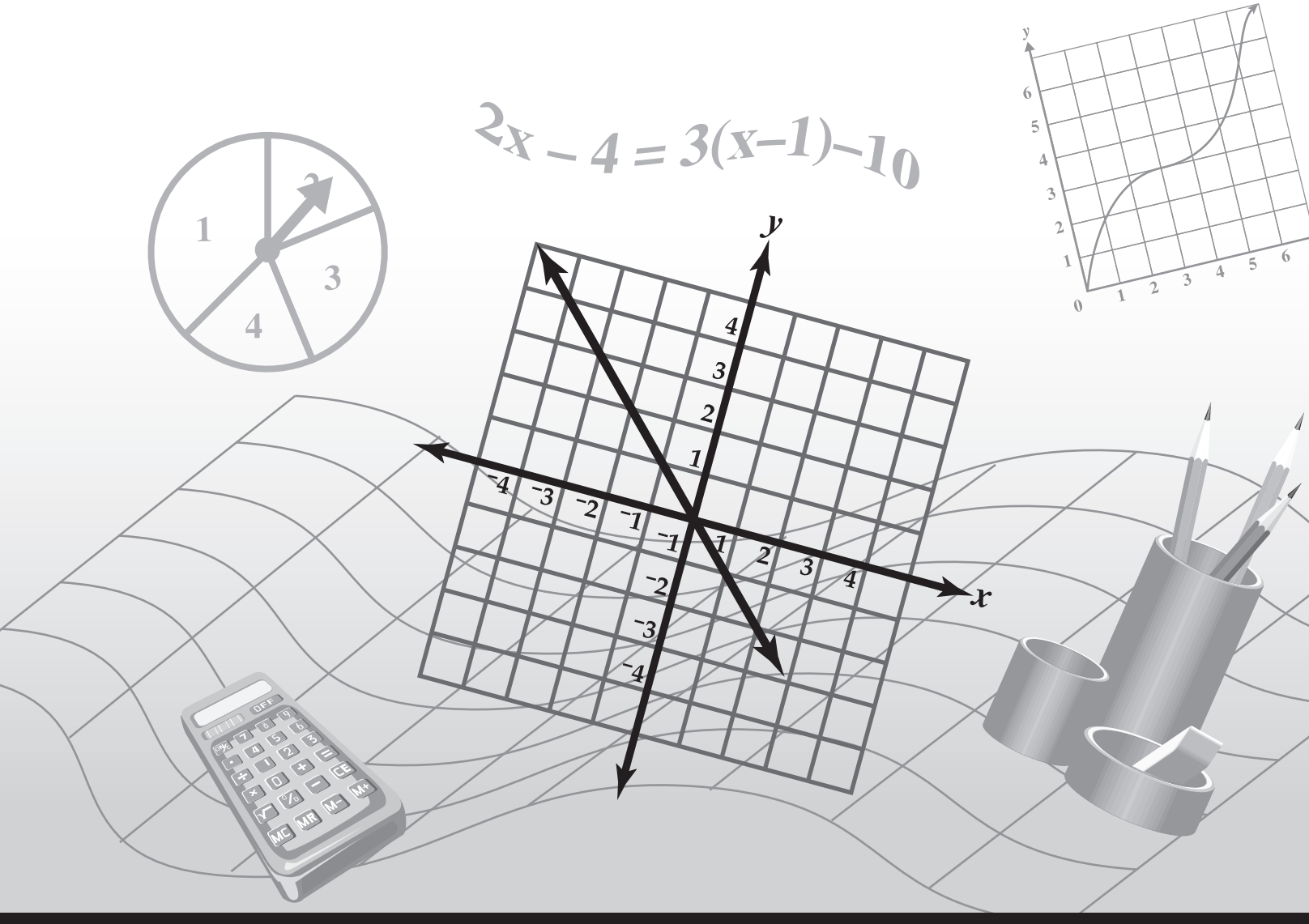
HSA

Maryland High School Assessment

Maryland State Department of Education

Achievement Matters Most



ALGEBRA/ DATA ANALYSIS

Public Release 2009

1 **Stephanie scored 88, 70, 84, and 72 on her first four science tests. What score does Stephanie need on her fifth science test to receive a mean score of 80?**

A 79

B 80

C 82

D 86

2 **The table below shows the number of words a student typed during five timed sessions.**

STUDENT'S TYPING

Time (m) (in minutes)	2	3	4	6	9
Number of Words Typed (w)	122	182	240	368	538

Which equation best models a line of best fit for these data?

