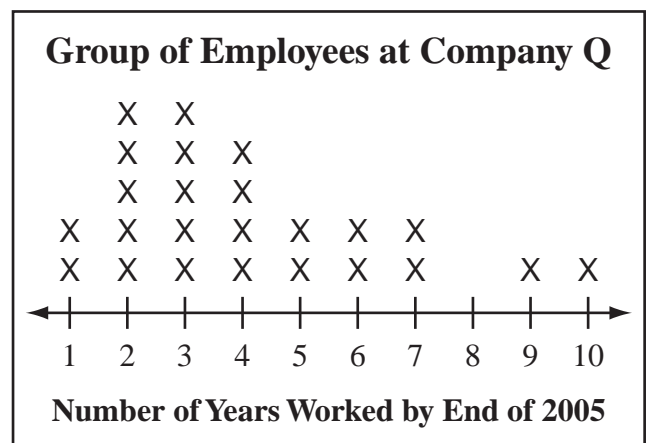The perimeter of parallelogram *MNPQ* is 54 centimeters. What is the length, in centimeters, of $\overline{NP}$?
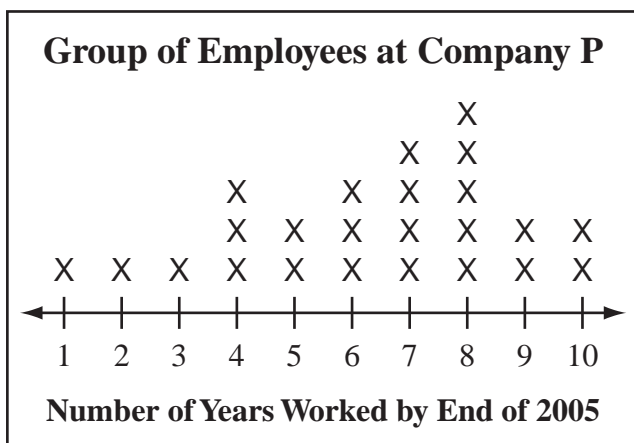
16   What is the value of $\sqrt{51}$ to the nearest whole number?

Question 17 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 17 in the space provided in your Student Answer Booklet.

17 Carla collects employment data. At the end of 2005, she asked a group of 24 employees at Company P how many years each had worked at that company. She asked the same question of a group of 24 employees at Company Q. The line plots below show her results, where each X represents one employee.

```
Group of Employees at Company P

                        X
              X   X
      X       X  X  X
      X  X  X  X  X  X  X
X  X  X  X  X  X  X  X  X  X
<---+--+--+--+--+--+--+--+--+--+--->
    1  2  3  4  5  6  7  8  9  10
    Number of Years Worked by End of 2005
```

```
Group of Employees at Company Q

      X  X
      X  X  X
      X  X  X
X  X  X  X  X  X  X
X  X  X  X  X  X  X        X  X
<---+--+--+--+--+--+--+--+--+--+--->
    1  2  3  4  5  6  7  8  9  10
    Number of Years Worked by End of 2005
```

    a. For the group of employees at Company P, what are the following measures for the number of years worked by the end of 2005?

- mode

- median

Show or explain how you got each of your answers.

    b. For the group of employees at Company Q, what are the following measures for the number of years worked by the end of 2005?

- mode

- median

Show or explain how you got each of your answers.

    c. **Without** computing the mean for either group, use the line plots to determine which group of employees has the greater mean number of years worked by the end of 2005. Explain how you got your answer without computing the means.

Questions 18 and 19 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

18 Serena bought some small and large picture frames.

- She paid $3 for each small picture frame.
- She paid $5 for each large picture frame.
- She bought a total of 10 picture frames.
- She paid a total of $36 for all the picture frames. There is no sales tax.

What is the number of **large** picture frames that Serena bought?

