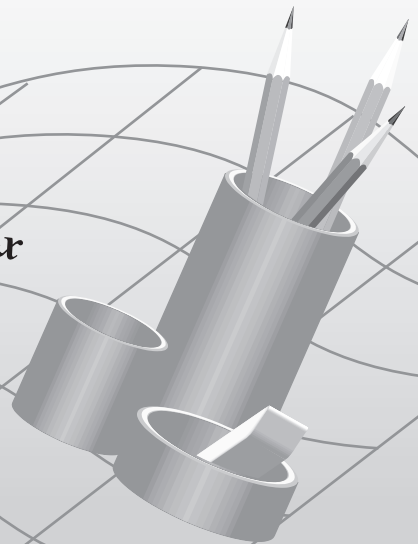
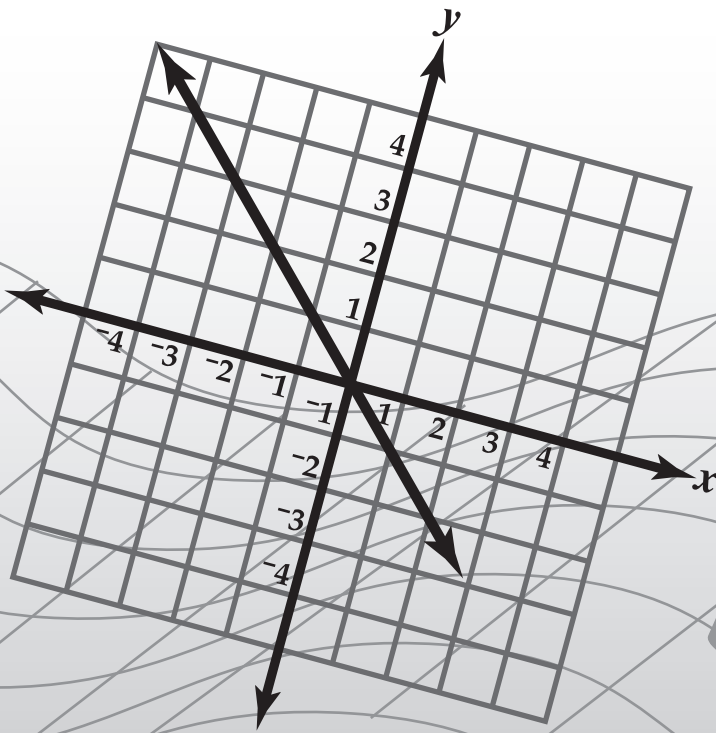
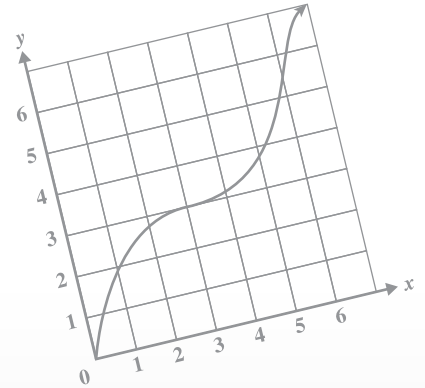


HSA

Maryland High School
Assessment

MARYLAND STATE DEPARTMENT OF
EDUCATION
Achievement Matters Most

$$2x - 4 = 3(x - 1) - 10$$



ALGEBRA/ DATA ANALYSIS

Public Release 2008

1 Look at the pattern below.

324, 108, 36, 12, . . .

If this pattern continues, what is the next term?

- A 6
- B 4
- C 3
- D 1

2 Richard surveys a room of 26 adults and finds that of the 12 men, 5 are married and 7 are single. Of the 14 women, 8 are married and 6 are single. Richard randomly assigns each person a number and places a card with each number in a hat. What is the probability that Richard will select a card with a number assigned to a married man?