F $w = 3m + 60$

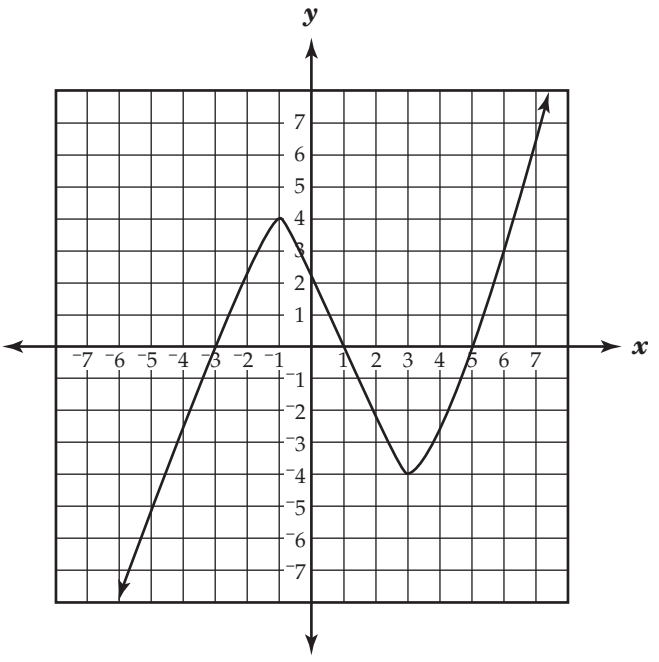
G $w = 60m + 3$

H $w = 102m - 117$

J $w = {}^{-}117m + 102$

GO ON

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



What are the zero(s) of the function?

A 2

B −1, 3

C −4, 4

D −3, 1, 5

GO ON

4 **Look at the pattern below.**

2.6, $^{-}$5.2, 10.4, $^{-}$20.8, . . .

If this pattern continues, what is the sixth term?

F $^{-}$83.2

G $^{-}$41.6

H 41.6

J 83.2

5 **Look at the table below.**

x	1	2	3	4
y	3	8	13	18

Which of these equations describes the relationship between the x-values and the y-values?

A $y = 2x - 5$

B $y = x + 2$

C $y = x + 5$

D $y = 5x - 2$

GO ON

Directions

Use the Response Grids in the Answer Sheet to complete Numbers 6 and 7.

6 **What is the slope of the line that passes through the points $(-3, -2)$ and $(1, 3)$?**

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

x	y
1	1
2	8
3	27
4	64
5	125
6	216
7	?

If this pattern continues, what is the value of y when $x = 7$?

GO ON

8 **A store sells T-shirts. The matrices below show the number of T-shirts in the store on November 1 and December 1.**

T-SHIRTS IN THE STORE

Number of T-shirts on November 1st

	S	M	L	XL
White	100	150	170	200
Grey	150	160	220	240

Number of T-shirts on December 1st

	S	M	L	XL
White	40	110	150	140
Grey	100	120	130	150

If the store did not add any additional T-shirts between November 1 and December 1, what size T-shirt sold the least?

F S

G M

H L

J XL

GO ON

9 **A box of cereal contains 1 of 5 different prizes. A simulation was conducted to predict how many boxes of cereal must be bought in order to get all 5 prizes. The results of 30 trials are shown in the stem-and-leaf plot below.**

NUMBER OF BOXES BOUGHT

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

KEY
1 | 5 = 15

Based on the results of the simulation, what is the total number of people out of 150 who would need to buy less than 10 boxes of cereal to get all 5 prizes?

A 3

B 5

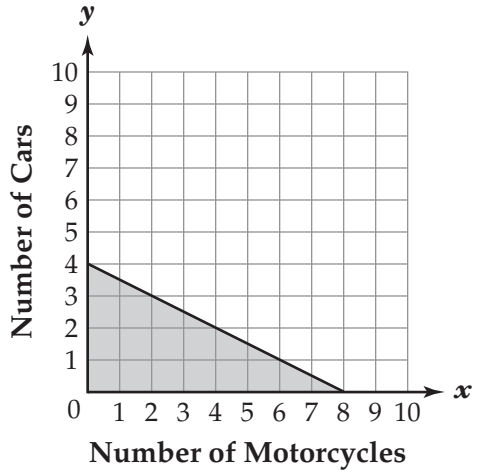
C 15

D 30

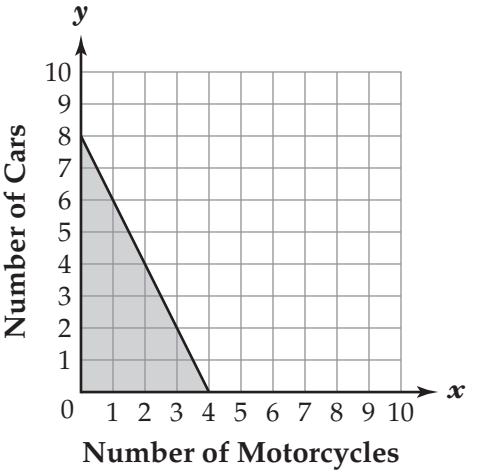
GO ON

10 **Patrick washes cars and motorcycles. He charges $6 per car and $3 per motorcycle. He earns no more than $24 a week. Which of these graphs best models this situation?**

