JMAP
REGENTS BY COMMON CORE
STATE STANDARD: TOPIC

NY Algebra I Regents Exam Questions
from Spring 2013 to January 2016 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: $L = \sqrt{2}$

$M = 3\sqrt{3}$

$N = \sqrt{16}$

$P = \sqrt{9}$

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

2 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 $W = \dfrac{1}{\sqrt{2}}$

3 Given the following expressions:

I. $-\dfrac{5}{8} + \dfrac{3}{5}$ III. $\left(\sqrt{5}\right) \cdot \left(\sqrt{5}\right)$

II. $\dfrac{1}{2} + \sqrt{2}$ IV. $3 \cdot \left(\sqrt{49}\right)$

Which expression(s) result in an irrational number?
1 II, only
2 III, only
3 I, III, IV
4 II, III, IV

4 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.

5 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.

6 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.

A.REI.1: IDENTIFYING PROPERTIES

7 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.2-3: CENTRAL TENDENCY AND DISPERSION

8 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.

9 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.

10 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.
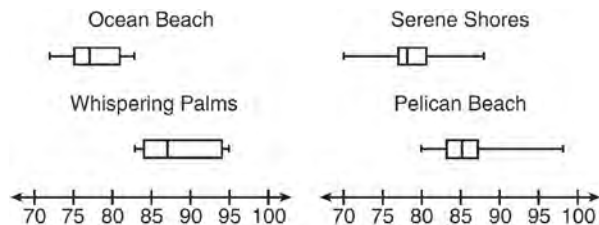
Which destination has a median temperature above 80 degrees and the smallest interquartile range?
1 Ocean Beach
2 Whispering Palms
3 Serene Shores
4 Pelican Beach

11 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

12 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.5: FREQUENCY HISTOGRAMS AND TABLES

13 A statistics class surveyed some students during one lunch period to obtain opinions about television programming preferences. The results of the survey are summarized in the table below.

Programming Preferences

	Comedy	Drama
Male	70	35
Female	48	42

Based on the sample, predict how many of the school's 351 males would prefer comedy. Justify your answer.

14 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

15 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.9: ANALYSIS OF DATA

16 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
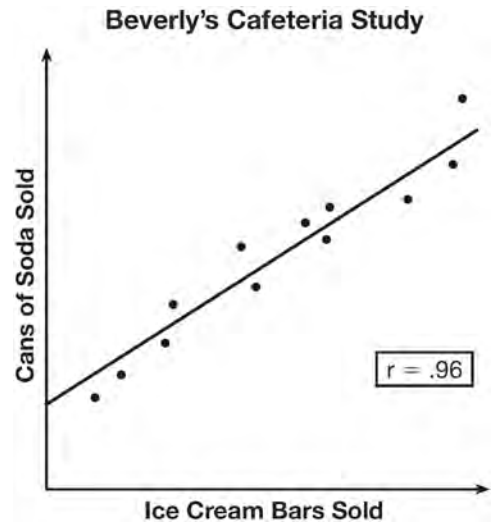
Given this information, which statement(s) can correctly be concluded?
I.   Eating more ice cream causes a person to become thirsty.
II. Drinking more soda causes a person to become hungry.
III. There is a strong correlation between ice cream sales and soda sales.
1   I, only
2   III, only
3   I and III
4   II and III

S.ID.6: REGRESSION

17 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 $y = 14.1x + 5.8$

18 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*.)

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.

20 Erica, the manager at Stellarbeans, collected data on the daily high temperature and revenue from coffee sales. Data from nine days this past fall are shown in the table below.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
High Temperature, t	54	50	62	67	70	58	52	46	48
Coffee Sales, f(t)	$2900	$3080	$2500	$2380	$2200	$2700	$3000	$3620	$3720

State the linear regression function, $f(t)$, that estimates the day's coffee sales with a high temperature of t. Round all values to the *nearest integer*. State the correlation coefficient, r, of the data to the *nearest hundredth*. Does r indicate a strong linear relationship between the variables? Explain your reasoning.

