Mathematics

Goal 1: Functions and Algebra
Goal 3: Data Analysis and Probability

Maryland High School Assessment

Public Release, Fall 2003

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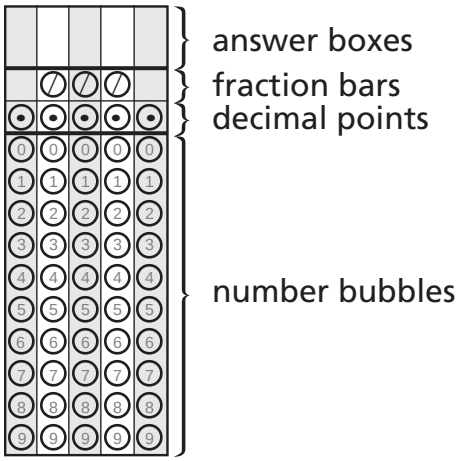
Session 1

Response Grid Questions

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



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.

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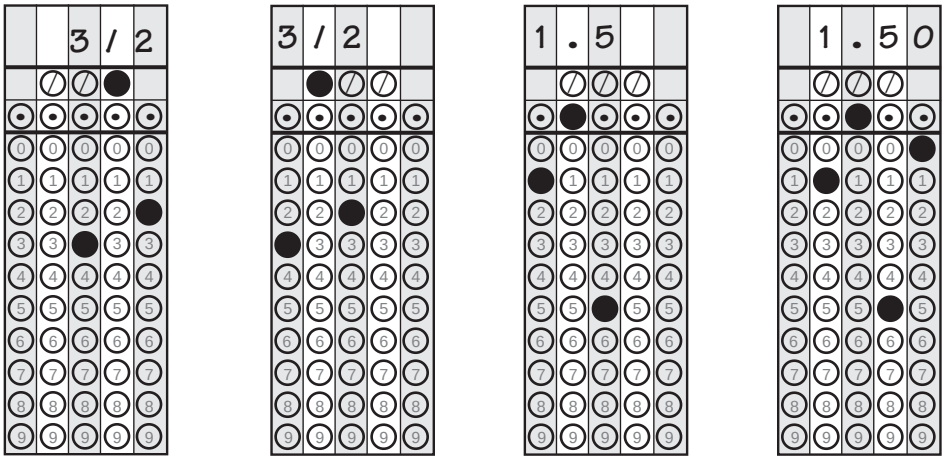
GO ON

Examples of Valid Responses

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



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.

GO ON

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 FGHJ. Selected response answer choices will alternate ABCD and FGHJ.

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 **The Class of 1998 sold class shirts in the styles and sizes shown in the matrix below. The Class of 1999 ordered twice the amount of shirts that were sold in 1998.**

CLASS OF 1998 SHIRTS

	Medium	Large	Extra-Large
Short Sleeve	12	30	37
Long Sleeve	7	11	23

What was the total number of extra-large shirts that were ordered by the Class of 1999?

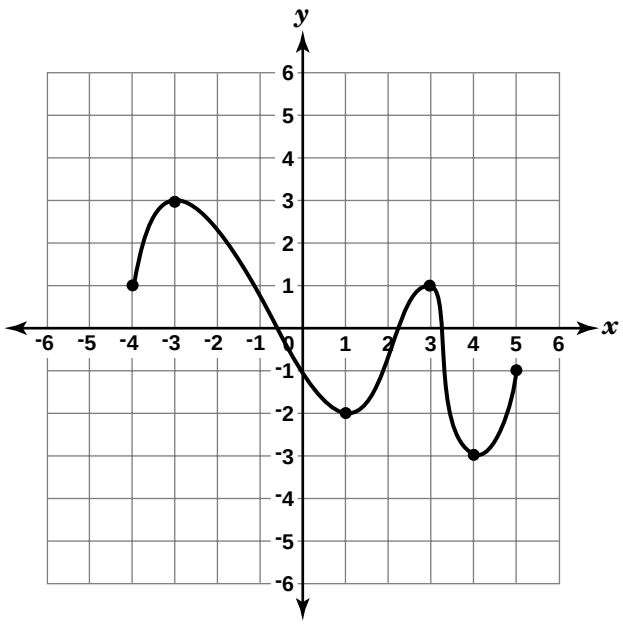
A 46

B 60

C 74

D 120

2 **Look at the function that is graphed below.**



What is the range of this function?