19 The stem-and-leaf plot below shows the number of cars that crossed a bridge each day for 23 days.

**Number of Cars per Day
That Crossed the Bridge**

16	5
17	
18	
19	2 7
20	8 9
21	0 1 3 5 5 6 8 9
22	1 4 7
23	4 8
24	0 0 2 9
25	
26	2
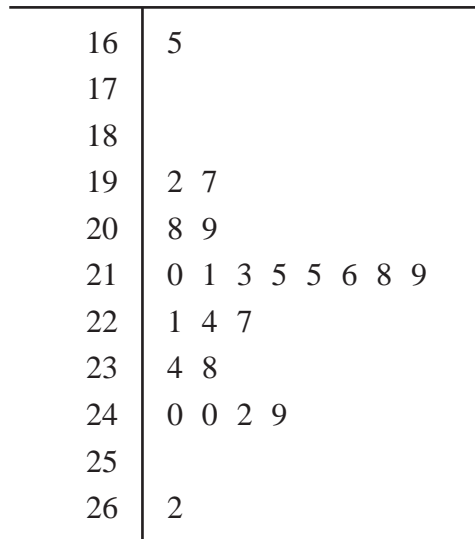
Key
24 │ 9 represents 249

What was the median number of cars per day that crossed the bridge during this time period?

Questions 20 and 21 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 20 in the space provided in your Student Answer Booklet.

**20** Thomas plays a number game using a spinner with four congruent sections. The sections are labeled W, X, Y, and Z, as shown below.
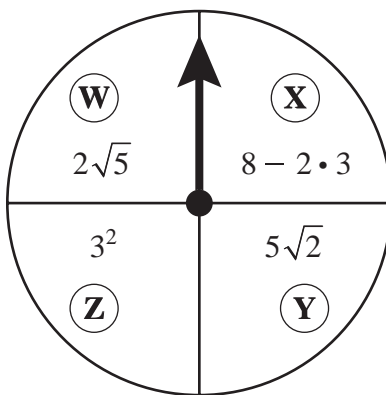
In the game, a player receives the number of points represented by the expression in the section where the arrow stops. The first player to get 20 points or more wins.

a. During one game, Thomas needed 10 or more points to win. On his next spin the arrow stopped on section Z. Did he receive enough points to win? Show your work to justify your answer.

b. Which is worth more points, section X or section Z? Show your work to justify your answer.

c. Thomas believes section W and section Y are worth an equal number of points. Is Thomas correct? Explain your reasoning.

Write your answer to question 21 in the space provided in your Student Answer Booklet.

21 Anthony plotted the point $P(2, 5)$ on a coordinate grid, as shown below.
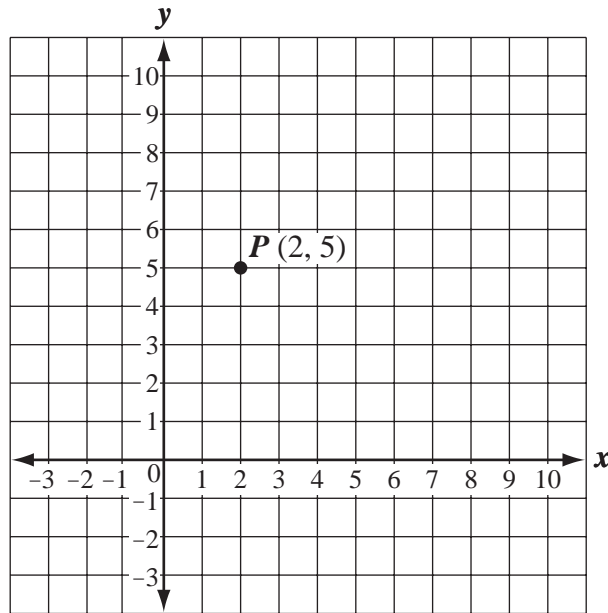
Anthony then graphed line q on the same coordinate grid.