21 Write an exponential equation for the graph shown below.
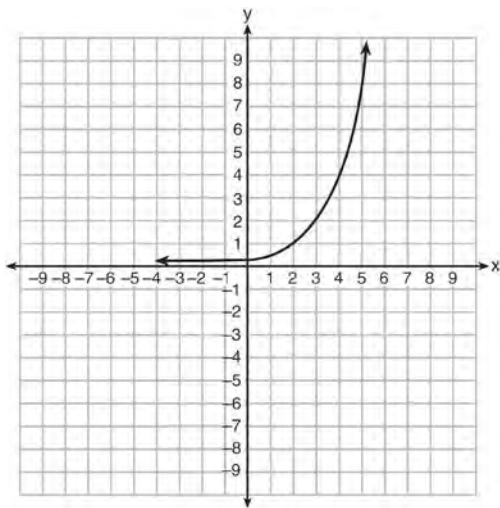
Explain how you determined the equation.

22 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.

23 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

a) Write a regression equation that best models these data. Round all values to the *nearest hundredth*. Justify your choice of regression equation. b) 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.

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

24 What is the correlation coefficient of the linear fit of the data shown below, to the *nearest hundredth*?
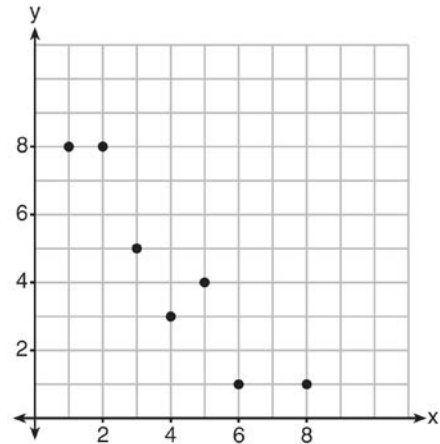
1   1.00
2   0.93
3   −0.93
4   −1.00

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.

26 After performing analyses on a set of data, Jackie examined the scatter plot of the residual values for each analysis. Which scatter plot indicates the best linear fit for the data?

1

2

3

4
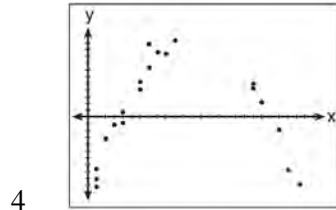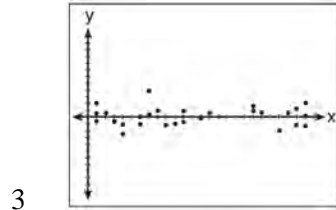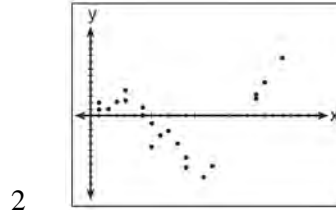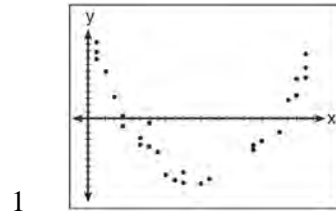
27 Which statistic would indicate that a linear function would *not* be a good fit to model a data set?

1 $r = -0.93$

2 $r = 1$

3

4
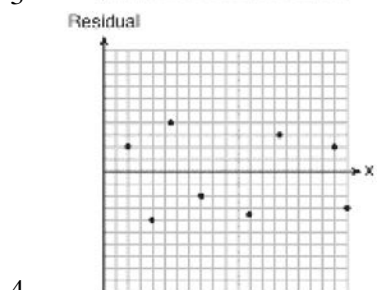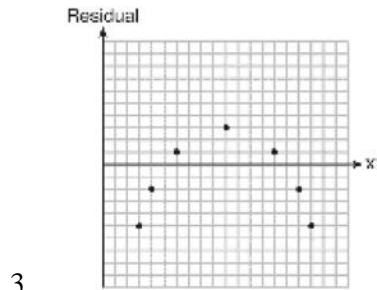
28 The residual plots from two different sets of bivariate data are graphed below.
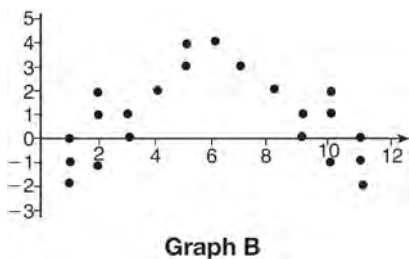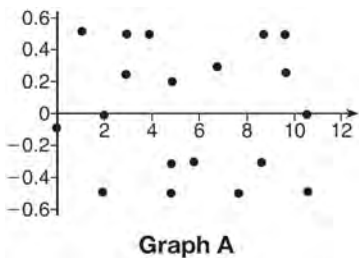
Graph A