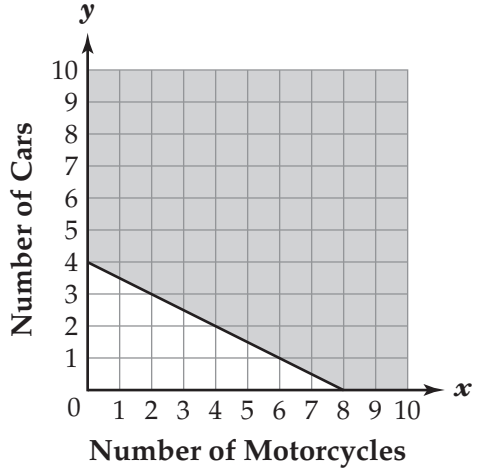
F



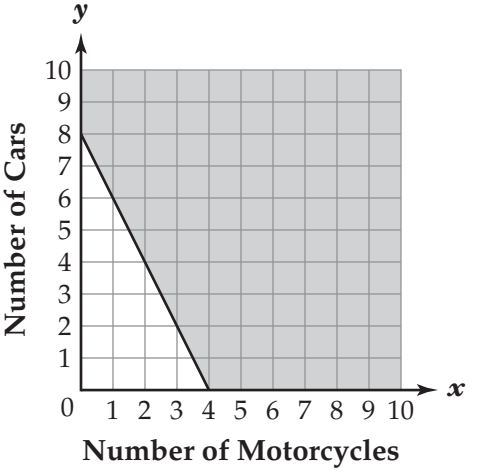
H



G



J



GO ON

11 **Steve bought 3 hot dogs and 1 large soda using the menu shown below.**

LUNCH MENU

Item	Price
Large Soda	$1.50
Hot Dog	$

The total cost of Steve's purchase was less than $6.75. Which of these inequalities best represents the cost (c) of each hot dog?

A $c < \$1.75$

B $c > \$1.75$

C $c < \$2.75$

D $c > \$2.75$

12 **The width and length, in feet, of a rectangular playground are x and $x+2$. A fence costs $17 per foot. Which of these expressions represents the cost, in dollars, to build a fence around this rectangular playground?**

F $17x(x+2)$

G $17+x+(x+2)$

H $17[x+(x+2)]$

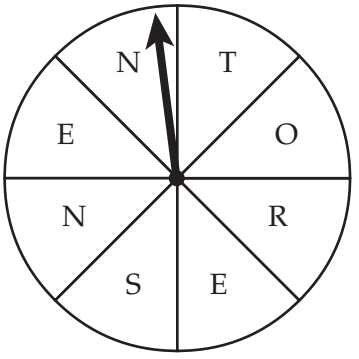
J $17[x+(x+2)+x+(x+2)]$

GO ON

Directions

Use the Response Grids in the Answer Sheet to complete Numbers 13 and 14.

13 **A spinner is divided into 8 equal sections as shown below.**



What is the theoretical probability that the arrow will not land on a section labeled E or O?

14 **The test scores for two classes are shown below.**

TEST SCORES

Class A		Class B
0	6	
8 8 8 6 2	7	4 4 4
4 2 0	8	2 6 6 7 8
0	9	2 5

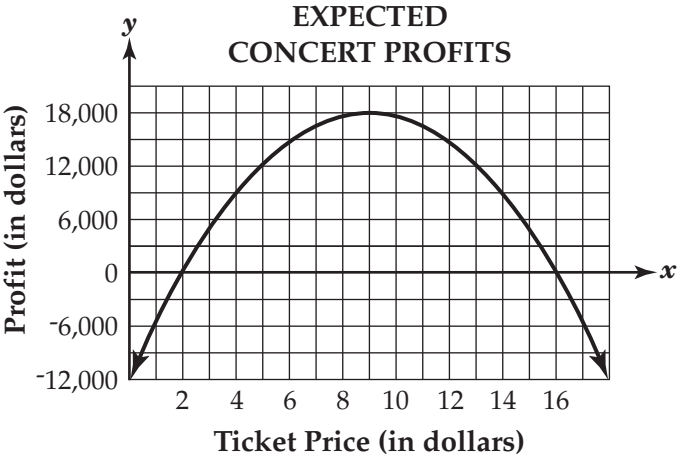
KEY
5|6| = 65

KEY
|6|1 = 61

What is the difference between the ranges of the scores for class A and class B?

GO ON

15 **The graph below models the relationship between the ticket price for a concert and the expected profits.**



Which of these best describes the zero(s) of this function?