- Line q contains point P.
- The y-intercept of line q is the point with coordinates $(0, 4)$.

a. What is the slope of line q? Show or explain how you got your answer.

b. Write an equation of line q. Show or explain how you got your equation.

Anthony also graphed line n on the same coordinate grid. Line n contains point P and is perpendicular to line q.

c. What is the slope of line n? Show or explain how you got your answer.

d. Write an equation of line n. Show or explain how you got your equation.

Mathematics

SESSION 2

You may use your reference sheet during this session.
You may use a calculator during this session.

DIRECTIONS
This session contains eighteen multiple-choice questions and three open-response questions.
Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

22 The first five terms of a number sequence are shown below.
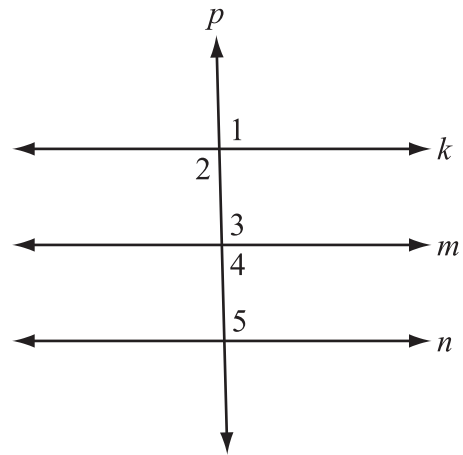
$$2, \ 4, \ 6, \ 10, \ 16, \ . . .$$

The rule for the sequence is shown in the box below.

> After the first two numbers, each number is the sum of the two previous numbers.

What is the eighth term of the sequence?

A. 22

B. 34

C. 46

D. 68

23 In the diagram below, lines k, m, and n are parallel lines intersected by line p.

Line p is **not** perpendicular to lines k, m, and n.

Which of the following angles has a measure that is **not** equal to the measure of $\angle 1$?

A. $\angle 2$

B. $\angle 3$

C. $\angle 4$

D. $\angle 5$

24 A magazine had 4000 subscribers at the end of the year 2004. The number of subscribers increased by 10% each year as compared with the previous year.

Which of the following is closest to the number of subscribers at the end of the year 2007?

A. 4330

B. 4400

C. 5200

D. 5320

25 Which of the following is equivalent to the expression below for all real values of n and k?

$$5^n \cdot 5^k$$

A. 5^{n+k}

B. 5^{n-k}

C. 5^{nk}

D. $5^{n \div k}$

26 The diagram below shows a small, shaded square inside a larger square.
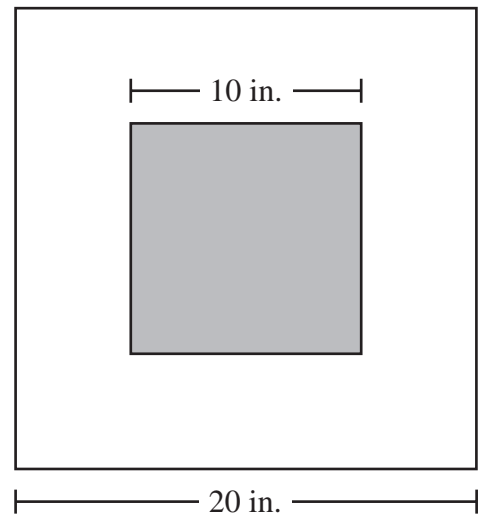
A point is located at random inside the larger square.

Based on the dimensions in the diagram, what is the probability that the point will be inside the small, shaded square?

A. $\frac{3}{4}$

B. $\frac{2}{3}$

C. $\frac{1}{2}$

D. $\frac{1}{4}$

27 The graph below shows Danielle's speed, in miles per hour, during the 24 minutes she spent riding her bicycle one day.