Graph B

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

29 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.
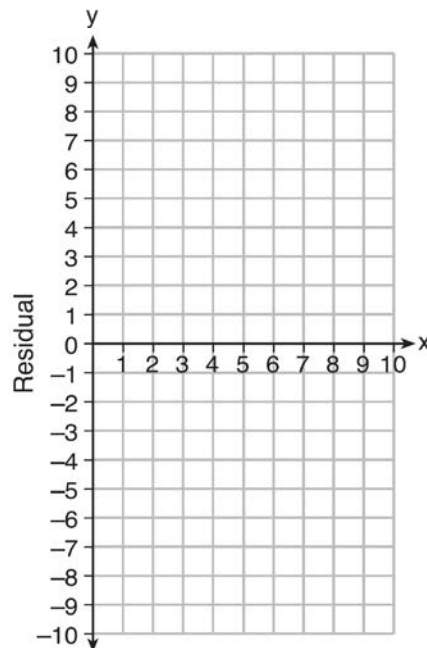
Based on the residual plot, state whether the equation is a good fit for the data. Justify your answer.

30 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.
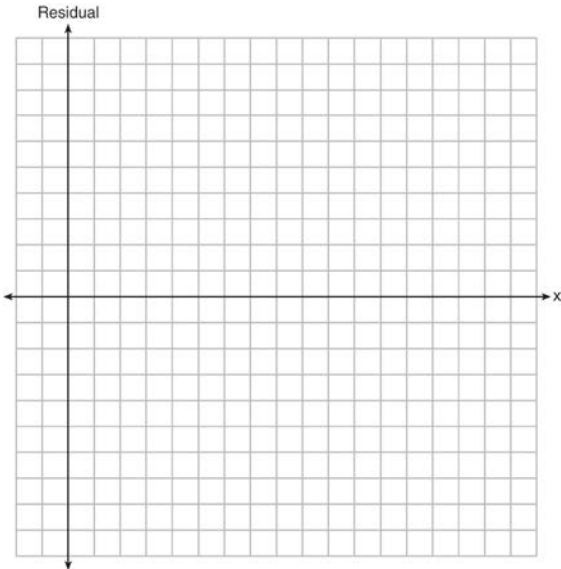
Residual

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

RATE
F.IF.6: RATE OF CHANGE

31 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

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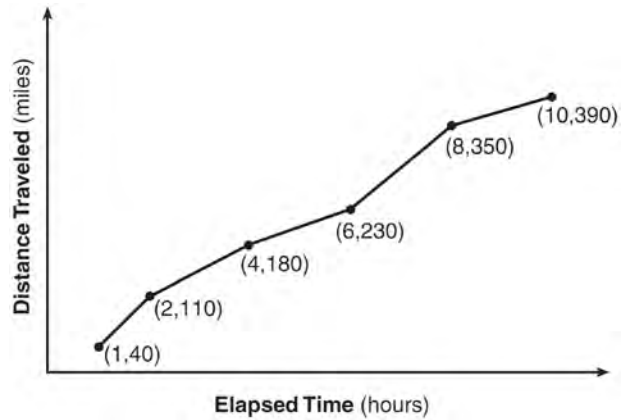
During which interval was their average speed the
greatest?
1 the first hour to the second hour
2 the second hour to the fourth hour
3 the sixth hour to the eighth hour
4 the eighth hour to the tenth hour

33 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.
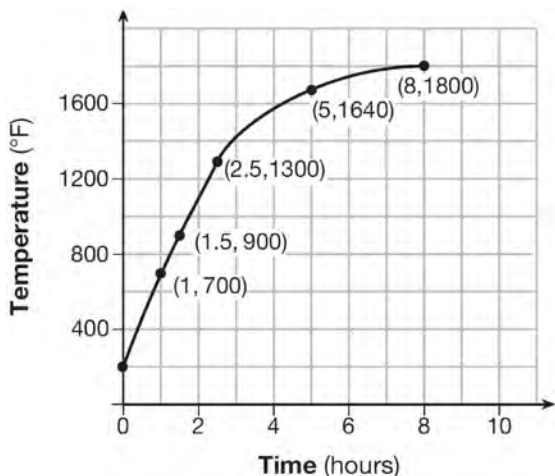
During which time interval did the temperature in the kiln show the greatest average rate of change?
1   0 to 1 hour
2   1 hour to 1.5 hours
3   2.5 hours to 5 hours
4   5 hours to 8 hours

34 The table below shows the cost of mailing a postcard in different years. During which time interval did the cost increase at the greatest average rate?