F $^{-}4 \leq y \leq 5$

G $^{-}3 \leq y \leq 3$

H $^{-}2 \leq y \leq 3$

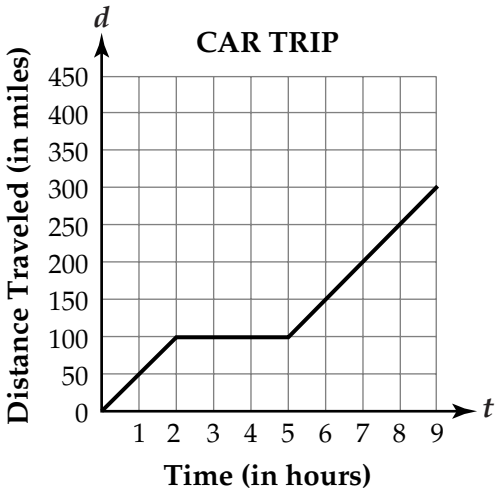
J $^{-}4 \leq y \leq {}^{-}1$

GO ON

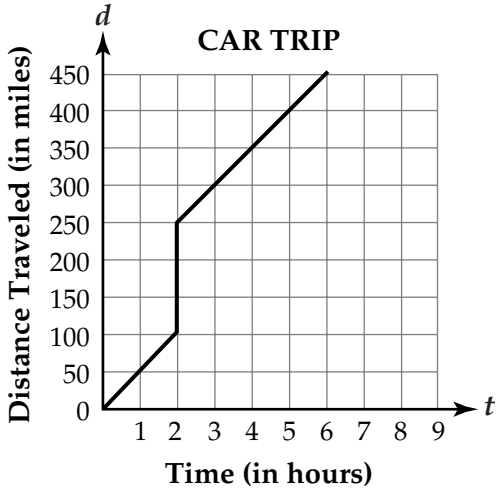
3 **A family travels at a constant speed during a road trip. After 3 hours, they stop for 2 hours to eat and rest. They then continue for 4 more hours at the same speed.**

Which of these graphs best represents this situation?

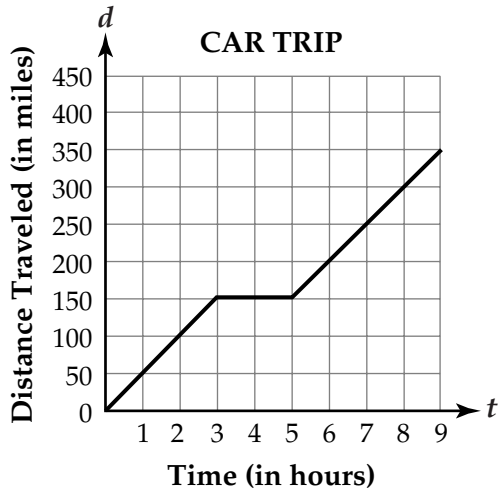
A



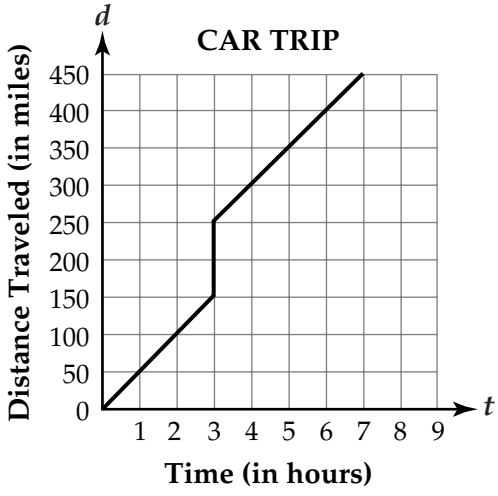
C



B



D



GO ON

4 **A week long soccer camp needs at least $72,000 in order to pay expenses. The camp receives $250 per person for day campers and $400 for full-time campers. Which of these combinations would be enough to pay expenses?**

F 78 day campers and 152 full-time campers

G 104 day campers and 114 full-time campers

H 117 day campers and 79 full-time campers

J 200 day campers and 29 full-time campers

5 **The table below shows the percentages of high school students who took a college entrance examination in 1997 in 7 states.**

STUDENTS WHO TOOK A COLLEGE ENTRANCE EXAM

State	Percentage
California	45
West Virginia	46
Alaska	48
Maryland	64
New Jersey	69
Pennsylvania	72
Massachusetts	80

Which of these states' percentages is at the third quartile?

A Maryland

B Massachusetts

C New Jersey

D Pennsylvania

GO ON

6
BCR

The Knitwear Company wants to know what sock colors teenagers will buy. The company is considering the three options below for collecting data.

