JMAP
REGENTS BY COMMON CORE STATE STANDARD: TOPIC

NY Algebra I Regents Exam Questions
from Fall 2013 to August 2015 Sorted by CCSS: Topic

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Algebra I Regents Exam Questions by Common Core State Standard: Topic

NUMBERS, OPERATIONS AND PROPERTIES
N.RN.3: CLASSIFYING NUMBERS

1 Given: $L = \sqrt{2}$

$\quad\quad\quad M = 3\sqrt{3}$

$\quad\quad\quad N = \sqrt{16}$

$\quad\quad\quad P = \sqrt{9}$

Which expression results in a rational number?
1 $L + M$
2 $M + N$
3 $N + P$
4 $P + L$

2 Which statement is *not* always true?
1 The product of two irrational numbers is irrational.
2 The product of two rational numbers is rational.
3 The sum of two rational numbers is rational.
4 The sum of a rational number and an irrational number is irrational.

3 Ms. Fox asked her class "Is the sum of 4.2 and $\sqrt{2}$ rational or irrational?" Patrick answered that the sum would be irrational. State whether Patrick is correct or incorrect. Justify your reasoning.

4 Which statement is *not* always true?
1 The sum of two rational numbers is rational.
2 The product of two irrational numbers is rational.
3 The sum of a rational number and an irrational number is irrational.
4 The product of a nonzero rational number and an irrational number is irrational.

5 For which value of P and W is $P + W$ a rational number?
1 $P = \dfrac{1}{\sqrt{3}}$ and $W = \dfrac{1}{\sqrt{6}}$
2 $P = \dfrac{1}{\sqrt{4}}$ and $W = \dfrac{1}{\sqrt{9}}$
3 $P = \dfrac{1}{\sqrt{6}}$ and $W = \dfrac{1}{\sqrt{10}}$
4 $P = \dfrac{1}{\sqrt{25}}$ and $W = \dfrac{1}{\sqrt{2}}$

A.REI.1: IDENTIFYING PROPERTIES

6 When solving the equation $4(3x^2 + 2) - 9 = 8x^2 + 7$, Emily wrote $4(3x^2 + 2) = 8x^2 + 16$ as her first step. Which property justifies Emily's first step?
1 addition property of equality
2 commutative property of addition
3 multiplication property of equality
4 distributive property of multiplication over addition

GRAPHS AND STATISTICS
S.ID.5: FREQUENCY HISTOGRAMS AND TABLES

7 The school newspaper surveyed the student body for an article about club membership. The table below shows the number of students in each grade level who belong to one or more clubs.

	1 Club	2 Clubs	3 or More Clubs
9th	90	33	12
10th	125	12	15
11th	87	22	18
12th	75	27	23

If there are 180 students in ninth grade, what percentage of the ninth grade students belong to more than one club?

S.ID.1: BOX PLOTS

8   Robin collected data on the number of hours she watched television on Sunday through Thursday nights for a period of 3 weeks. The data are shown in the table below.

	Sun	Mon	Tues	Wed	Thurs
Week 1	4	3	3.5	2	2
Week 2	4.5	5	2.5	3	1.5
Week 3	4	3	1	1.5	2.5

Using an appropriate scale on the number line below, construct a box plot for the 15 values.

S.ID.2-3: CENTRAL TENDENCY AND DISPERSION

9   Christopher looked at his quiz scores shown below for the first and second semester of his Algebra class.
Semester 1: 78, 91, 88, 83, 94
Semester 2: 91, 96, 80, 77, 88, 85, 92
Which statement about Christopher's performance is correct?
1   The interquartile range for semester 1 is greater than the interquartile range for semester 2.
2   The median score for semester 1 is greater than the median score for semester 2.
3   The mean score for semester 2 is greater than the mean score for semester 1.
4   The third quartile for semester 2 is greater than the third quartile for semester 1.

10 Isaiah collects data from two different companies, each with four employees. The results of the study, based on each worker's age and salary, are listed in the tables below.

Company 1

Worker's Age in Years	Salary in Dollars
25	30,000
27	32,000
28	35,000
33	38,000

Company 2

Worker's Age in Years	Salary in Dollars
25	29,000
28	35,500
29	37,000
31	65,000

Which statement is true about these data?
1   The median salaries in both companies are greater than $37,000.
2   The mean salary in company 1 is greater than the mean salary in company 2.
3   The salary range in company 2 is greater than the salary range in company 1.
4   The mean age of workers at company 1 is greater than the mean age of workers at company 2.

11 Corinne is planning a beach vacation in July and is analyzing the daily high temperatures for her potential destination. She would like to choose a destination with a high median temperature and a small interquartile range. She constructed box plots shown in the diagram below.
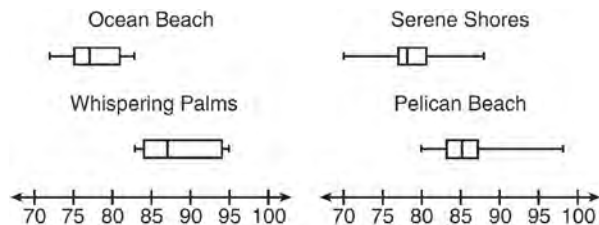
Which destination has a median temperature above 80 degrees and the smallest interquartile range?
1   Ocean Beach
2   Whispering Palms
3   Serene Shores
4   Pelican Beach

12 The two sets of data below represent the number of runs scored by two different youth baseball teams over the course of a season.
                Team *A*: 4, 8, 5, 12, 3, 9, 5, 2
                Team *B*: 5, 9, 11, 4, 6, 11, 2, 7
Which set of statements about the mean and standard deviation is true?
1   mean *A* < mean *B*
     standard deviation *A* > standard deviation *B*
2   mean *A* > mean *B*
     standard deviation *A* < standard deviation *B*
3   mean *A* < mean *B*
     standard deviation *A* < standard deviation *B*
4   mean *A* > mean *B*
     standard deviation *A* > standard deviation *B*

13 The table below shows the annual salaries for the 24 members of a professional sports team in terms of millions of dollars.

0.5	0.5	0.6	0.7	0.75	0.8
1.0	1.0	1.1	1.25	1.3	1.4
1.4	1.8	2.5	3.7	3.8	4
4.2	4.6	5.1	6	6.3	7.2

The team signs an additional player to a contract worth 10 million dollars per year. Which statement about the median and mean is true?
1   Both will increase.
2   Only the median will increase.
3   Only the mean will increase.
4   Neither will change.

S.ID.6: REGRESSION

14 Emma recently purchased a new car. She decided to keep track of how many gallons of gas she used on five of her business trips. The results are shown in the table below.

Miles Driven	Number of Gallons Used
150	7
200	10
400	19
600	29
1000	51

Write the linear regression equation for these data where miles driven is the independent variable. (Round all values to the *nearest hundredth*.)

15 About a year ago, Joey watched an online video of a band and noticed that it had been viewed only 843 times. One month later, Joey noticed that the band's video had 1708 views. Joey made the table below to keep track of the cumulative number of views the video was getting online.

Months Since First Viewing	Total Views
0	843
1	1708
2	forgot to record
3	7124
4	14,684
5	29,787
6	62,381

Write a regression equation that best models these data. Round all values to the *nearest hundredth*. Justify your choice of regression equation. As shown in the table, Joey forgot to record the number of views after the second month. Use the equation from part *a* to estimate the number of full views of the online video that Joey forgot to record.
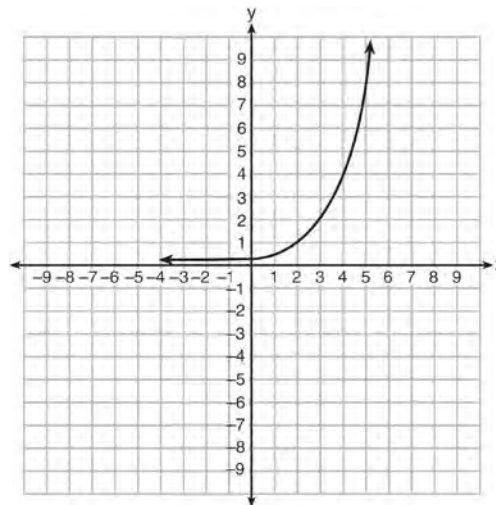
16 The table below shows the number of grams of carbohydrates, *x*, and the number of Calories, *y*, of six different foods.

Carbohydrates (*x*)	Calories (*y*)
8	120
9.5	138
10	147
6	88
7	108
4	62

Which equation best represents the line of best fit for this set of data?
1 $y = 15x$
2 $y = 0.07x$
3 $y = 0.1x - 0.4$
4 $y = 14.1x + 5.8$

17 Write an exponential equation for the graph shown below.

Explain how you determined the equation.

18 An application developer released a new app to be downloaded. The table below gives the number of downloads for the first four weeks after the launch of the app.

Number of Weeks	1	2	3	4
Number of Downloads	120	180	270	405

Write an exponential equation that models these data. Use this model to predict how many downloads the developer would expect in the 26th week if this trend continues. Round your answer to the nearest download. Would it be reasonable to use this model to predict the number of downloads past one year? Explain your reasoning.

19 The table below shows the attendance at a museum in select years from 2007 to 2013.

Attendance at Museum

Year	2007	2008	2009	2011	2013
Attendance (millions)	8.3	8.5	8.5	8.8	9.3

State the linear regression equation represented by the data table when $x = 0$ is used to represent the year 2007 and y is used to represent the attendance. Round all values to the *nearest hundredth*. State the correlation coefficient to the *nearest hundredth* and determine whether the data suggest a strong or weak association.

S.ID.6, 8: CORRELATION COEFFICIENT AND RESIDUALS

20 Which statistic would indicate that a linear function would *not* be a good fit to model a data set?
1 $r = -0.93$
2 $r = 1$

3

4
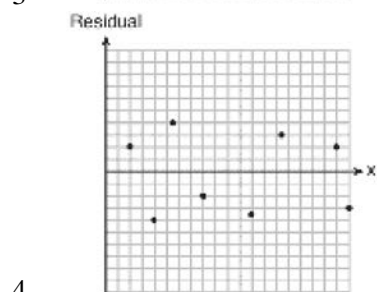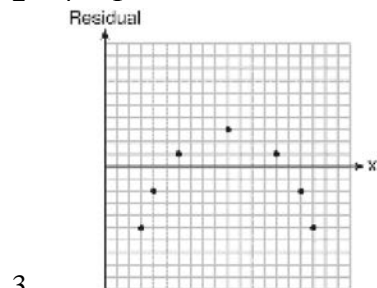
21 Use the data below to write the regression equation ($y = ax + b$) for the raw test score based on the hours tutored. Round all values to the *nearest hundredth*.

Tutor Hours, x	Raw Test Score	Residual (Actual – Predicted)
1	30	1.3
2	37	1.9
3	35	−6.4
4	47	−0.7
5	56	2.0
6	67	6.6
7	62	−4.7

Equation: _____

Create a residual plot on the axes below, using the residual scores in the table above.
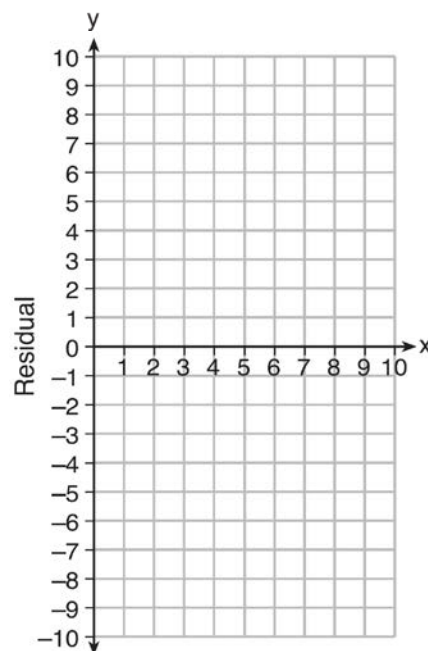
Based on the residual plot, state whether the equation is a good fit for the data. Justify your answer.

5

22 The table below represents the residuals for a line of best fit.

x	2	3	3	4	6	7	8	9	9	10
Residual	2	1	−1	−2	−3	−2	−1	2	0	3

Plot these residuals on the set of axes below.
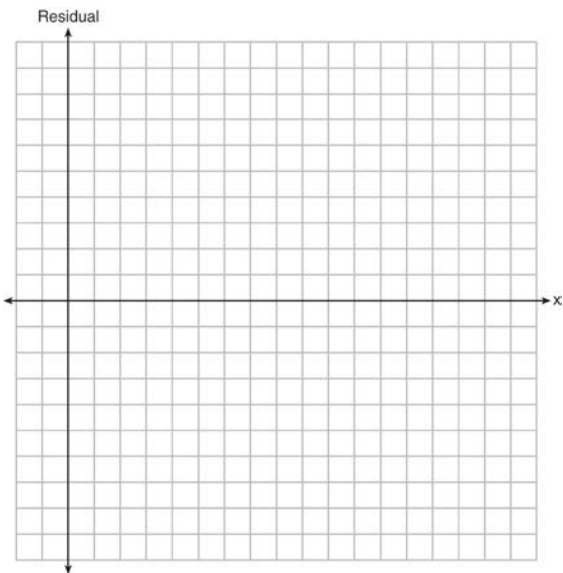
Residual

Using the plot, assess the fit of the line for these residuals and justify your answer.

23 The residual plots from two different sets of bivariate data are graphed below.
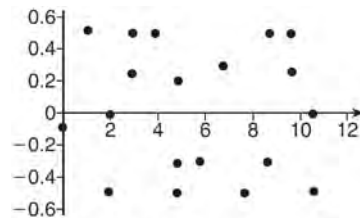
Graph A
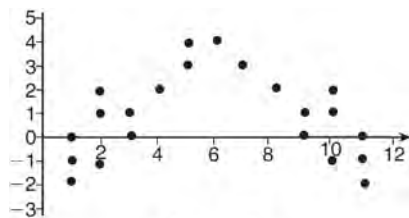
Graph B

Explain, using evidence from graph *A* and graph *B*, which graph indicates that the model for the data is a good fit.

24 What is the correlation coefficient of the linear fit of the data shown below, to the *nearest hundredth*?

1   1.00
2   0.93
3   −0.93
4   −1.00

25 A nutritionist collected information about different brands of beef hot dogs. She made a table showing the number of Calories and the amount of sodium in each hot dog.

Calories per Beef Hot Dog	Milligrams of Sodium per Beef Hot Dog
186	495
181	477
176	425
149	322
184	482
190	587
158	370
139	322

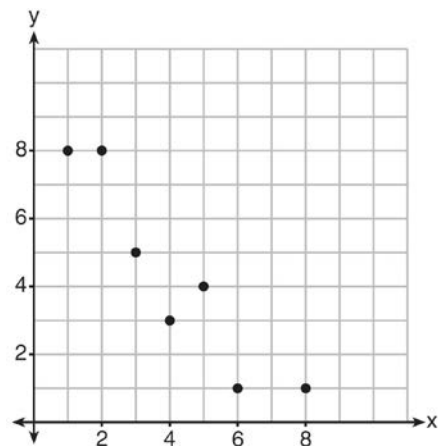a) Write the correlation coefficient for the line of best fit. Round your answer to the *nearest hundredth.*
b) Explain what the correlation coefficient suggests in the context of this problem.

S.ID.9: ANALYSIS OF DATA

26 Beverly did a study this past spring using data she collected from a cafeteria. She recorded data weekly for ice cream sales and soda sales. Beverly found the line of best fit and the correlation coefficient, as shown in the diagram below.

Beverly's Cafeteria Study
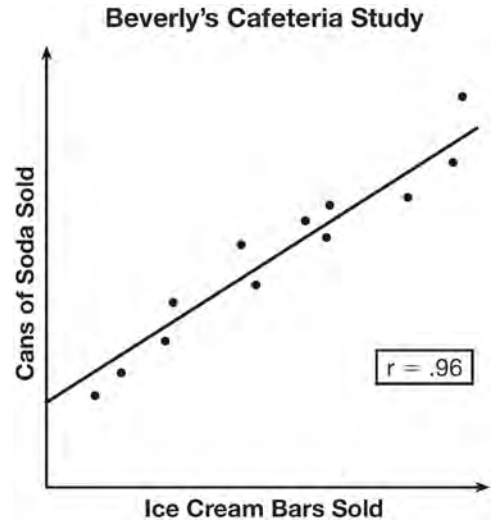
Given this information, which statement(s) can correctly be concluded?
I.   Eating more ice cream causes a person to become thirsty.
II. Drinking more soda causes a person to become hungry.
III. There is a strong correlation between ice cream sales and soda sales.
1   I, only
2   III, only
3   I and III
4   II and III

RATE
F.IF.6: RATE OF CHANGE

27 Given the functions $g(x)$, $f(x)$, and $h(x)$ shown below:

$$g(x) = x^2 - 2x$$

x	f(x)
0	1
1	2
2	5
3	7

h(x)
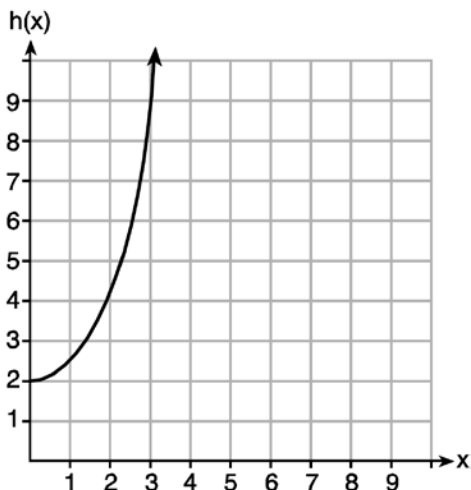
The correct list of functions ordered from greatest to least by average rate of change over the interval $0 \le x \le 3$ is
1 $f(x)$, $g(x)$, $h(x)$
2 $h(x)$, $g(x)$, $f(x)$
3 $g(x)$, $f(x)$, $h(x)$
4 $h(x)$, $f(x)$, $g(x)$

28 The Jamison family kept a log of the distance they traveled during a trip, as represented by the graph below.
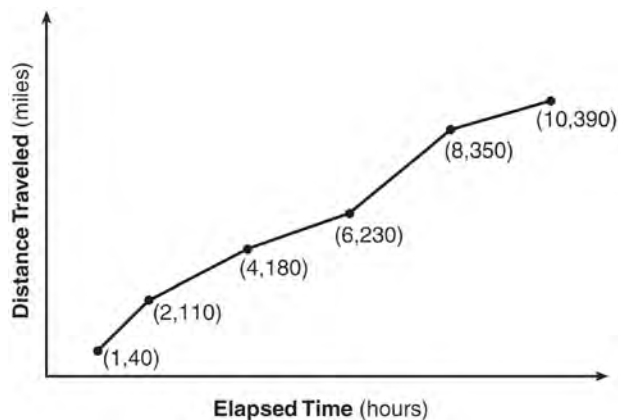
During which interval was their average speed the greatest?
1 the first hour to the second hour
2 the second hour to the fourth hour
3 the sixth hour to the eighth hour
4 the eighth hour to the tenth hour

29 The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

Age (years)	Average Pupil Diameter (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?
1 2.4
2 0.04
3 −2.4
4 −0.04

8

30 An astronaut drops a rock off the edge of a cliff on the Moon. The distance, $d(t)$, in meters, the rock travels after t seconds can be modeled by the function $d(t) = 0.8t^2$. What is the average speed, in meters per second, of the rock between 5 and 10 seconds after it was dropped?

1   12
2   20
3   60
4   80

31 Joey enlarged a 3-inch by 5-inch photograph on a copy machine. He enlarged it four times. The table below shows the area of the photograph after each enlargement.

Enlargement	0	1	2	3	4
Area (square inches)	15	18.8	23.4	29.3	36.6

What is the average rate of change of the area from the original photograph to the fourth enlargement, to the *nearest tenth*?

1   4.3
2   4.5
3   5.4
4   6.0

32 Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200°F.
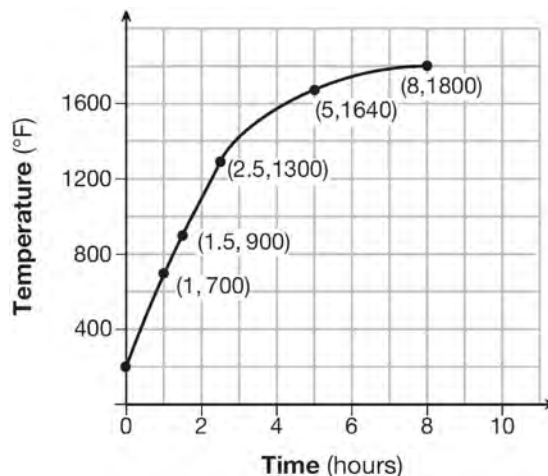
During which time interval did the temperature in the kiln show the greatest average rate of change?

1   0 to 1 hour
2   1 hour to 1.5 hours
3   2.5 hours to 5 hours
4   5 hours to 8 hours

N.Q.1: CONVERSIONS

33 Peyton is a sprinter who can run the 40-yard dash in 4.5 seconds. He converts his speed into miles per hour, as shown below.

$$\frac{40\text{ yd}}{4.5\text{ sec}} \cdot \frac{3\text{ ft}}{1\text{ yd}} \cdot \frac{5280\text{ ft}}{1\text{ mi}} \cdot \frac{60\text{ sec}}{1\text{ min}} \cdot \frac{60\text{ min}}{1\text{ hr}}$$

Which ratio is *incorrectly* written to convert his speed?

1   $\dfrac{3\text{ ft}}{1\text{ yd}}$

2   $\dfrac{5280\text{ ft}}{1\text{ mi}}$

3   $\dfrac{60\text{ sec}}{1\text{ min}}$

4   $\dfrac{60\text{ min}}{1\text{ hr}}$

9

LINEAR EQUATIONS
A.SSE.1: MODELING EXPRESSIONS

34 To watch a varsity basketball game, spectators must buy a ticket at the door. The cost of an adult ticket is $3.00 and the cost of a student ticket is $1.50. If the number of adult tickets sold is represented by a and student tickets sold by s, which expression represents the amount of money collected at the door from the ticket sales?
1    $4.50as$
2    $4.50(a+s)$
3    $(3.00a)(1.50s)$
4    $3.00a + 1.50s$

A.REI.3: SOLVING LINEAR EQUATIONS

35 Which value of x satisfies the equation
$$\frac{7}{3}\left(x+\frac{9}{28}\right)=20?$$
1   8.25
2   8.89
3   19.25
4   44.92

36 What is the value of x in the equation
$$\frac{x-2}{3}+\frac{1}{6}=\frac{5}{6}?$$
1   4
2   6
3   8
4   11

A.CED.1, 3: MODELING LINEAR EQUATIONS

37 John has four more nickels than dimes in his pocket, for a total of $1.25. Which equation could be used to determine the number of dimes, x, in his pocket?
1    $0.10(x+4)+0.05(x)=\$1.25$
2    $0.05(x+4)+0.10(x)=\$1.25$
3    $0.10(4x)+0.05(x)=\$1.25$
4    $0.05(4x)+0.10(x)=\$1.25$

38 A cell phone company charges $60.00 a month for up to 1 gigabyte of data. The cost of additional data is $0.05 per megabyte. If d represents the number of additional megabytes used and c represents the total charges at the end of the month, which linear equation can be used to determine a user's monthly bill?
1    $c=60-0.05d$
2    $c=60.05d$
3    $c=60d-0.05$
4    $c=60+0.05d$

39 A gardener is planting two types of trees:
>   Type A is three feet tall and grows at a rate of 15 inches per year.
>   Type B is four feet tall and grows at a rate of 10 inches per year.
Algebraically determine exactly how many years it will take for these trees to be the same height.