Danielle's Bicycle Speed
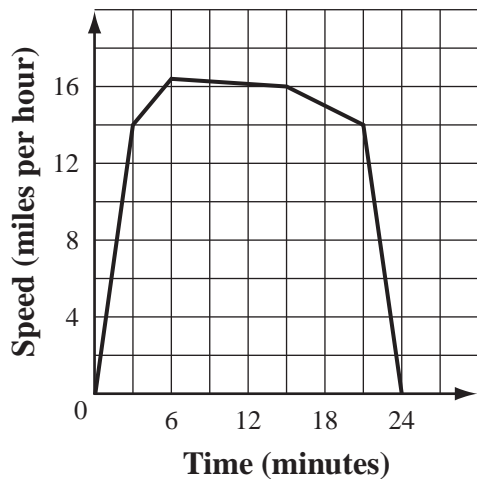
Which of the following is closest to the number of minutes that Danielle's speed was greater than 14 miles per hour?

A. 3
B. 9
C. 18
D. 21

28 A mechanic has two pieces of sandpaper of different sizes. Each piece is in the shape of a circle. The radius of the larger circle is 4 times the radius of the smaller circle.

The area of the larger circle is how many times the area of the smaller circle?

A. 2
B. 4
C. 8
D. 16

29 The slope of a line is $\frac{1}{3}$. The line contains the point $(6, 5)$.

Which of the following are the coordinates of another point on the line?

A. $(3, 4)$
B. $(3, 6)$
C. $(7, 2)$
D. $(7, 8)$

30 In the diagram below, $\triangle MNP \sim \triangle RST$.
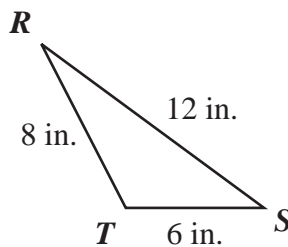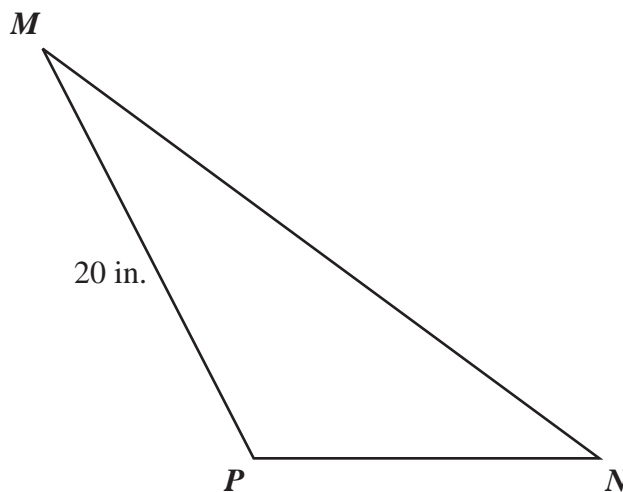
Based on the dimensions in the diagram, what is the length of $\overline{MN}$?

A. 15 in.
B. 24 in.
C. 30 in.
D. 40 in.

Question 31 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 31 in the space provided in your Student Answer Booklet.

31 Mr. Gomez's mathematics test consists of multiple-choice and short-answer questions only.

- Each multiple-choice question is worth 3 points.

- Each short-answer question is worth 5 points.

Let x and y be defined as follows:
- x = the number of multiple-choice questions
- y = the number of short-answer questions

a. The test has a total of 30 questions. Write an equation in terms of x and y that represents this fact.

b. Write an expression in terms of x that represents the total point value of all the multiple-choice questions.

c. Write an expression in terms of y that represents the total point value of all the short-answer questions.

d. The test has a total of 100 points. Write an equation in terms of x and y that represents this fact.

e. Use your equations from parts (a) and (d) to determine how many multiple-choice questions **and** how many short-answer questions are on the test. Show your work.

Mark your answers to multiple-choice questions 32 through 40 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

32 The label on a cereal box states the following:

- One serving of cereal contains 17 grams of carbohydrates.
- This number of grams is 6% of the maximum amount of carbohydrates that a person should eat in a day.