- F $\frac{5}{26}$
- G $\frac{8}{26}$
- H $\frac{12}{26}$
- J $\frac{13}{26}$



- 3** Mr. Smith's pool is filled with water to a height of 48 inches. It has developed a slow leak. At the end of the first day, after the leak started, the height of the water decreased by 0.5 inches. If this rate continues, which of these tables represents the height of the water at the end of the second, fifth, and seventh day?

A WATER LEVEL

End of Day	Height of Water (in inches)
2	49.0
5	50.5
7	51.5

C WATER LEVEL

End of Day	Height of Water (in inches)
2	58
5	73
7	83

B WATER LEVEL

End of Day	Height of Water (in inches)
2	47.0
5	45.5
7	44.5

D WATER LEVEL

End of Day	Height of Water (in inches)
2	38
5	23
7	13



- 4** Look at the system of equations below.

$$12x - 4y = 8$$

$$3x - y = 2$$

Which of these statements describes the graph of this system of equations?

- F the same line
- G two parallel lines
- H two lines that intersect only at $(1, 1)$
- J two lines that intersect only at $(0, -2)$

- 5** In a class of 15 students, each student has a different test score. The median test score is 79. How many students scored higher than 79?

- A 6
- B 7
- C 8
- D 9

- 6** Kaila and Joey are starting a lawn mowing company. They have to buy a lawn mower for \$250. They will charge \$15 per lawn. Which of these inequalities represents the number of lawns (l) that they need to mow to earn at least \$800 after they pay for the lawn mower?

- F $l \leq 54$
- G $l \geq 54$
- H $l \leq 70$
- J $l \geq 70$





7 Jeremy plays soccer. He scores a goal in 40% of his games. Jeremy wants to design a simulation using a spinner to predict the probability that he will score a goal in 8 out of 10 games. Which simulation design has an appropriate device and a correct trial?

- A Divide a spinner into 5 equal sections labeled 1, 2, 3, 4, and 5. Spin the spinner 8 times.
- B Divide a spinner into 5 equal sections labeled 1, 2, 3, 4, and 5. Spin the spinner 10 times.
- C Divide a spinner into 4 equal sections labeled 1, 2, 3, and 4. Spin the spinner 8 times.
- D Divide a spinner into 4 equal sections labeled 1, 2, 3, and 4. Spin the spinner 10 times.

8 Ichiro plans to spend no more than a total of \$60 for both lunch and dinner each day during his vacation.

ECR

Complete the following in the Answer Book:

- Write an inequality that models this relationship. Let x represent the amount, in dollars, that Ichiro spends on lunch. Let y represent the amount, in dollars, that Ichiro spends on dinner.
- Graph the inequality on the grid provided in the Answer Book.
- On Thursday, Ichiro spent exactly \$60 on lunch and dinner. He spent three times as much on dinner as he spent on lunch. How much did Ichiro spend on lunch? How much did Ichiro spend on dinner? Use mathematics to explain how you determined your answers. Use words, symbols, or both in your explanations.



Directions

Use the Response Grids in the Answer Book to complete Numbers 9 through 11.

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

x	1	2	3	4
y	2	5	10	17

What is the value of y when x is 10?

- 10** Bailey decorates a dance hall with balloons. A box of balloons contains 20 red, 18 blue, and 12 white balloons. Bailey randomly chooses a balloon without looking. What is the probability that he chooses a blue or a white balloon?

- 11** A car rental company has 2 rental plans. Plan A charges \$49.00 per day. Plan B charges \$25.00 per day, plus \$0.10 per mile. How many miles must Teri drive in one day for Plan A to cost the same as Plan B?



- 12** The following formula can be used to find the wind-chill temperature (w) when the wind speed is 20 miles per hour.