40 Donna wants to make trail mix made up of almonds, walnuts and raisins. She wants to mix one part almonds, two parts walnuts, and three parts raisins. Almonds cost $12 per pound, walnuts cost $9 per pound, and raisins cost $5 per pound. Donna has $15 to spend on the trail mix. Determine how many pounds of trail mix she can make. [Only an algebraic solution can receive full credit.]

A.SSE.1, F.LE.5, F.BF.1, A.CED.1-2: MODELING LINEAR FUNCTIONS

41 The owner of a small computer repair business has one employee, who is paid an hourly rate of $22. The owner estimates his weekly profit using the function $P(x)=8600-22x$. In this function, x represents the number of
1   computers repaired per week
2   hours worked per week
3   customers served per week
4   days worked per week

42 A company that manufactures radios first pays a start-up cost, and then spends a certain amount of money to manufacture each radio. If the cost of manufacturing r radios is given by the function $c(r) = 5.25r + 125$, then the value 5.25 best represents
1   the start-up cost
2   the profit earned from the sale of one radio
3   the amount spent to manufacture each radio
4   the average number of radios manufactured

43 A satellite television company charges a one-time installation fee and a monthly service charge. The total cost is modeled by the function $y = 40 + 90x$. Which statement represents the meaning of each part of the function?
1   y is the total cost, x is the number of months of service, $90 is the installation fee, and $40 is the service charge per month.
2   y is the total cost, x is the number of months of service, $40 is the installation fee, and $90 is the service charge per month.
3   x is the total cost, y is the number of months of service, $40 is the installation fee, and $90 is the service charge per month.
4   x is the total cost, y is the number of months of service, $90 is the installation fee, and $40 is the service charge per month.

44 The cost of airing a commercial on television is modeled by the function $C(n) = 110n + 900$, where n is the number of times the commercial is aired. Based on this model, which statement is true?
1   The commercial costs $0 to produce and $110 per airing up to $900.
2   The commercial costs $110 to produce and $900 each time it is aired.
3   The commercial costs $900 to produce and $110 each time it is aired.
4   The commercial costs $1010 to produce and can air an unlimited number of times.

45 Caitlin has a movie rental card worth $175. After she rents the first movie, the card's value is $172.25. After she rents the second movie, its value is $169.50. After she rents the third movie, the card is worth $166.75. Assuming the pattern continues, write an equation to define $A(n)$, the amount of money on the rental card after n rentals. Caitlin rents a movie every Friday night. How many weeks in a row can she afford to rent a movie, using her rental card only? Explain how you arrived at your answer.

46 Alex is selling tickets to a school play. An adult ticket costs $6.50 and a student ticket costs $4.00. Alex sells x adult tickets and 12 student tickets. Write a function, $f(x)$, to represent how much money Alex collected from selling tickets.

47 A typical cell phone plan has a fixed base fee that includes a certain amount of data and an overage charge for data use beyond the plan. A cell phone plan charges a base fee of $62 and an overage charge of $30 per gigabyte of data that exceed 2 gigabytes. If C represents the cost and g represents the total number of gigabytes of data, which equation could represent this plan when more than 2 gigabytes are used?
1    $C = 30 + 62(2 - g)$
2    $C = 30 + 62(g - 2)$
3    $C = 62 + 30(2 - g)$
4    $C = 62 + 30(g - 2)$

48 Each day Toni records the height of a plant for her science lab. Her data are shown in the table below.

Day (n)	1	2	3	4	5
Height (cm)	3.0	4.5	6.0	7.5	9.0

The plant continues to grow at a constant daily rate. Write an equation to represent $h(n)$, the height of the plant on the nth day.

49 Jackson is starting an exercise program. The first day he will spend 30 minutes on a treadmill. He will increase his time on the treadmill by 2 minutes each day. Write an equation for $T(d)$, the time, in minutes, on the treadmill on day d. Find $T(6)$, the minutes he will spend on the treadmill on day 6.

50 In 2013, the United States Postal Service charged $0.46 to mail a letter weighing up to 1 oz. and $0.20 per ounce for each additional ounce. Which function would determine the cost, in dollars, $c(z)$, of mailing a letter weighing z ounces where z is an integer greater than 1?

1 $c(z) = 0.46z + 0.20$
2 $c(z) = 0.20z + 0.46$
3 $c(z) = 0.46(z - 1) + 0.20$
4 $c(z) = 0.20(z - 1) + 0.46$

A.CED.2, A.REI.10, F.IF.4: GRAPHING LINEAR FUNCTIONS

51 Max purchased a box of green tea mints. The nutrition label on the box stated that a serving of three mints contains a total of 10 Calories. On the axes below, graph the function, C, where $C(x)$ represents the number of Calories in x mints.
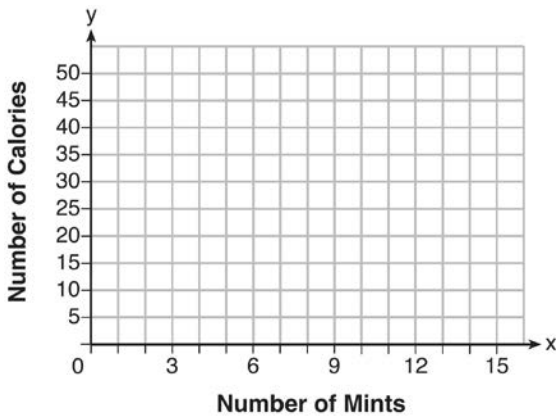
Write an equation that represents $C(x)$. A full box of mints contains 180 Calories. Use the equation to determine the total number of mints in the box.

52 Which graph shows a line where each value of y is three more than half of x?

1

2

3

4
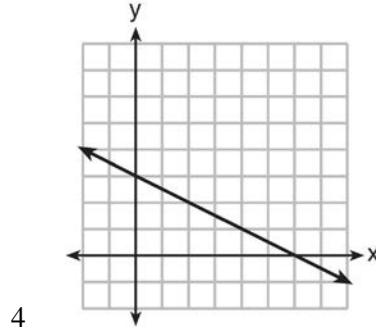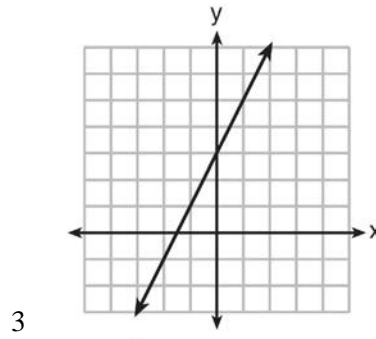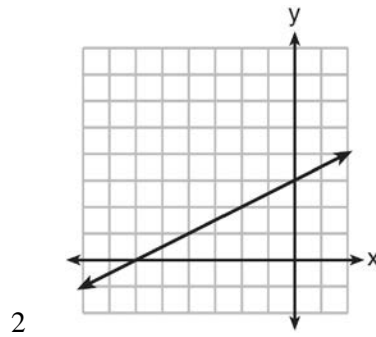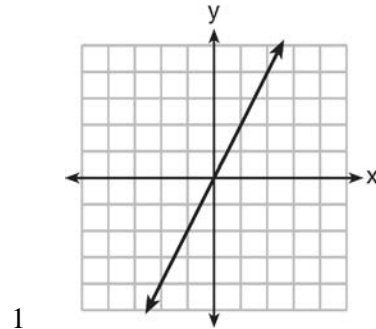
53 On the set of axes below, draw the graph of the equation $y = -\dfrac{3}{4}x + 3$.

Is the point $(3,2)$ a solution to the equation? Explain your answer based on the graph drawn.

54 The graph of a linear equation contains the points $(3,11)$ and $(-2,1)$. Which point also lies on the graph?
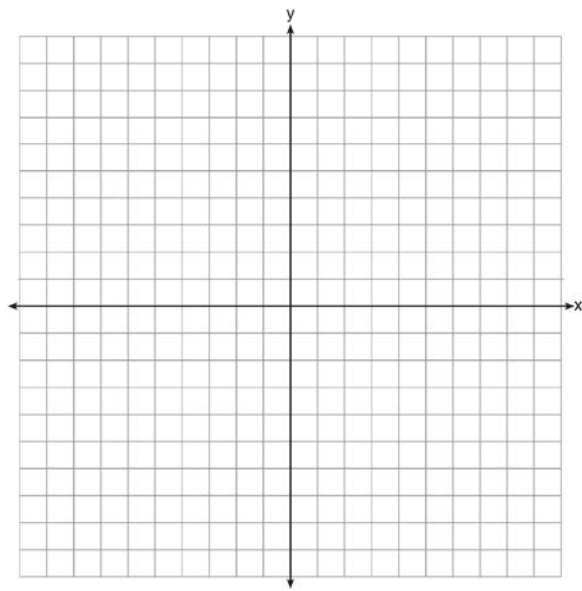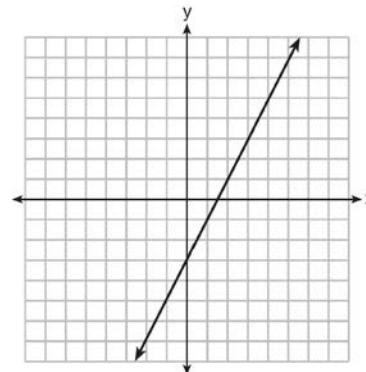1 $(2,1)$
2 $(2,4)$
3 $(2,6)$
4 $(2,9)$

55 The value of the x-intercept for the graph of $4x - 5y = 40$ is
1 10
2 $\dfrac{4}{5}$
3 $-\dfrac{4}{5}$
4 -8

56 Which function has the same y-intercept as the graph below?

1 $y = \dfrac{12 - 6x}{4}$
2 $27 + 3y = 6x$
3 $6y + x = 18$
4 $y + 3 = 6x$

A.CED.4: TRANSFORMING FORMULAS

57 The formula for the volume of a cone is $V = \dfrac{1}{3}\pi r^2 h$. The radius, r, of the cone may be expressed as
1 $\sqrt{\dfrac{3V}{\pi h}}$
2 $\sqrt{\dfrac{V}{3\pi h}}$
3 $3\sqrt{\dfrac{V}{\pi h}}$
4 $\dfrac{1}{3}\sqrt{\dfrac{V}{\pi h}}$

58 The formula for the area of a trapezoid is $A = \dfrac{1}{2}h(b_1 + b_2)$. Express b_1 in terms of A, h, and b_2. The area of a trapezoid is 60 square feet, its height is 6 ft, and one base is 12 ft. Find the number of feet in the other base.

59 The equation for the volume of a cylinder is $V = \pi r^2 h$. The positive value of r, in terms of h and V, is

1 $r = \sqrt{\dfrac{V}{\pi h}}$

2 $r = \sqrt{V \pi h}$

3 $r = 2V\pi h$

4 $r = \dfrac{V}{2\pi}$

60 The distance a free falling object has traveled can be modeled by the equation $d = \dfrac{1}{2} at^2$, where a is acceleration due to gravity and t is the amount of time the object has fallen. What is t in terms of a and d?

1 $t = \sqrt{\dfrac{da}{2}}$

2 $t = \sqrt{\dfrac{2d}{a}}$

3 $t = \left(\dfrac{da}{d}\right)^2$

4 $t = \left(\dfrac{2d}{a}\right)^2$

61 The volume of a large can of tuna fish can be calculated using the formula $V = \pi r^2 h$. Write an equation to find the radius, r, in terms of V and h. Determine the diameter, to the *nearest inch*, of a large can of tuna fish that has a volume of 66 cubic inches and a height of 3.3 inches.

LINEAR INEQUALITIES
A.REI.3: SOLVING LINEAR INEQUALITIES

62 Given $2x + ax - 7 > -12$, determine the largest integer value of a when $x = -1$.

63 Solve the inequality below to determine and state the smallest possible value for x in the solution set.
$$3(x + 3) \le 5x - 3$$

64 The inequality $7 - \dfrac{2}{3}x < x - 8$ is equivalent to

1 $x > 9$

2 $x > -\dfrac{3}{5}$

3 $x < 9$

4 $x < -\dfrac{3}{5}$

65 Determine the smallest integer that makes $-3x + 7 - 5x < 15$ true.

66 Solve for x algebraically:
$7x - 3(4x - 8) \le 6x + 12 - 9x$
If x is a number in the interval $[4,8]$, state all integers that satisfy the given inequality. Explain how you determined these values.

A.CED.3: MODELING LINEAR INEQUALITIES

67 David has two jobs. He earns \$8 per hour babysitting his neighbor's children and he earns \$11 per hour working at the coffee shop. Write an inequality to represent the number of hours, x, babysitting and the number of hours, y, working at the coffee shop that David will need to work to earn a minimum of \$200. David worked 15 hours at the coffee shop. Use the inequality to find the number of full hours he must babysit to reach his goal of \$200.

68 Connor wants to attend the town carnival. The price of admission to the carnival is \$4.50, and each ride costs an additional 79 cents. If he can spend at most \$16.00 at the carnival, which inequality can be used to solve for r, the number of rides Connor can go on, and what is the maximum number of rides he can go on?

1 $0.79 + 4.50r \le 16.00$; 3 rides

2 $0.79 + 4.50r \le 16.00$; 4 rides

3 $4.50 + 0.79r \le 16.00$; 14 rides

4 $4.50 + 0.79r \le 16.00$; 15 rides

69 Natasha is planning a school celebration and wants to have live music and food for everyone who attends. She has found a band that will charge her $750 and a caterer who will provide snacks and drinks for $2.25 per person. If her goal is to keep the average cost per person between $2.75 and $3.25, how many people, p, must attend?

1 $225 < p < 325$
2 $325 < p < 750$
3 $500 < p < 1000$
4 $750 < p < 1500$

70 The cost of a pack of chewing gum in a vending machine is $0.75. The cost of a bottle of juice in the same machine is $1.25. Julia has $22.00 to spend on chewing gum and bottles of juice for her team and she must buy seven packs of chewing gum. If b represents the number of bottles of juice, which inequality represents the maximum number of bottles she can buy?

1 $0.75b + 1.25(7) \geq 22$
2 $0.75b + 1.25(7) \leq 22$
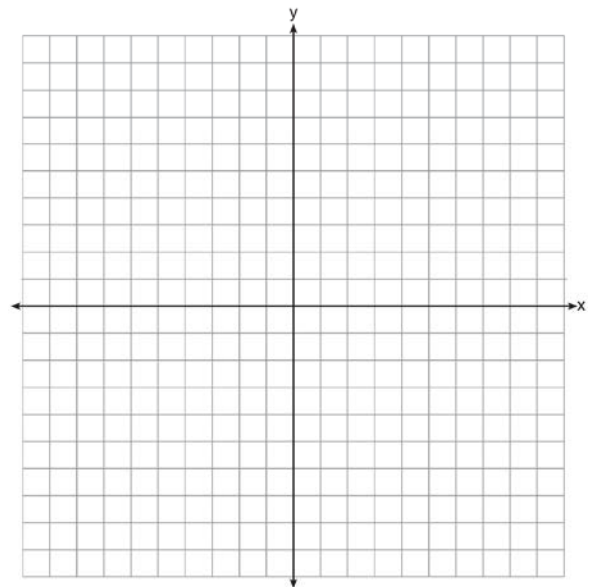3 $0.75(7) + 1.25b \geq 22$
4 $0.75(7) + 1.25b \leq 22$

A.REI.12: GRAPHING LINEAR INEQUALITIES

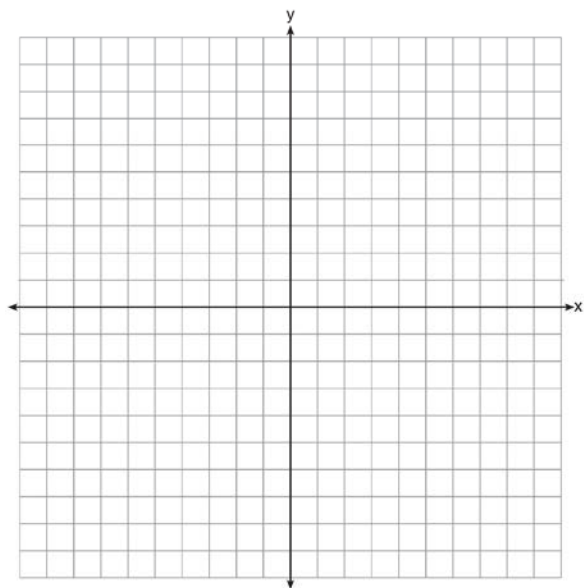71 Which inequality is represented in the graph below?
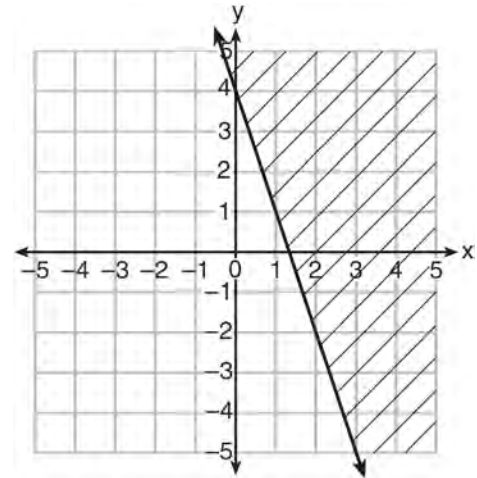
1 $y \geq -3x + 4$
2 $y \leq -3x + 4$
3 $y \geq -4x - 3$
4 $y \leq -4x - 3$

72 On the set of axes below, graph the inequality $2x + y > 1$.

ABSOLUTE VALUE
F.IF.7b: GRAPHING ABSOLUTE VALUE FUNCTIONS

73 On the set of axes below, graph the function
$y = |x + 1|$.

State the range of the function. State the domain over which the function is increasing.

QUADRATICS
A.SSE.3, A.REI.4: SOLVING QUADRATICS

74 Solve $8m^2 + 20m = 12$ for m by factoring.

75 Keith determines the zeros of the function $f(x)$ to be −6 and 5. What could be Keith's function?
1 $f(x) = (x + 5)(x + 6)$
2 $f(x) = (x + 5)(x - 6)$
3 $f(x) = (x - 5)(x + 6)$
4 $f(x) = (x - 5)(x - 6)$

76 In the equation $x^2 + 10x + 24 = (x + a)(x + b)$, b is an integer. Find algebraically *all* possible values of b.

77 Which equation has the same solutions as
$2x^2 + x - 3 = 0$
1 $(2x - 1)(x + 3) = 0$
2 $(2x + 1)(x - 3) = 0$
3 $(2x - 3)(x + 1) = 0$
4 $(2x + 3)(x - 1) = 0$

78 The zeros of the function $f(x) = 3x^2 - 3x - 6$ are
1 −1 and −2
2 1 and −2
3 1 and 2
4 −1 and 2

79 If Lylah completes the square for
$f(x) = x^2 - 12x + 7$ in order to find the minimum, she must write $f(x)$ in the general form
$f(x) = (x - a)^2 + b$. What is the value of a for $f(x)$?
1 6
2 −6
3 12
4 −12

80 If the quadratic formula is used to find the roots of the equation $x^2 - 6x - 19 = 0$, the correct roots are
1 $3 \pm 2\sqrt{7}$
2 $-3 \pm 2\sqrt{7}$
3 $3 \pm 4\sqrt{14}$
4 $-3 \pm 4\sqrt{14}$

81 Ryker is given the graph of the function
$y = \frac{1}{2}x^2 - 4$. He wants to find the zeros of the
function, but is unable to read them exactly from
the graph.
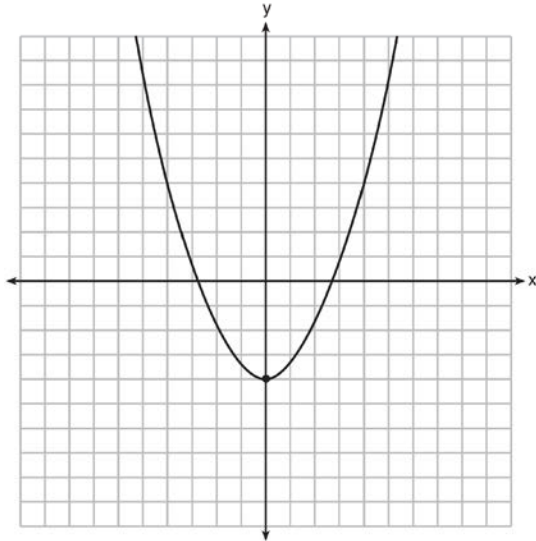
Find the zeros in simplest radical form.

82 Which equation has the same solution as
$x^2 - 6x - 12 = 0$?
1 $(x+3)^2 = 21$
2 $(x-3)^2 = 21$
3 $(x+3)^2 = 3$
4 $(x-3)^2 = 3$

83 What are the roots of the equation $x^2 + 4x - 16 = 0$?
1 $2 \pm 2\sqrt{5}$
2 $-2 \pm 2\sqrt{5}$
3 $2 \pm 4\sqrt{5}$
4 $-2 \pm 4\sqrt{5}$

84 Write an equation that defines $m(x)$ as a trinomial
where $m(x) = (3x-1)(3-x) + 4x^2 + 19$. Solve for x
when $m(x) = 0$.

85 If $4x^2 - 100 = 0$, the roots of the equation are
1 -25 and 25
2 -25, only
3 -5 and 5
4 -5, only

86 A student was given the equation $x^2 + 6x - 13 = 0$
to solve by completing the square. The first step
that was written is shown below.
$$x^2 + 6x = 13$$
The next step in the student's process was
$x^2 + 6x + c = 13 + c$. State the value of c that
creates a perfect square trinomial. Explain how the
value of c is determined.