Based on this information, which of the following is closest to the maximum amount of carbohydrates that a person should eat in a day?

A. 1.02 grams
B. 2.83 grams
C. 102 grams
D. 283 grams

33 The circle graph below shows the distribution of the ages of 24 team members.

Ages of Team Members
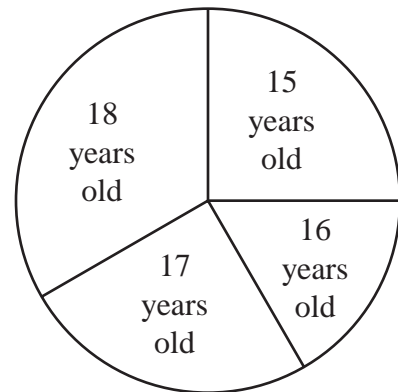
What is the median age, in years, of the team members?
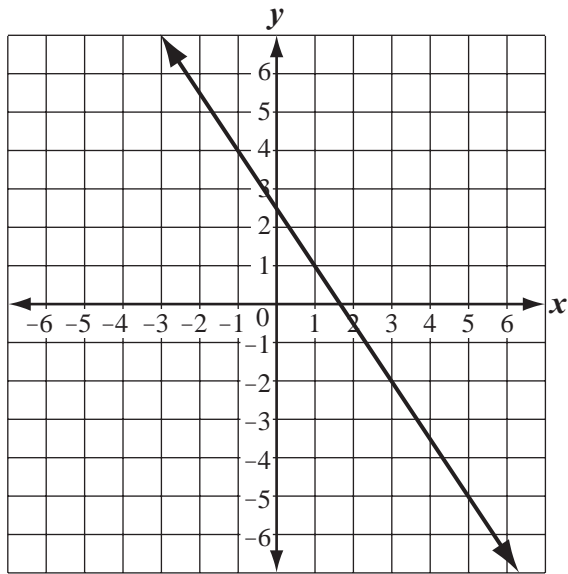
A. 15
B. 16
C. 17
D. 18

34 The diagram below shows the dimensions of a garden.
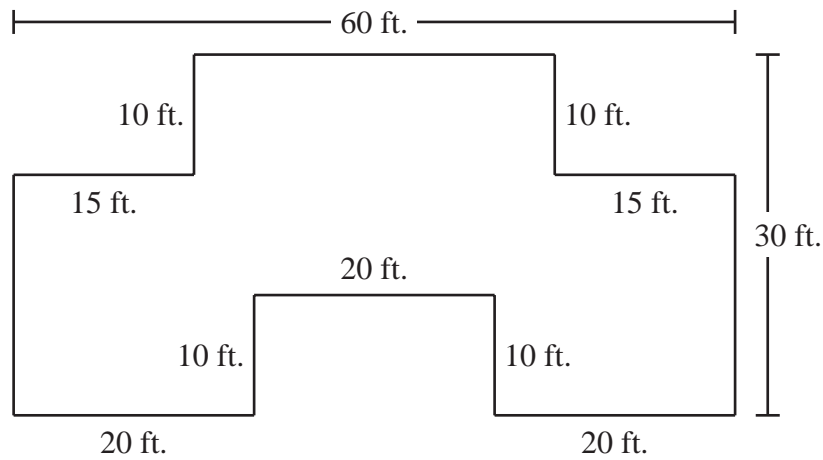
In the diagram, all intersecting line segments intersect at right angles. What is the area of the garden?

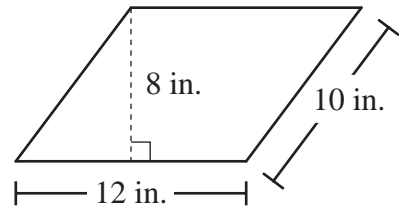A. 1200 sq. ft.
B. 1300 sq. ft.
C. 1500 sq. ft.
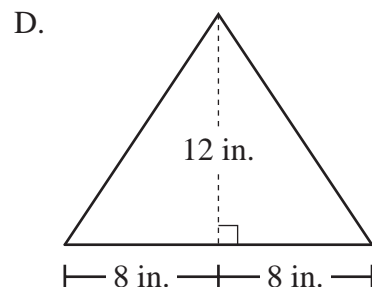D. 1800 sq. ft.