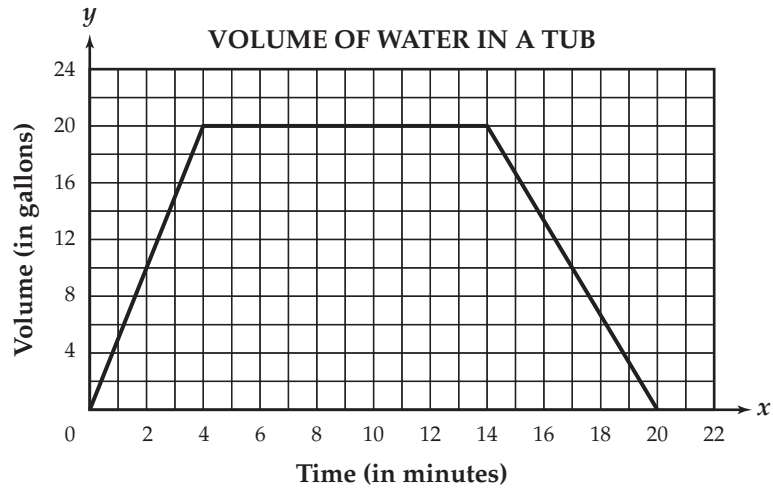
$$w = -39 + \frac{3}{2}t \quad (t = \text{actual air temperature})$$

Which of these is the actual air temperature if the wind-chill temperature is -12° ?

- F -57°
- G -21°
- H 18°
- J 41°



13 The graph below models the relationship between time, in minutes, and the volume of water, in gallons, in a tub.



What is the rate, in gallons per minute, at which the tub is being filled?

- A 4 gallons per minute
- B 5 gallons per minute
- C 14 gallons per minute
- D 20 gallons per minute



- 14** Jared wants to rent a carpet cleaner. The table below shows the cost of renting a carpet cleaner.
ECR

CARPET CLEANER RENTAL

Number of Hours	Cost
1	\$16
2	\$22
3	\$28
4	\$34
5	?
6	?

Complete the following in the Answer Book:

- Complete the table to show the cost of renting a carpet cleaner for 5 and 6 hours if this pattern continues.
- Write an equation to represent the relationship between the cost of renting a carpet cleaner and the number of hours that a carpet cleaner is rented.
- If Jared has \$60, can he rent the carpet cleaner for 9 hours? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- The store also sells the same carpet cleaner for \$165, including tax. What is the maximum number of hours that the cost of renting the carpet cleaner is less than the cost of buying the carpet cleaner? Use mathematics to justify your answer.



- 15** The table below shows a company’s annual income over 5 years. The equation $y = 100,000(2)^x$ describes the curve of best fit for the company’s annual income (y). Let x represent the number of years since 1996.

ANNUAL INCOME

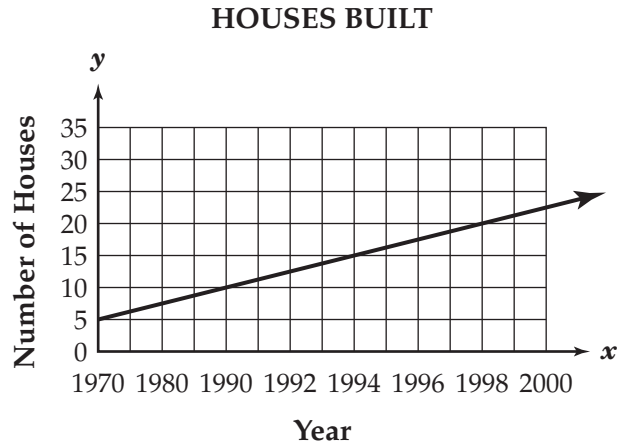
Year	Income
1996	\$105,000
1997	\$200,000
1998	\$396,000
1999	\$801,000
2000	\$1,598,000

Using this equation, what would be the company’s annual income in the year 2003?

- A \$3,200,000
- B \$4,000,000
- C \$6,400,000
- D \$12,800,000



16 The graph below shows the number of new houses built in a town from 1970 to 2000.



The mayor of the town used the graph to claim that between 1970 and 2000 the number of new houses built increased at a constant rate. Is the claim valid?

- F It is valid because the graph shows a constant rate of change.
- G It is valid because 30 years is long enough to evaluate the increase.
- H It is not valid because the scale on the vertical axis is inappropriate.
- J It is not valid because the scale on the horizontal axis is inappropriate.



