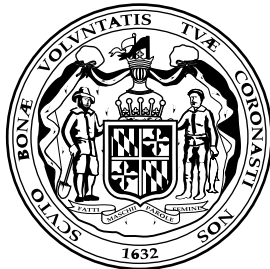


# ***Mathematics***

**Goal 1: Functions and Algebra**

**Goal 3: Data Analysis and Probability**



*Maryland High School Assessment*

Public Release, Fall 2002

**CTB/McGraw-Hill**

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# Session

# 1



## Response Grid Questions

Several questions in this test require you to enter your answer on a special grid like the one shown below.

/	/	/		
.	.	.	.	.
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

answer boxes  
fraction bars  
decimal points  
number bubbles

### Directions for Completing the Response Grids

1. Find the answer to the problem.
2. Write your answer in the boxes at the top of the grid.
  - Print your answer with the first digit (or symbol) in the left answer box, or with the last digit in the right answer box.
  - Print no more than one digit or symbol in each answer box. Do not leave a blank answer box in the middle of an answer.
  - Be sure to write a decimal point or fraction bar in the answer box if it is part of the answer.
3. Fill in the appropriate bubble under each box in which you wrote your answer.
  - Fill in only one bubble for each answer box used in your answer. Do not fill in a bubble under an unused answer box.
  - You must fill in the bubbles accurately to receive credit for your answer.



## Examples of Valid Responses

The Response Grids below show valid ways to enter an answer of  $\frac{3}{2}$ .

		3	/	2	
	/	/	•		
•	•	•	•	•	
0	0	0	0	0	
1	1	1	1	1	
2	2	2	2	•	
3	3	•	3	3	
4	4	4	4	4	
5	5	5	5	5	
6	6	6	6	6	
7	7	7	7	7	
8	8	8	8	8	
9	9	9	9	9	

3	/	2			
•	•	/	/		
•	•	•	•	•	
0	0	0	0	0	
1	1	1	1	1	
2	2	•	2	2	
•	3	3	3	3	
4	4	4	4	4	
5	5	5	5	5	
6	6	6	6	6	
7	7	7	7	7	
8	8	8	8	8	
9	9	9	9	9	

1	.	5			
/	/	/			
•	•	•	•	•	
0	0	0	0	0	
•	1	1	1	1	
2	2	2	2	2	
3	3	3	3	3	
4	4	4	4	4	
5	5	•	5	5	
6	6	6	6	6	
7	7	7	7	7	
8	8	8	8	8	
9	9	9	9	9	

1	.	5	0		
/	/	/			
•	•	•	•	•	
0	0	0	0	•	
1	•	1	1	1	
2	2	2	2	2	
3	3	3	3	3	
4	4	4	4	4	
5	5	5	•	5	
6	6	6	6	6	
7	7	7	7	7	
8	8	8	8	8	
9	9	9	9	9	

## Special Directions for Mixed Numbers, Decimals, and Negative Numbers

- Mixed numbers must be entered as decimals or improper fractions. For example, an answer of  $1\frac{1}{2}$  should be entered as 1.5 or  $\frac{3}{2}$ .
- Decimal answers should be entered as accurately as possible unless otherwise indicated in the problem. Some answers may need to be rounded in order to fit in the Response Grid space.
- No Response Grid questions have negative answers.



## Directions

Use the Response Grid in the Answer Book to complete Sample A.

### Sample A

Diana earned the scores below on her science tests.

79, 98, 85, 91

What is the mean of these scores?

### Sample B

Look at the pattern below.

0, 2, 4, 6, 8, . . .

If the pattern continues, what will be the next term?

- A 2
- B 8
- C 10
- D 14

### Sample C

The sum of the angles of a triangle is 180 degrees. The measures of two angles of a triangle are  $x$  and  $3x$ . Which of these expressions represents the measure of the third angle?

F  $180 + x + 3x$

G  $180 - x + 3x$

H  $180 - x - 3x$

J  $180 + x - 3x$



---

Notice that the answer choices for Sample C are FGHIJ. Selected response answer choices will alternate ABCD and FGHIJ.

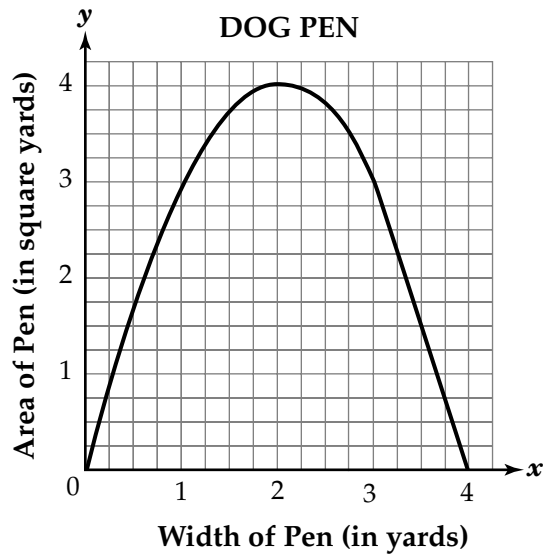
In addition to Response Grid questions such as Sample A and selected response questions such as Sample B and Sample C, there will be constructed response questions that require a written answer. Brief Constructed Response items, which require a short written answer, are labeled "BCR" below the question number in the Student Test Book. Extended Constructed Response questions, which require a longer written answer, are labeled "ECR" below the question number in the Student Test Book. The Rubric Sheet provides information about how constructed response questions will be scored. You may refer to the Rubric Sheet during the test. You will also be provided with "Cues for Students," which further clarifies how to respond to the constructed response questions. For students taking the geometry assessment, the difference between a construction and drawing is clarified under "Representation" on the "Cues for Students" sheet.