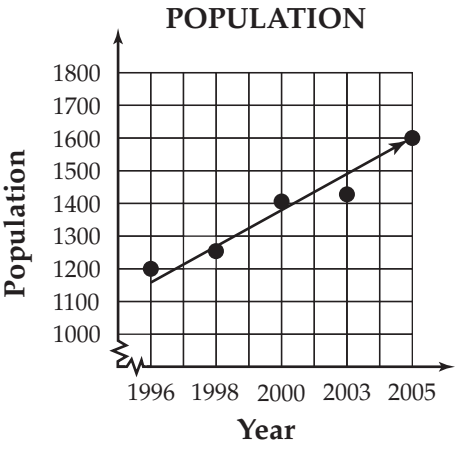
A 9 is the zero, and indicates when profit is at the maximum

B $-12{,}000$ is the zero, and indicates the cost to put on the concert

C 2 and 16 are the zeros, and indicate the ticket price for which the profit is 0

D 2 and 16 are the zeros, and indicate the number of tickets sold for which the profit is 0

16 **The population for the years 1996 to 2005 of a small town is shown on the graph below.**



Based on the graph, the mayor states that the population of the town increased at a steady rate for the years 1996 to 2005. Which of the following statements is true about the mayor's conclusion?

F It is valid because the scaling on both axes is appropriate.

G It is valid because the scaling on the vertical axis is appropriate.

H It is not valid because the scaling on both axes is inappropriate.

J It is not valid because the scaling on the horizontal axis is inappropriate.

GO ON

17 **The sign below shows the admission prices for an amusement park.**

The Gomez family has 2 adults and 3 children. They want to determine how many times the whole family can visit the amusement park before the Summer Family Pass is cheaper than the Daily Admission price for the whole family. Let x represent the number of times the whole family can visit the amusement park. Which of these inequalities represents this situation?

A $5x \leq 210$

B $35x \leq 210$

C $85x \leq 210$

D $90x \leq 210$

GO ON

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

$$y = -2x + 5$$
$$y = -2x + 3$$

Which of these statements must be true?

F The lines intersect at $(3,5)$.

G The lines intersect at $\left(-\frac{1}{2},4\right)$.

H The equations represent the same line.

J The equations represent parallel lines.

STOP

19 **Look at the pattern shown in the table below.**

x	1	2	3	4	5
y	9	12	17	24	33

If this pattern continues, what is the value of y when x is 10?

A 66

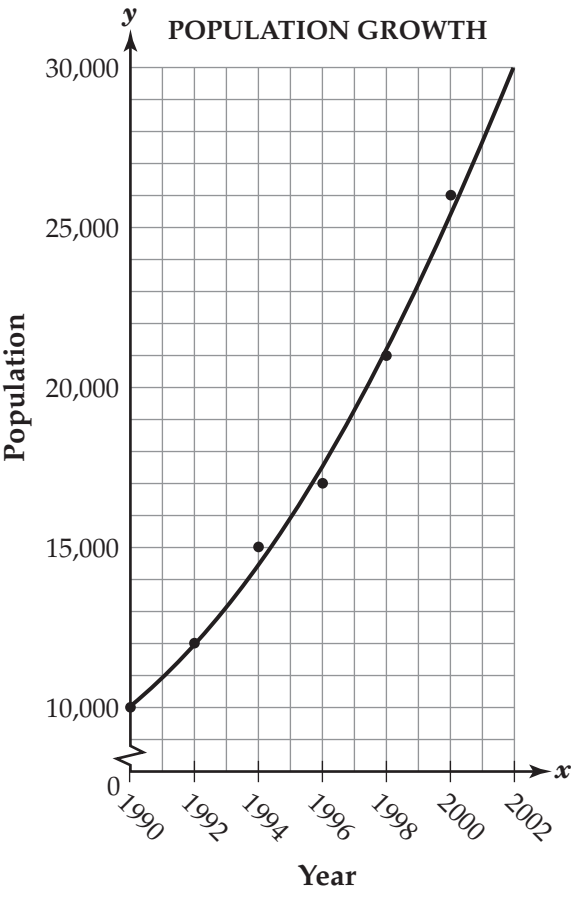
B 89

C 108

D 129

GO ON

20 **The scatter plot below shows the population growth of a town. A curve of best fit has been drawn.**



According to the curve of best fit, approximately how long did it take for the town's 1990 population to double?

F 2.0 years

G 4.5 years

H 6.0 years

J 7.5 years

21 **Alexis advertised that 25 percent of the cars that she sold were red. Which of these could not be used to simulate the number of red cars that Alexis sold?**

A Toss a fair coin once.

B Spin a spinner with 4 equally-sized sections.

C Draw a card from a deck of cards numbered 1 through 24.

D Use a random number generator to generate the digits 1 through 8.

Directions

Use the Response Grids in the Answer Sheet to complete Numbers 22 and 23.