87 Which equation has the same solutions as
$x^2 + 6x - 7 = 0$?
1 $(x+3)^2 = 2$
2 $(x-3)^2 = 2$
3 $(x-3)^2 = 16$
4 $(x+3)^2 = 16$

88 Solve the equation $4x^2 - 12x = 7$ algebraically for
x.

89 When directed to solve a quadratic equation by
completing the square, Sam arrived at the equation
$\left(x - \frac{5}{2}\right)^2 = \frac{13}{4}$. Which equation could have been
the original equation given to Sam?
1 $x^2 + 5x + 7 = 0$
2 $x^2 + 5x + 3 = 0$
3 $x^2 - 5x + 7 = 0$
4 $x^2 - 5x + 3 = 0$

90 A student is asked to solve the equation
$4(3x-1)^2 - 17 = 83$. The student's solution to the
problem starts as $4(3x-1)^2 = 100$

$$(3x-1)^2 = 25$$

A correct next step in the solution of the problem is
1    $3x-1 = \pm 5$
2    $3x-1 = \pm 25$
3    $9x^2 - 1 = 25$
4    $9x^2 - 6x + 1 = 5$

91 What are the solutions to the equation
$x^2 - 8x = 24?$
1    $x = 4 \pm 2\sqrt{10}$
2    $x = -4 \pm 2\sqrt{10}$
3    $x = 4 \pm 2\sqrt{2}$
4    $x = -4 \pm 2\sqrt{2}$

92 The solution of the equation $(x+3)^2 = 7$ is
1    $3 \pm \sqrt{7}$
2    $7 \pm \sqrt{3}$
3    $-3 \pm \sqrt{7}$
4    $-7 \pm \sqrt{3}$

A.CED.1: MODELING QUADRATICS

93 Sam and Jeremy have ages that are consecutive odd
integers. The product of their ages is 783. Which
equation could be used to find Jeremy's age, j, if he
is the younger man?
1    $j^2 + 2 = 783$
2    $j^2 - 2 = 783$
3    $j^2 + 2j = 783$
4    $j^2 - 2j = 783$

A.CED.1: GEOMETRIC APPLICATIONS OF
QUADRATICS

94 The length of the shortest side of a right triangle is
8 inches. The lengths of the other two sides are
represented by consecutive odd integers. Which
equation could be used to find the lengths of the
other sides of the triangle?
1    $8^2 + (x+1) = x^2$
2    $x^2 + 8^2 = (x+1)^2$
3    $8^2 + (x+2) = x^2$
4    $x^2 + 8^2 = (x+2)^2$

95 A rectangular garden measuring 12 meters by 16
meters is to have a walkway installed around it
with a width of x meters, as shown in the diagram
below. Together, the walkway and the garden have
an area of 396 square meters.
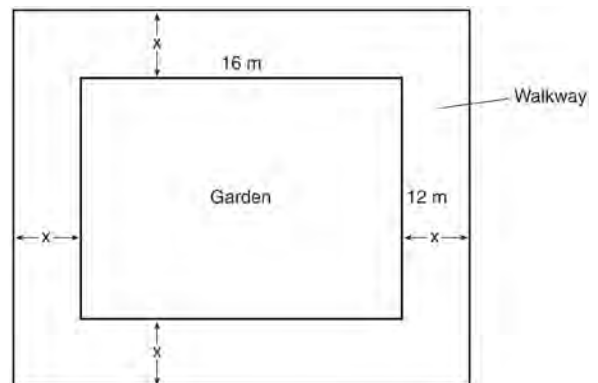
Write an equation that can be used to find x, the
width of the walkway. Describe how your equation
models the situation. Determine and state the
width of the walkway, in meters.

96 A school is building a rectangular soccer field that
has an area of 6000 square yards. The soccer field
must be 40 yards longer than its width. Determine
algebraically the dimensions of the soccer field, in
yards.

97 New Clarendon Park is undergoing renovations to its gardens. One garden that was originally a square is being adjusted so that one side is doubled in length, while the other side is decreased by three meters. The new rectangular garden will have an area that is 25% more than the original square garden. Write an equation that could be used to determine the length of a side of the original square garden. Explain how your equation models the situation. Determine the area, in square meters, of the new rectangular garden.

98 A landscaper is creating a rectangular flower bed such that the width is half of the length. The area of the flower bed is 34 square feet. Write and solve an equation to determine the width of the flower bed, to the *nearest tenth of a foot*.

99 A rectangular picture measures 6 inches by 8 inches. Simon wants to build a wooden frame for the picture so that the framed picture takes up a maximum area of 100 square inches on his wall. The pieces of wood that he uses to build the frame all have the same width. Write an equation or inequality that could be used to determine the maximum width of the pieces of wood for the frame Simon could create. Explain how your equation or inequality models the situation. Solve the equation or inequality to determine the maximum width of the pieces of wood used for the frame to the *nearest tenth of an inch*.

A.REI.10, F.IF.4, 8, 9: GRAPHING QUADRATIC FUNCTIONS

100 Which point is *not* on the graph represented by $y = x^2 + 3x - 6$?

1 $(-6, 12)$
2 $(-4, -2)$
3 $(2, 4)$
4 $(3, -6)$

101 A ball is thrown into the air from the edge of a 48-foot-high cliff so that it eventually lands on the ground. The graph below shows the height, y, of the ball from the ground after x seconds.
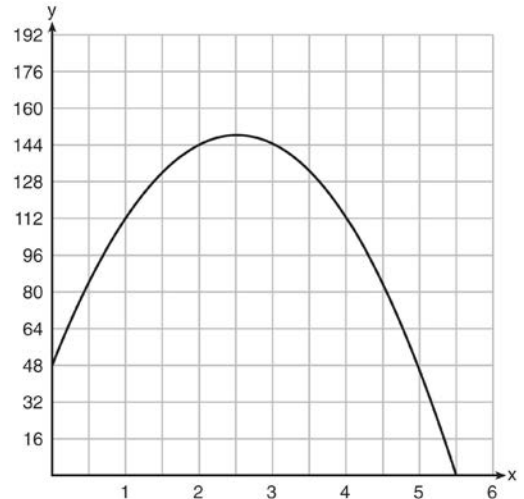
For which interval is the ball's height always *decreasing*?

1 $0 \leq x \leq 2.5$
2 $0 < x < 5.5$
3 $2.5 < x < 5.5$
4 $x \geq 2$

102 A football player attempts to kick a football over a goal post. The path of the football can be modeled by the function $h(x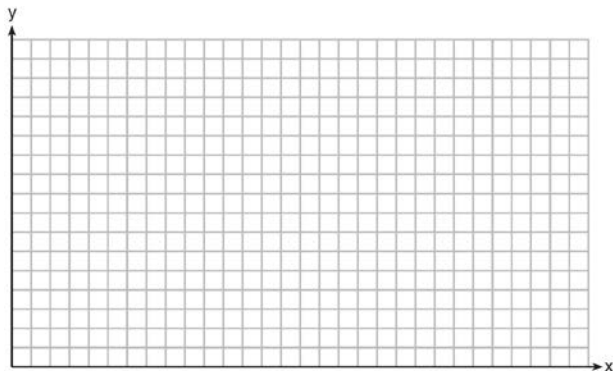) = -\frac{1}{225} x^2 + \frac{2}{3} x$, where x is the horizontal distance from the kick, and $h(x)$ is the height of the football above the ground, when both are measured in feet. On the set of axes below, graph the function $y = h(x)$ over the interval $0 \le x \le 150$.


Determine the vertex of $y = h(x)$. Interpret the meaning of this vertex in the context of the problem. The goal post is 10 feet high and 45 yards away from the kick. Will the ball be high enough to pass over the goal post? Justify your answer.

103 A toy rocket is launched from the ground straight upward. The height of the rocket above the ground, in feet, is given by the equation $h(t) = -16t^2 + 64t$, where t is the time in seconds. Determine the domain for this function in the given context. Explain your reasoning.

104 a) Given the function $f(x) = -x^2 + 8x + 9$, state whether the vertex represents a maximum or minimum point for the function. Explain your answer.
b) Rewrite $f(x)$ in vertex form by completing the square.

105 Let f be the function represented by the graph below.
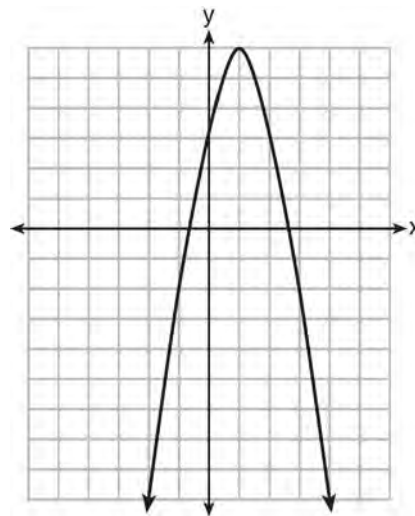
Let g be a function such that $g(x) = -\frac{1}{2} x^2 + 4x + 3$.
Determine which function has the larger maximum value. Justify your answer.
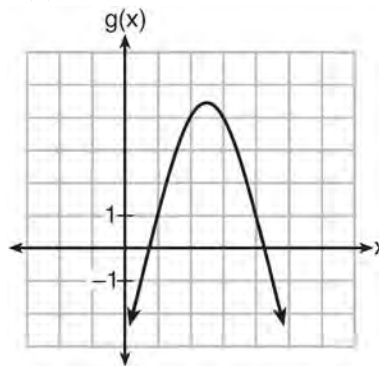
106 Which quadratic function has the largest maximum?
1   $h(x) = (3 - x)(2 + x)$

x	f(x)
-1	-3
0	5
1	9
2	9
3	5
4	-3

2
3   $k(x) = -5x^2 - 12x + 4$

4

107 Given the following quadratic functions:

$$g(x) = -x^2 - x + 6$$

and

x	−3	−2	−1	0	1	2	3	4	5
n(x)	−7	0	5	8	9	8	5	0	−7

Which statement about these functions is true?

1 Over the interval $-1 \le x \le 1$, the average rate of change for $n(x)$ is less than that for $g(x)$.

2 The y-intercept of $g(x)$ is greater than the y-intercept for $n(x)$.

3 The function $g(x)$ has a greater maximum value than $n(x)$.

4 The sum of the roots of $n(x) = 0$ is greater than the sum of the roots of $g(x) = 0$.

A.REI.4: USING THE DISCRIMINANT

108 How many real solutions does the equation $x^2 - 2x + 5 = 0$ have? Justify your answer.

POWERS
A.APR.1: OPERATIONS WITH POLYNOMIALS

109 If $A = 3x^2 + 5x - 6$ and $B = -2x^2 - 6x + 7$, then $A - B$ equals

1 $-5x^2 - 11x + 13$

2 $5x^2 + 11x - 13$

3 $-5x^2 - x + 1$

4 $5x^2 - x + 1$

110 A company produces x units of a product per month, where $C(x)$ represents the total cost and $R(x)$ represents the total revenue for the month. The functions are modeled by $C(x) = 300x + 250$ and $R(x) = -0.5x^2 + 800x - 100$. The profit is the difference between revenue and cost where $P(x) = R(x) - C(x)$. What is the total profit, $P(x)$, for the month?

1 $P(x) = -0.5x^2 + 500x - 150$

2 $P(x) = -0.5x^2 + 500x - 350$

3 $P(x) = -0.5x^2 - 500x + 350$

4 $P(x) = -0.5x^2 + 500x + 350$

111 Express the product of $2x^2 + 7x - 10$ and $x + 5$ in standard form.

112 Fred is given a rectangular piece of paper. If the length of Fred's piece of paper is represented by $2x - 6$ and the width is represented by $3x - 5$, then the paper has a total area represented by

1 $5x - 11$

2 $6x^2 - 28x + 30$

3 $10x - 22$

4 $6x^2 - 6x - 11$

113 Subtract $5x^2 + 2x - 11$ from $3x^2 + 8x - 7$. Express the result as a trinomial.

114 If the difference $(3x^2 - 2x + 5) - (x^2 + 3x - 2)$ is multiplied by $\frac{1}{2}x^2$, what is the result, written in standard form?

115 Which trinomial is equivalent to $3(x - 2)^2 - 2(x - 1)$?

1 $3x^2 - 2x - 10$

2 $3x^2 - 2x - 14$

3 $3x^2 - 14x + 10$

4 $3x^2 - 14x + 14$

A.SSE.2: FACTORING POLYNOMIALS

116 Factor the expression $x^4 + 6x^2 - 7$ completely.

117 Which expression is equivalent to $x^4 - 12x^2 + 36$?
  1 $(x^2 - 6)(x^2 - 6)$
  2 $(x^2 + 6)(x^2 + 6)$
  3 $(6 - x^2)(6 + x^2)$
  4 $(x^2 + 6)(x^2 - 6)$

118 When factored completely, the expression $p^4 - 81$
     is equivalent to
  1 $(p^2 + 9)(p^2 - 9)$
  2 $(p^2 - 9)(p^2 - 9)$
  3 $(p^2 + 9)(p + 3)(p - 3)$
  4 $(p + 3)(p - 3)(p + 3)(p - 3)$

119 If the area of a rectangle is expressed as $x^4 - 9y^2$,
     then the product of the length and the width of the
     rectangle could be expressed as
  1 $(x - 3y)(x + 3y)$
  2 $(x^2 - 3y)(x^2 + 3y)$
  3 $(x^2 - 3y)(x^2 - 3y)$
  4 $(x^4 + y)(x - 9y)$

120 Four expressions are shown below.
$$I \qquad 2(2x^2 - 2x - 60)$$
$$II \qquad 4(x^2 - x - 30)$$
$$III \qquad 4(x + 6)(x - 5)$$
$$IV \qquad 4x(x - 1) - 120$$
     The expression $4x^2 - 4x - 120$ is equivalent to
  1 I and II, only
  2 II and IV, only
  3 I, II, and IV
  4 II, III, and IV

A.APR.3: ZEROS OF POLYNOMIALS

121 The graphs below represent functions defined by
   polynomials. For which function are the zeros of
     the polynomials 2 and −3?

1

2

3

4
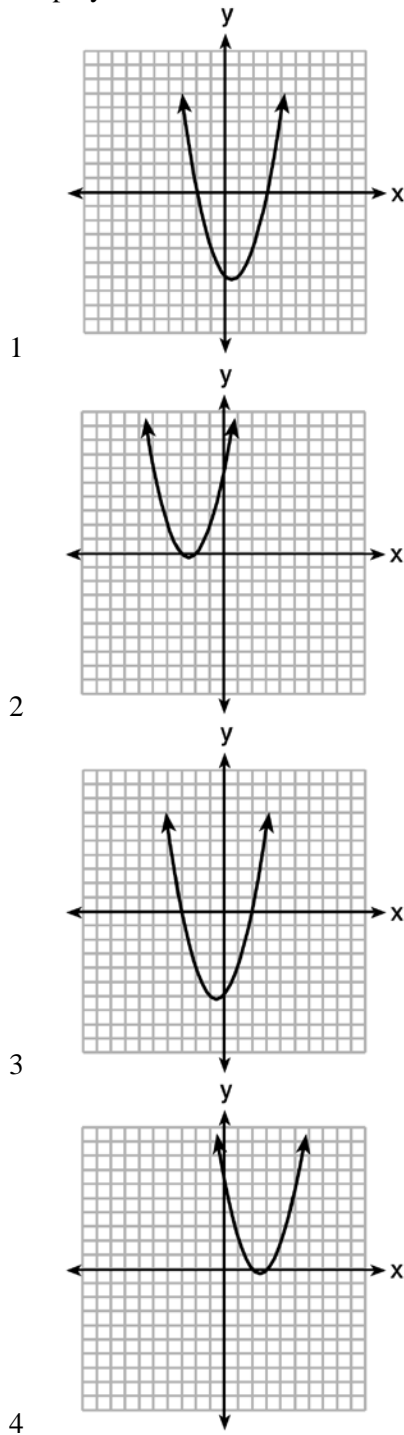
122 For which function defined by a polynomial are the zeros of the polynomial −4 and −6?

1 $y = x^2 − 10x − 24$
2 $y = x^2 + 10x + 24$
3 $y = x^2 + 10x − 24$
4 $y = x^2 − 10x + 24$

123 The zeros of the function $f(x) = (x + 2)^2 − 25$ are

1 −2 and 5
2 −3 and 7
3 −5 and 2
4 −7 and 3

124 A polynomial function contains the factors x, $x − 2$, and $x + 5$. Which graph(s) below could represent the graph of this function?
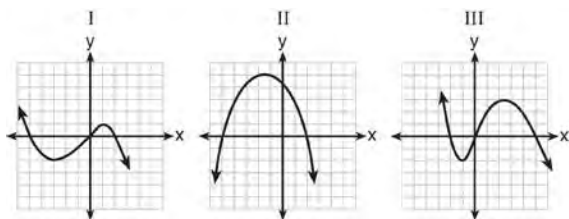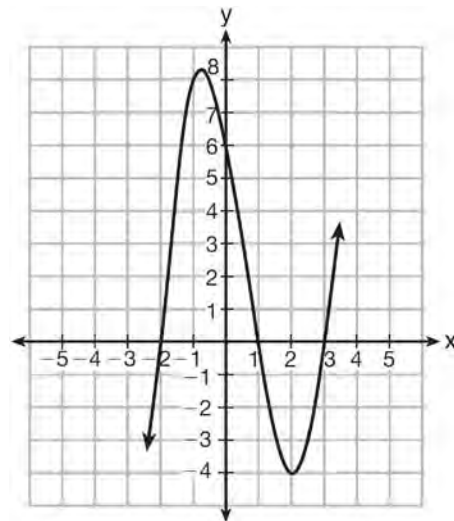

1 I, only
2 II, only
3 I and III
4 I, II, and III

125 What are the zeros of the function
$f(x) = x^2 − 13x − 30?$
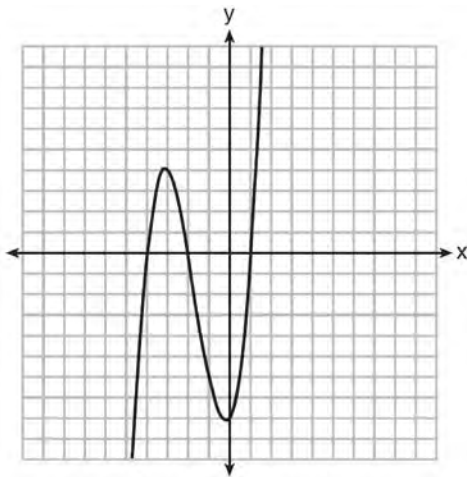
1 −10 and 3
2 10 and −3
3 −15 and 2
4 15 and −2

126 Which equation(s) represent the graph below?

I $y = (x + 2)(x^2 − 4x − 12)$
II $y = (x − 3)(x^2 + x − 2)$
III $y = (x − 1)(x^2 − 5x − 6)$

1 I, only
2 II, only
3 I and II
4 II and III

23

127 The graph of $f(x)$ is shown below.

Which function could represent the graph of $f(x)$?

1 $f(x) = (x + 2)(x^2 + 3x - 4)$

2 $f(x) = (x - 2)(x^2 + 3x - 4)$

3 $f(x) = (x + 2)(x^2 + 3x + 4)$

4 $f(x) = (x - 2)(x^2 + 3x + 4)$

F.IF.8: EVALUATING EXPONENTIAL EXPRESSIONS

128 The value in dollars, $v(x)$, of a certain car after x years is represented by the equation $v(x) = 25,000(0.86)^x$. To the *nearest dollar*, how much more is the car worth after 2 years than after 3 years?

1 2589

2 6510

3 15,901

4 18,490

A.SSE.1, A.CED.1, F.BF.1, F.LE.2, F.IF.8, F.LE.5: MODELING EXPONENTIAL EQUATIONS

129 The function $V(t) = 1350(1.017)^t$ represents the value $V(t)$, in dollars, of a comic book t years after its purchase. The yearly rate of appreciation of the comic book is

1 17%

2 1.7%

3 1.017%

4 0.017%

130 Dylan invested $600 in a savings account at a 1.6% annual interest rate. He made no deposits or withdrawals on the account for 2 years. The interest was compounded annually. Find, to the *nearest cent*, the balance in the account after 2 years.

131 Rhonda deposited $3000 in an account in the Merrick National Bank, earning 4.2% interest, compounded annually. She made no deposits or withdrawals. Write an equation that can be used to find B, her account balance after t years.

132 Krystal was given $3000 when she turned 2 years old. Her parents invested it at a 2% interest rate compounded annually. No deposits or withdrawals were made. Which expression can be used to determine how much money Krystal had in the account when she turned 18?

1 $3000(1 + 0.02)^{16}$

2 $3000(1 - 0.02)^{16}$

3 $3000(1 + 0.02)^{18}$

4 $3000(1 - 0.02)^{18}$

133 The country of Benin in West Africa has a population of 9.05 million people. The population is growing at a rate of 3.1% each year. Which function can be used to find the population 7 years from now?

1 $f(t) = (9.05 \times 10^6)(1 - 0.31)^7$

2 $f(t) = (9.05 \times 10^6)(1 + 0.31)^7$

3 $f(t) = (9.05 \times 10^6)(1 + 0.031)^7$

4 $f(t) = (9.05 \times 10^6)(1 - 0.031)^7$

134 Some banks charge a fee on savings accounts that are left inactive for an extended period of time.

The equation $y = 5000(0.98)^x$ represents the value, y, of one account that was left inactive for a period of x years. What is the y-intercept of this equation and what does it represent?

1 0.98, the percent of money in the account initially

2 0.98, the percent of money in the account after x years

3 5000, the amount of money in the account initially

4 5000, the amount of money in the account after x years

135 The breakdown of a sample of a chemical compound is represented by the function $p(t) = 300(0.5)^t$, where $p(t)$ represents the number of milligrams of the substance and t represents the time, in years. In the function $p(t)$, explain what 0.5 and 300 represent.

136 The number of carbon atoms in a fossil is given by the function $y = 5100(0.95)^x$, where x represents the number of years since being discovered. What is the percent of change each year? Explain how you arrived at your answer.

A.SSE.3: SOLVING EXPONENTIAL EQUATIONS

137 Miriam and Jessica are growing bacteria in a laboratory. Miriam uses the growth function $f(t) = n^{2t}$ while Jessica uses the function $g(t) = n^{4t}$, where n represents the initial number of bacteria and t is the time, in hours. If Miriam starts with 16 bacteria, how many bacteria should Jessica start with to achieve the same growth over time?