Remember, read all directions and questions very carefully and choose the best answer for each question. If you are not sure about an answer, do the best you can, but don't spend too much time on any one question.

Answer all questions until you come to the end of Session 1, where you will see a stop sign. If you finish early, you may check your answers in Session 1, but do not go on to Session 2. You have 55 minutes to complete Session 1.



- 1 Doug makes a rectangular dog pen using 8 yards of fencing. The graph below shows the relationship between the width of the pen and the area of the pen.



In the ordered pair (2, 4), what does the  $y$ -coordinate represent?

- A maximum area of the pen
- B maximum width of the pen
- C maximum length of the pen
- D maximum perimeter of the pen

- 2 The matrices below compare teen consumption of milk and soda in 1978 and 1996.

**TEEN CONSUMPTION OF MILK AND SODA**  
(in ounces per day)

		1978		1996	
		Boys	Girls	Boys	Girls
Milk	$\begin{bmatrix} 16 & 9 \end{bmatrix}$	Milk	$\begin{bmatrix} 9 & 7 \end{bmatrix}$		
Soda	$\begin{bmatrix} 7 & 6 \end{bmatrix}$	Soda	$\begin{bmatrix} 20 & 12 \end{bmatrix}$		

Which of these matrices shows the change in consumption from 1978 to 1996?

**F**

	Boys	Girls
Milk	$\begin{bmatrix} -11 & -5 \end{bmatrix}$	
Soda	$\begin{bmatrix} 9 & 3 \end{bmatrix}$	

**H**

	Boys	Girls
Milk	$\begin{bmatrix} 2 & 7 \end{bmatrix}$	
Soda	$\begin{bmatrix} 8 & 1 \end{bmatrix}$	

**G**

	Boys	Girls
Milk	$\begin{bmatrix} -7 & -2 \end{bmatrix}$	
Soda	$\begin{bmatrix} 13 & 6 \end{bmatrix}$	

**J**

	Boys	Girls
Milk	$\begin{bmatrix} 25 & 16 \end{bmatrix}$	
Soda	$\begin{bmatrix} 27 & 18 \end{bmatrix}$	

- 3 Mary graphed the system of equations below.

$$y = \frac{3}{2}x + \frac{7}{2}$$

$$y = -\frac{2}{3}x + \frac{7}{3}$$

Which of these best describes the relationship between the two lines?

- A They have no point in common.
- B They have one point in common.
- C They have two points in common.
- D They have infinite points in common.





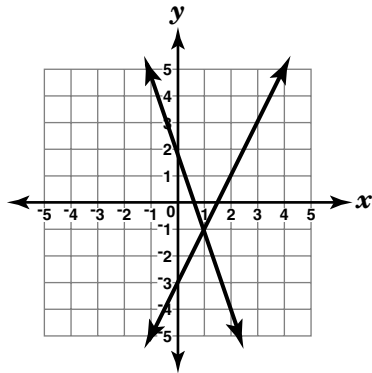
4 Look at the system of equations below.

$$y = -3x + 2$$

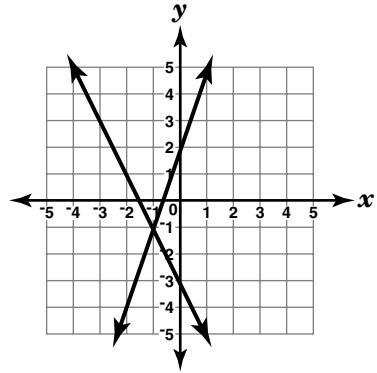
$$y = 2x - 3$$

Which of these graphs represents this system of equations?

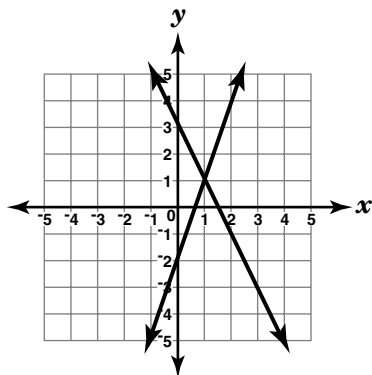
F



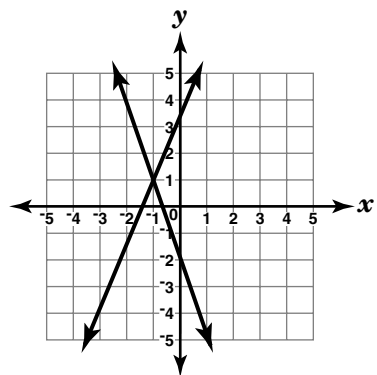
H



G



J



- 5** Lydia has \$200 in her bank account at the beginning of the year. Each month, she deposits \$40 into her account. She does not withdraw any money from her account, and the account pays no interest. Which of these equations could Lydia use to find the total amount ( $T$ ) in her bank account at the end of  $m$  months?