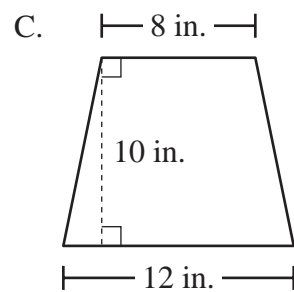**35** A line is shown on the coordinate grid below.

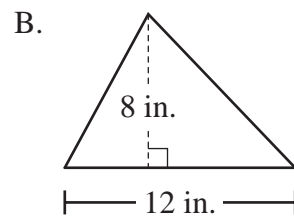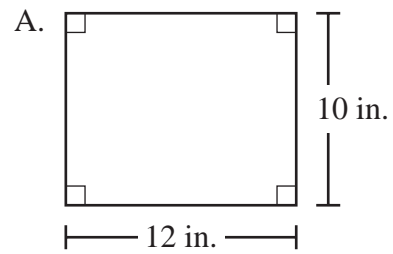Which of the following best represents the slope of the line?

A. $\dfrac{3}{2}$

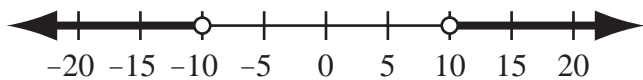B. $\dfrac{2}{3}$

C. $-\dfrac{2}{3}$

D. $-\dfrac{3}{2}$

36 The diagram below shows a parallelogram and its dimensions.

Which of the following has an area equal to the area of the parallelogram?

A.

B.

C.

D.

37 The graph below is the solution of which of the following inequalities?



A. $|x| > 10$

B. $|x| < 10$

C. $x > 10$

D. $x < -10$

**38** The coordinates of the endpoints of $\overline{ST}$ and its image $\overline{S'T'}$ are given below.

$$S(2, -4) \qquad S'(-2, -4)$$
$$T(-1, 1) \qquad T'(1, 1)$$

Which of the following single transformations maps $\overline{ST}$ to $\overline{S'T'}$?

A. translation 4 units to the left

B. rotation 180° clockwise about the origin

C. reflection over the x-axis

D. reflection over the y-axis

39 Beth drew a scatterplot and then correctly drew the line of best fit for her scatterplot. The line of best fit had a slope of 2. Which of the following is most likely Beth's scatterplot?

A.

B.

C.