1 32

2 16

3 8

4 4

F.LE.1-3: COMPARING LINEAR AND EXPONENTIAL FUNCTIONS

138 The table below shows the average yearly balance in a savings account where interest is compounded annually. No money is deposited or withdrawn after the initial amount is deposited.

Year	Balance, in Dollars
0	380.00
10	562.49
20	832.63
30	1232.49
40	1824.39
50	2700.54

Which type of function best models the given data?
1 linear function with a negative rate of change
2 linear function with a positive rate of change
3 exponential decay function
4 exponential growth function

139 Rachel and Marc were given the information shown below about the bacteria growing in a Petri dish in their biology class.

Number of Hours, x	1	2	3	4	5	6	7	8	9	10
Number of Bacteria, B(x)	220	280	350	440	550	690	860	1070	1340	1680

Rachel wants to model this information with a linear function. Marc wants to use an exponential function. Which model is the better choice? Explain why you chose this model.

140 The table below represents the function F.

x	3	4	6	7	8
$F(x)$	9	17	65	129	257

The equation that represents this function is

1 $F(x) = 3^x$

2 $F(x) = 3x$

3 $F(x) = 2^x + 1$

4 $F(x) = 2x + 3$

141 A laboratory technician studied the population growth of a colony of bacteria. He recorded the number of bacteria every other day, as shown in the partial table below.

t (time, in days)	0	2	4
f(t) (bacteria)	25	15,625	9,765,625

Which function would accurately model the technician's data?

1 $f(t) = 25^t$

2 $f(t) = 25^{t+1}$

3 $f(t) = 25t$

4 $f(t) = 25(t + 1)$

142 If $f(x) = 3^x$ and $g(x) = 2x + 5$, at which value of x is $f(x) < g(x)$?

1 -1

2 2

3 -3

4 4

143 Alicia has invented a new app for smart phones that two companies are interested in purchasing for a 2-year contract. Company A is offering her $10,000 for the first month and will increase the amount each month by $5000. Company B is offering $500 for the first month and will double their payment each month from the previous month. Monthly payments are made at the end of each month. For which monthly payment will company B's payment first exceed company A's payment?

1 6

2 7

3 8

4 9

F.LE.3: COMPARING QUADRATIC AND EXPONENTIAL FUNCTIONS

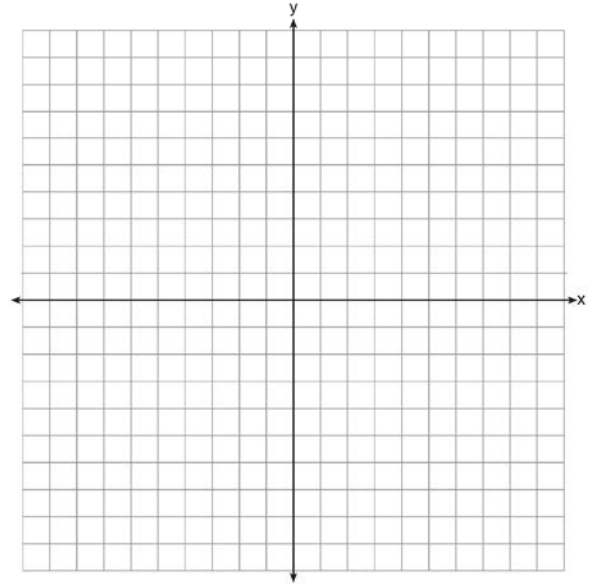144 Graph $f(x) = x^2$ and $g(x) = 2^x$ for $x \geq 0$ on the set of axes below.
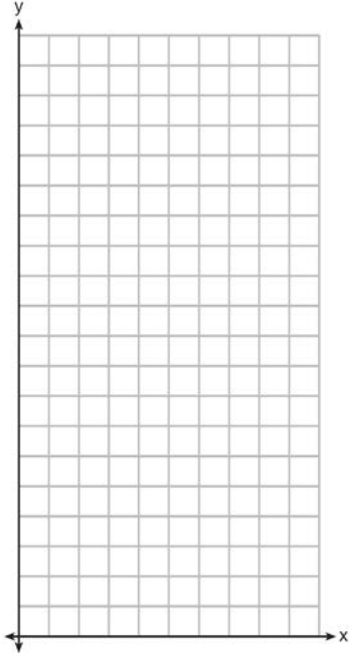
State which function, $f(x)$ or $g(x)$, has a greater value when $x = 20$. Justify your reasoning.
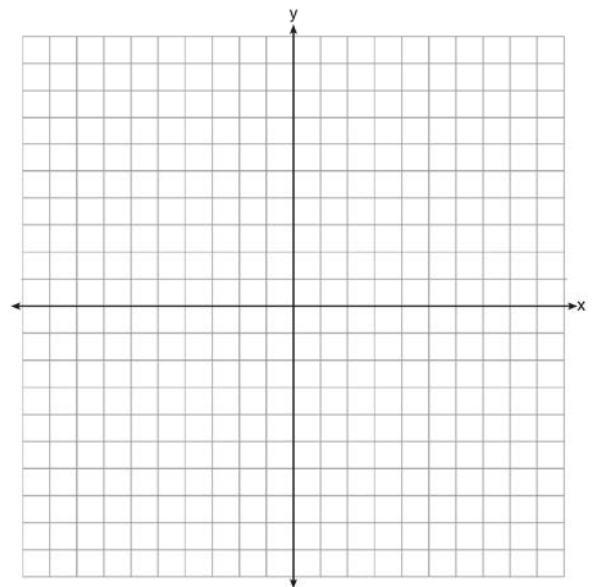
RADICALS

F.IF.7: GRAPHING ROOT FUNCTIONS

145 On the set of axes below, graph the function represented by $y = \sqrt[3]{x-2}$ for the domain $-6 \leq x \leq 10$.
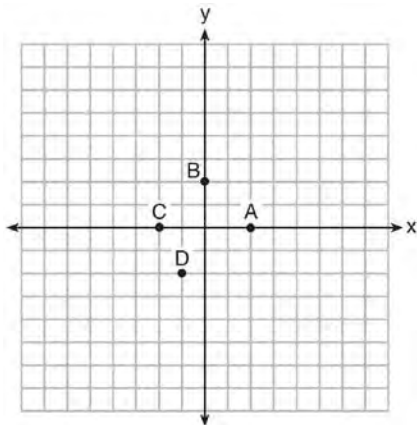
146 Draw the graph of $y = \sqrt{x} - 1$ on the set of axes below.

FUNCTIONS

F.IF.2: FUNCTIONAL NOTATION

147 The graph of $y = f(x)$ is shown below.

Which point could be used to find $f(2)$?

1 A
2 B
3 C
4 D

148 The equation to determine the weekly earnings of an employee at The Hamburger Shack is given by $w(x)$, where x is the number of hours worked.

$$w(x) = \begin{cases} 10x, & 0 \le x \le 40 \\ 15(x - 40) + 400, & x > 40 \end{cases}$$

Determine the difference in salary, *in dollars*, for an employee who works 52 hours versus one who works 38 hours. Determine the number of hours an employee must work in order to earn $445. Explain how you arrived at this answer.

149 If $f(x) = \dfrac{\sqrt{2x + 3}}{6x - 5}$, then $f\left(\dfrac{1}{2}\right) =$

1 1
2 -2
3 −1
4 $-\dfrac{13}{3}$

F.IF.1: DEFINING FUNCTIONS

150 The function f has a domain of $\{1,3,5,7\}$ and a range of $\{2,4,6\}$. Could f be represented by $\{(1,2),(3,4),(5,6),(7,2)\}$? Justify your answer.

151 A function is shown in the table below.

x	f(x)
−4	2
−1	−4
0	−2
3	16

If included in the table, which ordered pair, $(-4,1)$ or $(1,-4)$, would result in a relation that is no longer a function? Explain your answer.

152 Which table represents a function?

1

x	2	4	2	4
f(x)	3	5	7	9

2

x	0	−1	0	1
f(x)	0	1	−1	0

3

x	3	5	7	9
f(x)	2	4	2	4

4

x	0	1	−1	0
f(x)	0	−1	0	1

153 Which representations are functions?

x	y
2	6
3	−12
4	7
5	5
2	−6

I

III
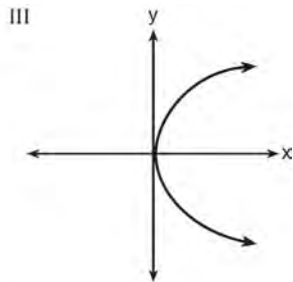
II { (1,1), (2,1), (3,2), (4,3), (5,5), (6,8), (7,13) }   IV $y = 2x + 1$

1   I and II
2   II and IV
3   III, only
4   IV, only

F.IF.2, 5: DOMAIN AND RANGE

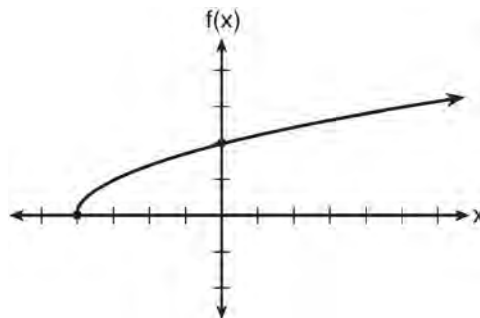154 If $f(x) = \frac{1}{3}x + 9$, which statement is always true?

1   $f(x) < 0$
2   $f(x) > 0$
3   If $x < 0$, then $f(x) < 0$.
4   If $x > 0$, then $f(x) > 0$.

155 Let f be a function such that $f(x) = 2x - 4$ is defined on the domain $2 \le x \le 6$. The range of this function is

1   $0 \le y \le 8$
2   $0 \le y < \infty$
3   $2 \le y \le 6$
4   $-\infty < y < \infty$

156 The graph of the function $f(x) = \sqrt{x+4}$ is shown below.

The domain of the function is
1   $\{x \mid x > 0\}$
2   $\{x \mid x \ge 0\}$
3   $\{x \mid x > -4\}$
4   $\{x \mid x \ge -4\}$

157 Officials in a town use a function, C, to analyze traffic patterns. $C(n)$ represents the rate of traffic through an intersection where n is the number of observed vehicles in a specified time interval. What would be the most appropriate domain for the function?
1   $\{\ldots -2, -1, 0, 1, 2, 3, \ldots\}$
2   $\{-2, -1, 0, 1, 2, 3\}$
3   $\{0, \frac{1}{2}, 1, 1\frac{1}{2}, 2, 2\frac{1}{2}\}$
4   $\{0, 1, 2, 3, \ldots\}$

158 The function $h(t) = -16t^2 + 144$ represents the height, $h(t)$, in feet, of an object from the ground at t seconds after it is dropped. A realistic domain for this function is
1   $-3 \le t \le 3$
2   $0 \le t \le 3$
3   $0 \le h(t) \le 144$
4   all real numbers

159 Which domain would be the most appropriate set to use for a function that predicts the number of household online-devices in terms of the number of people in the household?
1 integers
2 whole numbers
3 irrational numbers
4 rational numbers

F.LE.1-2: FAMILIES OF FUNCTIONS

160 Which situation could be modeled by using a linear function?
1 a bank account balance that grows at a rate of 5% per year, compounded annually
2 a population of bacteria that doubles every 4.5 hours
3 the cost of cell phone service that charges a base amount plus 20 cents per minute
4 the concentration of medicine in a person's body that decays by a factor of one-third every hour

161 Which table of values represents a linear relationship?

x	f(x)
-1	-3
0	-2
1	1
2	6
3	13

1

x	f(x)
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

2

x	f(x)
-1	-3
0	-1
1	1
2	3
3	5

3

x	f(x)
-1	-1
0	0
1	1
2	8
3	27

4

162 A population that initially has 20 birds approximately doubles every 10 years. Which graph represents this population growth?

1

2

3

4
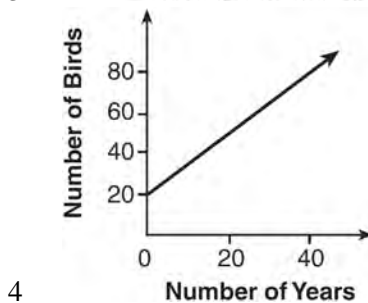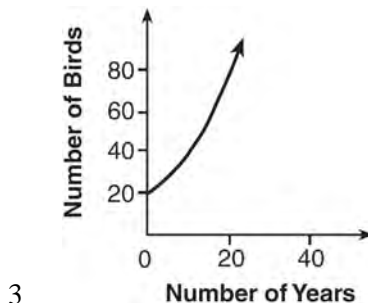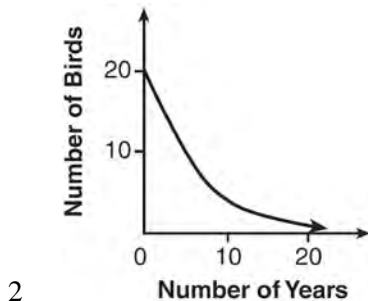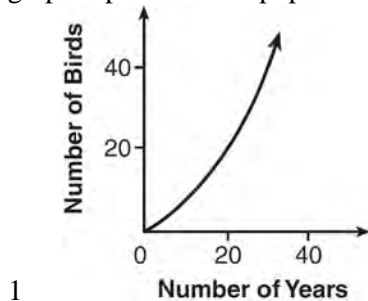
F.BF.3: TRANSFORMATIONS WITH FUNCTIONS AND RELATIONS

163 The vertex of the parabola represented by $f(x) = x^2 - 4x + 3$ has coordinates $(2, -1)$. Find the coordinates of the vertex of the parabola defined by $g(x) = f(x - 2)$. Explain how you arrived at your answer. [The use of the set of axes below is optional.]
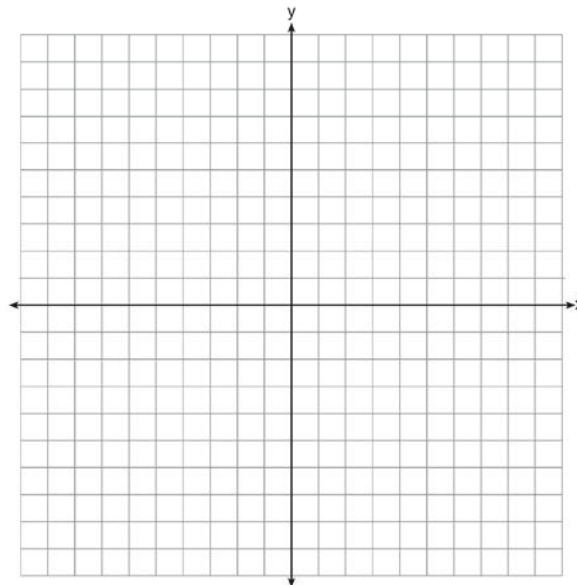
164 The graph of the equation $y = ax^2$ is shown below.

If a is multiplied by $-\dfrac{1}{2}$, the graph of the new equation is
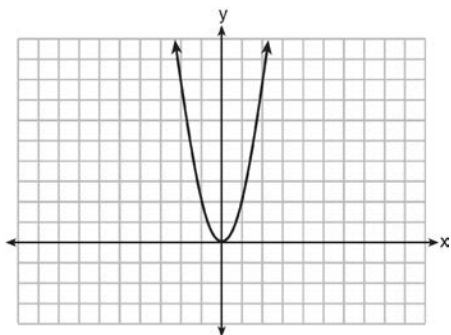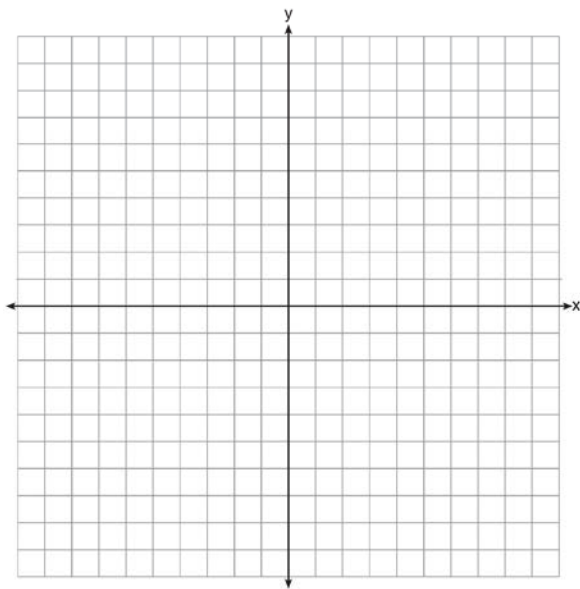1   wider and opens downward
2   wider and opens upward
3   narrower and opens downward
4   narrower and opens upward

165 On the axes below, graph $f(x) = |3x|$.

If $g(x) = f(x) - 2$, how is the graph of $f(x)$ translated to form the graph of $g(x)$? If $h(x) = f(x - 4)$, how is the graph of $f(x)$ translated to form the graph of $h(x)$?

166 How does the graph of $f(x) = 3(x - 2)^2 + 1$ compare to the graph of $g(x) = x^2$?
1   The graph of $f(x)$ is wider than the graph of $g(x)$, and its vertex is moved to the left 2 units and up 1 unit.
2   The graph of $f(x)$ is narrower than the graph of $g(x)$, and its vertex is moved to the right 2 units and up 1 unit.
3   The graph of $f(x)$ is narrower than the graph of $g(x)$, and its vertex is moved to the left 2 units and up 1 unit.
4   The graph of $f(x)$ is wider than the graph of $g(x)$, and its vertex is moved to the right 2 units and up 1 unit.

167 Graph the function $y = |x - 3|$ on the set of axes below.
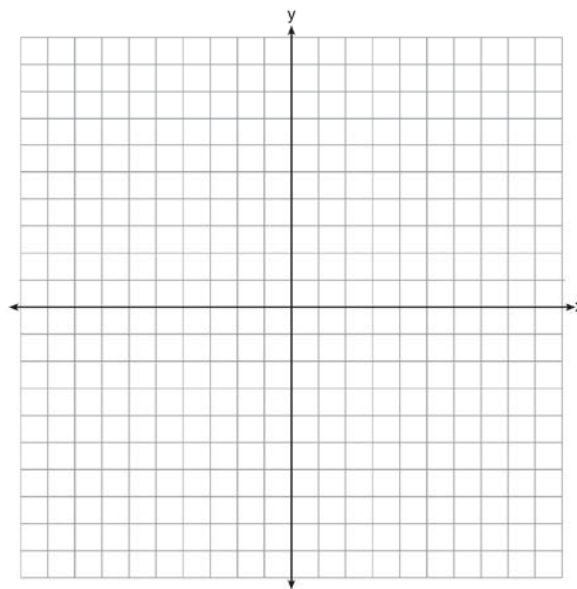
Explain how the graph of $y = |x - 3|$ has changed from the related graph $y = |x|$.

32

168 Given the graph of the line represented by the equation $f(x) = -2x + b$, if b is increased by 4 units, the graph of the new line would be shifted 4 units
1 right
2 up
3 left
4 down

F.IF.4: RELATING GRAPHS TO EVENTS

169 During a snowstorm, a meteorologist tracks the amount of accumulating snow. For the first three hours of the storm, the snow fell at a constant rate of one inch per hour. The storm then stopped for two hours and then started again at a constant rate of one-half inch per hour for the next four hours.
a) On the grid below, draw and label a graph that models the accumulation of snow over time using the data the meteorologist collected.
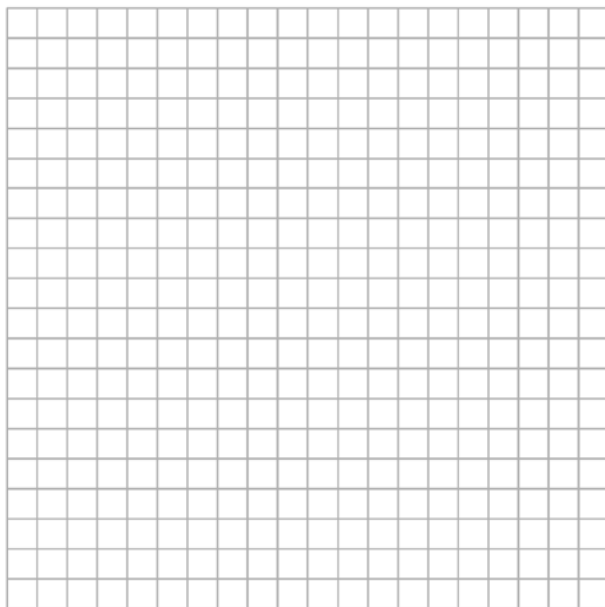
b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

170 The graph below represents a jogger's speed during her 20-minute jog around her neighborhood.
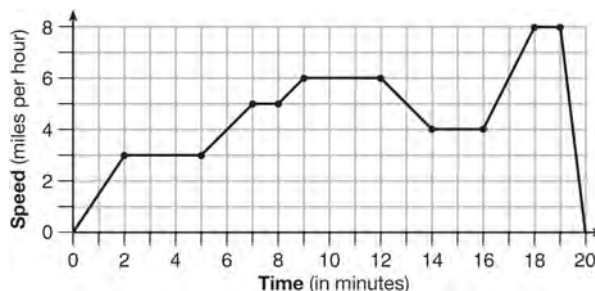
Which statement best describes what the jogger was doing during the $9 - 12$ minute interval of her jog?
1 She was standing still.
2 She was increasing her speed.
3 She was decreasing her speed
4 She was jogging at a constant rate.