- A  $T = 40m$   
B  $T = 240m$   
C  $T = 200m + 40$   
D  $T = 40m + 200$

- 6** The table below shows a relationship between  $x$  and  $y$ .

$x$	$y$
-4	-2
0	0
4	2
8	4

Which of these equations represents this relationship?

- F  $y = x^2$   
G  $y = 2x$   
H  $y = \frac{1}{2}x$   
J  $y = x - 2$



**7**  
**ECR**

Stephanie must complete class projects for history and mathematics. Each project is worth a maximum of 100 points if she turns it in on time. Each teacher uses a different method to calculate the maximum number of points that a student can earn for a late paper. The tables below show the two methods.

POSSIBLE POINTS FOR HISTORY

Number of Days Late	Maximum Possible Points
0	100
1	95
2	90
3	85
4	?
5	?

POSSIBLE POINTS FOR MATH

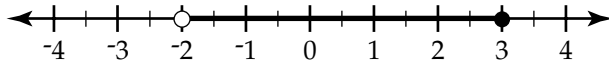
Number of Days Late	Maximum Possible Points
0	100
1	96
2	88
3	76
4	?
5	?

Complete the following in the Answer Book:

- Complete the tables to show the number of possible points for projects that are 4 and 5 days late.
- How many days late can Stephanie turn in each project and still possibly receive a score of 65 or better on each project? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Stephanie can complete only one project on time. The second project will be only one day late. To receive the maximum total number of possible points, which project should she complete first? Use mathematics to justify your answer.
- Describe the method that each teacher uses to determine the maximum possible points that a student can earn for a late paper.



- 8** Look at the graph below.



Which of these inequalities has the solution set that is shown in the graph?

- F  $-2 \leq x \leq 3$
- G  $-2 < x < 3$
- H  $-2 \leq x < 3$
- J  $-2 < x \leq 3$

- 9** When a snack bar opens, the cash register contains at least 50 dollars in \$1 and \$5 bills. Which of these inequalities represents this situation, where  $x$  is the number of \$1 bills and  $y$  is the number of \$5 bills?

- A  $x - 5y > 50$
- B  $x - 5y < 50$
- C  $x + 5y \geq 50$
- D  $x + 5y \leq 50$

- 10** The formula for the height of a falling object is shown below, where  $h$  is the height of the object in meters,  $t$  is the time in seconds, and  $k$  is the height, in meters, from which the object began its fall.

$$h = -4.9t^2 + k$$

If a rock is dropped from a building that is 150 meters tall, what is the height of the rock 4 seconds after it was dropped?

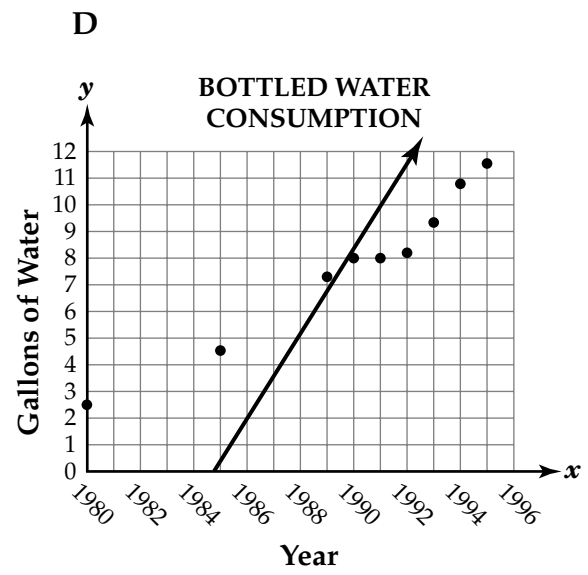
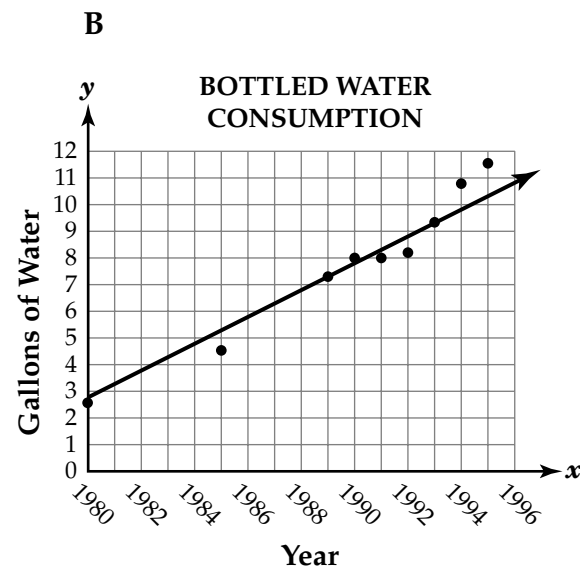
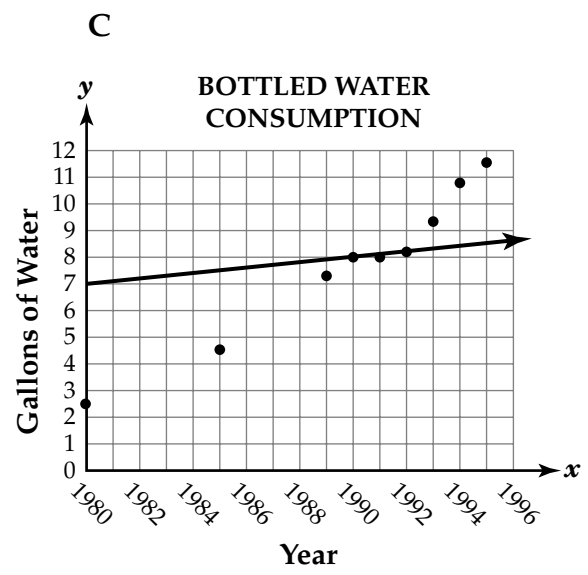
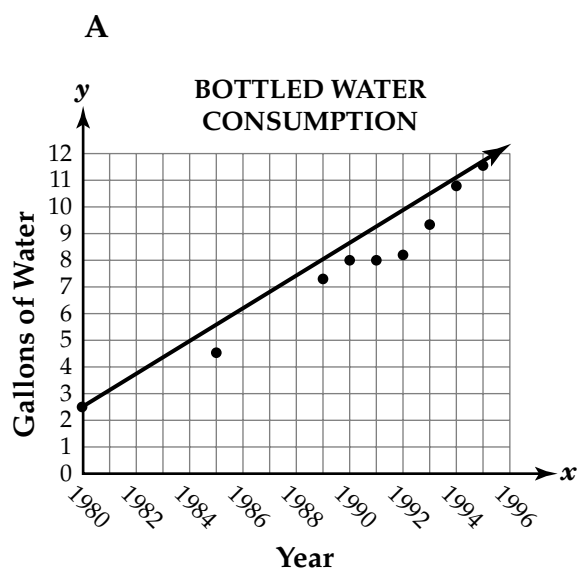
- F 71.6 meters
- G 78.4 meters
- H 130.4 meters
- J 145.1 meters