22 **The table below shows the number of people on the boards of directors of 23 companies.**

BOARDS OF DIRECTORS

Number of People	Number of Companies
3	10
4	3
5	2
6	3
7	5

What is the median number of people on the boards of directors of these 23 companies?

23 **The matrix below shows the grades on an algebra test and a science test for three students.**

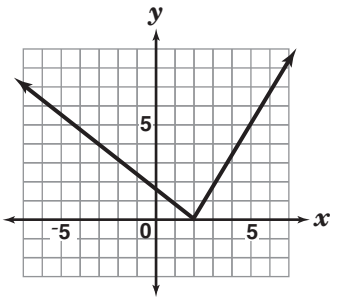
TEST GRADES

	Algebra	Science
Leo	74	82
Lauren	94	80
Anthony	91	78

Lauren increased her grade on the next science test by 5%. What was Lauren's grade on her next science test?

GO ON

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



Which of these describes the range of this function?

F $y \geq 0$

G $0 \leq y \leq 5$

H all real numbers

J all whole numbers

25 **The growing season of a major city is defined as the average number of days between the last frost in the spring and the first frost of the fall. Study the table below showing the average growing seasons of thirty major U.S. cities.**

AVERAGE GROWING SEASON (IN DAYS)

332	220	180
321	217	179
318	210	169
302	201	166
279	198	165
271	193	156
262	192	156
252	189	145
248	182	134
244	181	125

If the circled number 279 is changed to 179, how would the mode of this data change?

A mode would not change

B mode would decrease from 213 to 210

C mode would decrease from 196 to 193

D there would be two modes: 156 and 179

26 **Eric and Pam are each saving money to buy a car. Eric has $750 saved and will save an additional $30 a week. Pam has $1,200 saved and will save an additional $20 a week. How many weeks will it take Eric and Pam to save the same amount of money?**

F 39 weeks

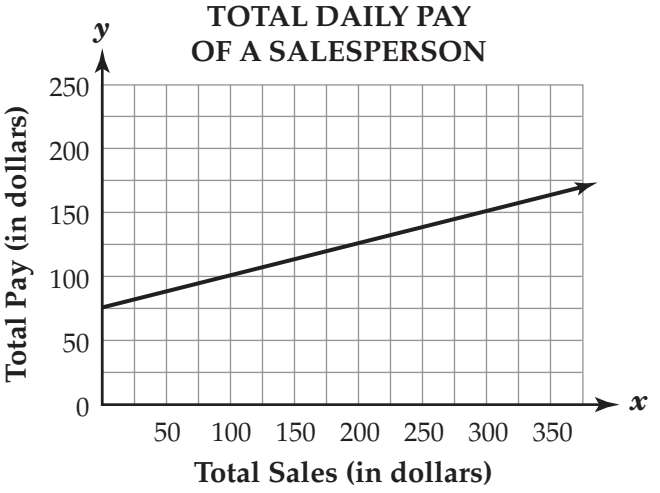
G 45 weeks

H 50 weeks

J 55 weeks

GO ON

27 **A salesperson earns 25% of her total sales in addition to a base pay. The graph below represents her total pay for a given day.**



How much does she earn if she does not make any sales on a given day?

A $0

B $25

C $75

D $175

GO ON

28 **Look at the pattern below.**

3, 10, 17, 24, 31, . . .

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

F 38

G 62

H 66

J 73

29 **The test scores for the nine students in Mrs. Miller's history class are shown below.**

68 69 70 71 71 72 72 72 100

Which of the following statements is true about the test scores?

A The mean misrepresents these test scores because 100 is an extreme value.

B The median misrepresents these test scores because 100 is an extreme value.

C The median represents these test scores because it is the value that occurs the most.

D The mean represents these test scores because it is the middle value of these test scores.

GO ON

Directions

Use the Response Grids in the Answer Sheet to complete Numbers 30 and 31.

30 **Look at the pattern shown below.**

2, 6, 18, 54, …

If this pattern continues, what is the sixth term?

31 **Internet Company A charges a $25 fee plus an additional $0.35 per hour. Internet Company B charges a $10 fee plus an additional $0.50 per hour. For what number of hours are the charges for both companies the same?**

32 **A company spends $2x+3,000$ dollars for materials to make calculators. The cost of labor to make these calculators is $3.2x+3,500$ dollars. Which expression represents the difference between the cost of labor and the cost of materials?**

F $(3.2x+3,500)+(2x+3,000)$

G $(3.2x+3,500)-(2x+3,000)$

H $(3.2x+3,500)\times(2x+3,000)$

J $(3.2x+3,500)\div(2x+3,000); x \neq -1,500$

33 **Javier wants to collect data about the number of hours students in his school exercise each week. Based on the principles of simple random sampling, which of these is the best method for Javier to collect his data?**

A Randomly select 20 students from both the girls' and boys' soccer teams.

B Randomly select 10 freshmen, 10 sophomores, 10 juniors, and 10 seniors.