Year	1898	1971	1985	2006	2012
Cost (¢)	1	6	14	24	35

1   1898-1971
2   1971-1985
3   1985-2006
4   2006-2012

35 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

36 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

37 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
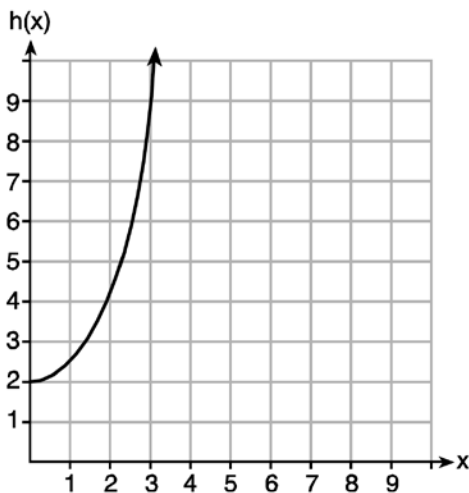
The correct list of functions ordered from greatest to least by average rate of change over the interval $0 \le x \le 3$ is
1   $f(x)$, $g(x)$, $h(x)$
2   $h(x)$, $g(x)$, $f(x)$
3   $g(x)$, $f(x)$, $h(x)$
4   $h(x)$, $f(x)$, $g(x)$

38 The graph below shows the variation in the average temperature of Earth's surface from 1950-2000, according to one source.
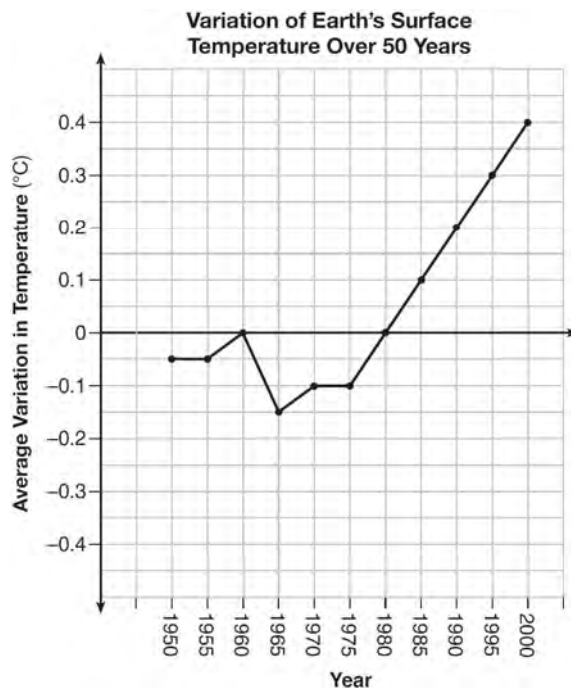
During which years did the temperature variation change the most per unit time? Explain how you determined your answer.

N.Q.1: CONVERSIONS

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

12

LINEAR EQUATIONS
A.SSE.1: MODELING EXPRESSIONS

40 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

41 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

42 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

43 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   $0.05(4x) + 0.10(x) = \$1.25$

44 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.

45 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   $c = 60 + 0.05d$

46 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   $C = 62 + 30(g - 2)$

47 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.]

F.BF.1, F.LE.5: MODELING LINEAR
FUNCTIONS

48 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    $c(z) = 0.20(z - 1) + 0.46$

49 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.

50 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.

51 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.

52 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.

53 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

54 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

55 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.

56 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.

57 The cost of belonging to a gym can be modeled by $C(m) = 50m + 79.50$, where $C(m)$ is the total cost for m months of membership. State the meaning of the slope and y-intercept of this function with respect to the costs associated with the gym membership.