**11** The table below shows the consumption of bottled water per person for the years 1980 through 1995.

**CONSUMPTION OF BOTTLED WATER PER PERSON**

Year	1980	1985	1989	1990	1991	1992	1993	1994	1995
Water Consumption (in gallons)	2.4	4.5	7.4	8.0	8.0	8.2	9.4	10.7	11.6

Which of these lines best models the data?



- 12** The table below shows the sales for a greeting card company for the years 1990 through 1998.  
**BCR**

GREETING CARD SALES

Year	Sales (in thousands)
1990	\$205
1991	\$230
1992	\$245
1993	\$270
1994	\$295
1995	\$320
1996	\$340
1997	\$350
1998	\$365

Complete the following in the Answer Book:

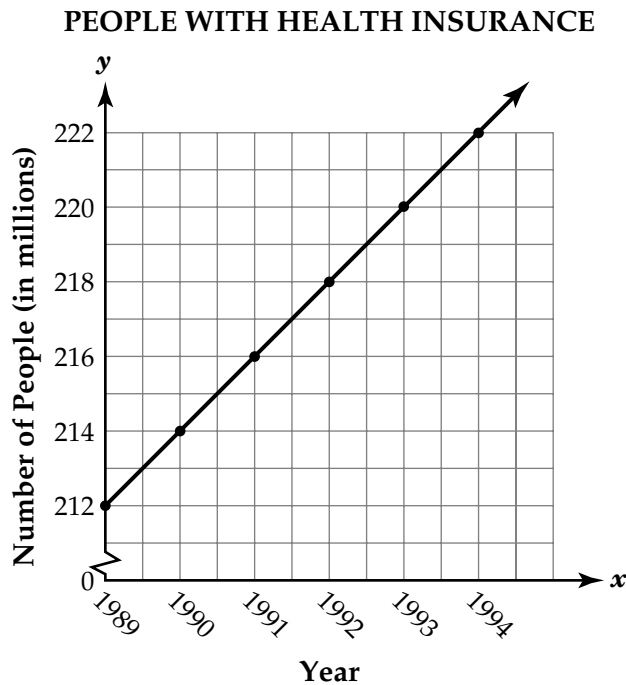
- Write an equation for the line of best fit for this data. Let  $x$  represent the years since 1900 and  $y$  represent the sales, in thousands of dollars. (If you choose to draw a graph, use the grid provided in the Answer Book.)
- According to your equation, what were the sales in 1999? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.



**D**irections

Use the Response Grids in the Answer Book to complete Numbers 13 through 16.

- 13** The graph below shows a linear model of the number of people in the United States who have private or government health insurance.



What is the slope, in millions of people per year, of this linear model?

- 14** There are 26 students in an algebra class. The number of girls in the class is one less than twice the number of boys. How many boys are in the class?

- 15** Mrs. Penner has 7 keys for her school on her key ring. All of the keys are different but look alike. One of these keys is for the bathroom and two are for her classroom. If she picks one key at random, what is the probability that the key is not for the bathroom or her classroom?
- 16** Hank tosses 4 coins at the same time. He repeats this action 10 times. The results are shown below, where H represents heads and T represents tails.

HHTT	TTHT	HHHH	THTH	HHTT
HTHT	TTHT	HTHH	HTTH	HTHH

Based on this data, what is the probability that at least one out of the group of 4 coins tossed will land with tails up?