17 Ms. Thaler’s class conducted a simulation using a random number generator to predict how many goals a hockey team will score per game next year. The table below shows how she assigned the digits.

RANDOM DIGIT ASSIGNMENT

Number of Goals per Game	Digits
0 – 1	0, 1, 2
2 – 4	3, 4, 5, 6, 7
5 or more	8, 9

The class conducted 30 trials. The results of the simulation are shown below.

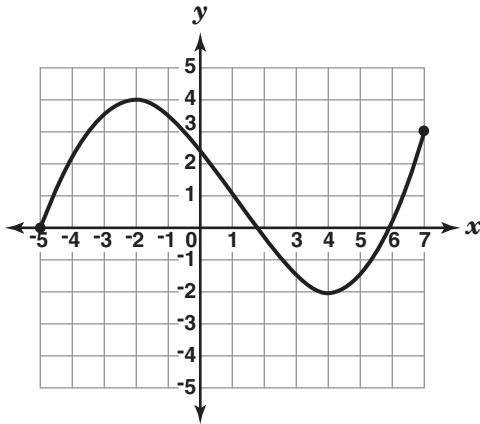
5 6 7 7 9 8 9 0 4 8 5 3 2 9 5 8 0 8 3 8 9 1 0 6 4 2 2 6 1 4

The hockey team will play 90 games next year. Based on this simulation, in how many games will the hockey team score 0 – 1 goals?

- A 24
- B 27
- C 30
- D 39



18 Look at the function that is graphed below.



What is the range of this function?

- F $-5 \leq y \leq 7$
- G $-5 \leq y \leq 3$
- H $-2 \leq y \leq 3$
- J $-2 \leq y \leq 4$



19 Marina has \$20 in a savings account. She wants to deposit \$10 each week for x weeks into her savings account. If she does not withdraw any money, which expression below represents the total amount of money, in dollars, she will have in her savings account in x weeks?

- A $10(20 + x)$
- B $x(10 + 20)$
- C $10x + 20$
- D $20x + 10$

20 The table below shows a relationship between x and y .

x	-2	-1	0	1	2
y	7	4	1	-2	-5

What is the value of y when x is 7?

- F -21
- G -20
- H -11
- J -2



21 Sean's movie rental company charges a monthly fee of \$5.00 plus an additional cost of \$1.25 per movie rental. Which of these equations represents the total monthly cost (c) of renting x movies?

- A $c = 1.25x + 5.00$
- B $c = 3.75x + 5.00$
- C $c = 5.00x + 1.25$
- D $c = 5.00x + 3.75$

22 **BCR** Nineteen families live in a small town. The income for each family is listed in the table below.

FAMILY INCOME

Income	Number of Families
\$35,000	5
\$40,000	5
\$45,000	4
\$50,000	4
\$320,000	1

Complete the following in the Answer Book:

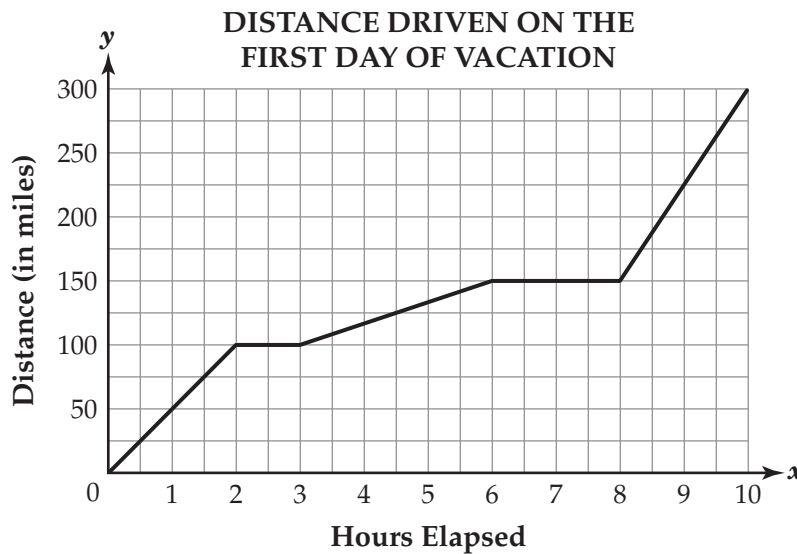
- What are the median and mean family incomes for this small town?
- Should the mean or median be used to describe the typical family income in this small town? Use mathematics to justify your answer.
- If each family's income increases by \$1,000, Alison believes the mean family income will increase more than the median family income. Do you agree with Alison? Use mathematics to justify your answer.