D.
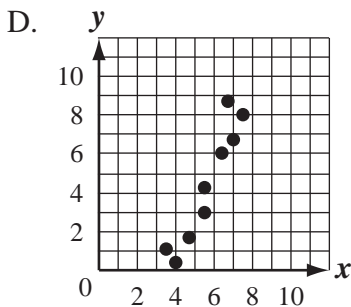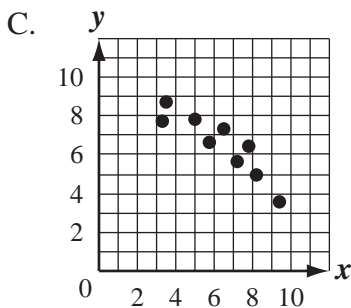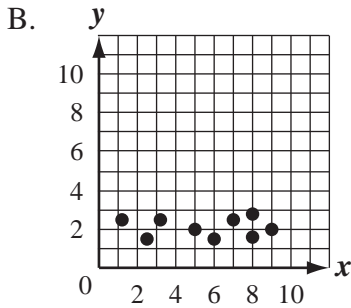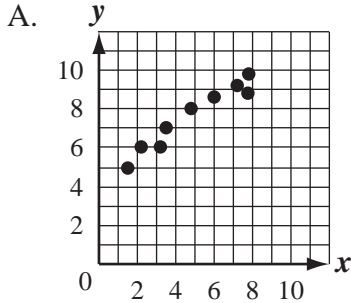
40 Triangle *PQR* in the diagram below represents Pam's trip across a river.
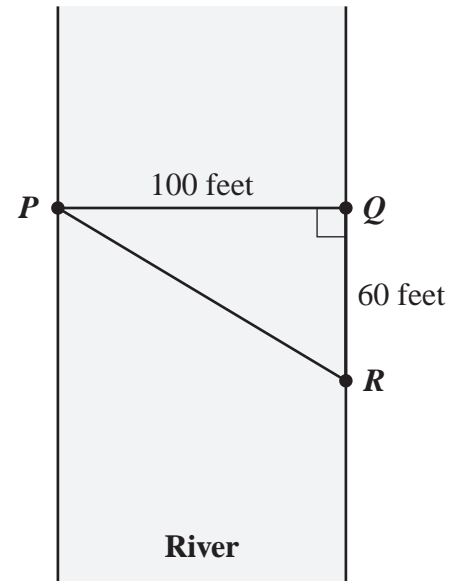
In the diagram, $\overline{PQ}$ represents her planned trip across the river, and $\overline{PR}$ represents her actual trip across the river.

Based on the dimensions in the diagram, which of the following is closest to the length of $\overline{PR}$?

A. 104 feet

B. 117 feet

C. 120 feet

D. 160 feet

Questions 41 and 42 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 41 in the space provided in your Student Answer Booklet.

41   Triangle *MNP* has vertices at *M*(0, 0), *N*(12, 0), and *P*(12, 16), as shown in the diagram below.
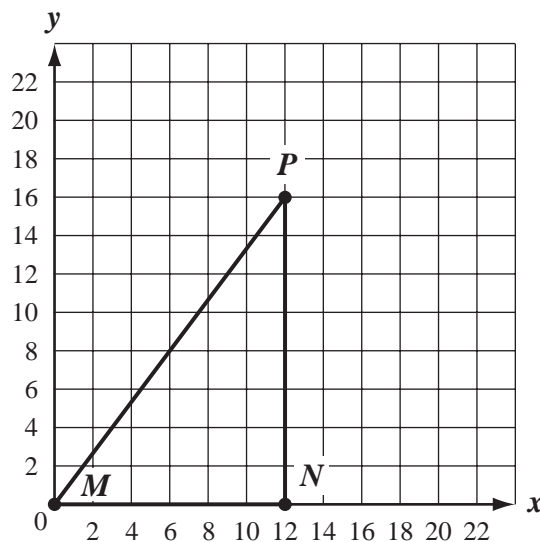
Let point *R* be the midpoint of $\overline{MN}$. Let point *S* be the midpoint of $\overline{NP}$.

a. What are the coordinates of each of the points listed below?
- point *R*
- point *S*

Show or explain how you got your answer for each point.

b. Is $\overline{RS}$ parallel to $\overline{MP}$? Show or explain how you got your answer.

c. What is the length, in units, of each of the line segments listed below?
- $\overline{MN}$
- $\overline{NP}$
- $\overline{MP}$

Show or explain how you got your answer for each line segment.

d. The length of $\overline{MP}$ is how many times the length of $\overline{RS}$? Show or explain how you got your answer.

Write your answer to question 42 in the space provided in your Student Answer Booklet.