- 17** Terry is going to the county fair. She has two choices for purchasing tickets, as shown in the table below.

**ECR**

Ticket Choices	Admission Price	Cost per Ride
A	\$6	\$0.50
B	\$2	\$0.75

Complete the following in the Answer Book:

- Write an equation for Terry's total cost ( $y$ ) for ticket Choice A. Write an equation for Terry's total cost ( $y$ ) for ticket Choice B. Let  $x$  represent the number of rides she plans to go on.
- How many rides would Terry have to go on for the total cost of ticket A and ticket B to be equal? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation. (If you choose to draw a graph, use the grid provided in the Answer Book to add to your written response.)
- Terry plans to go on 14 rides. To spend the least amount of money, which ticket choice should Terry choose? Use mathematics to justify your answer.

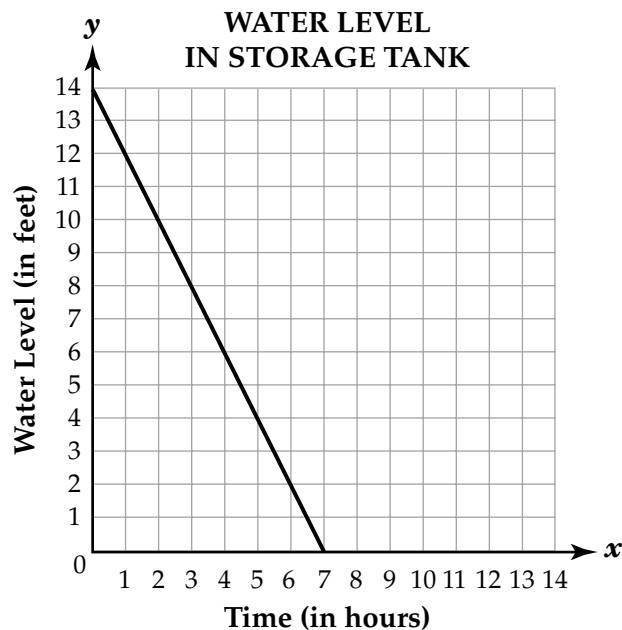


*Session*



Answer all questions until you come to the end of Session 2, where you will see a stop sign. If you finish early, you may check your answers in Session 2, but do not go back to Session 1. You have 55 minutes to complete Session 2.

- 18** The water level in a storage tank is 14 feet. Water is released at a constant rate until the tank is empty. The graph below shows the water level ( $y$ ) in the tank, as a function of time ( $x$ ).

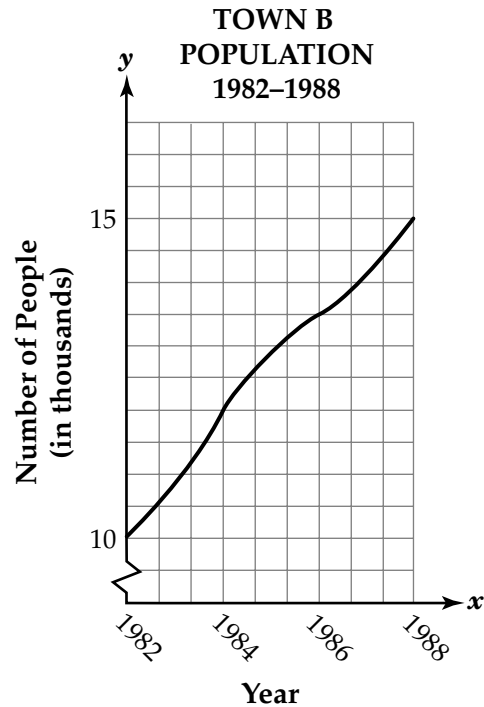
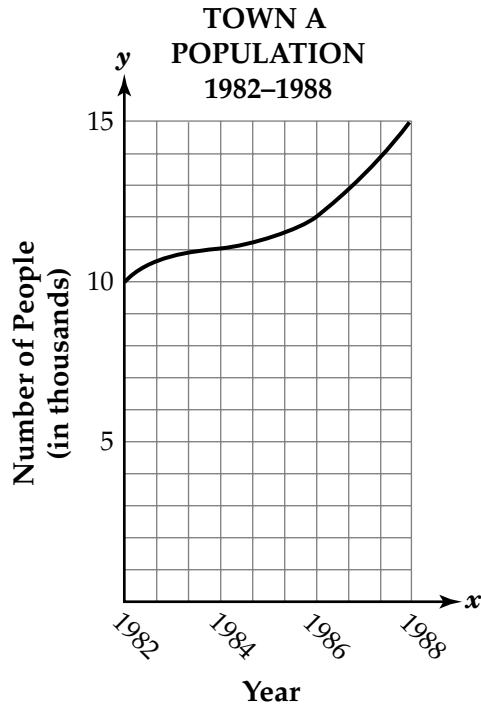


Which of these equations represents the relationship between time and the water level?

- F  $y = -2x + 14$
- G  $y = -2x - 14$
- H  $y = 2x + 14$
- J  $y = 2x - 14$



- 19** The graphs below show the number of residents in Town A and Town B from the years 1982 to 1988. The two towns have comparable populations. The mayor of Town B uses the graphs to claim that there was a larger increase in the number of residents in Town B than in Town A from the years 1982 to 1988.