C Choose any 3 buses, and randomly select a total of 40 students from those buses.

D Number all students in the school, and randomly select the numbers of 40 students.

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

x	y
-1	1
0	0
1	1
2	4

Which equation represents this relationship?

F $y = x^2$

G $y = x^3$

H $y = x - 1$

J $y = x + 2$

GO ON

35 **The tenth-grade class is planning a homecoming dance. They want to hire a band.**

Band A: **The band charges $500 to play for the night.**
Band B: **The band charges $275 and $1.50 for each ticket sold.**

Let n represent the number of tickets sold and c represent the total cost of hiring the band. Which system of equations models this situation?

A
$c = 500 + 500n$
$c = 1.5n + 275$

B
$c = 500$
$c = n + 275$

C
$c = 500n$
$c = 275n + 1.5$

D
$c = 500$
$c = 1.5n + 275$

36 **The table below shows the cost of health care, in millions of dollars, from 1996 to 2001.**

COST OF HEALTH CARE

Year	Cost (in millions)
1996	$482
1997	$504
1998	$522
1999	$560
2000	$591
2001	$630

The equation of a line of best fit for this data is $y = 30x + 474$, where x represents the number of years since 1996 and y represents the cost of health care, in millions of dollars. Which statement best describes the meaning of the slope of this equation?

F The cost of health care increased by $30 per year since 1996.

G The cost of health care increased by $474 per year since 1996.

H The cost of health care increased by $30,000,000 per year since 1996.

J The cost of health care increased by $474,000,000 per year since 1996.

STOP

37 **The owner of a store wants to decide when to close the store after 4 P.M. The table below shows the median profit of the store for five time intervals during a six-month period.**

MEDIAN PROFIT

Time Intervals	4 P.M. – 5 P.M.	5 P.M. – 6 P.M.	6 P.M. – 7 P.M.	7 P.M. – 8 P.M.	8 P.M. – 9 P.M.
Median Profit	$2,000	$5,000	-$2,500	-$4,000	$1,000

Based on the data in the table, at which of these times should the owner close the store to maximize profit?

A 5:00 P.M.

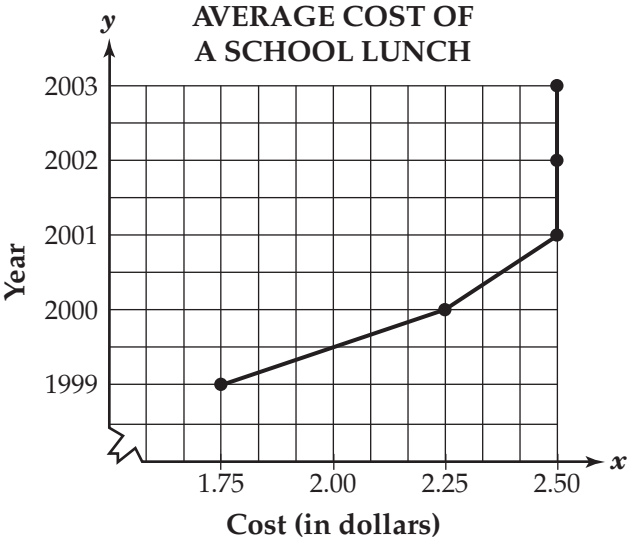
B 6:00 P.M.

C 7:00 P.M.

D 9:00 P.M.

GO ON

38 **Minh used the graph below to show that the average cost of a school lunch is increasing at a rapid rate.**



Which of these best describes why this is a misuse of statistics?

F The cost of a school lunch is actually decreasing.

G A line of best fit should be used instead of a line graph.

H The graph should not include the years where the cost stayed the same.

J The years should be placed on the horizontal axis to show how the average cost of a school lunch changes over time.

GO ON

Directions

Use the Response Grids in the Answer Sheet to complete Numbers 39 and 40.

39 **A fish tank at a pet store has 3 red fish, 6 blue fish, 7 yellow fish, and 4 orange fish. If one fish is chosen at random from the tank, what is the probability that the fish will be blue or yellow?**

40 **Each student pays a one-time fee of $25 to be in the chorus. Each student also pays an additional $5 each month for travel expenses. In how many months will a student spend $100 to be in the chorus?**

GO ON

41 **A school wants to conduct a survey of its 1200 students to decide on a school song. Based on the principles of simple random sampling, which of these is the best method for the school to use to conduct its survey?**

A Assign a different number to each student who has been at the school for at least one year and select 30 students using a random number generator.

B Assign a different number to each student whose age is 16 years or older, and select 30 students using a random number generator.

C Assign a different number to each student, and select 15 males and 15 females using a random number generator.

D Assign a different number to each student, and select 30 students using a random number generator.