23 William charges \$4 per hour to babysit. LaRhonda charges \$10, plus an additional \$2 per hour to babysit. Both William and LaRhonda work the same number of hours. After how many hours will they earn the same amount of money?

- A 2 hours
- B 2.5 hours
- C 4.5 hours
- D 5 hours

24 The graph below shows the distance, in miles, that the Campbell family drives on the first day of their vacation.



What is the total number of hours that the Campbell family stopped during the first day?

- F 2 hours
- G 3 hours
- H 4 hours
- J 5 hours



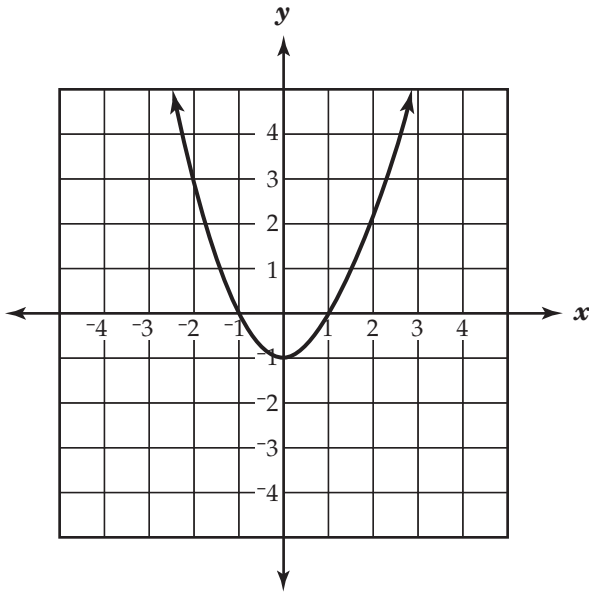
25 There are 826 deer in an enclosed animal park. Scientists capture, tag, and release 60 deer. A week later, the scientists capture 100 deer. How many deer should the scientists expect to have tags? Round the answer to the nearest whole number.