According to the information given, which of these explains why the graphs are misleading?

- A The time periods are different.
- B The types of data are different.
- C The vertical scales are different.
- D The population of the towns are different.



- 20** Sue is scheduled to take a biology test at school today. To perform well on the test, she knows it is best to eat a breakfast with a high ratio of carbohydrates to serving size.

CARBOHYDRATE CHART

Food	Serving Size (in grams)	Carbohydrates (in grams)
Bagel	68	38
Milkshake	283	60
Raisins	145	115
Wheat cereal	25	23

Which of these foods has the highest ratio of carbohydrates to serving size?

- F Bagel
- G Milkshake
- H Raisins
- J Wheat cereal



**21**

Pedro designed a board game with a spinner that is divided into 4 equal sections: 1, 2, 3, and "Lose a Turn." He wanted to determine how many times a player would spin "Lose a Turn" in 10 spins. He conducted a simulation where one trial consisted of 10 spins. The table below shows his results for 50 trials.

**SIMULATION RESULTS**

Number of "Lose a Turn" Spins	Frequency
0	5
1	12
2	11
3	15
4	4
5	2
6	0
7	1
8	0
9	0
10	0

Based on the simulation, what is the probability that a player will spin "Lose a Turn" 3 or more times in 10 spins?

- A  $\frac{7}{50}$
- B  $\frac{15}{50}$
- C  $\frac{22}{50}$
- D  $\frac{43}{50}$



- 22** Apples from an orchard need to be sampled to see if they are sweet enough for juice. The orchard has 25,000 apple trees. Each tree has at least 1,000 apples.

**BCR**

Alfred suggests, "Randomly choose one tree and test 500 apples from that tree."

Betsy suggests, "Randomly choose 1,000 trees and test one apple from each tree."

Complete the following in the Answer Book:

- Whose suggestion gives a sample that is more representative of the apples in the orchard? Use mathematics to justify your answer.

- 23** The growing season is defined as the average number of days between the last frost in the spring and the first frost of the fall. The table below shows the average growing season for nine major U.S. cities.

AVERAGE GROWING  
SEASON (IN DAYS)

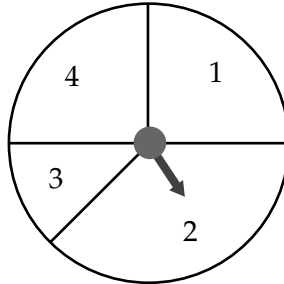
279	198	165
271	193	156
262	192	156

If the circled number 156 is changed to 256, how would the mean, median, and mode of this data change?

- A increase mean, median, and mode
- B decrease mean, median, and mode
- C increase mean, median, eliminate mode
- D increase mean and mode, decrease median



**24** The spinner shown below is spun 20 times.



The results of the spins are shown below.

1	2	1	4	3
2	1	2	2	2
4	4	2	3	1
2	4	1	4	2

Based on these results, how many times would 2 be expected to appear in 60 spins?

- F 8
- G 15
- H 24
- J 28



- 25** An athletic director asked 4 groups of students, "What is the most that you would pay for an athletic event?" The responses are shown below.

AMOUNT STUDENTS WOULD  
PAY FOR ATHLETIC EVENT

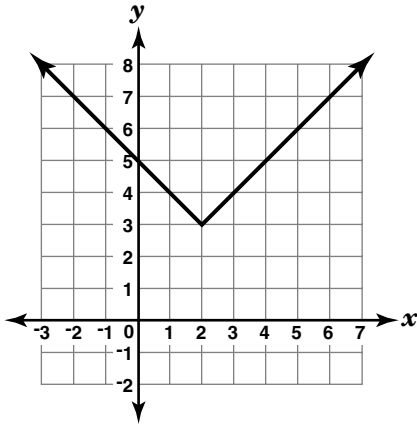
Group 1	Group 2	Group 3	Group 4
\$5.00	\$4.00	\$4.00	\$4.00
\$4.00	\$3.00	\$5.00	\$3.00
\$3.00	\$2.00	\$1.00	\$3.00
\$3.00	\$5.00	\$2.00	\$3.00
\$2.00	\$2.00	\$3.00	\$4.00

Which group's answers showed the least variability?

- A Group 1
- B Group 2
- C Group 3
- D Group 4



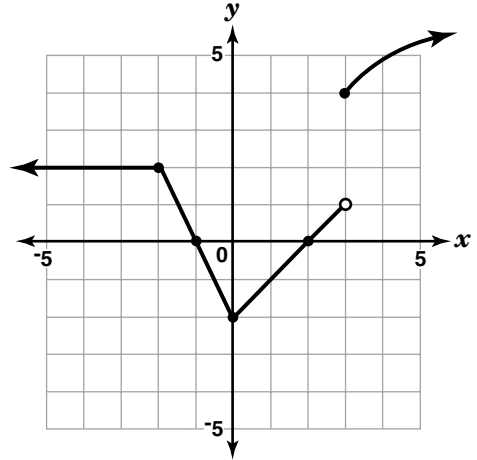
- 26** Look at the function that is graphed below.



Which of these statements about this function is true?

- F The minimum value is 2.
- G The minimum value is 3.
- H The maximum value is 3.
- J The maximum value is 5.