GO ON

42 **A teacher collects data to show the relationship between the number of student absences (x) and the grade a student earns (y). Using the data, the teacher determines the equation for the line of best fit, as shown below.**

$$y = {}^{-}0.25x + 4$$

The teacher then uses the equation to predict the letter grade that a student earns. This relationship is shown in the table below.

STUDENT GRADE

Letter Grade	Grade Earned
A	3.5–4.0
B	2.5–3.4
C	1.5–2.4
D	0.5–1.4
F	0.0–0.4

What is the letter grade for a student that has 4 absences?

F A

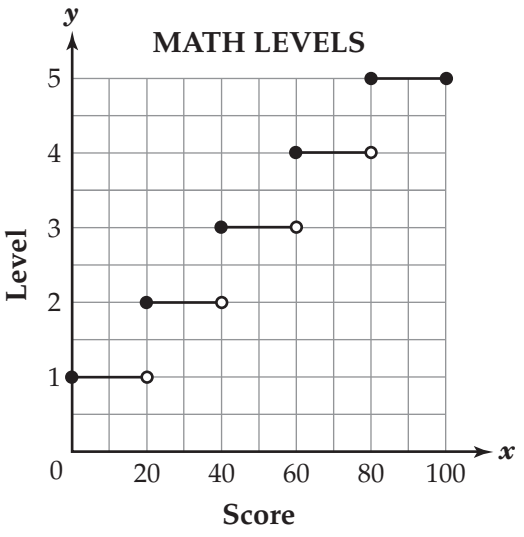
G B

H C

J D

GO ON

43 **Students take a math exam before entering a certain college. The graph below shows the relationship between students' scores on the exam and their math levels.**



Kalia earns a score of 80 on the exam. What is her math level?

A Level 2

B Level 3

C Level 4

D Level 5

44 **A television station will conduct a survey to determine the most popular television show in its viewing area. Which of these methods provides the most representative sample?**

F Survey 50 randomly selected residents in its viewing area.

G Survey 50 randomly selected people who leave a video rental store.

H Survey 50 randomly selected people who enter the television station.

J Survey 50 randomly selected residents from the local telephone book.

GO ON

45 **In a recipe for spice cake, the ratio of flour to milk is 3 to 1. Which of these tables shows the correct amount of flour and milk needed to make more than one spice cake?**

A **SPICE CAKE INGREDIENTS**

Flour	Milk
2	6
5	15
8	24
10	30

B **SPICE CAKE INGREDIENTS**

Flour	Milk
6	2
15	5
24	8
30	10

C **SPICE CAKE INGREDIENTS**

Flour	Milk
5	8
7	10
9	12
11	14

D **SPICE CAKE INGREDIENTS**

Flour	Milk
15	12
30	27
40	34
55	52

GO ON

46 **There are coconut, caramel, and fudge candy in a box. Kevin uses a random number generator to simulate choosing one piece of candy. The table below shows the assignment of digits to the types of candy.**

CANDY SIMULATION

Digit	Type of Candy
0, 1, 2, 3	Coconut
4, 5, 6	Caramel
7, 8, 9	Fudge

Kevin ran the simulation 20 times. The results are shown below:

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

Based on the results of the simulation, what is the probability that a randomly selected piece of candy is a coconut candy?

F $\frac{6}{20}$

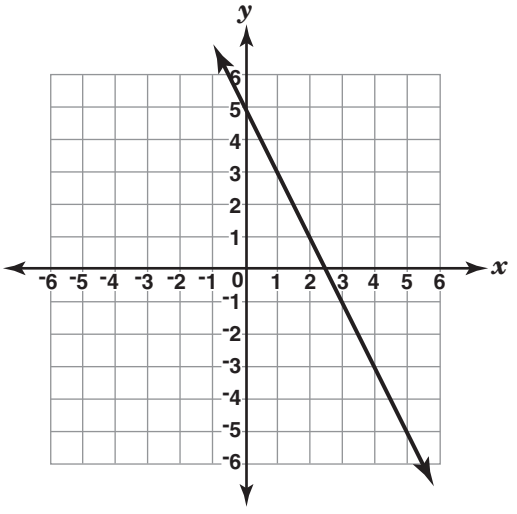
G $\frac{8}{20}$

H $\frac{10}{20}$

J $\frac{14}{20}$

GO ON

47 **The line $y = {}^{-}2x + 5$ is graphed below.**



What is the value of x when y is $^{-}3$?

A $^{-}1$

B 1

C 4

D 11

48 **A school has 750 students. A randomly selected sample of 100 students was asked to name their favorite class. The results are shown in the table below.**

SURVEY RESULTS

Favorite Class	Number of Students
English	15
Math	17
Science	12
Social Studies	10
Technical Education	13
Music/Art	12
Physical Education	15
Foreign Language	6

Based on the survey results, what is the total number of students at the school who will choose science as their favorite class?