- A 5
- B 7
- C 8
- D 14

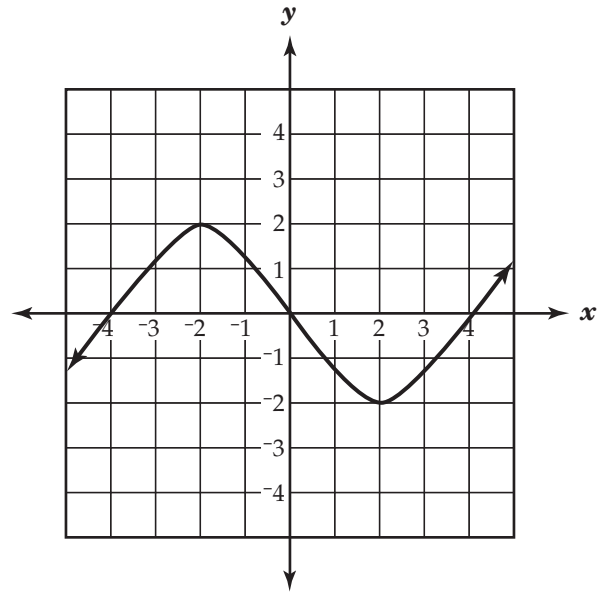


26 Which function graphed below is not continuous?

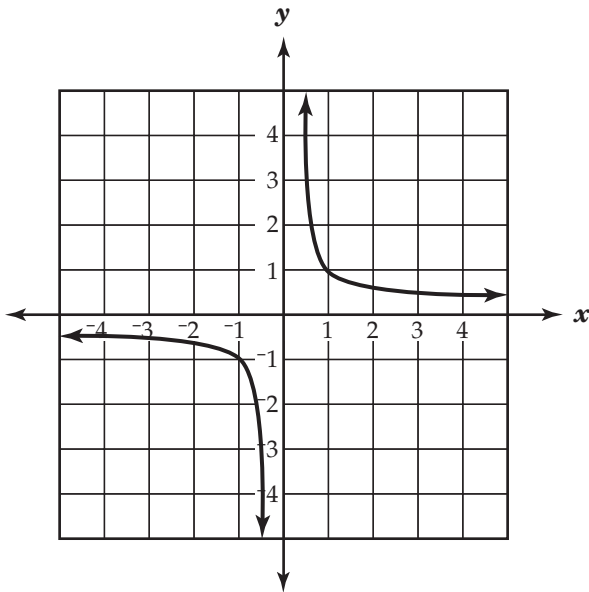
F



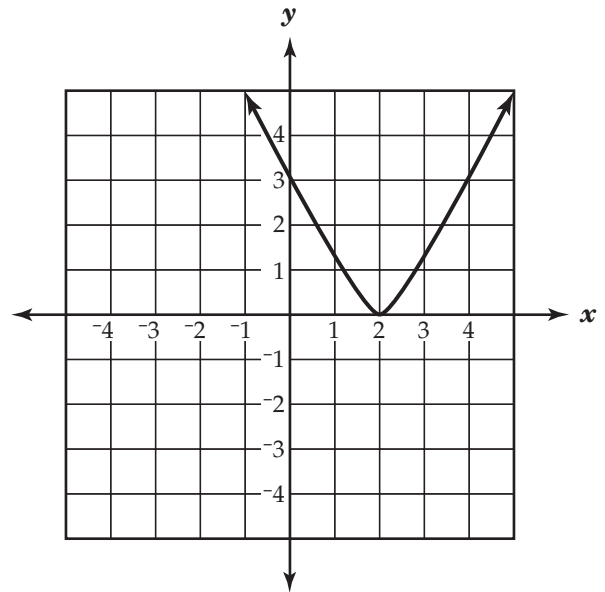
H



G



J



27
BCR

The president of the student government wants to survey the students in the school about their satisfaction with the 36 after-school activities. There are 1,000 students in the school—200 freshmen, 200 sophomores, 300 juniors, and 300 seniors. The president suggested three different sampling methods.

Method A: Randomly choose three students from each of the 36 after-school activities for the survey.

Method B: Randomly select 100 students from the honor roll list to survey.

Method C: Randomly select 20 freshmen, 20 sophomores, 30 juniors, and 30 seniors for the survey.

Complete the following in the Answer Book:

- Which method provides the most representative sample of the student population? Use mathematics to justify your answer.
- Use mathematics to justify why each of the other two methods does not provide a representative sample.

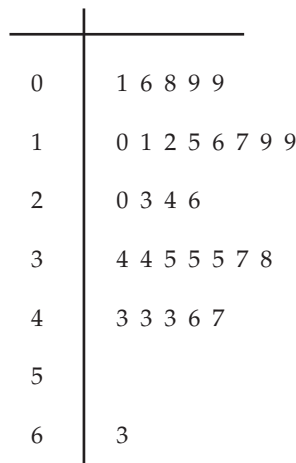


Directions

Use the Response Grids in the Answer Book to complete Numbers 28 through 30.

- 28** José conducted a survey of 30 people to determine how many times a person ate at a restaurant between January and July. The results are shown in the stem-and-leaf plot below.

SURVEY RESULTS



Key
2 0 = 20

Based on the survey results, what is the probability of randomly selecting a person who ate at a restaurant 20 or more times between January and July?