A.CED.2, F.BF.3, F.IF.4: GRAPHING LINEAR FUNCTIONS

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

1

2

3

4
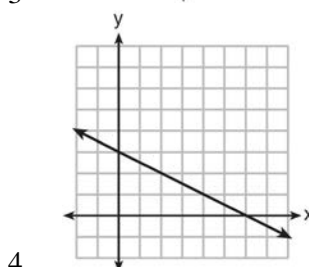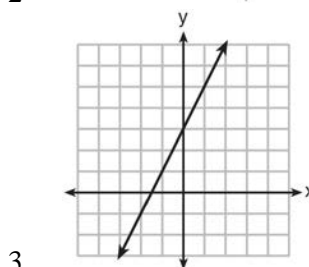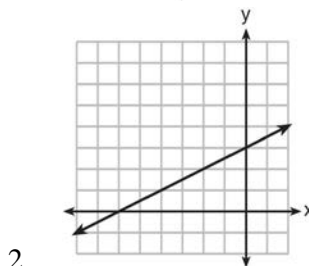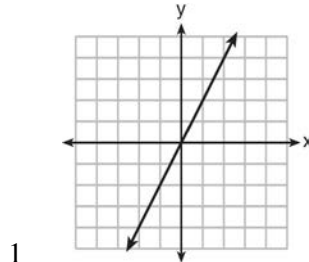
59 The graph below was created by an employee at a gas station.

Gas Sales
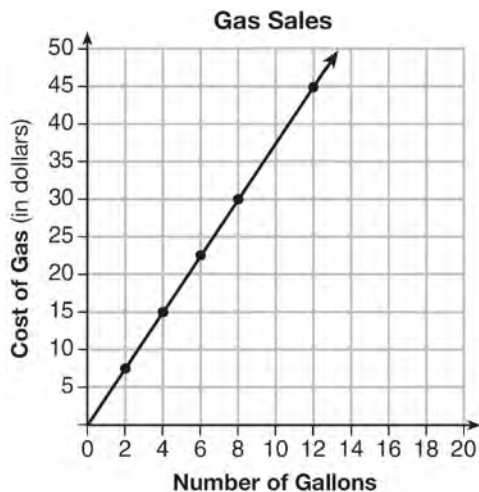
Which statement can be justified by using the graph?
1   If 10 gallons of gas was purchased, $35 was paid.
2   For every gallon of gas purchased, $3.75 was paid.
3   For every 2 gallons of gas purchased, $5.00 was paid.
4   If zero gallons of gas were purchased, zero miles were driven.

60 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.
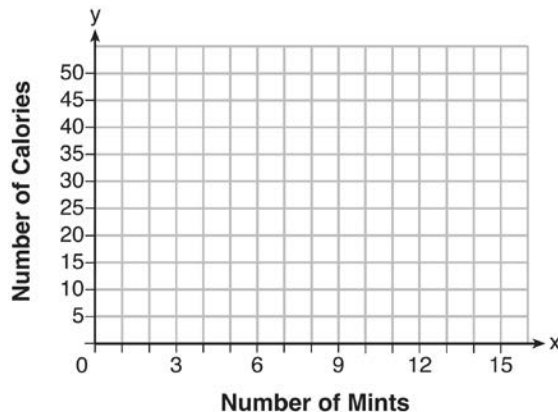
Write an equation that represents $C(x)$. A full box of mints contains 180 Calories. Use the equation to determine the total number of mints in the box.

61 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

62 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

63 Which function has the same y-intercept as the graph below?
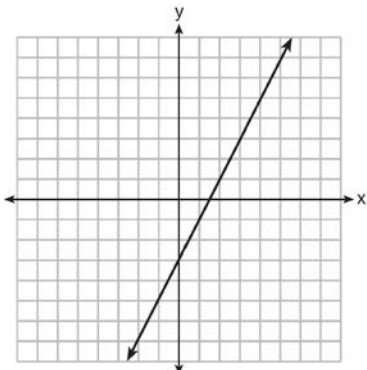
1   $y = \dfrac{12 - 6x}{4}$

2   $27 + 3y = 6x$

3   $6y + x = 18$

4   $y + 3 = 6x$

A.CED.4: TRANSFORMING FORMULAS

64 Michael borrows money from his uncle, who is charging him simple interest using the formula $I = \text{Pr}\, t$. To figure out what the interest rate, r, is, Michael rearranges the formula to find r. His new formula is r equals

1   $\dfrac{I - P}{t}$

2   $\dfrac{P - I}{t}$

3   $\dfrac{I}{Pt}$

4   $\dfrac{Pt}{I}$

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

66 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   $\dfrac{1}{3}\sqrt{\dfrac{V}{\pi h}}$

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

68 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.