Option 1: **Spend five days in the sock department of a randomly selected store and ask every person who enters what color socks they buy.**

Option 2: **Spend one day in the sock departments of five randomly selected stores in randomly selected cities and ask every teenager who enters what color socks they buy.**

Option 3: **Spend one day in eight randomly selected shopping centers and ask ten randomly selected teenagers at each shopping center what color socks they buy.**

Complete the following in the Answer Book:

- **Which option gives the company the most representative sample of sock colors that teenagers will buy?**
- **Use mathematics to justify why the other two options do not give the company the most representative sample.**

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GO ON

7 **A company makes a standard model flashlight (s) and a deluxe model flashlight (d). The company makes a \$3 profit on each standard model and a \$4 profit on each deluxe model. The company wants to make a profit of at least \$320. Which of these inequalities represents this situation?**

A $3s + 4d \leq 320$

B $3s + 4d \geq 320$

C $4s + 3d \leq 320$

D $4s + 3d \geq 320$

8 **Martha is x years old. Esteban is $x + 7$ years old. Martha's mother is $3x + 5$ years old. Which of these expressions represents how much older Martha's mother is than Esteban?**

F $(x + 7) - x$

G $(3x + 5) - x$

H $(x + 7) - (3x + 5)$

J $(3x + 5) - (x + 7)$

9 **Look at the system of equations below.**

$$y = \frac{2}{3}x + 10$$

$$y = \frac{2}{3}x - 10$$

Which of these statements is correct?

A The system has no solution.

B The solution of the system is $(^{-}3, 8)$.

C The solution of the system is $(6, ^{-}6)$.

D The system has an infinite number of solutions.

GO ON

10 **The words "mathematics" and "algebra" are written on cards with one letter on each card. If one card is drawn at random, what is the probability that the card will have an "a" on it?**

F $\frac{2}{9}$

G $\frac{2}{11}$

H $\frac{1}{12}$

J $\frac{4}{19}$

11 **The table below shows a relationship between x and y.**

x	y
1	1
3	-3
6	-9
8	-13

Which of these equations represents this relationship?

A $y = 2x - 1$

B $y = 2x - 2$

C $y = {}^{-}2x + 3$

D $y = {}^{-}2x - 1$

GO ON

12
ECR

Park rangers determined that the current deer population in a park is 78. Ranger Jones predicted that the deer population will increase by 6 deer each year. Ranger Percy predicted that the deer population will increase by 8 deer each year.

Complete the following in the Answer Book:

- **Complete the tables in the Answer Book for Ranger Jones and Ranger Percy.**
- **For each ranger's prediction, write an expression that can be used to determine the deer population in the park n years from now.**
- **What is the difference in the number of deer that Ranger Percy predicted will be in the park 10 years from now compared to Ranger Jones' 10-year prediction? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.**

Directions

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

13

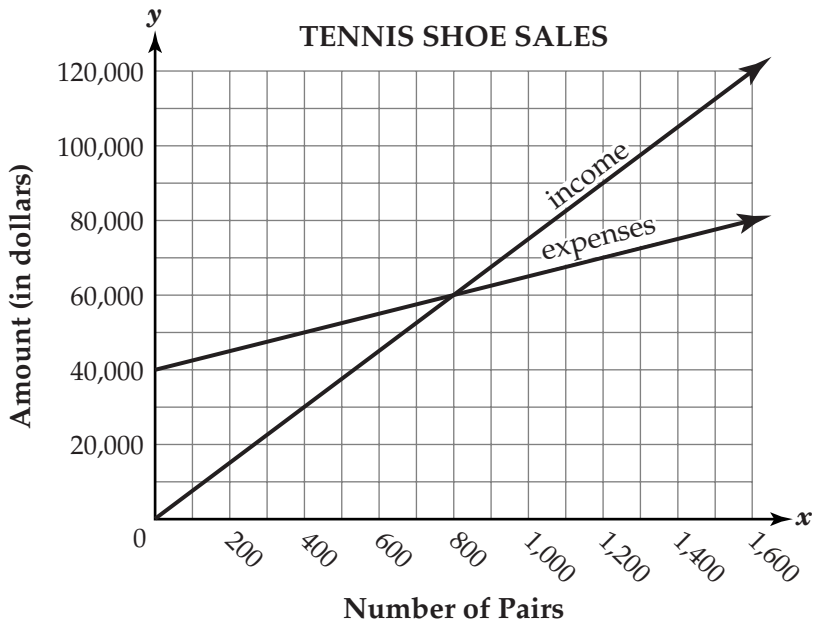
The formula to approximate the height (h) of a male, in inches, is shown below, where t is the length of the tibia bone, in inches.

$$h = 2.4t + 32.2$$

Paul's height is 69.4 inches. What is the approximate length, in inches, of Paul's tibia bone?