- 29** For a party, Simon has pizza delivered to his home. Pizza House charges \$8 per pizza plus an additional \$12 for delivery. Spaghetti World charges \$10 per pizza with no delivery charge. If Simon orders the same number of pizzas from each store, how many pizzas must be delivered for the total cost to be the same for Pizza House and Spaghetti World?



- 30** Brooke and Josh each took a two-day road trip. The matrix below shows their average speeds, in miles per hour, for each day that they traveled.

AVERAGE SPEED (mph)		
	Day 1	Day 2
Brooke	61	46
Josh	54	56

If they each traveled 6 hours per day, what is the longest distance, in miles, traveled by either Josh or Brooke in a single day?



31
ECR

The table below shows the population of a small town from 1960 to 1990.

POPULATION OF A
SMALL TOWN

Year	Population
1960	5,063
1970	6,244
1980	7,840
1990	9,179

Complete the following in the Answer Book:

- Write an equation for a line of best fit. Let x represent the years since 1960. Let y represent the population of the town. (If you choose to draw a graph to help you write the equation, use the grid provided in the Answer Book.)
- What is the slope of your equation? What does the slope represent in the context of this problem?
- Using your equation, estimate the population in the year 1995. Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Is your equation a good model to predict the population of this town in the year 2025? Use mathematics to justify your answer.



32 The table below shows a relationship between x and y .

x	y
2	5
3	7
4	9
5	11

Which of these equations represents this relationship?

F $y = x + 3$

G $y = x + 4$

H $y = 2x + 1$

J $y = 2x - 1$



- 33** The matrices below show the sales information for 3 different Fast Food Unlimited stores over a 2-week period. The district manager will present an award to the store with the single highest-selling item over this 2-week period.

FAST FOOD UNLIMITED SALES

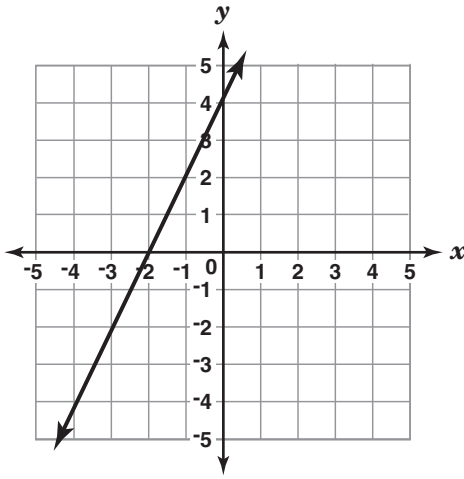
	WEEK 1				WEEK 2		
	Store A	Store B	Store C		Store A	Store B	Store C
Hamburgers	355	324	310	Hamburgers	497	445	360
Hot dogs	445	302	384	Hot dogs	350	498	485
Grilled chicken	361	495	305	Grilled chicken	308	322	440

Using the matrices above, determine which store received the award and for which highest-selling item.

- A Store A for hamburgers
- B Store B for grilled chicken
- C Store B for hot dogs
- D Store C for hot dogs



34 Look at the function that is graphed below.



Which of these equations represents this function?

F $y = \frac{1}{2}x - 4$

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

H $y = 2x - 2$

J $y = 2x + 4$

35 The yearbook club washes cars to raise at least \$600. The club charges \$3 for each car (c) that they wash. Which of these inequalities models this situation?

A $3c \leq 600$

B $3c < 600$

C $3c \geq 600$

D $3c > 600$

36 Three students sold pizzas to raise money. Dwayne sold x pizzas. Tamara sold $x + 20$ pizzas. Rueben sold $3(x + 20)$ pizzas. Which of these expressions represents the total number of pizzas that all three students sold?

F $x(x + 20) \cdot 3(x + 20)$

G $x + (x + 20) + 3(x + 20)$

H $\frac{x(x + 20) + 3(x + 20)}{3}$

J $\frac{x + (x + 20) + 3(x + 20)}{3}$



37 The table below shows the average life span of United States currency.

LIFE SPAN OF UNITED STATES CURRENCY

Type of Currency	\$1	\$5	\$10	\$20	\$50	\$100
Average Life Span (in years)	1.5	2	3	4	9	9

According to the data, which of these conclusions can be made about the life span of United States currency?