69 The formula for the area of a trapezoid is $A = \frac{1}{2} h(b_1 + b_2)$. 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.

INEQUALITIES
A.REI.3: SOLVING LINEAR INEQUALITIES

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

1 $x > 9$
2 $x > -\frac{3}{5}$
3 $x < 9$
4 $x < -\frac{3}{5}$

71 Given that $a > b$, solve for x in terms of a and b:
$$b(x - 3) \geq ax + 7b$$

A.REI.3: INTERPRETING SOLUTIONS

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

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

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

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

A.CED.1,3: MODELING LINEAR INEQUALITIES

76 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 $750 < p < 1500$

77 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 $0.75(7) + 1.25b \leq 22$

78 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 $0.79 + 4.50r \leq 16.00$; 3 rides
2 $0.79 + 4.50r \leq 16.00$; 4 rides
3 $4.50 + 0.79r \leq 16.00$; 14 rides
4 $4.50 + 0.79r \leq 16.00$; 15 rides

79 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.

A.REI.12: GRAPHING LINEAR INEQUALITIES

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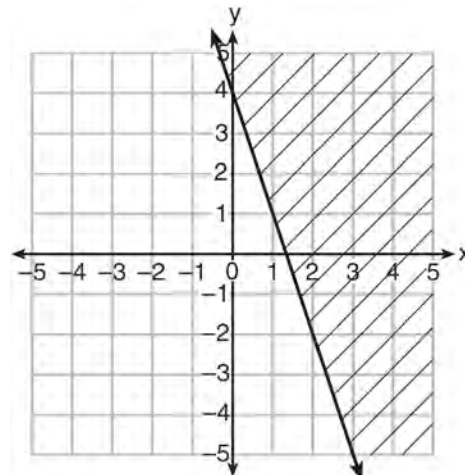
1 $y \geq -3x + 4$
2 $y \leq -3x + 4$
3 $y \geq -4x - 3$
4 $y \leq -4x - 3$

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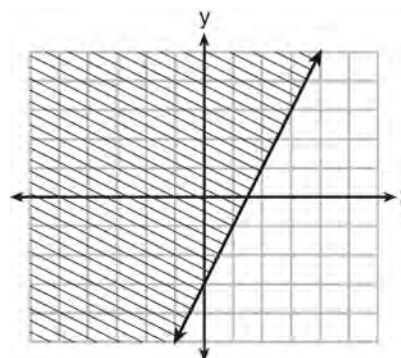
1 $y \leq 2x - 3$
2 $y \geq 2x - 3$
3 $y \leq -3x + 2$
4 $y \geq -3x + 2$

19

82 On the set of axes below, graph the inequality
$2x + y > 1$.
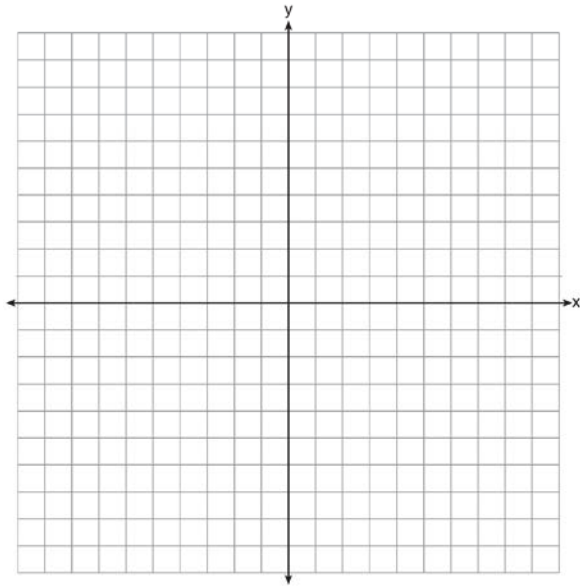
ABSOLUTE VALUE
F.IF.7, F.BF.3: GRAPHING ABSOLUTE VALUE
FUNCTIONS