14 **Alexis has $345 in her savings account and will deposit $15 each week. Alexis will not withdraw any money from her savings account. After how many weeks will she have $1,035?**

15 **The graph below compares the income and expenses involved in the production and sales of tennis shoes at a shoe factory.**



How many pairs of tennis shoes must be sold for income and expenses to be equal?

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GO ON

16 **Valerie surveyed 50 people about their choice of pizza crusts. Her results are shown in the table below.**

FAVORITE PIZZA CRUSTS

	Thin Crust	Thick Crust
Teens	18	7
Adults	14	11

If an adult is selected at random, what is the probability that the adult prefers thin crust?

17
BCR **Amar compared the ages of the U.S. presidents who served between 1789 and 1845 at their first inaugurations to the ages of the presidents who served between 1945 and 2000 at their first inaugurations, as shown below.**

Presidents Who Served Between 1789 and 1845:
57, 61, 57, 58, 57, 57, 61, 54, 68, and 51

Presidents Who Served Between 1945 and 2000:
60, 62, 43, 55, 56, 61, 52, 69, 64, and 46

Complete the following in the Answer Book:

- **What are the mean and median for each group of U.S. presidents?**
- **Amar wanted to use this data to show that the ages of the U.S. presidents at their first inaugurations have decreased between 1789 and 2000. How could Amar use this data to support his conclusion?**
- **Do you think the data provides Amar with support strong enough to make his conclusion valid? Use mathematics to justify your answer.**

STOP

Session 2

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 60 minutes to complete Session 2.

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18 **Josh hit a baseball straight up into the air. The equation below describes the height of the ball (h), in meters, as a function of time (t) in seconds.**

$$h(t) = -9.8t^2 + 30t + 1.5$$

What is the height of the ball after 3 seconds?

F 3.3 meters

G 62.1 meters

H 120.9 meters

J 179.7 meters

19 **In one day, a store sold 300 shirts at 25% off the regular price of x dollars. Which of these expressions represents the total amount, in dollars, that was received for the sale of shirts on that day?**

A $0.25(x - 300)$

B $25(x - 300)$

C $300(x - 25)$

D $300(x - 0.25x)$

GO ON

20 **Mr. Shin wants to order notebooks for the school store. Notebooks come in four colors: red, blue, green, and black. He randomly surveyed 50 students to determine which color notebook they would buy. The table below shows the results.**

NOTEBOOK COLOR VOTES

Color	Red	Blue	Green	Black
Number of Votes	16	22	5	7

Mr. Shin will order 400 notebooks. How many blue notebooks should he order?

F 22

G 88

H 176

J 200

21 **ECR**

Juan conducted two different surveys about student transportation to school. For Survey A, he stood at the entrance of the school at 7:30 A.M. and surveyed the first 80 students. For Survey B, he used a random number generator to select 80 students in the school to survey. His results are shown in the tables below.

SURVEY A
(FIRST 80 ARRIVALS)

Method of Transportation	Number of Students
Walk	10
Bike	16
Car	8
Bus	46

SURVEY B
(NUMBER GENERATOR)

Method of Transportation	Number of Students
Walk	8
Bike	10
Car	1
Bus	61

Complete the following in the Answer Book:

- **Use principles of simple random sampling to justify why Juan should have more confidence in the results of Survey B.**
- **Use principles of simple random sampling to justify why Juan should have less confidence in the results of Survey A.**
- **According to the data collected from Survey B, of the 400 total students in the school, how many students should Juan expect to ride a bike? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.**

GO ON

22 **The table below shows the number of points scored by the winner of the men's ski jumping competition during the Olympics from 1980 to 1994.**

MEN'S SKI JUMPING

Year	Points
1980	266.3
1984	215.2
1988	230.5
1992	222.8
1994	282.0
1998	?

After the 1998 Olympics, the mean number of points scored by all winners since 1980 was 241.9. Which of these might have been the winning number of points in 1998?

F 217.5

G 234.6

H 243.1

J 248.4

GO ON

23 **A teacher conducts a random survey to determine how many students use the school library on a regular basis. Which of these methods would provide the teacher with a simple random sample?**

A Choose every 3rd student that enters the library on Monday.