- 27** Look at the graph below.



What is the  $x$ -value of the point where the graph is not continuous?

- A -3
- B -2
- C 0
- D 3

- 28** A library is trying to decrease the number of overdue books by increasing the fines. They plan to charge \$0.25 for the first day a book is late and \$0.10 for each additional day. Which of these tables represents the fines for the first five days a book is late?

**F LIBRARY FINES**

Days Late	Fine
1	\$0.10
2	\$0.20
3	\$0.30
4	\$0.40
5	\$0.50

**H LIBRARY FINES**

Days Late	Fine
1	\$0.25
2	\$0.35
3	\$0.45
4	\$0.55
5	\$0.65

**G LIBRARY FINES**

Days Late	Fine
1	\$0.10
2	\$0.35
3	\$0.60
4	\$0.85
5	\$1.10

**J LIBRARY FINES**

Days Late	Fine
1	\$0.25
2	\$0.45
3	\$0.55
4	\$0.65
5	\$0.75



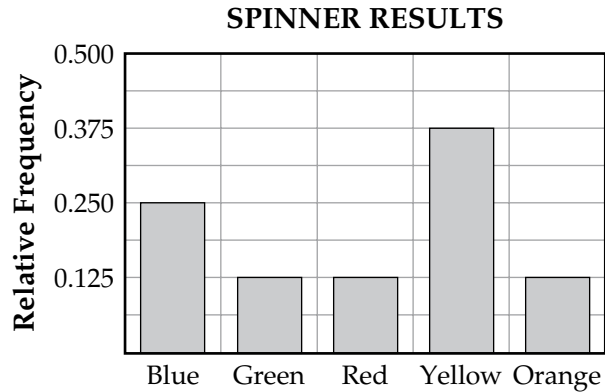
- 29** The table below shows a relationship between  $x$  and  $y$ .

$x$	0	1	2	3	4	5
$y$	1	2	5	10	?	?

What are the next two values for  $y$  ?

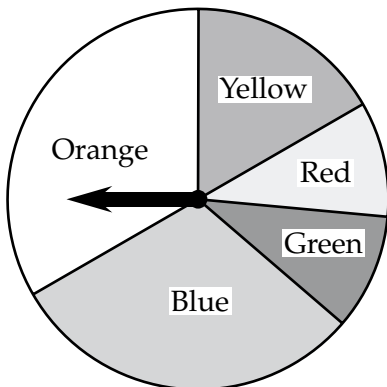
- A 11 and 13
- B 15 and 22
- C 16 and 25
- D 17 and 26

- 30** The bar graph below shows the results of spinning a spinner 1,000 times. The spinner has 5 colored sections.

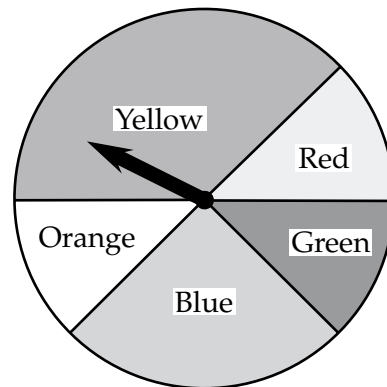


Which of these spinners most likely produced the above bar graph?

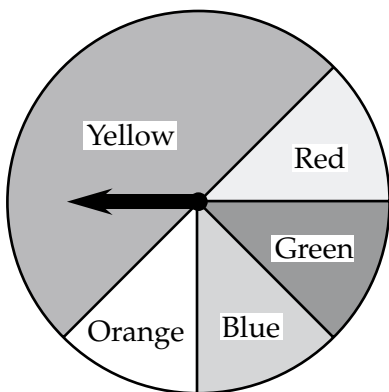
F



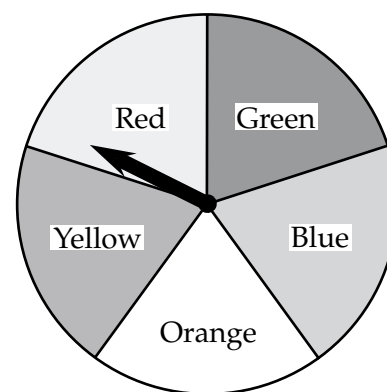
H



G



J



**31**  
**BCR**

The table below shows the number of medals won by 24 countries during the 1998 Winter Olympic Games.

1998 FINAL MEDAL STANDINGS WINTER OLYMPIC GAMES

Country	Medals Won	Country	Medals Won
Germany	29	Switzerland	7
Norway	25	Korea	6
Russia	18	Czech Republic	3
Austria	17	Sweden	3
Canada	15	Belarus	2
United States	13	Kazakhstan	2
Finland	12	Bulgaria	1
Netherlands	11	Denmark	1
Japan	10	Ukraine	1
Italy	10	Australia	1
France	8	Belgium	1
China	8	Great Britain	1

Complete the following in the Answer Book:

- Use the data from the table to create a box-and-whisker plot on the grid provided in the Answer Book.
- What was the least number of medals won by a country in the top 25% of the final medal standings? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.



**32** A gas and electric bill totals \$324.86. If  $x$  represents the charge for electricity, which of these expressions represents the charge for gas?