171 A driver leaves home for a business trip and drives at a constant speed of 60 miles per hour for 2 hours. Her car gets a flat tire, and she spends 30 minutes changing the tire. She resumes driving and drives at 30 miles per hour for the remaining one hour until she reaches her destination. On the set of axes below, draw a graph that models the driver's distance from home.
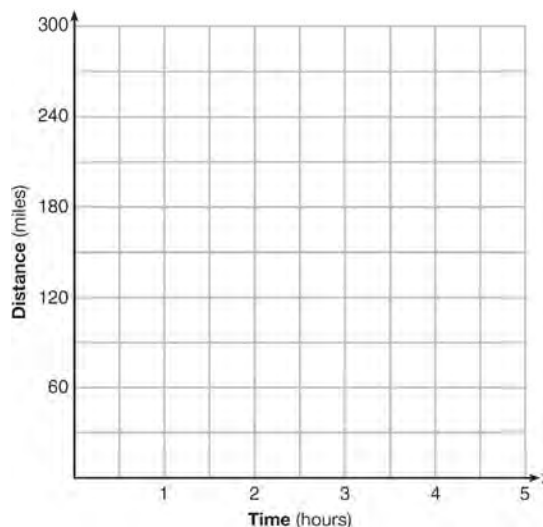
F.IF.7: GRAPHING PIECEWISE-DEFINED FUNCTIONS

172 At an office supply store, if a customer purchases fewer than 10 pencils, the cost of each pencil is $1.75. If a customer purchases 10 or more pencils, the cost of each pencil is $1.25. Let c be a function for which $c(x)$ is the cost of purchasing x pencils, where x is a whole number.

$$c(x) = \begin{cases} 1.75x, & \text{if } 0 \leq x \leq 9 \\ 1.25x, & \text{if } x \geq 10 \end{cases}$$

Create a graph of c on the axes below.
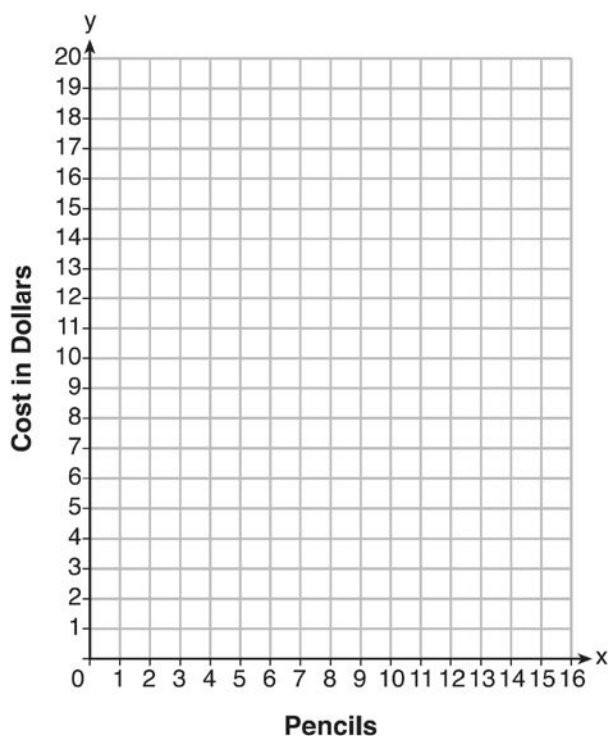
A customer brings 8 pencils to the cashier. The cashier suggests that the total cost to purchase 10 pencils would be less expensive. State whether the cashier is correct or incorrect. Justify your answer.

173 A function is graphed on the set of axes below.
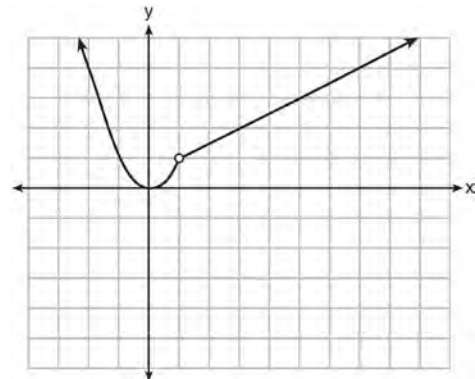
Which function is related to the graph?

1 $f(x) = \begin{cases} x^2, & x < 1 \\ x - 2, & x > 1 \end{cases}$

2 $f(x) = \begin{cases} x^2, & x < 1 \\ \dfrac{1}{2}x + \dfrac{1}{2}, & x > 1 \end{cases}$

3 $f(x) = \begin{cases} x^2, & x < 1 \\ 2x - 7, & x > 1 \end{cases}$

4 $f(x) = \begin{cases} x^2, & x < 1 \\ \dfrac{3}{2}x - \dfrac{9}{2}, & x > 1 \end{cases}$

174 Graph the following function on the set of axes below.

$$f(x) = \begin{cases} |x|, & -3 \le x < 1 \\ 4, & 1 \le x \le 8 \end{cases}$$
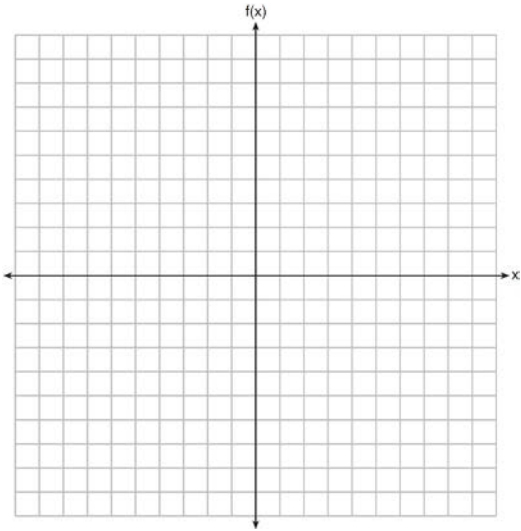
175 Which graph represents $f(x) = \begin{cases} |x| & x < 1 \\ \sqrt{x} & x \ge 1 \end{cases}$?
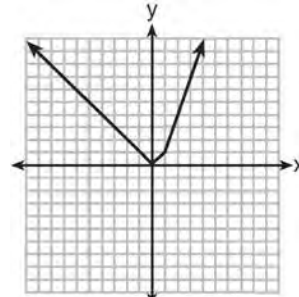
1
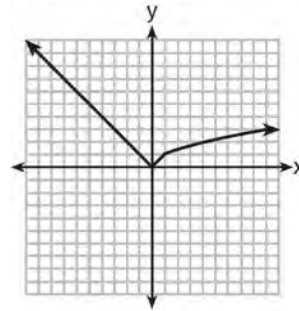
2
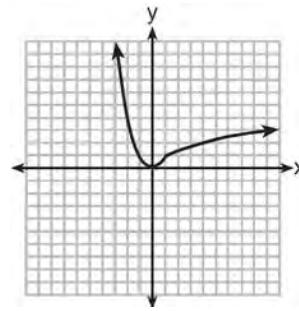
3
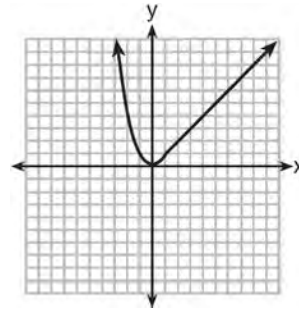
4

F.IF.7: GRAPHING STEP FUNCTIONS

176 The table below lists the total cost for parking for a period of time on a street in Albany, N.Y. The total cost is for any length of time up to and including the hours parked. For example, parking for up to and including 1 hour would cost $1.25; parking for 3.5 hours would cost $5.75.

Hours Parked	Total Cost
1	1.25
2	2.50
3	4.00
4	5.75
5	7.75
6	10.00

Graph the step function that represents the cost for the number of hours parked.
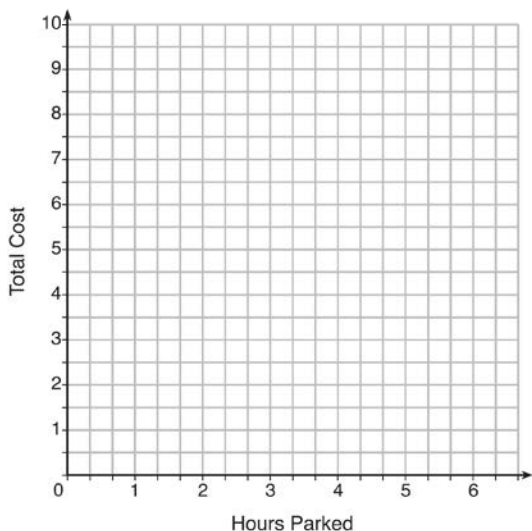
Explain how the cost per hour to park changes over the six-hour period.

177 Morgan can start wrestling at age 5 in Division 1. He remains in that division until his next odd birthday when he is required to move up to the next division level. Which graph correctly represents this information?

1

2

3

4
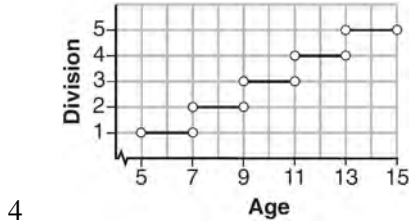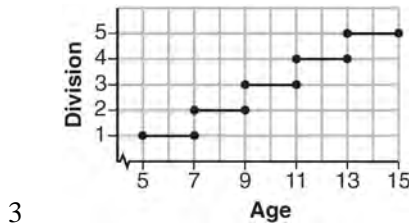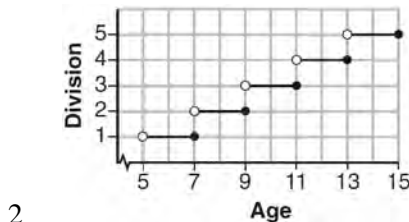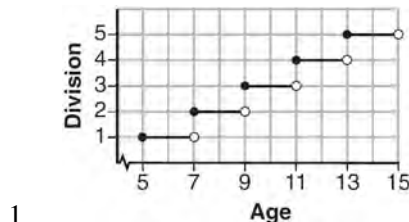
F.IF.3, F.LE.2, F.BF.2: SEQUENCES

178 A sunflower is 3 inches tall at week 0 and grows 2 inches each week. Which function(s) shown below can be used to determine the height, $f(n)$, of the sunflower in n weeks?

I. $f(n) = 2n + 3$
II. $f(n) = 2n + 3(n - 1)$
III. $f(n) = f(n - 1) + 2$ where $f(0) = 3$

1 I and II
2 II, only
3 III, only
4 I and III

179 If $f(1) = 3$ and $f(n) = -2f(n-1) + 1$, then $f(5) =$
1 −5
2 11
3 21
4 43

180 If a sequence is defined recursively by $f(0) = 2$ and $f(n+1) = -2f(n) + 3$ for $n \geq 0$, then $f(2)$ is equal to
1 1
2 −11
3 5
4 17

181 Which recursively defined function has a first term equal to 10 and a common difference of 4?
1 $f(1) = 10$

   $f(x) = f(x-1) + 4$
2 $f(1) = 4$

   $f(x) = f(x-1) + 10$
3 $f(1) = 10$

   $f(x) = 4f(x-1)$
4 $f(1) = 4$

   $f(x) = 10f(x-1)$

182 The diagrams below represent the first three terms of a sequence.

Term 1   Term 2   Term 3
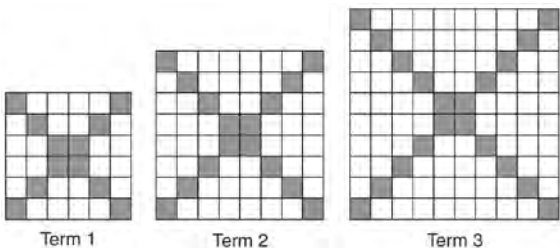
Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the nth term?
1 $a_n = 4n + 12$
2 $a_n = 4n + 8$
3 $a_n = 4n + 4$
4 $a_n = 4n + 2$

183 The third term in an arithmetic sequence is 10 and the fifth term is 26. If the first term is a_1, which is an equation for the nth term of this sequence?
1 $a_n = 8n + 10$
2 $a_n = 8n - 14$
3 $a_n = 16n + 10$
4 $a_n = 16n - 38$

184 A pattern of blocks is shown below.

Term 1   Term 2   Term 3   Term 4
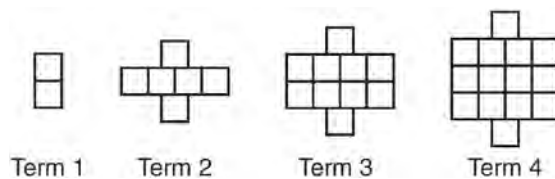
If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the nth term?

I	II	III
$a_n = n + 4$	$a_1 = 2$ $a_n = a_{n-1} + 4$	$a_n = 4n - 2$

1 I and II
2 I and III
3 II and III
4 III, only

37

SYSTEMS
A.REI.5-6: SOLVING LINEAR SYSTEMS

185 Which system of equations has the same solution as the system below?
$$2x + 2y = 16$$
$$3x - y = 4$$

1 $2x + 2y = 16$
$$6x - 2y = 4$$

2 $2x + 2y = 16$
$$6x - 2y = 8$$

3 $x + y = 16$
$$3x - y = 4$$

4 $6x + 6y = 48$
$$6x + 2y = 8$$

186 Guy and Jim work at a furniture store. Guy is paid $185 per week plus 3% of his total sales in dollars, x, which can be represented by $g(x) = 185 + 0.03x$. Jim is paid $275 per week plus 2.5% of his total sales in dollars, x, which can be represented by $f(x) = 275 + 0.025x$. Determine the value of x, in dollars, that will make their weekly pay the same.

187 Albert says that the two systems of equations shown below have the same solutions.

First System	Second System
$8x + 9y = 48$	$8x + 9y = 48$
$12x + 5y = 21$	$-8.5y = -51$

Determine and state whether you agree with Albert. Justify your answer.

A.CED.2-3, A.REI.6: MODELING LINEAR SYSTEMS

188 During the 2010 season, football player McGee's earnings, m, were 0.005 million dollars more than those of his teammate Fitzpatrick's earnings, f. The two players earned a total of 3.95 million dollars. Which system of equations could be used to determine the amount each player earned, in millions of dollars?

1 $m + f = 3.95$
$$m + 0.005 = f$$

2 $m - 3.95 = f$
$$f + 0.005 = m$$

3 $f - 3.95 = m$
$$m + 0.005 = f$$

4 $m + f = 3.95$
$$f + 0.005 = m$$

189 Jacob and Zachary go to the movie theater and purchase refreshments for their friends. Jacob spends a total of $18.25 on two bags of popcorn and three drinks. Zachary spends a total of $27.50 for four bags of popcorn and two drinks. Write a system of equations that can be used to find the price of one bag of popcorn and the price of one drink. Using these equations, determine and state the price of a bag of popcorn and the price of a drink, to the *nearest cent*.

190 An animal shelter spends $2.35 per day to care for each cat and $5.50 per day to care for each dog. Pat noticed that the shelter spent $89.50 caring for cats and dogs on Wednesday. Write an equation to represent the possible numbers of cats and dogs that could have been at the shelter on Wednesday. Pat said that there might have been 8 cats and 14 dogs at the shelter on Wednesday. Are Pat's numbers possible? Use your equation to justify your answer. Later, Pat found a record showing that there were a total of 22 cats and dogs at the shelter on Wednesday. How many cats were at the shelter on Wednesday?

191 A local business was looking to hire a landscaper to work on their property. They narrowed their choices to two companies. Flourish Landscaping Company charges a flat rate of $120 per hour. Green Thumb Landscapers charges $70 per hour plus a $1600 equipment fee. Write a system of equations representing how much each company charges. Determine and state the number of hours that must be worked for the cost of each company to be the same. [The use of the grid below is optional.] If it is estimated to take at least 35 hours to complete the job, which company will be less expensive? Justify your answer.
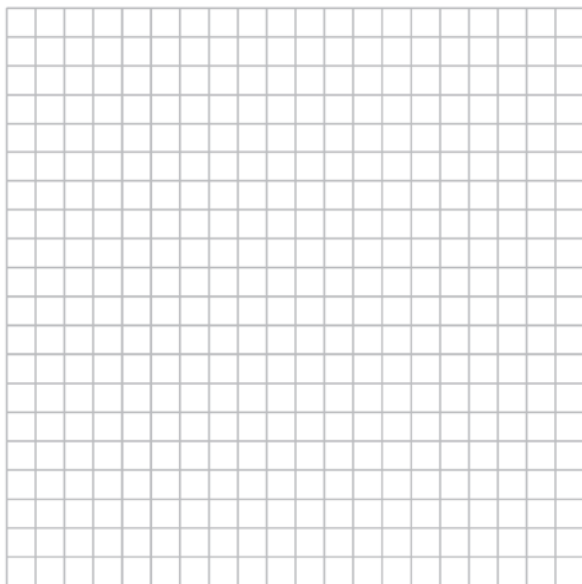
192 Next weekend Marnie wants to attend either carnival A or carnival B. Carnival A charges $6 for admission and an additional $1.50 per ride. Carnival B charges $2.50 for admission and an additional $2 per ride.
a) In function notation, write $A(x)$ to represent the total cost of attending carnival A and going on x rides. In function notation, write $B(x)$ to represent the total cost of attending carnival B and going on x rides.
b) Determine the number of rides Marnie can go on such that the total cost of attending each carnival is the same. [Use of the set of axes below is optional.]
c) Marnie wants to go on five rides. Determine which carnival would have the lower total cost. Justify your answer.
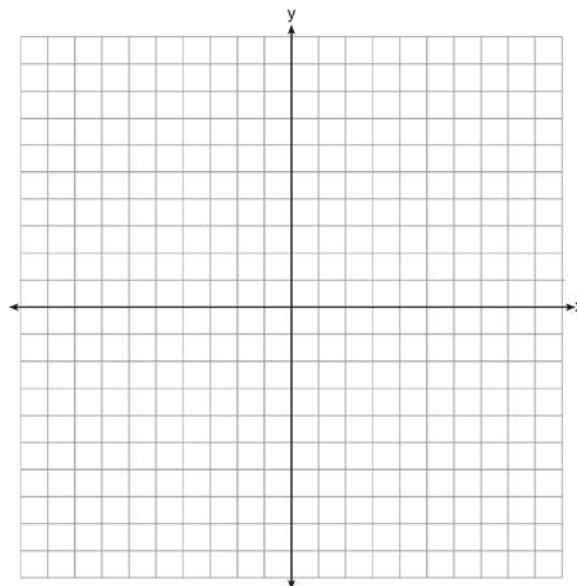
193 Mo's farm stand sold a total of 165 pounds of apples and peaches. She sold apples for $1.75 per pound and peaches for $2.50 per pound. If she made $337.50, how many pounds of peaches did she sell?
1   11
2   18
3   65
4   100

194 Last week, a candle store received $355.60 for selling 20 candles. Small candles sell for $10.98 and large candles sell for $27.98. How many large candles did the store sell?
   1   6
   2   8
   3   10
   4   12

A.CED.2: GRAPHING LINEAR SYSTEMS

195 Rowan has $50 in a savings jar and is putting in $5 every week. Jonah has $10 in his own jar and is putting in $15 every week. Each of them plots his progress on a graph with time on the horizontal axis and amount in the jar on the vertical axis. Which statement about their graphs is true?
   1   Rowan's graph has a steeper slope than Jonah's.
   2   Rowan's graph always lies above Jonah's.
   3   Jonah's graph has a steeper slope than Rowan's.
   4   Jonah's graph always lies above Rowan's.

A.CED.3: MODELING SYSTEMS OF LINEAR INEQUALITIES

196 A high school drama club is putting on their annual theater production. There is a maximum of 800 tickets for the show. The costs of the tickets are $6 before the day of the show and $9 on the day of the show. To meet the expenses of the show, the club must sell at least $5,000 worth of tickets.
a) Write a system of inequalities that represent this situation.
b) The club sells 440 tickets before the day of the show. Is it possible to sell enough additional tickets on the day of the show to at least meet the expenses of the show? Justify your answer.

197 Edith babysits for x hours a week after school at a job that pays $4 an hour. She has accepted a job that pays $8 an hour as a library assistant working y hours a week. She will work both jobs. She is able to work no more than 15 hours a week, due to school commitments. Edith wants to earn at least $80 a week, working a combination of both jobs. Write a system of inequalities that can be used to represent the situation. Graph these inequalities on the set of axes below.
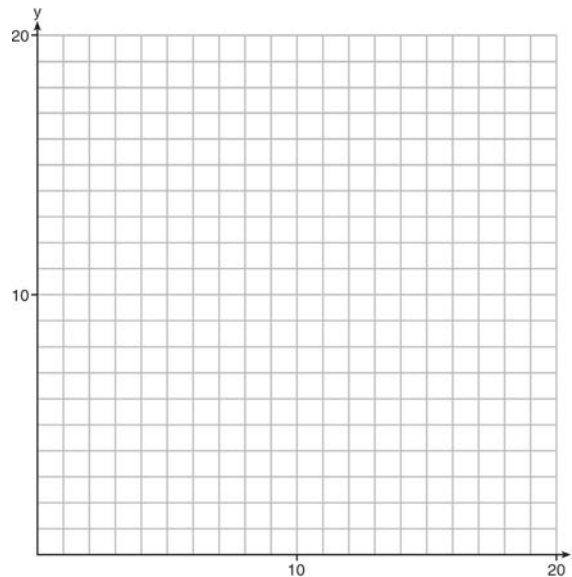
Determine and state one combination of hours that will allow Edith to earn *at least* $80 per week while working *no more than* 15 hours.

198 An on-line electronics store must sell at least $2500 worth of printers and computers per day. Each printer costs $50 and each computer costs $500. The store can ship a maximum of 15 items per day. On the set of axes below, graph a system of inequalities that models these constraints.

Number of Computers

Number of Printers
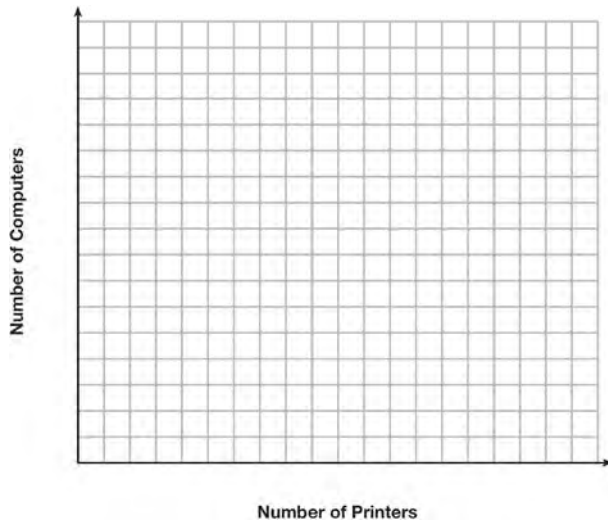
Determine a combination of printers and computers that would allow the electronics store to meet all of the constraints. Explain how you obtained your answer.

A.REI.12: GRAPHING SYSTEMS OF LINEAR INEQUALITIES

199 Which ordered pair is *not* in the solution set of

$y > -\dfrac{1}{2}x + 5$ and $y \le 3x - 2$?

1 (5,3)
2 (4,3)
3 (3,4)
4 (4,4)

200 Given: $y + x > 2$

$y \le 3x - 2$

Which graph shows the solution of the given set of inequalities?