B Select 50 students from the list of students who have perfect attendance.

C Choose the name of every 10th student in her grade book until 30 names are selected.

D Number every student in the school and then generate random numbers to select 50 students.

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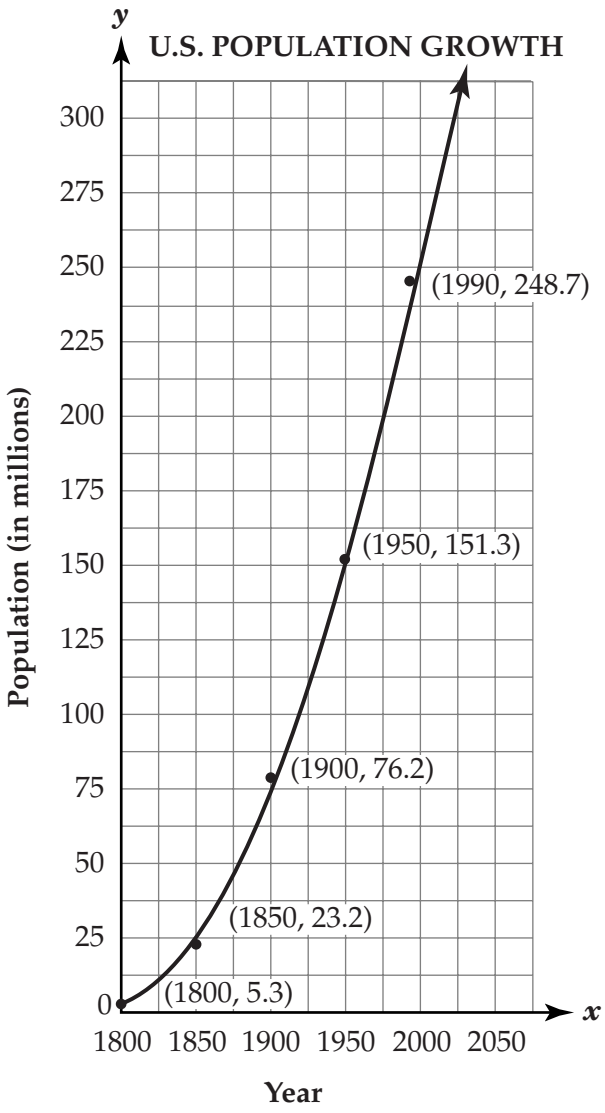
GO ON

24 **The graph below shows the population growth for the United States since 1800. A curve of best fit has been drawn.**



According to the curve of best fit, in what year will the population be 300 million?

F 2000

G 2024

H 2031

J 2050

GO ON

25 **Look at the pattern below.**

$$2x + 4,\ 2x + 1,\ 2x - 2,\ \ldots$$

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

A $2x + 11$

B $2x - 11$

C $2x + 14$

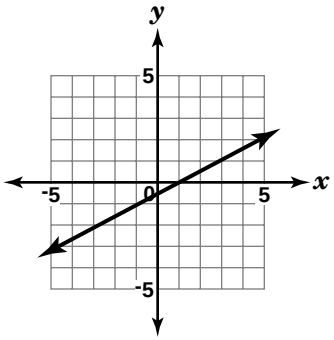
D $2x - 14$

26 **The table below shows a linear relationship between x and y.**

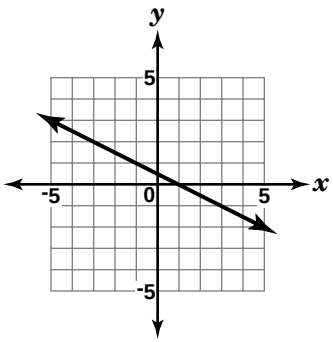
x	-2	-1	0	1	2
y	5	3	1	-1	-3

Which of these graphs shows this relationship?