- A The mode is 9 years.
- B The range is 7 years.
- C The mean is 4 years.
- D The median is 3 years.



HSA Item Number	Answer	Indicators Assessed
1	B	1.1.1 The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
2	F	3.1.3 The student will calculate theoretical probability or use simulations or statistical inference from data to estimate the probability of an event.
3	B	1.1.2 The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression.
4	F	1.2.3 The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect.
5	B	3.1.2 The student will use the measures of central tendency and/or variability to make informed conclusions.
6	J	1.2.2 The student will solve linear inequalities and describe the solutions using numbers, symbols, and/or graphs.
7	B	3.1.1 The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
8	ECR	1.2.1 The student will determine the equation for a line, solve linear equations, and/or describe the solutions using numbers, symbols, and/or graphs. 1.2.2 The student will solve linear inequalities and describe the solutions using numbers, symbols, and/or graphs.
9	101	1.1.1 The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
10	0.6	3.1.3 The student will calculate theoretical probability or use simulations or statistical inference from data to estimate the probability of an event.
11	240	1.2.1 The student will determine the equation for a line, solve linear equations, and/or describe the solutions using numbers, symbols, and/or graphs.
12	H	1.2.5 The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.
13	B	1.2.4 The student will describe how the graphical model of a non-linear function represents a given problem and will estimate the solution.
14	ECR	1.1.1 The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically. 1.1.2 The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression.
15	D	3.2.2 The student will interpret data and/or make predictions by finding and using a line of best fit and by using a given curve of best fit.
16	J	3.2.3 The student will communicate the use and misuse of statistics.

HSA Item Number	Answer	Indicators Assessed
17	A	3.2.1 The student will make informed decisions and predictions based upon the results of simulations and data from research.
18	J	1.1.4 The student will describe the graph of a non-linear function and discuss its appearance in terms of the basic concepts of maxima and minima, zeros (roots), rate of change, domain and range, and continuity.
19	C	1.1.3 The student will apply addition, subtraction, multiplication, and/or division of algebraic expressions to mathematical and real-world problems.
20	G	1.1.1 The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
21	A	1.2.1 The student will determine the equation for a line, solve linear equations, and/or describe the solutions using numbers, symbols, and/or graphs.
22	BCR	3.1.2 The student will use the measures of central tendency and/or variability to make informed conclusions.
23	D	1.2.3 The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect.
24	G	1.2.4 The student will describe how the graphical model of a non-linear function represents a given problem and will estimate the solution.
25	B	3.2.1 The student will make informed decisions and predictions based upon the results of simulations and data from research.
26	G	1.1.4 The student will describe the graph of a non-linear function and discuss its appearance in terms of the basic concepts of maxima and minima, zeros (roots), rate of change, domain and range, and continuity.
27	BCR	3.1.1 The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
28	Range 0.56 - 0.57	3.1.3 The student will calculate theoretical probability or use simulations or statistical inference from data to estimate the probability of an event.
29	6	1.2.3 The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect.
30	366	1.2.5 The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.
31	ECR	3.2.2 The student will interpret data and/or make predictions by finding and using a line of best fit and by using a given curve of best fit. 3.2.3 The student will communicate the use and misuse of statistics.
32	H	1.1.2 The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression.

HSA Item Number	Answer	Indicators Assessed
33	D	1.2.5 The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.
34	J	1.2.1 The student will determine the equation for a line, solve linear equations, and/or describe the solutions using numbers, symbols, and/or graphs.
35	C	1.2.2 The student will solve linear inequalities and describe the solutions using numbers, symbols, and/or graphs.
36	G	1.1.3 The student will apply addition, subtraction, multiplication, and/or division of algebraic expressions to mathematical and real-world problems.
37	A	3.1.2 The student will use the measures of central tendency and/or variability to make informed conclusions.