83 On the set of axes below, graph the function
$y = |x + 1|$.
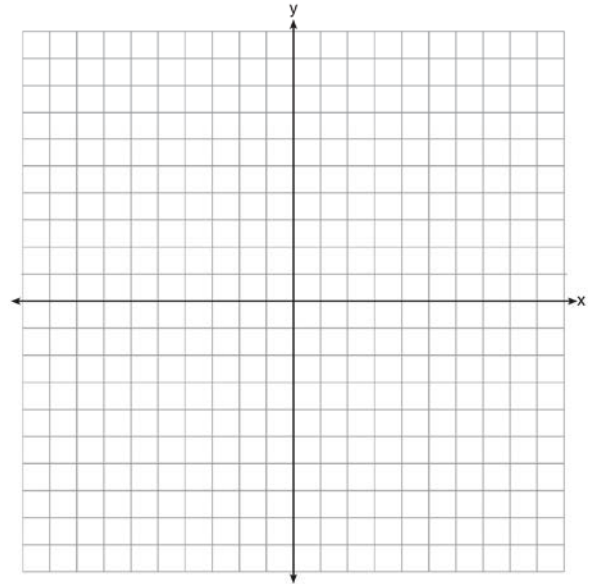
State the range of the function. State the domain over which the function is increasing.

84 On the axes below, graph $f(x) = |3x|$.
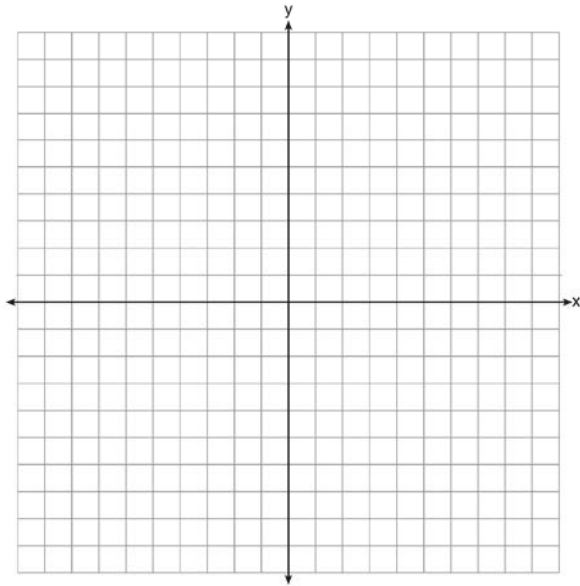
If $g(x) = f(x) - 2$, how is the graph of $f(x)$ translated to form the graph of $g(x)$? If $h(x) = f(x - 4)$, how is the graph of $f(x)$ translated to form the graph of $h(x)$?

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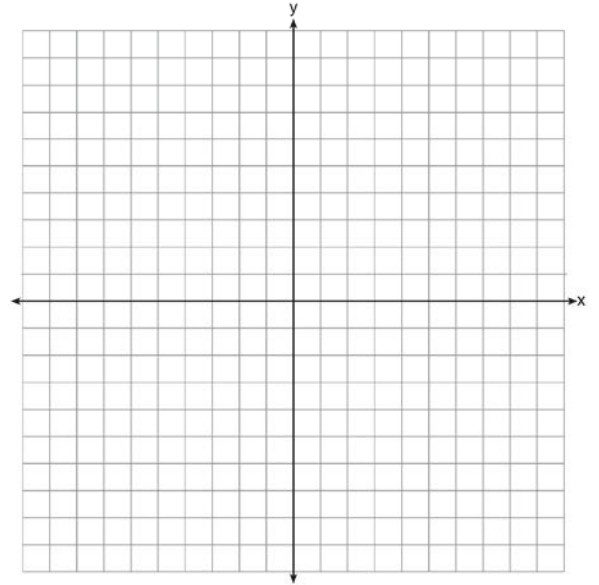
Explain how the graph of $y = |x - 3|$ has changed from the related graph $y = |x|$.