F 12

G 16

H 75

J 90

GO ON

49 **Sally bought a copy machine. As a machine's age increases its value, in dollars, decreases. This is called depreciation. The equation used to calculate the depreciation for this copy machine is shown below, where y is the depreciated value, in dollars, of the machine after x years.**

$$y = {}^{-}500x + 7000$$

What is the depreciated value of the copy machine after 5 years?

A $1,399

B $2,500

C $4,500

D $7,500

50 **The test scores of 8 students are listed below.**

STUDENT TEST SCORES

Student	Score
Abe	71
Rhonda	65
Elvin	76
Melanie	84
Jackie	60
Nate	84
Daniel	82
Steve	73

Which students' scores would fall above the third quartile?

F Rhonda and Abe

G Melanie and Nate

H Steve and Daniel

J Abe and Steve

51 **In a mathematics class, the formula below is used to convert the number of points scored on a test from a raw score (R) to an adjusted score (A).**

$$A = \frac{7}{8}R + 20$$

What is the adjusted score if the raw score is 64?

A 73

B 76

C 93

D 96

GO ON

52 **The cafeteria manager is going to start selling cookies at lunch. She surveyed 300 randomly selected students on their cookie preferences. The survey results are shown in the table below.**

COOKIE PREFERENCE SURVEY RESULTS

Type of Cookie	Number of Students
Chocolate chip	125
Oatmeal	23
Vanilla creme	67
Peanut butter	85

She needs cookies for 1,640 students. Based on the survey results, if each student buys one cookie, what is the total number of vanilla creme cookies she should buy? Round the answer to the nearest whole number.

F 12

G 67

H 366

J 734

STOP

HSA Item Number	Answer	Indicators Assessed
1	D	**3.1.2** The student will use the measures of central tendency and/or variability to make informed conclusions.
2	G	**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	D	**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.
4	F	**1.1.1** The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
5	D	**1.1.2** The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression.
6	1.25	**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.
7	343	**1.1.1** The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
8	G	**1.2.5** The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.
9	C	**3.2.1** The student will make informed decisions and predictions based upon the results of simulations and data from research.
10	F	**1.2.2** The student will solve linear inequalities and describe the solutions using numbers, symbols, and/or graphs.
11	A	**1.2.2** The student will solve linear inequalities and describe the solutions using numbers, symbols, and/or graphs.
12	J	**1.1.3** The student will apply addition, subtraction, multiplication, and/or division of algebraic expressions to mathematical and real-world problems.
13	0.625	**3.1.3** The student will calculate theoretical probability or use simulations or statistical inference from data to estimate the probability of an event.
14	9	**3.1.2** The student will use the measures of central tendency and/or variability to make informed conclusions.
15	C	**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.
16	J	**3.2.3** The student will communicate the use and misuse of statistics.
17	C	**1.2.2** The student will solve linear inequalities and describe the solutions using numbers, symbols, and/or graphs.
18	J	**1.2.3** The student will solve and describe using numbers, symbols, and/or graphs

HSA Item Number	Answer	Indicators Assessed
		if and where two straight lines intersect.
19	C	**1.1.1** The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
20	J	**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.
21	A	**3.1.1** The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
22	4	**3.1.2** The student will use the measures of central tendency and/or variability to make informed conclusions.
23	84	**1.2.5** The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.
24	F	**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.
25	D	**3.1.2** The student will use the measures of central tendency and/or variability to make informed conclusions.
26	G	**1.2.3** The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect.
27	C	**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.
28	H	**1.1.1** The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
29	A	**3.2.3** The student will communicate the use and misuse of statistics.
30	486	**1.1.1** The student will recognize, describe, and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.
31	100	**1.2.3** The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect.
32	G	**1.1.3** The student will apply addition, subtraction, multiplication, and/or division of algebraic expressions to mathematical and real-world problems.
33	D	**3.1.1** The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
34	F	**1.1.2** The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression.
35	D	**1.2.3** The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect.

HSA Item Number	Answer	Indicators Assessed
36	H	**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.
37	B	**3.2.1** The student will make informed decisions and predictions based upon the results of simulations and data from research.
38	J	**3.2.3** The student will communicate the use and misuse of statistics.
39	0.65	**3.1.3** The student will calculate theoretical probability or use simulations or statistical inference from data to estimate the probability of an event.
40	15	**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.
41	D	**3.1.1** The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
42	G	**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.
43	D	**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.
44	F	**3.1.1** The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.
45	B	**1.1.2** The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression.
46	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.
47	C	**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.
48	J	**3.2.1** The student will make informed decisions and predictions based upon the results of simulations and data from research.
49	C	**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.
50	G	**3.1.2** The student will use the measures of central tendency and/or variability to make informed conclusions.
51	B	**1.2.5** The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.
52	H	**3.2.1** The student will make informed decisions and predictions based upon the results of simulations and data from research.