1

2

3

4
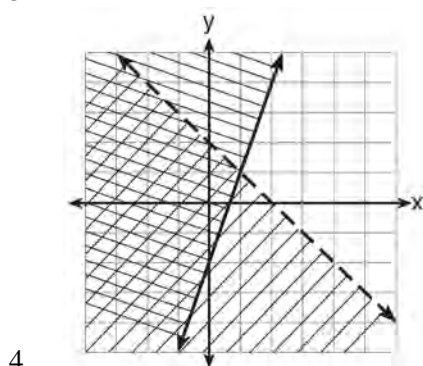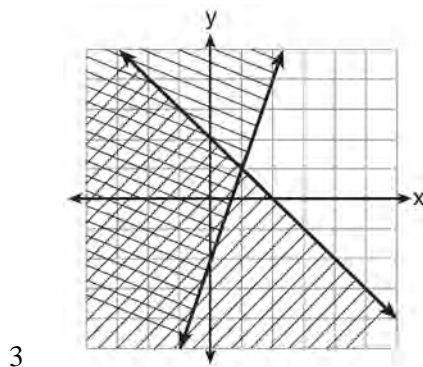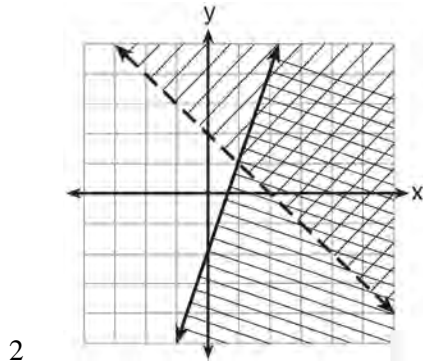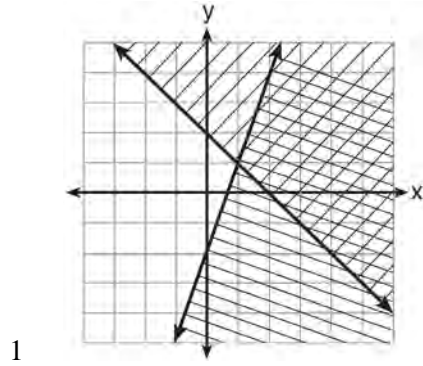
201 What is one point that lies in the solution set of the system of inequalities graphed below?
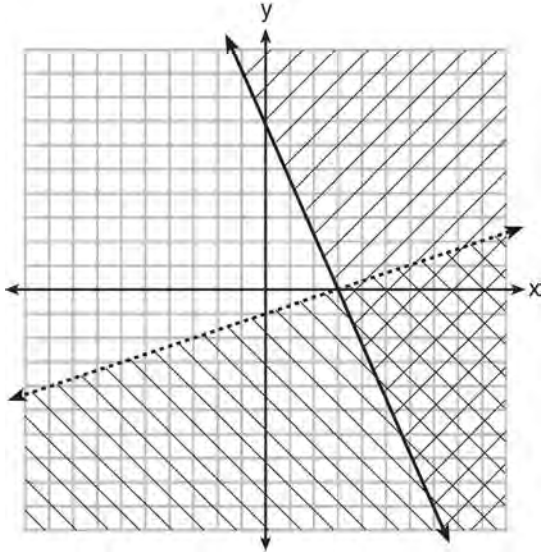
1 (7,0)
2 (3,0)
3 (0,7)
4 (−3,5)

202 The graph of an inequality is shown below.
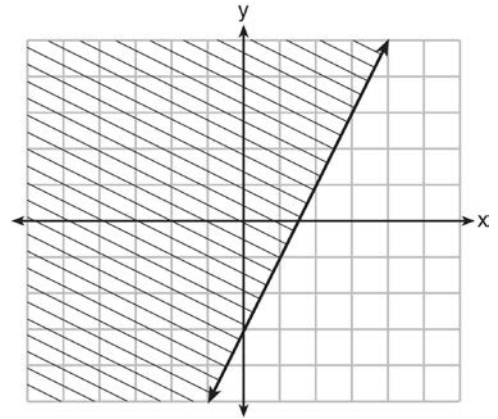
a) Write the inequality represented by the graph.
b) On the same set of axes, graph the inequality $x + 2y < 4$.
c) The two inequalities graphed on the set of axes form a system. Oscar thinks that the point $(2,1)$ is in the solution set for this system of inequalities. Determine and state whether you agree with Oscar. Explain your reasoning.

203 Which graph represents the solution of $y \le x + 3$ and $y \ge -2x - 2$?

1

2

3

4
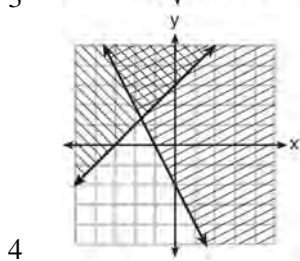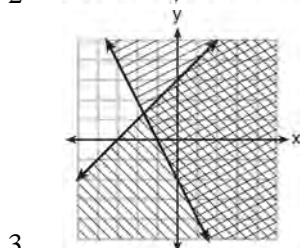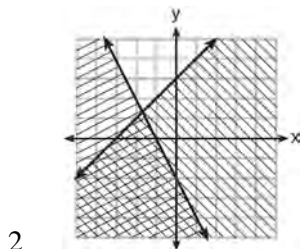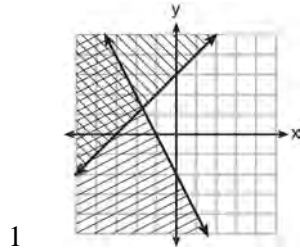
A.REI.7, 11: QUADRATIC-LINEAR SYSTEMS

204 A company is considering building a manufacturing plant. They determine the weekly production cost at site A to be $A(x) = 3x^2$ while the production cost at site B is $B(x) = 8x + 3$, where x represents the number of products, *in hundreds*, and $A(x)$ and $B(x)$ are the production costs, *in hundreds of dollars*. Graph the production cost functions on the set of axes below and label them site A and site B.
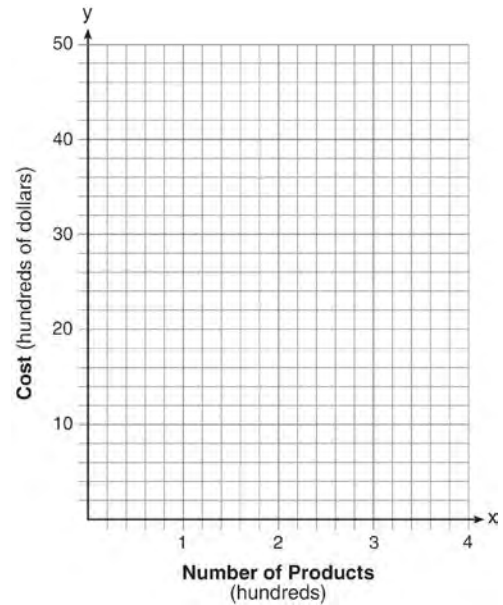
State the positive value(s) of x for which the production costs at the two sites are equal. Explain how you determined your answer. If the company plans on manufacturing 200 products per week, which site should they use? Justify your answer.

205 Let $f(x) = -2x^2$ and $g(x) = 2x - 4$. On the set of axes below, draw the graphs of $y = f(x)$ and $y = g(x)$.
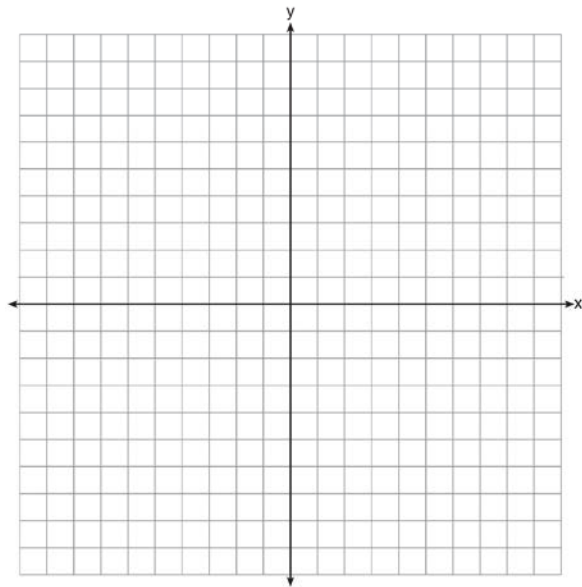
Using this graph, determine and state *all* values of x for which $f(x) = g(x)$.

206 John and Sarah are each saving money for a car. The total amount of money John will save is given by the function $f(x) = 60 + 5x$. The total amount of money Sarah will save is given by the function $g(x) = x^2 + 46$. After how many weeks, x, will they have the same amount of money saved? Explain how you arrived at your answer.

207 If $f(x) = x^2 - 2x - 8$ and $g(x) = \frac{1}{4}x - 1$, for which value of x is $f(x) = g(x)$?
1   -1.75 and -1.438
2   -1.75 and 4
3   -1.438 and 0
4   4 and 0

A.REI.11: NONLINEAR SYSTEMS

208 Two functions, $y = |x - 3|$ and $3x + 3y = 27$, are graphed on the same set of axes. Which statement is true about the solution to the system of equations?
1   $(3,0)$ is the solution to the system because it satisfies the equation $y = |x - 3|$.
2   $(9,0)$ is the solution to the system because it satisfies the equation $3x + 3y = 27$.
3   $(6,3)$ is the solution to the system because it satisfies both equations.
4   $(3,0)$, $(9,0)$, and $(6,3)$ are the solutions to the system of equations because they all satisfy at least one of the equations.

Algebra I Regents Exam Questions by Common Core State Standard: Topic
Answer Section

1 ANS: 3
$\sqrt{16} + \sqrt{9} = \dfrac{7}{1}$ may be expressed as the ratio of two integers.

   PTS: 2   REF: 061413ai   NAT: N.RN.3   TOP: Classifying Numbers
2 ANS: 1   PTS: 2   REF: 081401ai   NAT: N.RN.3
   TOP: Classifying Numbers
3 ANS:
   Correct. The sum of a rational and irrational is irrational.

   PTS: 2   REF: 011525ai   NAT: N.RN.3   TOP: Classifying Numbers
4 ANS: 2   PTS: 2   REF: 061508ai   NAT: N.RN.3
   TOP: Classifying Numbers
5 ANS: 2
$\dfrac{1}{\sqrt{4}} + \dfrac{1}{\sqrt{9}} = \dfrac{1}{2} + \dfrac{1}{3} = \dfrac{5}{6}$

   PTS: 2   REF: 081522ai   NAT: N.RN.3   TOP: Classifying Numbers
6 ANS: 1   PTS: 2   REF: 061401ai   NAT: A.REI.1
   TOP: Identifying Properties
7 ANS:
$\dfrac{33 + 12}{180} = 25\%$

   PTS: 2   REF: 011526ai   NAT: S.ID.5
   TOP: Frequency Histograms, Bar Graphs and Tables
8 ANS:
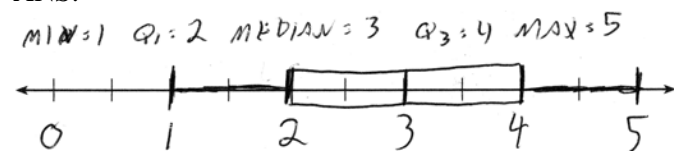
   PTS: 2   REF: 061432ai   NAT: S.ID.1   TOP: Box Plots
9 ANS: 3

	Mean	Q1	Median	Q3	IQR
Semester 1	86.8	80.5	88	92.5	12
Semester 2	87	80	88	92	12

   PTS: 2   REF: 061419ai   NAT: S.ID.2   TOP: Central Tendency and Dispersion

10 ANS: 3

		Company 1	Company 2
1	median salary	33,500	36,250
2	mean salary	33,750	44,125
3	salary range	8,000	36,000
4	mean age	28.25	28.25

    PTS: 2   REF: 081404ai   NAT: S.ID.2   TOP: Central Tendency and Dispersion

11 ANS: 4   PTS: 2   REF: 011514ai   NAT: S.ID.2
    TOP: Central Tendency and Dispersion

12 ANS: 1
$A: \bar{x} = 6; \sigma_x = 3.16$ $B: \bar{x} = 6.875; \sigma_x = 3.06$

    PTS: 2   REF: 081519ai   NAT: S.ID.2   TOP: Central Tendency and Dispersion

13 ANS: 3
Median remains at 1.4.

    PTS: 2   REF: 061520ai   NAT: S.ID.3   TOP: Central Tendency and Dispersion

14 ANS:
$y = 0.05x - 0.92$

    PTS: 2   REF: fall1307ai   NAT: S.ID.6   TOP: Regression
    KEY: linear

15 ANS:
$y = 836.47(2.05)^x$ The data appear to grow at an exponential rate. $y = 836.47(2.05)^2 \approx 3515$.

    PTS: 4   REF: fall1313ai   NAT: S.ID.6   TOP: Regression

16 ANS: 4   PTS: 2   REF: 081421ai   NAT: S.ID.6
    TOP: Regression   KEY: linear

17 ANS:
$y = 0.25(2)^x$. I inputted the four integral values from the graph into my graphing calculator and determined the exponential regression equation.

    PTS: 2   REF: 011532ai   NAT: S.ID.6   TOP: Regression
    KEY: exponential

18 ANS:
$y = 80(1.5)^x$ $80(1.5)^{26} \approx 3,030,140$. No, because the prediction at $x = 52$ is already too large.

    PTS: 4   REF: 061536ai   NAT: S.ID.6   TOP: Regression
    KEY: exponential

19 ANS:
$y = 0.16x + 8.27$ $r = 0.97$, which suggests a strong association.

    PTS: 4   REF: 081536ai   NAT: S.ID.6   TOP: Regression
    KEY: linear

20 ANS: 3

A correlation coefficient close to –1 or 1 indicates a good fit. For a residual plot, there should be no observable pattern and a similar distribution of residuals above and below the *x*-axis.

PTS: 2   REF: fall1303ai   NAT: S.ID.6   TOP: Correlation Coefficient and Residuals

21 ANS:
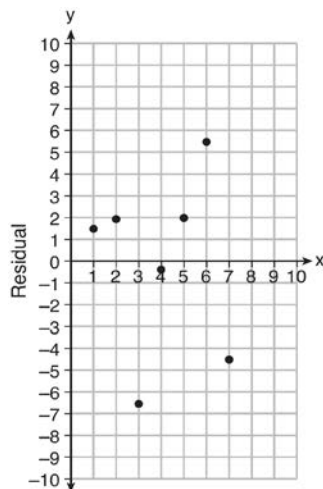
$y = 6.32x + 22.43$ Based on the residual plot, the equation is a good fit for the data because the residual values are scattered without a pattern and are fairly evenly distributed above and below the *x*-axis.

PTS: 4   REF: fall1314ai   NAT: S.ID.6   TOP: Correlation Coefficient and Residuals

22 ANS:
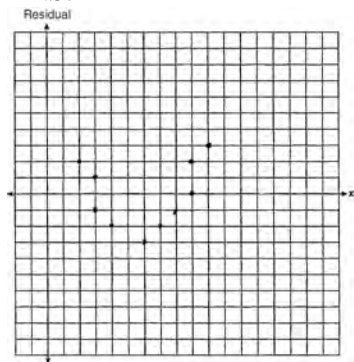
The line is a poor fit because the residuals form a pattern.

PTS: 2   REF: 081431ai   NAT: S.ID.6   TOP: Correlation Coefficient and Residuals

23 ANS:

Graph A is a good fit because it does not have a clear pattern, whereas Graph B does.

PTS: 2   REF: 061531ai   NAT: S.ID.6   TOP: Correlation Coefficient and Residuals

24 ANS: 3   PTS: 2   REF: 061411ai   NAT: S.ID.8

TOP: Correlation Coefficient and Residuals

25 ANS:

$r \approx 0.94$. The correlation coefficient suggests that as calories increase, so does sodium.

PTS: 4   REF: 011535ai   NAT: S.ID.8   TOP: Correlation Coefficient and Residuals

26 ANS: 2 PTS: 2 REF: 061516ai NAT: S.ID.9
TOP: Analysis of Data

27 ANS: 4

Over the interval $0 \le x \le 3$, the average rate of change for $h(x) = \dfrac{9-2}{3-0} = \dfrac{7}{3}$, $f(x) = \dfrac{7-1}{3-0} = \dfrac{6}{3} = 2$, and

$g(x) = \dfrac{3-0}{3-0} = \dfrac{3}{3} = 1$.

PTS: 2 REF: spr1301ai NAT: F.IF.6 TOP: Rate of Change

28 ANS: 1

$\dfrac{110-40}{2-1} > \dfrac{350-230}{8-6}$

$70 > 60$

PTS: 2 REF: 061418ai NAT: F.IF.6 TOP: Rate of Change

29 ANS: 4

$\dfrac{4.7-2.3}{20-80} = \dfrac{2.4}{-60} = -0.04$.

PTS: 2 REF: 081414ai NAT: F.IF.6 TOP: Rate of Change

30 ANS: 1

$\dfrac{0.8(10^2) - 0.8(5^2)}{10-5} = \dfrac{80-20}{5} = 12$

PTS: 2 REF: 011521ai NAT: F.IF.6 TOP: Rate of Change

31 ANS: 3

$\dfrac{36.6-15}{4-0} = \dfrac{21.6}{4} = 5.4$

PTS: 2 REF: 061511ai NAT: F.IF.6 TOP: Rate of Change

32 ANS: 1 PTS: 2 REF: 081515ai NAT: F.IF.6
TOP: Rate of Change

33 ANS: 2 PTS: 2 REF: 011502ai NAT: N.Q.1
TOP: Conversions

34 ANS: 4 PTS: 2 REF: 081503ai NAT: A.SSE.1
TOP: Modeling Expressions

35 ANS: 1

$$\frac{7}{3}\left(x + \frac{9}{28}\right) = 20$$

$$\frac{7}{3}x + \frac{3}{4} = \frac{80}{4}$$

$$\frac{7}{3}x = \frac{77}{4}$$

$$x = \frac{33}{4} = 8.25$$

PTS: 2   REF: 061405ai   NAT: A.REI.3   TOP: Solving Linear Equations
KEY: fractional expressions

36 ANS: 1

$$\frac{x-2}{3} = \frac{4}{6}$$

$$6x - 12 = 12$$

$$6x = 24$$

$$x = 4$$

PTS: 2   REF: 081420ai   NAT: A.REI.3   TOP: Solving Linear Equations
KEY: fractional expressions

37 ANS: 2   PTS: 2   REF: 061416ai   NAT: A.CED.1
TOP: Modeling Linear Equations

38 ANS: 4   PTS: 2   REF: 061422ai   NAT: A.CED.1
TOP: Modeling Linear Equations

39 ANS:

$$15x + 36 = 10x + 48$$

$$5x = 12$$

$$x = 2.4$$

PTS: 2   REF: 011531ai   NAT: A.CED.1   TOP: Modeling Linear Equations

40 ANS:

$$12x + 9(2x) + 5(3x) = 15 \quad 6\left(\frac{1}{3}\right) = 2 \text{ pounds}$$

$$45x = 15$$

$$x = \frac{1}{3}$$

PTS: 2   REF: spr1305ai   NAT: A.CED.3   TOP: Modeling Linear Equations

41 ANS: 2   PTS: 2   REF: 011501ai   NAT: A.SSE.1
TOP: Modeling Linear Functions

42 ANS: 3   PTS: 2   REF: 061407ai   NAT: F.LE.5
TOP: Modeling Linear Functions

43 ANS: 2   PTS: 2   REF: 081402ai   NAT: F.LE.5
    TOP: Modeling Linear Functions

44 ANS: 3   PTS: 2   REF: 061501ai   NAT: F.LE.5
    TOP: Modeling Linear Functions

45 ANS:

$A(n) = 175 - 2.75n$ $0 = 175 - 2.75n$ After 63 weeks, Caitlin will not have enough money to rent another movie.

$$2.75n = 175$$
$$n = 63.6$$

    PTS: 4   REF: 061435ai   NAT: F.BF.1   TOP: Modeling Linear Functions

46 ANS:

$f(x) = 6.50x + 4(12)$

    PTS: 2   REF: 061526ai   NAT: F.BF.1   TOP: Modeling Linear Functions

47 ANS: 4   PTS: 2   REF: 081508ai   NAT: F.BF.1
    TOP: Modeling Linear Functions

48 ANS:

$h(n) = 1.5(n - 1) + 3$

    PTS: 2   REF: 081525ai   NAT: F.BF.1   TOP: Modeling Linear Functions

49 ANS:

$T(d) = 2d + 28$ $T(6) = 2(6) + 28 = 40$

    PTS: 2   REF: 081532ai   NAT: A.CED.1   TOP: Modeling Linear Functions

50 ANS: 4   PTS: 2   REF: 011523ai   NAT: A.CED.2
    TOP: Modeling Linear Functions

51 ANS:
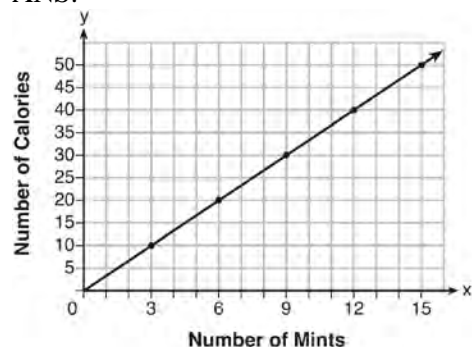
$$C(x) = \frac{10}{3}x \quad 180 = \frac{10}{3}x$$
$$540 = 10x$$
$$54 = x$$

    PTS: 4   REF: fall1308ai   NAT: A.CED.2   TOP: Graphing Linear Functions

52 ANS: 2   PTS: 2   REF: 081413ai   NAT: A.CED.2
    TOP: Graphing Linear Functions   KEY: bimodalgraph

53 ANS:
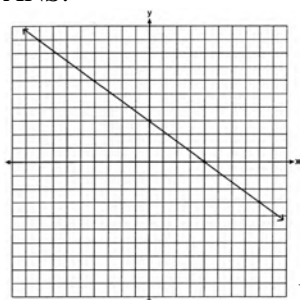
No, because $(3,2)$ is not on the graph.

PTS: 2 REF: 061429ai NAT: A.REI.10 TOP: Graphing Linear Functions

54 ANS: 4

$$m = \frac{11-1}{3-(-2)} = \frac{10}{5} = 2 \quad y = mx + b \quad y = 2x + 5$$
$$11 = 2(3) + b \quad 9 = 2(2) + 5$$
$$5 = b$$

PTS: 2 REF: 011511ai NAT: A.REI.10 TOP: Graphing Linear Functions

55 ANS: 1

$$4x - 5(0) = 40$$
$$4x = 40$$
$$x = 10$$

PTS: 2 REF: 081408ai NAT: F.IF.4 TOP: Graphing Linear Functions

56 ANS: 4

$$y + 3 = 6(0)$$
$$y = -3$$

PTS: 2 REF: 011509ai NAT: F.IF.4 TOP: Graphing Linear Functions

57 ANS: 1

$$V = \frac{1}{3}\pi r^2 h$$
$$3V = \pi r^2 h$$
$$\frac{3V}{\pi h} = r^2$$
$$\sqrt{\frac{3V}{\pi h}} = r$$

PTS: 2 REF: 061423ai NAT: A.CED.4 TOP: Transforming Formulas

58 ANS:

$$A = \frac{1}{2}h(b_1 + b_2) \quad b_1 = \frac{2(60)}{6} - 12 = 20 - 12 = 8$$

$$\frac{2A}{h} = b_1 + b_2$$

$$\frac{2A}{h} - b_2 = b_1$$

PTS: 4　　　REF: 081434ai　　NAT: A.CED.4　　TOP: Transforming Formulas

59 ANS: 1　　　PTS: 2　　　REF: 011516ai　　NAT: A.CED.4
TOP: Transforming Formulas

60 ANS: 2

$$d = \frac{1}{2}at^2$$

$$2d = at^2$$

$$\frac{2d}{a} = t^2$$

$$\sqrt{\frac{2d}{a}} = t$$

PTS: 2　　　REF: 061519ai　　NAT: A.CED.4　　TOP: Transforming Formulas

61 ANS:

$$\frac{V}{\pi h} = \frac{\pi r^2 h}{\pi h} \quad d = 2\sqrt{\frac{66}{3.3\pi}} \approx 5$$

$$\frac{V}{\pi h} = r^2$$

$$\sqrt{\frac{V}{\pi h}} = r$$

PTS: 4　　　REF: 081535ai　　NAT: A.CED.4　　TOP: Transforming Formulas

62 ANS:

$$2(-1) + a(-1) - 7 > -12 \quad a = 2$$

$$-a - 9 > -12$$

$$-a > -3$$

$$a < 3$$

PTS: 2　　　REF: 061427ai　　NAT: A.REI.3　　TOP: Solving Linear Inequalities

63 ANS:

6. $3x + 9 \le 5x - 3$

$12 \le 2x$

$6 \le x$

PTS: 2   REF: 081430ai   NAT: A.REI.3   TOP: Solving Linear Inequalities

64 ANS: 1

$7 - \dfrac{2}{3}x < x - 8$

$15 < \dfrac{5}{3}x$

$9 < x$

PTS: 2   REF: 011507ai   NAT: A.REI.3   TOP: Solving Linear Inequalities

65 ANS:

$-3x + 7 - 5x < 15$ 0 is the smallest integer.