42   Ralph's company makes doormats. Each doormat is in the shape of a semicircle, as shown in the diagram below.
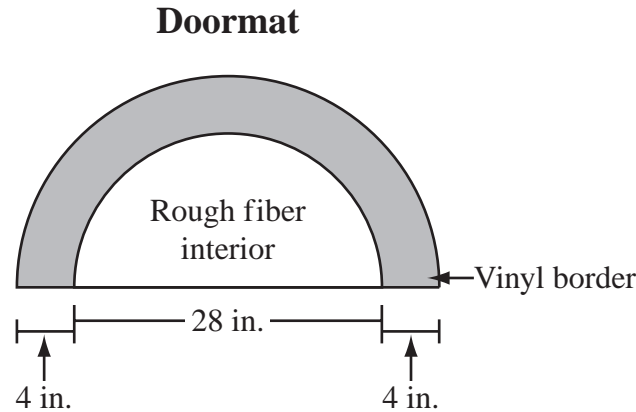
Doormat

Each doormat has two parts: a rough fiber interior and a vinyl border.

- The rough fiber interior is in the shape of a semicircle with a diameter of 28 inches.

- The vinyl border has a uniform width of 4 inches. The shaded part in the diagram represents the vinyl border.

a. What is the radius, in inches, of the rough fiber interior? Show or explain how you got your answer.

b. What is the radius, in inches, of the **entire** doormat? Show or explain how you got your answer.

c. What is the area, in square inches, of the rough fiber interior? Show or explain how you got your answer.

d. What is the area, in square inches, of the vinyl border? Show or explain how you got your answer.

Grade 10 Mathematics
Spring 2009 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	217	*Data Analysis, Statistics, and Probability*	10.D.1	B
2	217	*Number Sense and Operations*	10.N.4	C
3	217	*Patterns, Relations, and Algebra*	10.P.4	A
4	218	*Patterns, Relations, and Algebra*	10.P.6	A
5	218	*Measurement*	10.M.4	B
6	218	*Number Sense and Operations*	10.N.3	B
7	219	*Number Sense and Operations*	10.N.2	B
8	219	*Geometry*	10.G.1	D
9	219	*Data Analysis, Statistics, and Probability*	10.D.1	B
10	219	*Patterns, Relations, and Algebra*	10.P.3	A
11	220	*Number Sense and Operations*	10.N.1	C
12	220	*Patterns, Relations, and Algebra*	10.P.2	B
13	220	*Number Sense and Operations*	10.N.2	C
14	220	*Data Analysis, Statistics, and Probability*	10.D.2	D
15	221	*Measurement*	10.M.1	15 cm
16	221	*Number Sense and Operations*	10.N.3	7
17	222	*Data Analysis, Statistics, and Probability*	10.D.1	
18	223	*Patterns, Relations, and Algebra*	10.P.8	3
19	223	*Data Analysis, Statistics, and Probability*	10.D.1	218
20	224	*Number Sense and Operations*	10.N.2	
21	225	*Patterns, Relations, and Algebra*	10.P.2	
22	226	*Patterns, Relations, and Algebra*	10.P.1	D
23	226	*Geometry*	10.G.3	C
24	227	*Patterns, Relations, and Algebra*	10.P.7	D
25	227	*Number Sense and Operations*	10.N.1	A
26	227	*Data Analysis, Statistics, and Probability*	8.D.4	D
27	228	*Data Analysis, Statistics, and Probability*	10.D.1	C
28	228	*Measurement*	10.M.3	D
29	229	*Patterns, Relations, and Algebra*	10.P.2	A
30	229	*Geometry*	10.G.4	C
31	230	*Patterns, Relations, and Algebra*	10.P.8	
32	231	*Patterns, Relations, and Algebra*	10.P.7	D
33	231	*Data Analysis, Statistics, and Probability*	10.D.1	C
34	232	*Measurement*	10.M.1	B
35	233	*Patterns, Relations, and Algebra*	10.P.2	D
36	233	*Measurement*	10.M.1	D
37	234	*Patterns, Relations, and Algebra*	10.P.6	A
38	234	*Geometry*	10.G.9	D
39	235	*Data Analysis, Statistics, and Probability*	10.D.2	D
40	235	*Geometry*	10.G.5	B
41	236	*Geometry*	10.G.7	
42	237	*Measurement*	10.M.1	

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.