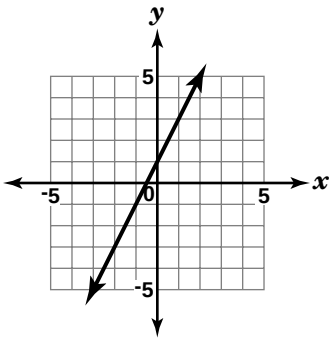
F



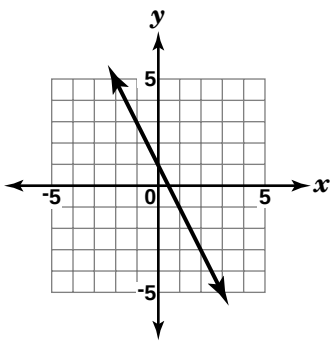
H



G

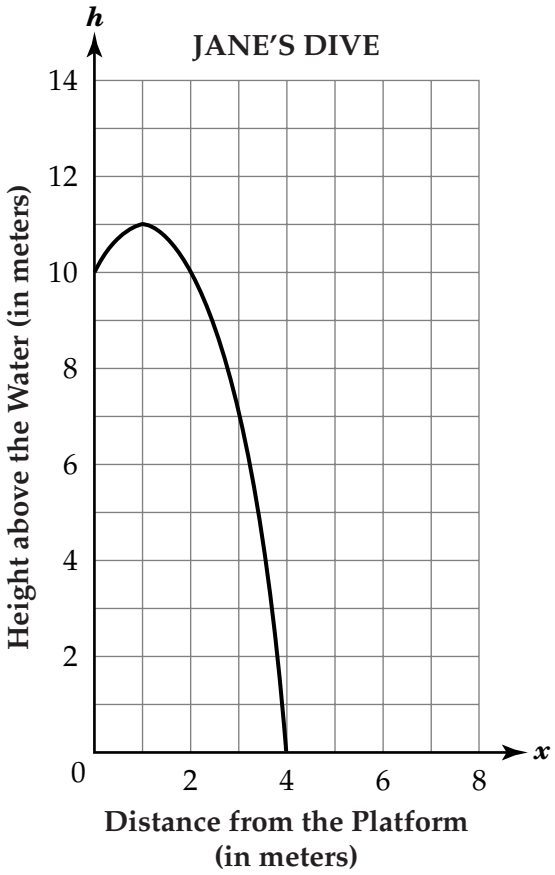


J



GO ON

27 **Jane dives off a platform into a diving pool. The platform is 10 meters above the water. The graph below shows the relationship between her height above the water and her distance, in meters, from the platform.**



How far away from the platform is Jane when she enters the water?

A 1 meter

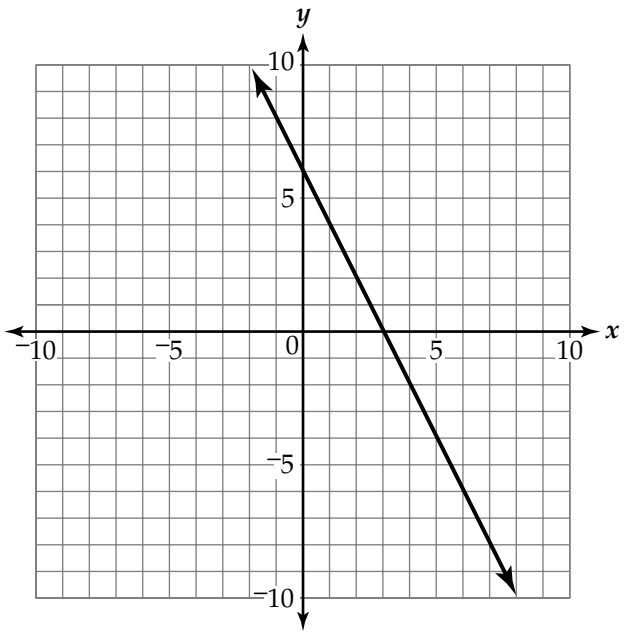
B 4 meters

C 10 meters

D 11 meters

GO ON

28 **Look at the line that is graphed below.**



Which of these equations describes this line?

F $y = {}^{-}2x + 6$

G $y = {}^{-}\frac{1}{2}x + 6$

H $y = \frac{1}{2}x + 6$

J $y = 2x + 6$

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GO ON

29 **A quality-control expert for a key manufacturer examined the keys produced by a particular machine. The table below shows the number of defective keys found in the 8 groups of 100 keys he examined.**

GROUPS OF 100 KEYS EXAMINED

Group Number	1	2	3	4	5	6	7	8
Number of Defective Keys	7	2	4	5	7	8	1	0

How many defective keys would be expected in a group of 5,000 keys? Round the answer to the nearest whole number.

A 150

B 170

C 213

D 243

GO ON

30
BCR

Mike wants to know how many calories he can burn while jogging. The number of calories burned depends on the length of time Mike jogs. The table below shows the number of calories Mike burns while jogging.