$-8x < 8$

$x > -1$

PTS: 2   REF: 061530ai   NAT: A.REI.3   TOP: Solving Linear Inequalities

66 ANS:

$7x - 3(4x - 8) \le 6x + 12 - 9x$ 6, 7, 8 are the numbers greater than or equal to 6 in the interval.

$7x - 12x + 24 \le -3x + 12$

$-5x + 24 \le -3x + 12$

$12 \le 2x$

$6 \le x$

PTS: 4   REF: 081534ai   NAT: A.REI.3   TOP: Solving Linear Inequalities

67 ANS:

$8x + 11y \ge 200$ $8x + 11(15) \ge 200$

$8x + 165 \ge 200$

$8x \ge 35$

$x \ge 4.375$

5 hours

PTS: 4   REF: fall1309ai   NAT: A.CED.3   TOP: Modeling Linear Inequalities

68 ANS: 3   PTS: 2   REF: 011513ai   NAT: A.CED.3

TOP: Modeling Linear Inequalities

69 ANS: 4

$$\frac{750 + 2.25p}{p} > 2.75 \quad \frac{750 + 2.25p}{p} < 3.25$$

$$750 + 2.25p > 2.75p \quad 750 + 2.25p < 3.25p$$

$$750 > .50p \qquad\qquad 750 < p$$

$$1500 > p$$

PTS: 2   REF: 061524ai   NAT: A.CED.3   TOP: Modeling Linear Inequalities
70 ANS: 4   PTS: 2   REF: 081505ai   NAT: A.CED.3
TOP: Modeling Linear Inequalities
71 ANS: 1   PTS: 2   REF: 061505ai   NAT: A.REI.12
TOP: Graphing Linear Inequalities
72 ANS:
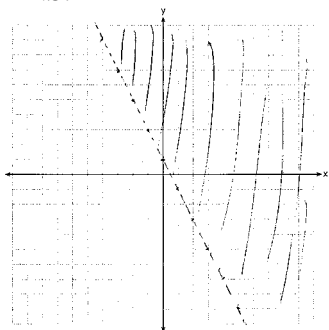
PTS: 2   REF: 081526ai   NAT: A.REI.12   TOP: Graphing Linear Inequalities
73 ANS:
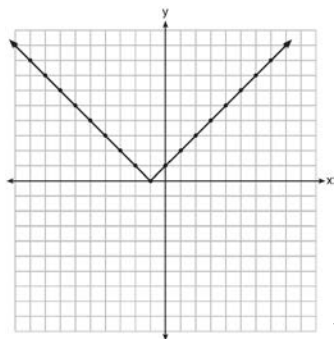
Range: $y \geq 0$. The function is increasing for $x > -1$.

PTS: 4   REF: fall1310ai   NAT: F.IF.7   TOP: Graphing Absolute Value Functions

74 ANS:

$8m^2 + 20m - 12 = 0$

$4(2m^2 + 5m - 3) = 0$

$(2m - 1)(m + 3) = 0$

$$m = \frac{1}{2}, -3$$

PTS: 2   REF: fall1305ai   NAT: A.SSE.3   TOP: Solving Quadratics

75 ANS: 3   PTS: 2   REF: 061412ai   NAT: A.SSE.3
TOP: Solving Quadratics

76 ANS:

$x^2 + 10x + 24 = (x + 4)(x + 6) = (x + 6)(x + 4)$. 6 and 4

PTS: 2   REF: 081425ai   NAT: A.SSE.3   TOP: Solving Quadratics

77 ANS: 4   PTS: 2   REF: 011503ai   NAT: A.SSE.3
TOP: Solving Quadratics

78 ANS: 4

$3x^2 - 3x - 6 = 0$

$3(x^2 - x - 2) = 0$

$3(x - 2)(x + 1) = 0$

$$x = 2, -1$$

PTS: 2   REF: 081513ai   NAT: A.SSE.3   TOP: Solving Quadratics

79 ANS: 1

$x^2 - 12x + 7$

$x^2 - 12x + 36 - 29$

$(x - 6)^2 - 29$

PTS: 2   REF: 081520ai   NAT: A.SSE.3   TOP: Solving Quadratics
KEY: completing the square

80 ANS: 1

$x^2 - 6x = 19$

$x^2 - 6x + 9 = 19 + 9$

$(x - 3)^2 = 28$

$x - 3 = \pm\sqrt{4 \cdot 7}$

$$x = 3 \pm 2\sqrt{7}$$

PTS: 2   REF: fall1302ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: completing the square

81 ANS:

$$\frac{1}{2}x^2 - 4 = 0$$

$$x^2 - 8 = 0$$

$$x^2 = 8$$

$$x = \pm 2\sqrt{2}$$

PTS: 2   REF: fall1306ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: taking square roots

82 ANS: 2

$$x^2 - 6x = 12$$

$$x^2 - 6x + 9 = 12 + 9$$

$$(x - 3)^2 = 21$$

PTS: 2   REF: 061408ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: completing the square

83 ANS: 2

$$x^2 + 4x = 16$$

$$x^2 + 4x + 4 = 16 + 4$$

$$(x + 2)^2 = 20$$

$$x + 2 = \pm\sqrt{4 \cdot 5}$$

$$= -2 \pm 2\sqrt{5}$$

PTS: 2   REF: 061410ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: completing the square

84 ANS:

$$m(x) = (3x - 1)(3 - x) + 4x^2 + 19 \qquad x^2 + 10x + 16 = 0$$

$$m(x) = 9x - 3x^2 - 3 + x + 4x^2 + 19 \qquad (x + 8)(x + 2) = 0$$

$$m(x) = x^2 + 10x + 16 \qquad\qquad\qquad x = -8, -2$$

PTS: 4   REF: 061433ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: factoring

85 ANS: 3   PTS: 2   REF: 081403ai   NAT: A.REI.4
TOP: Solving Quadratics   KEY: taking square roots

86 ANS:

Since $(x + p)^2 = x^2 + 2px + p^2$, p is half the coefficient of x, and the constant term is equal to p^2. $\left(\dfrac{6}{2}\right)^2 = 9$

PTS: 2 REF: 081432ai NAT: A.REI.4 TOP: Solving Quadratics
KEY: completing the square

87 ANS: 4

$$x^2 + 6x = 7$$

$$x^2 + 6x + 9 = 7 + 9$$

$$(x + 3)^2 = 16$$

PTS: 2 REF: 011517ai NAT: A.REI.4 TOP: Solving Quadratics
KEY: completing the square

88 ANS:

$$4x^2 - 12x - 7 = 0$$

$$(4x^2 - 14x) + (2x - 7) = 0$$

$$2x(2x - 7) + (2x - 7) = 0$$

$$(2x + 1)(2x - 7) = 0$$

$$x = -\frac{1}{2}, \frac{7}{2}$$

PTS: 2 REF: 011529ai NAT: A.REI.4 TOP: Solving Quadratics
KEY: factoring

89 ANS: 4

$$x^2 - 5x = -3$$

$$x^2 - 5x + \frac{25}{4} = \frac{-12}{4} + \frac{25}{4}$$

$$\left(x - \frac{5}{2}\right)^2 = \frac{13}{4}$$

PTS: 2 REF: 061518ai NAT: A.REI.4 TOP: Solving Quadratics
KEY: completing the square

90 ANS: 1 PTS: 2 REF: 061521ai NAT: A.REI.4
TOP: Solving Quadratics KEY: completing the square

13

91 ANS: 1

$x^2 - 8x + 16 = 24 + 16$

$(x - 4)^2 = 40$

$x - 4 = \pm\sqrt{40}$

$x = 4 \pm 2\sqrt{10}$

PTS: 2   REF: 061523ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: completing the square

92 ANS: 3   PTS: 2   REF: 081523ai   NAT: A.REI.4
TOP: Solving Quadratics   KEY: completing the square

93 ANS: 3   PTS: 2   REF: 081409ai   NAT: A.CED.1
TOP: Modeling Quadratics

94 ANS: 4   PTS: 2   REF: spr1304ai   NAT: A.CED.1
TOP: Geometric Applications of Quadratics

95 ANS:

$(2x + 16)(2x + 12) = 396$. The length, $2x + 16$, and the width, $2x + 12$, are multiplied and set equal to the area.

$(2x + 16)(2x + 12) = 396$

$4x^2 + 24x + 32x + 192 = 396$

$4x^2 + 56x - 204 = 0$

$x^2 + 14x - 51 = 0$

$(x + 17)(x - 3) = 0$

$x = 3 = \text{width}$

PTS: 4   REF: 061434ai   NAT: A.CED.1   TOP: Geometric Applications of Quadratics

96 ANS:

$w(w + 40) = 6000$

$w^2 + 40w - 6000 = 0$

$(w + 100)(w - 60) = 0$

$w = 60, l = 100$

PTS: 4   REF: 081436ai   NAT: A.CED.1   TOP: Geometric Applications of Quadratics

97 ANS:

$(x - 3)(2x) = 1.25x^2$ Because the original garden is a square, x^2 represents the original area, $x - 3$ represents the side decreased by 3 meters, $2x$ represents the doubled side, and $1.25x^2$ represents the new garden with an area 25% larger. $(x - 3)(2x) = 1.25x^2$ $1.25(8)^2 = 80$

$$2x^2 - 6x = 1.25x^2$$

$$.75x^2 - 6x = 0$$

$$x^2 - 8x = 0$$

$$x(x - 8) = 0$$

$$x = 8$$

PTS: 6   REF: 011537ai   NAT: A.CED.1   TOP: Geometric Applications of Quadratics

98 ANS:

$$34 = l\left(\frac{1}{2}l\right)$$

$$68 = l^2$$

$$8.2 \approx l$$

$$4.1 \approx w$$

PTS: 2   REF: 061532ai   NAT: A.CED.1   TOP: Geometric Applications of Quadratics

99 ANS:

$(2x + 8)(2x + 6) = 100$ The frame has two parts added to each side, so $2x$ must be added to the length and width.

$$4x^2 + 28x + 48 = 100$$

$$x^2 + 7x - 13 = 0$$

Multiply length and width to find area and set equal to 100. $x = \dfrac{-7 \pm \sqrt{7^2 - 4(1)(-13)}}{2(1)} = \dfrac{-7 + \sqrt{101}}{2} \approx 1.5$

PTS: 6   REF: 081537ai   NAT: A.CED.1   TOP: Geometric Applications of Quadratics

100 ANS: 4   PTS: 2   REF: 081405ai   NAT: A.REI.10
TOP: Graphing Quadratic Functions

101 ANS: 3   PTS: 2   REF: 061409ai   NAT: F.IF.4
TOP: Graphing Quadratic Functions

102 ANS:
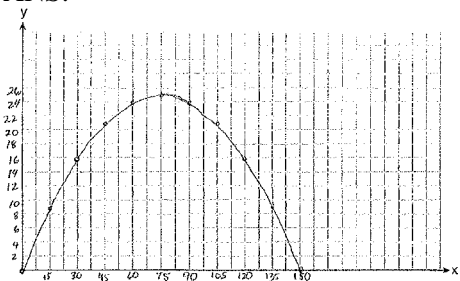
$$x = \frac{-\frac{2}{3}}{2\left(-\frac{1}{225}\right)} = -\frac{2}{3} \cdot -\frac{225}{2} = 75 \quad y = -\frac{1}{225}(75)^2 + \frac{2}{3}(75) = -25 + 50 = 25$$

(75,25) represents the horizontal distance (75) where the football is at its greatest height (25). No, because the ball is less than 10 feet high $y = -\frac{1}{225}(135)^2 + \frac{2}{3}(135) = -81 + 90 = 9$

PTS: 6   REF: 061537ai   NAT: F.IF.4   TOP: Graphing Quadratic Functions

103 ANS:

$-16t^2 + 64t = 0 \quad 0 \le t \le 4$ The rocket launches at $t = 0$ and lands at $t = 4$

$-16t(t - 4) = 0$

$\qquad t = 0, 4$

PTS: 2   REF: 081531ai   NAT: F.IF.4   TOP: Graphing Quadratic Functions

104 ANS:

The vertex represents a maximum since $a < 0$. $f(x) = -x^2 + 8x + 9$

$$= -(x^2 - 8x - 9)$$
$$= -(x^2 - 8x + 16) + 9 + 16$$
$$= -(x - 4)^2 + 25$$

PTS: 4   REF: 011536ai   NAT: F.IF.8   TOP: Graphing Quadratic Functions

105 ANS:

g. The maximum of f is 6. For g, the maximum is 11. $x = \frac{-b}{2a} = \frac{-4}{2\left(-\frac{1}{2}\right)} = \frac{-4}{-1} = 4$

$$y = -\frac{1}{2}(4)^2 + 4(4) + 3 = -8 + 16 + 3 = 11$$

PTS: 2   REF: 081429ai   NAT: F.IF.9   TOP: Graphing Quadratic Functions

106 ANS: 3

$h(x) = -x^2 + x + 6$ Maximum of $f(x) = 9$ $k(x) = -5x^2 - 12x + 4$ Maximum of $g(x) < 5$

$$x = \frac{-1}{2(-1)} = \frac{1}{2} \qquad\qquad\qquad\qquad x = \frac{12}{2(-5)} = -\frac{6}{5}$$

$$y = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 6 \qquad\qquad y = -5\left(-\frac{6}{5}\right)^2 - 12\left(-\frac{6}{5}\right) + 4$$

$$\quad = -\frac{1}{4} + \frac{2}{4} + 6 \qquad\qquad\qquad = -\frac{36}{5} + \frac{72}{5} + \frac{20}{5}$$

$$\quad = 6\frac{1}{4} \qquad\qquad\qquad\qquad\qquad = \frac{56}{5}$$

$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 11\frac{1}{5}$$

PTS: 2   REF: 061514ai   NAT: F.IF.9   TOP: Graphing Quadratic Functions

107 ANS: 4

1) $\frac{g(1) - g(-1)}{1 - -1} = \frac{4 - 6}{2} = \frac{-2}{2} = -1$ 2) $g(0) = 6$ 3) $x = \frac{-(-1)}{2(-1)} = -\frac{1}{2};$ $g\left(-\frac{1}{2}\right) = -\left(-\frac{1}{2}\right)^2 + \frac{1}{2} + 6 = 6\frac{1}{4}$

$\frac{n(1) - n(-1)}{1 - -1} = \frac{9 - 5}{2} = \frac{4}{2} = 2$ $n(0) = 8$ $x = 1; n(1) = 9$

4) $g : S = \frac{-(-1)}{-1} = -1$

    $n : S = -2 + 4 = 2$

PTS: 2   REF: 081521ai   NAT: F.IF.9   TOP: Graphing Quadratic Functions

108 ANS:

$b^2 - 4ac = (-2)^2 - 4(1)(5) = 4 - 20 = -16$ None

PTS: 2   REF: 081529ai   NAT: A.REI.4   TOP: Using the Discriminant

109 ANS: 2   PTS: 2   REF: 061403ai   NAT: A.APR.1

TOP: Operations with Polynomials   KEY: subtraction

110 ANS: 2

$P(x) = -0.5x^2 + 800x - 100 - (300x + 250) = -0.5x^2 + 500x - 350$

PTS: 2   REF: 081406ai   NAT: A.APR.1   TOP: Operations with Polynomials

KEY: subtraction

111 ANS:

$$(2x^2 + 7x - 10)(x + 5)$$

$$2x^3 + 7x^2 - 10x + 10x^2 + 35x - 50$$

$$2x^3 + 17x^2 + 25x - 50$$

PTS: 2 REF: 081428ai NAT: A.APR.1 TOP: Operations with Polynomials
KEY: multiplication

112 ANS: 2 PTS: 2 REF: 011510ai NAT: A.APR.1
TOP: Operations with Polynomials KEY: multiplication

113 ANS:

$$-2x^2 + 6x + 4$$

PTS: 2 REF: 011528ai NAT: A.APR.1 TOP: Operations with Polynomials
KEY: subtraction

114 ANS:

$$(3x^2 - 2x + 5) - (x^2 + 3x - 2) = 2x^2 - 5x + 7$$

$$\frac{1}{2}x^2(2x^2 - 5x + 7) = x^4 - \frac{5}{2}x^3 + \frac{7}{2}x^2$$

PTS: 2 REF: 061528ai NAT: A.APR.1 TOP: Operations with Polynomials
KEY: mixed

115 ANS: 4

$$3(x^2 - 4x + 4) - 2x + 2 = 3x^2 - 12x + 12 - 2x + 2 = 3x^2 - 14x + 14$$

PTS: 2 REF: 081524ai NAT: A.APR.1 TOP: Operations with Polynomials
KEY: mixed

116 ANS:

$$x^4 + 6x^2 - 7$$

$$(x^2 + 7)(x^2 - 1)$$

$$(x^2 + 7)(x + 1)(x - 1)$$

PTS: 2 REF: 061431ai NAT: A.SSE.2 TOP: Factoring Polynomials

117 ANS: 1 PTS: 2 REF: 081415ai NAT: A.SSE.2
TOP: Factoring Polynomials

118 ANS: 3 PTS: 2 REF: 011522ai NAT: A.SSE.2
TOP: Factoring Polynomials

119 ANS: 2 PTS: 2 REF: 061503ai NAT: A.SSE.2
TOP: Factoring Polynomials

120 ANS: 3 PTS: 2 REF: 081509ai NAT: A.SSE.2
TOP: Factoring Polynomials

121 ANS: 3 PTS: 2 REF: spr1302ai NAT: A.APR.3
TOP: Zeros of Polynomials KEY: bimodalgraph

122 ANS: 2

$(x+4)(x+6) = 0$

$x^2 + 10x + 24 = 0$

PTS: 2   REF: spr1303ai   NAT: A.APR.3   TOP: Zeros of Polynomials

123 ANS: 4

$$(x+2)^2 - 25 = 0$$

$((x+2)+5))((x+2)-5)) = 0$

$$x = -7, 3$$

PTS: 2   REF: 081418ai   NAT: A.APR.3   TOP: Zeros of Polynomials

124 ANS: 1   PTS: 2   REF: 011524ai   NAT: A.APR.3
TOP: Zeros of Polynomials

125 ANS: 4

$x^2 - 13x - 30 = 0$

$(x-15)(x+2) = 0$

$$x = 15, -2$$

PTS: 2   REF: 061510ai   NAT: A.APR.3   TOP: Zeros of Polynomials

126 ANS: 2

$y = (x-3)(x+2)(x-1)$

PTS: 2   REF: 061512ai   NAT: A.APR.3   TOP: Zeros of Polynomials

127 ANS: 1   PTS: 2   REF: 081504ai   NAT: A.APR.3
TOP: Zeros of Polynomials

128 ANS: 1

$25,000(0.86)^2 - 25,000(0.86)^3 = 18490 - 15901.40 = 2588.60$

PTS: 2   REF: 011508ai   NAT: F.IF.8   TOP: Evaluating Exponential Expressions

129 ANS: 2   PTS: 2   REF: 061517ai   NAT: A.SSE.1
TOP: Modeling Exponential Functions

130 ANS:

$A = 600(1.016)^2 \approx 619.35$

PTS: 2   REF: 061529ai   NAT: A.CED.1   TOP: Modeling Exponential Functions

131 ANS:

$B = 3000(1.042)^t$

PTS: 2   REF: 081426ai   NAT: F.BF.1   TOP: Modeling Exponential Functions

132 ANS: 1   PTS: 2   REF: 011504ai   NAT: F.BF.1
TOP: Modeling Exponential Functions

133 ANS: 3   PTS: 2   REF: 081507ai   NAT: F.LE.2
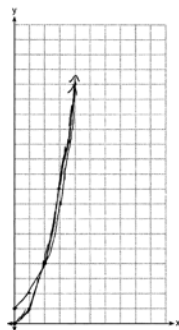TOP: Modeling Exponential Functions

134 ANS: 3   PTS: 2   REF: 011515ai   NAT: F.IF.8
     TOP: Modeling Exponential Functions
135 ANS:
     0.5 represents the rate of decay and 300 represents the initial amount of the compound.

     PTS: 2   REF: 061426ai   NAT: F.LE.5   TOP: Modeling Exponential Functions
136 ANS:
     $1 - 0.95 = 0.05 = 5\%$ To find the rate of change of an equation in the form $y = ab^x$, subtract b from 1.