F  $\$324.86x$

G  $\$324.86 + x$

H  $\$324.86 - x$

J  $\$324.86 \div x$

**33** The expression  $16x^2 + 28x - 36$  represents the perimeter of a square. Which of these expressions represents the length of one side?

A  $\frac{16x^2 + 28x - 36}{2}$

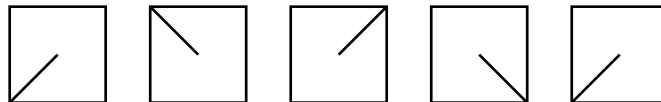
B  $(16x^2 + 28x - 36)^2$

C  $\sqrt{16x^2 + 28x - 36}$

D  $\frac{16x^2 + 28x - 36}{4}$



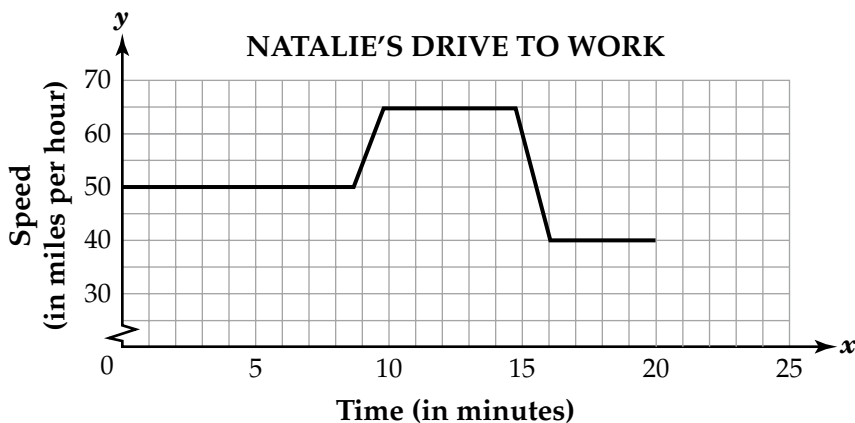
**34** The diagram below shows a floor tile that is moved in different positions.



Which of these describes the movement of the tile?

- F flipped vertically
- G flipped horizontally
- H turned clockwise  $90^\circ$
- J turned counterclockwise  $90^\circ$

**35** The graph below shows Natalie's speed as she drives to work Wednesday morning.



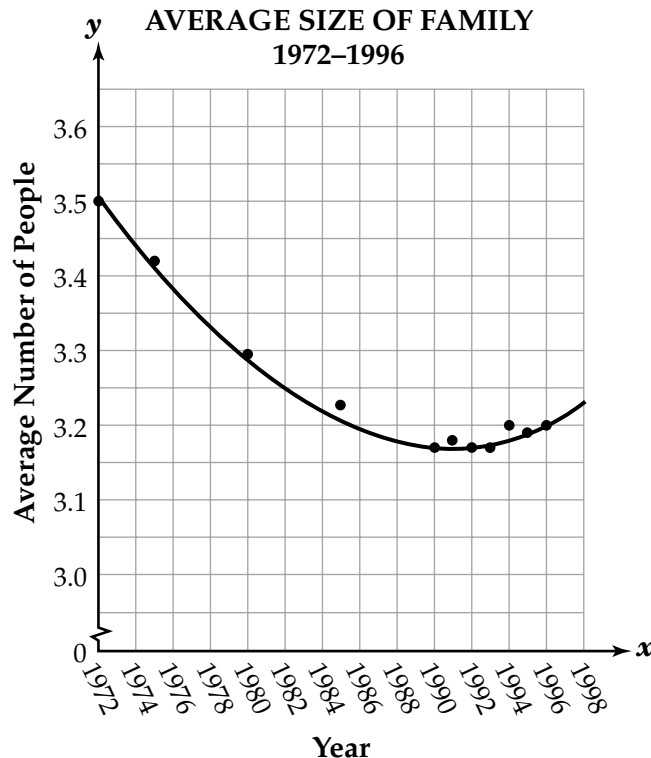
According to the graph, what is the range of Natalie's speeds ( $y$ ) on her drive to work?

- A  $0 \leq y \leq 25$
- B  $10 \leq y \leq 25$
- C  $40 \leq y \leq 65$
- D  $50 \leq y \leq 65$





- 36** The scatter plot below shows the average family size for the years 1972 through 1996. A curve of best fit has been drawn.  
**ECR**



Complete the following in the Answer Book:

- Describe the changes in family size that are indicated by the graph for the years 1972 through 1996.
- According to the curve of best fit, what is the average family size in 1998? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Would it be reasonable to use this curve of best fit to predict the average family size for 2010? Use mathematics to justify your answer.

**D**irections

Use the Response Grids in the Answer Book to complete Numbers 37 and 38.

- 37** The sign shown below is posted at a parking garage.

<b><i>PARKING COSTS</i></b>	
<b>up to 1 hour</b>	<b>\$3.00</b>
<b>Each Additional Hour</b>	<b>\$1.50</b>

What is the cost, in dollars, for parking 7 hours?

- 38** The matrix below shows the sales, in thousands of dollars, for three different stores over a period of two years.

	<b>SALES</b>		
	Store A	Store B	Store C
Year 1	110	250	400
Year 2	150	300	350

Each store's profit is 3% of its sales. What is the profit, in thousands of dollars, for Store B in Year 2?