JOGGING DATA

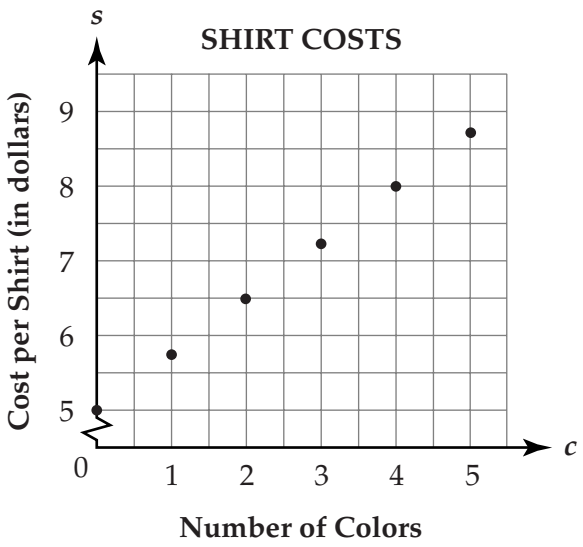
Length of Time Jogging (in minutes)	Calories Burned
0	0
10	98
20	196
30	295
40	393
50	490

Complete the following in the Answer Book:

- **Write an equation for a line of best fit. (If you choose to draw a graph, use the grid provided in the Answer Book.)**
- **What is the slope of your line of best fit? What does the slope mean in the context of this problem?**
- **Mike jogged for 60 minutes. According to your line of best fit, how many calories did he burn? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.**

GO ON

31 **Tees for Teens is a store that sells shirts. The graph below represents the total cost per shirt based on the number of colors in the design.**



Which of these equations represents the relationship between the cost per shirt (*s*) and the number of colors (*c*)?

A $s = 0.75c + 5$

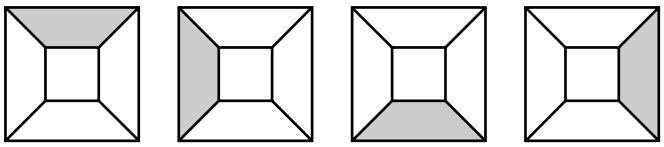
B $s = 1.5c + 5$

C $s = 5c + 0.75$

D $s = 5c + 3$

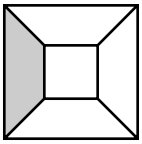
GO ON

32 **The first four tiles in a pattern are shown below.**

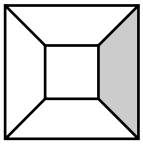


If the pattern continues, what will be the ninth tile in the pattern?

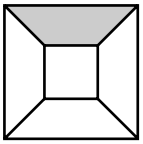
F



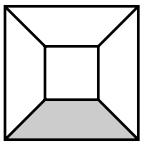
H



G



J



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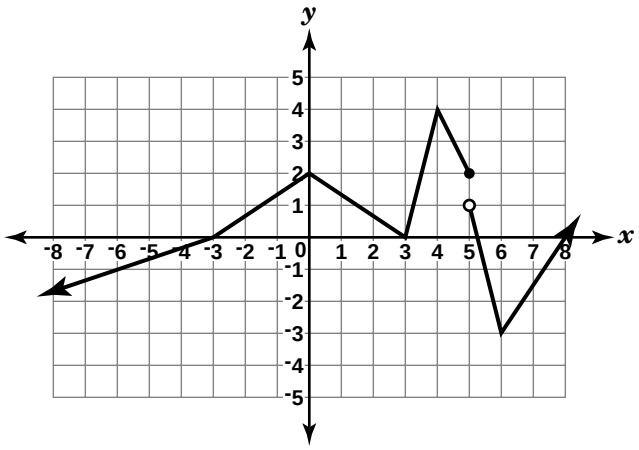
GO ON

33 **Look at the function that is graphed below.**



For what value of x is this function not continuous?

A 2

B 3

C 4

D 5

34 **Monique found that 90% of the students in her computer applications class have computers at home. She then predicted that since there are 800 students in her school, about 720 of them have computers in their homes. Which of these best describes the reason that her prediction is not valid?**