     PTS: 2   REF: 081530ai   NAT: F.LE.5   TOP: Modeling Exponential Functions
137 ANS: 4
     $16^{2t} = n^{4t}$

     $16^2 = n^4$

     $256 = n^4$

     $4 = n$

     PTS: 2   REF: 011519ai   NAT: A.SSE.3   TOP: Solving Exponential Equations
138 ANS: 4   PTS: 2   REF: 061406ai   NAT: F.LE.1
     TOP: Comparing Linear and Exponential Functions
139 ANS:
     Exponential, because the function does not grow at a constant rate.

     PTS: 2   REF: 081527ai   NAT: F.LE.1
     TOP: Comparing Linear and Exponential Functions
140 ANS: 3   PTS: 2   REF: 061415ai   NAT: F.LE.2
     TOP: Comparing Linear and Exponential Functions
141 ANS: 2   PTS: 2   REF: 061513ai   NAT: F.LE.2
     TOP: Comparing Linear and Exponential Functions
142 ANS: 1
     $f(-1) < g(-1)$

     $3^{-1} < 2(-1) + 5$

     $\dfrac{1}{3} < 3$

     PTS: 2   REF: 061515ai   NAT: F.LE.3
     TOP: Comparing Linear and Exponential Functions

143 ANS: 3

x	$A = 5000x + 10000$	$B = 500(2)^{x-1}$
6	40,000	16,000
7	45,000	32,000
8	50,000	64,000
9	55,000	128,000

PTS: 2   REF: 081518ai   NAT: F.LE.3
TOP: Comparing Linear and Exponential Functions
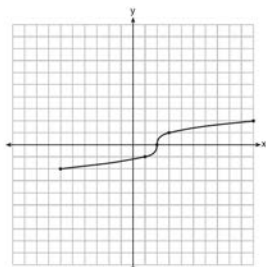
144 ANS:

 $g(x)$ has a greater value: $2^{20} > 20^2$
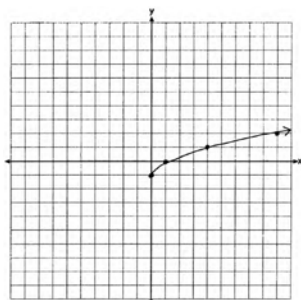
PTS: 4   REF: 081533ai   NAT: F.LE.3
TOP: Comparing Quadratic and Exponential Functions

145 ANS:

PTS: 2   REF: fall1304ai   NAT: F.IF.7   TOP: Graphing Root Functions

146 ANS:

PTS: 2   REF: 061425ai   NAT: F.IF.7   TOP: Graphing Root Functions

147 ANS: 1   PTS: 2   REF: 061420ai   NAT: F.IF.2
TOP: Functional Notation

148 ANS:

$w(52) - w(38)$ $\quad$ $15(x - 40) + 400 = 445$ Since $w(x) > 400$, $x > 40$. I substituted 445 for $w(x)$ and solved

$15(52 - 40) + 400 - 10(38)$ $\quad$ $15(x - 40) = 45$

$180 + 400 - 380$ $\quad\quad$ $x - 40 = 3$

200 $\quad\quad\quad\quad$ $x = 43$

for x.

PTS: 4 $\quad$ REF: 061534ai $\quad$ NAT: F.IF.2 $\quad$ TOP: Functional Notation

149 ANS: 3

$$\dfrac{\sqrt{2\left(\dfrac{1}{2}\right) + 3}}{6\left(\dfrac{1}{2}\right) - 5} = \dfrac{\sqrt{4}}{-2} = \dfrac{2}{-2} = -1$$

PTS: 2 $\quad$ REF: 081512ai $\quad$ NAT: F.IF.2 $\quad$ TOP: Functional Notation

150 ANS:

Yes, because every element of the domain is assigned one unique element in the range.

PTS: 2 $\quad$ REF: 061430ai $\quad$ NAT: F.IF.1 $\quad$ TOP: Defining Functions

151 ANS:

$(-4, 1)$, because then every element of the domain is not assigned one unique element in the range.

PTS: 2 $\quad$ REF: 011527ai $\quad$ NAT: F.IF.1 $\quad$ TOP: Defining Functions

152 ANS: 3 $\quad$ PTS: 2 $\quad$ REF: 061504ai $\quad$ NAT: F.IF.1
TOP: Defining Functions

153 ANS: 2 $\quad$ PTS: 2 $\quad$ REF: 081511ai $\quad$ NAT: F.IF.1
TOP: Defining Functions

154 ANS: 4 $\quad$ PTS: 2 $\quad$ REF: 061417ai $\quad$ NAT: F.IF.2
TOP: Domain and Range

155 ANS: 1

$f(2) = 0$

$f(6) = 8$

PTS: 2 $\quad$ REF: 081411ai $\quad$ NAT: F.IF.2 $\quad$ TOP: Domain and Range

156 ANS: 4 $\quad$ PTS: 2 $\quad$ REF: 061509ai $\quad$ NAT: F.IF.2
TOP: Domain and Range

157 ANS: 4

There are no negative or fractional cars.

PTS: 2 $\quad$ REF: 061402ai $\quad$ NAT: F.IF.5 $\quad$ TOP: Domain and Range

158 ANS: 2

$$0 = -16t^2 + 144$$

$$16t^2 = 144$$

$$t^2 = 9$$

$$t = 3$$

PTS: 2 REF: 081423ai NAT: F.IF.5 TOP: Domain and Range

159 ANS: 2 PTS: 2 REF: 011506ai NAT: F.IF.5
TOP: Domain and Range

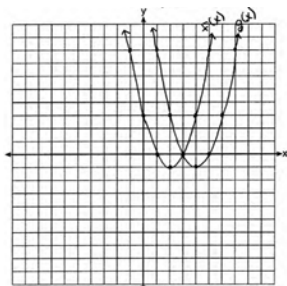160 ANS: 3 PTS: 2 REF: 081412ai NAT: F.LE.1
TOP: Families of Functions

161 ANS: 3 PTS: 2 REF: 011505ai NAT: F.LE.1
TOP: Families of Functions

162 ANS: 3 PTS: 2 REF: 081410ai NAT: F.LE.2
TOP: Families of Functions KEY: bimodalgraph

163 ANS:

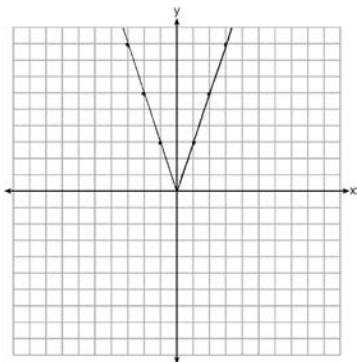$(4,-1)$. $f(x-2)$ is a horizontal shift two units to the right.

PTS: 2 REF: 061428ai NAT: F.BF.3
TOP: Transformations with Functions and Relations

164 ANS: 1 PTS: 2 REF: 081417ai NAT: F.BF.3
TOP: Transformations with Functions and Relations
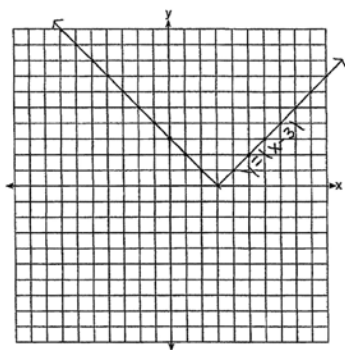
165 ANS:

2 down. 4 right.

PTS: 4 REF: 081433ai NAT: F.BF.3
TOP: Transformations with Functions and Relations

166 ANS: 2 PTS: 2 REF: 011512ai NAT: F.BF.3
TOP: Transformations with Functions and Relations

167 ANS:

The graph has shifted three units to the right.
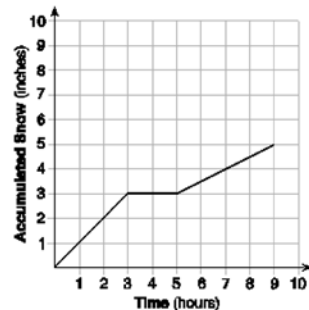
PTS: 2   REF: 061525ai   NAT: F.BF.3
TOP: Transformations with Functions and Relations
168 ANS: 2   PTS: 2   REF: 081501ai   NAT: F.BF.3
TOP: Transformations with Functions and Relations
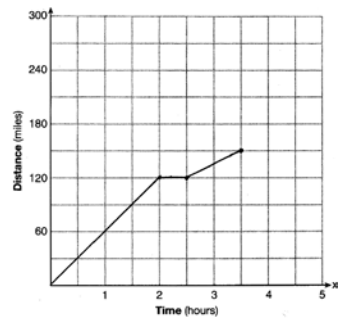169 ANS:

At 6 hours, $3\frac{1}{2}$ inches of snow have fallen.

PTS: 4   REF: spr1307ai   NAT: F.IF.4   TOP: Relating Graphs to Events
170 ANS: 4   PTS: 2   REF: 061502ai   NAT: F.IF.4
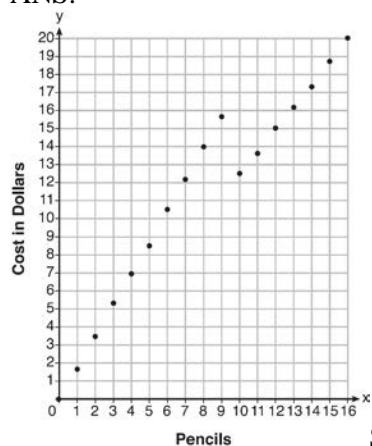TOP: Relating Graphs to Events
171 ANS:

PTS: 2   REF: 081528ai   NAT: F.IF.4   TOP: Relating Graphs to Events
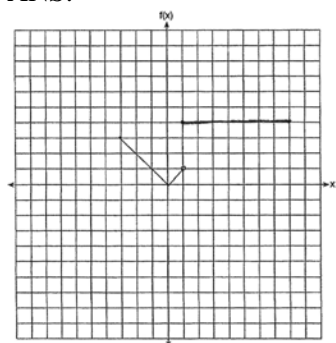
172 ANS:

Since according to the graph, 8 pencils cost $14 and 10 pencils cost $12.50, the cashier is correct.

PTS: 4   REF: fall1312ai   NAT: F.IF.7   TOP: Graphing Piecewise-Defined Functions

173 ANS: 2   PTS: 2   REF: 081422ai   NAT: F.IF.7
TOP: Graphing Piecewise-Defined Functions

174 ANS:

PTS: 2   REF: 011530ai   NAT: F.IF.7   TOP: Graphing Piecewise-Defined Functions

175 ANS: 2   PTS: 2   REF: 081516ai   NAT: F.IF.7
TOP: Graphing Piecewise-Defined Functions   KEY: bimodalgraph

176 ANS:
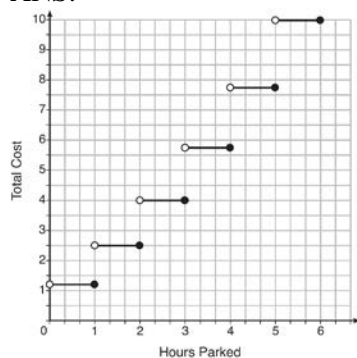
The cost for each additional hour increases after the first 2 hours.

PTS: 4   REF: fall1311ai   NAT: F.IF.7   TOP: Graphing Step Functions

177 ANS: 1   PTS: 2   REF: 061507ai   NAT: F.IF.7
TOP: Graphing Step Functions   KEY: bimodalgraph

178 ANS: 4 PTS: 2 REF: 061421ai NAT: F.IF.3
TOP: Sequences
179 ANS: 4
$f(1) = 3; f(2) = -5; f(3) = 11; f(4) = -21; f(5) = 43$

PTS: 2 REF: 081424ai NAT: F.IF.3 TOP: Sequences
180 ANS: 3
$f(0 + 1) = -2f(0) + 3 = -2(2) + 3 = -1$

$f(1 + 1) = -2f(1) + 3 = -2(-1) + 3 = 5$

PTS: 2 REF: 011520ai NAT: F.IF.3 TOP: Sequences
181 ANS: 1 PTS: 2 REF: 081514ai NAT: F.IF.3
TOP: Sequences
182 ANS: 2 PTS: 2 REF: 061424ai NAT: F.LE.2
TOP: Sequences
183 ANS: 2 PTS: 2 REF: 081416ai NAT: F.LE.2
TOP: Sequences
184 ANS: 3 PTS: 2 REF: 061522ai NAT: F.BF.2
TOP: Sequences
185 ANS: 2
$2(3x - y = 4)$

$6x - 2y = 8$

PTS: 2 REF: 061414ai NAT: A.REI.5 TOP: Solving Linear Systems
186 ANS:
$185 + 0.03x = 275 + 0.025x$

$0.005x = 90$

$x = 18000$

PTS: 2 REF: 081427ai NAT: A.REI.6 TOP: Solving Linear Systems
187 ANS:
$24x + 27y = 144$ $-8.5y = -51$ Agree, as both systems have the same solution.

$24x + 10y = 42$ $y = 6$

$17y = 102$ $8x + 9(6) = 48$

$y = 6$ $8x = -6$

$8x + 9(6) = 48$
$x = -\dfrac{3}{4}$

$8x = -6$

$x = -\dfrac{3}{4}$

PTS: 4 REF: 061533ai NAT: A.REI.6 TOP: Solving Linear Systems
188 ANS: 4 PTS: 2 REF: 081419ai NAT: A.CED.2
TOP: Modeling Linear Systems

189 ANS:

$2p + 3d = 18.25$ $4p + 6d = 36.50$ $4p + 2(2.25) = 27.50$

$4p + 2d = 27.50$ $4p + 2d = 27.50$ $\quad\quad\quad 4p = 23$

$\quad\quad\quad\quad\quad\quad 4d = 9$ $\quad\quad\quad\quad p = 5.75$

$\quad\quad\quad\quad\quad\quad d = 2.25$

PTS: 2 REF: 011533ai NAT: A.CED.2 TOP: Modeling Linear Systems

190 ANS:

$2.35c + 5.50d = 89.50$ Pat's numbers are not possible: $2.35(8) + 5.50(14) \neq 89.50$ $\quad\quad c + d = 22$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad 18.80 + 77.00 \neq 89.50$ $2.35c + 5.50(22 - c) = 89.50$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad 95.80 \neq 89.50$ $2.35c + 121 - 5.50c = 89.50$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad -3.15c = -31.50$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad c = 10$

PTS: 4 REF: 061436ai NAT: A.CED.3 TOP: Modeling Linear Systems

191 ANS:
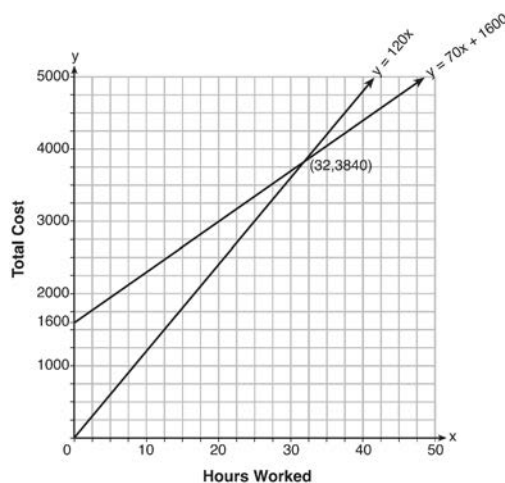
$y = 120x$ and $y = 70x + 1600$ $\quad\quad\quad\quad\quad\quad\quad\quad 120x = 70x + 1600$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad 50x = 1600$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad x = 32$

$y = 120(35) = 4200$ $\quad\quad$ Green Thumb is less expensive.

$y = 70(35) + 1600 = 4050$

PTS: 6 REF: fall1315ai NAT: A.REI.6 TOP: Modeling Linear Systems

192 ANS:

a) $A(x) = 1.50x + 6$ b) $1.50x + 6 = 2x + 2.50$ c) $A(x) = 1.50(5) + 6 = 13.50$ Carnival B has a lower cost.

$\quad B(x) = 2x + 2.50$ $\quad\quad\quad .50x = 3.50$ $\quad\quad\quad B(x) = 2(5) + 2.50 = 12.50$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad x = 7$

PTS: 6 REF: spr1308ai NAT: A.REI.6 TOP: Modeling Linear Systems

193 ANS: 3

$$a + p = 165 \qquad 1.75(165 - p) + 2.5p = 337.5$$
$$1.75a + 2.5p = 337.5 \quad 288.75 - 1.75p + 2.5p = 337.5$$
$$0.75p = 48.75$$
$$p = 65$$

PTS: 2 REF: 061506ai NAT: A.REI.6 TOP: Modeling Linear Systems

194 ANS: 2

$$L + S = 20 \qquad 27.98L + 10.98(20 - L) = 355.60$$
$$27.98L + 10.98S = 355.60 \quad 27.98L + 219.60 - 10.98L = 355.60$$
$$17L = 136$$
$$L = 8$$

PTS: 2 REF: 081510ai NAT: A.REI.6 TOP: Modeling Linear Systems

195 ANS: 3

$15 > 5$

PTS: 2 REF: 081502ai NAT: A.CED.2 TOP: Graphing Linear Systems

196 ANS:

a) $p + d \le 800$ b) $6(440) + 9d \ge 5000$ Since $440 + 263 \le 800$, it is possible.

$$6p + 9d \ge 5000 \qquad 2640 + 9d \ge 5000$$
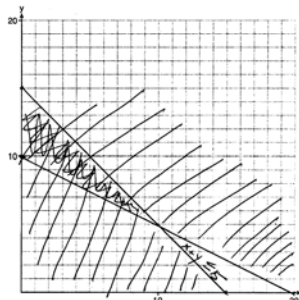$$9d \ge 2360$$
$$d \ge 262.\overline{2}$$

PTS: 2 REF: spr1306ai NAT: A.CED.3 TOP: Modeling Systems of Linear Inequalities

197 ANS:

$x + y \le 15$ One hour at school and eleven hours at the library.
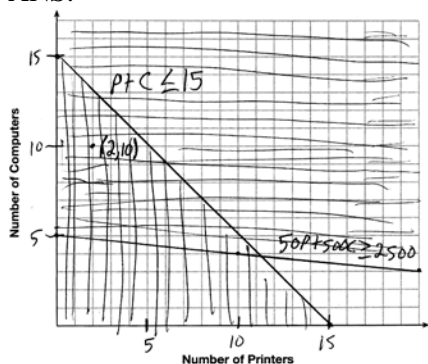
$4x + 8y \ge 80$

PTS: 6 REF: 081437ai NAT: A.CED.3 TOP: Modeling Systems of Linear Inequalities

198 ANS:

A combination of 2 printers and 10 computers meets all the constraints because $(2, 10)$ is in the solution set of the graph.

PTS: 4   REF: 061535ai   NAT: A.CED.3   TOP: Modeling Systems of Linear Inequalities
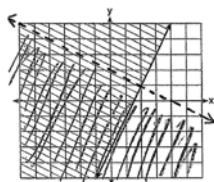
199 ANS: 2

$(4, 3)$ is on the boundary of $y > -\dfrac{1}{2}x + 5$, so $(4, 3)$ is not a solution of the system.

PTS: 2   REF: fall1301ai   NAT: A.REI.12   TOP: Graphing Systems of Linear Inequalities

200 ANS: 2   PTS: 2   REF: 061404ai   NAT: A.REI.12
TOP: Graphing Systems of Linear Inequalities   KEY: bimodalgraph

201 ANS: 1   PTS: 2   REF: 081407ai   NAT: A.REI.12
TOP: Graphing Systems of Linear Inequalities
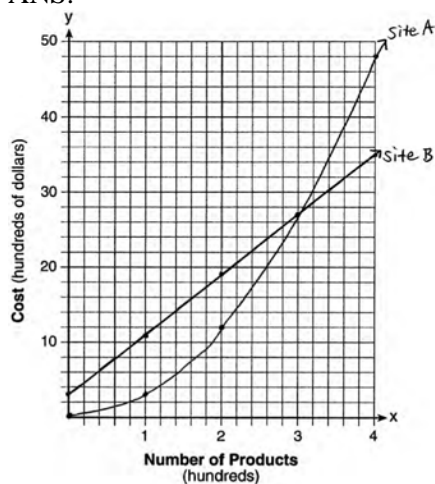
202 ANS:

$y \geq 2x - 3$.   Oscar is wrong. $(2) + 2(1) < 4$ is not true.

PTS: 4   REF: 011534ai   NAT: A.REI.12   TOP: Graphing Systems of Linear Inequalities

203 ANS: 3   PTS: 2   REF: 081506ai   NAT: A.REI.12
TOP: Graphing Systems of Linear Inequalities

204 ANS:

The graphs of the production costs intersect at $x = 3$. The company should use Site A, because the cost of Site A is lower at $x = 2$.
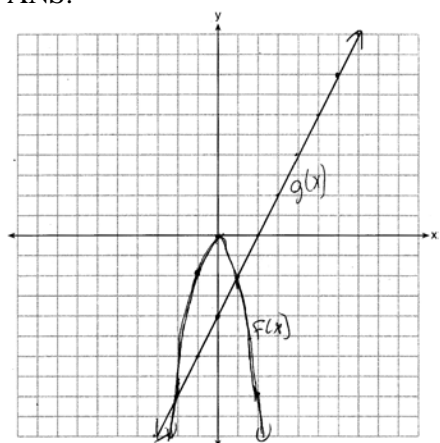
PTS: 6   REF: 061437ai   NAT: A.REI.7   TOP: Quadratic-Linear Systems

205 ANS:

$x = -2, 1$

PTS: 4   REF: 081435ai   NAT: A.REI.7   TOP: Quadratic-Linear Systems

206 ANS:

$x^2 + 46 = 60 + 5x$ John and Sarah will have the same amount of money saved at 7 weeks. I set the

$x^2 - 5x - 14 = 0$

$(x - 7)(x + 2) = 0$

$x = 7$

expressions representing their savings equal to each other and solved for the positive value of x by factoring.

PTS: 2   REF: 061527ai   NAT: A.REI.11   TOP: Quadratic-Linear Systems

207 ANS: 2

$$x^2 - 2x - 8 = \frac{1}{4}x - 1$$

$$4x^2 - 8x - 32 = x - 4$$

$$4x^2 - 9x - 28 = 0$$

$$(4x + 7)(x - 4) = 0$$

$$x = -\frac{7}{4}, 4$$

PTS: 2   REF: 081517ai   NAT: A.REI.11   TOP: Quadratic-Linear Systems

208 ANS: 3   PTS: 2   REF: 011518ai   NAT: A.REI.11

TOP: Nonlinear Systems