F use of opinion to influence a prediction

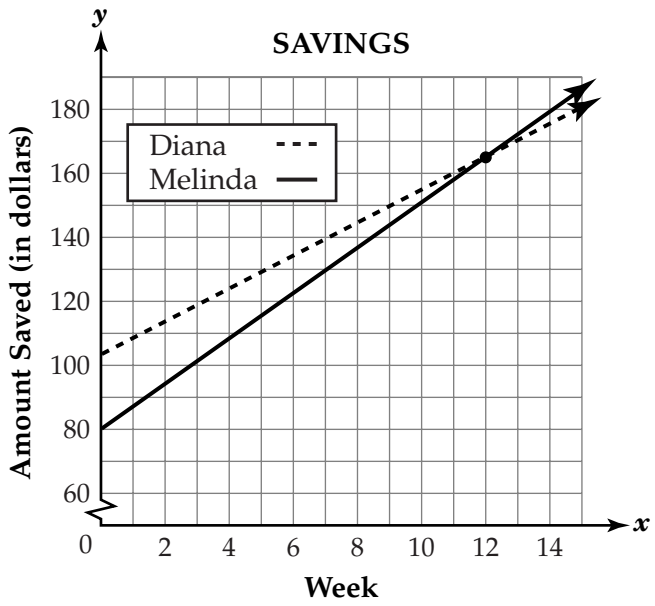
G incorrect arithmetic computation

H inappropriate use of mean

J biased sampling

GO ON

35 **The graph below shows the amount of money Diana and Melinda each saved during their summer vacation.**



Which of these statements can be concluded from the graph?

A Diana will always have more money than Melinda.

B Diana will never have more money than Melinda.

C The amount of Melinda's savings becomes greater than Diana's after 12 weeks.

D The amount of Diana's savings becomes greater than Melinda's after 12 weeks.

GO ON

36
ECR

At a baseball game Sam bought 2 hamburgers and 1 order of French fries for a total of $3.75. Erica bought 1 hamburger and 2 orders of French fries for a total of $3.00.

Complete the following in the Answer Book:

- **Write an equation that represents Sam's total cost. Write an equation that represents Erica's total cost.**
- **What is the cost of one hamburger? What is the cost of one order of French fries? Use mathematics to explain how you determined your answers. Use words, symbols, or both in your explanations. (If you choose to draw a graph, use the grid provided in the Answer Book to add to your written response.)**
- **Use mathematics to justify your answers for the cost of one hamburger and the cost of one order of French fries.**

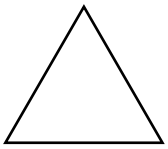
GO ON

Directions

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

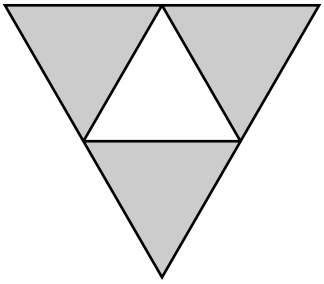
37 **A design starts with one equilateral, triangular tile. A tile of the same shape is added to each side. The first three stages with number of tiles used are shown below.**

STAGE 1



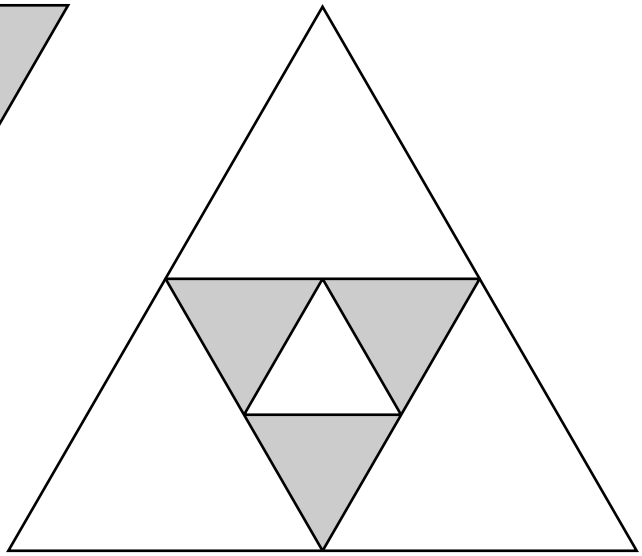
1 tile

STAGE 2



4 tiles

STAGE 3



7 tiles

If this pattern continues, how many triangular tiles will be used in the pattern at stage 8?

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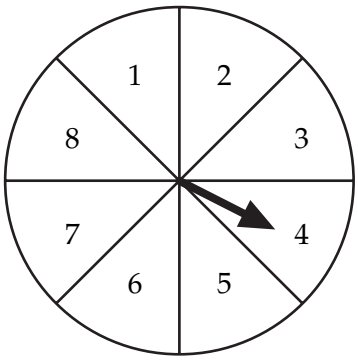
GO ON

38 **The spinner below is divided into 8 equal sections.**



If the arrow lands on a number, what is the probability that it will land on a 1 or a 4?

STOP