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

86 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   $f(x) = (x - 5)(x - 6)$

87 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   $(2x + 3)(x - 1) = 0$

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

89 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

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

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

92 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

93 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 $9x^2 - 6x + 1 = 5$

94 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 $-7 \pm \sqrt{3}$

95 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.
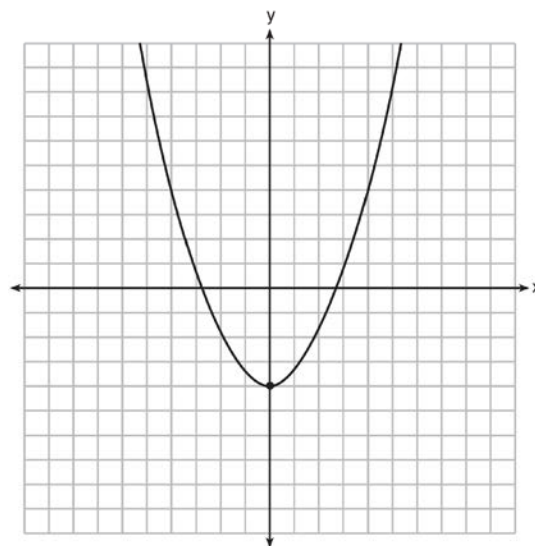
Find the zeros in simplest radical form.

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

97 Solve the equation for y: $(y - 3)^2 = 4y - 12$

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

99 When solving the equation $x^2 - 8x - 7 = 0$ by completing the square, which equation is a step in the process?

1   $(x-4)^2 = 9$

2   $(x-4)^2 = 23$

3   $(x-8)^2 = 9$

4   $(x-8)^2 = 23$

100 When directed to solve a quadratic equation by completing the square, Sam arrived at the equation $\left(x - \dfrac{5}{2}\right)^2 = \dfrac{13}{4}$. 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   $x^2 - 5x + 3 = 0$

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

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

103 Which equation is equivalent to $y - 34 = x(x - 12)$?

1   $y = (x - 17)(x + 2)$

2   $y = (x - 17)(x - 2)$

3   $y = (x - 6)^2 + 2$

4   $y = (x - 6)^2 - 2$

104 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   $-2 \pm 4\sqrt{5}$

105 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   $x = -4 \pm 2\sqrt{2}$

106 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.

107 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   $-3 \pm 4\sqrt{14}$

108 Fred's teacher gave the class the quadratic function $f(x) = 4x^2 + 16x + 9$.
a) State two different methods Fred could use to solve the equation $f(x) = 0$.
b) Using one of the methods stated in part a, solve $f(x) = 0$ for x, to the *nearest tenth*.

23

A.REI.4: USING THE DISCRIMINANT

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

F.IF.4, F.BF.3: GRAPHING QUADRATIC FUNCTIONS

110 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.
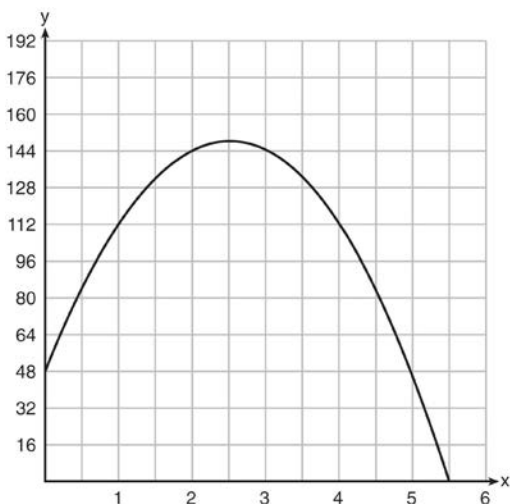
For which interval is the ball's height always *decreasing*?
1   $0 \le x \le 2.5$
2   $0 < x < 5.5$
3   $2.5 < x < 5.5$
4   $x \ge 2$

111 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.

112 Let $h(t) = -16t^2 + 64t + 80$ represent the height of an object above the ground after t seconds. Determine the number of seconds it takes to achieve its maximum height. Justify your answer. State the time interval, in seconds, during which the height of the object *decreases*. Explain your reasoning.

113 A football player attempts to kick a football over a goal post. The path of the football can be modeled by the function $h(x) = -\dfrac{1}{225} x^2 + \dfrac{2}{3} x$, 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 $0 \le x \le 150$.
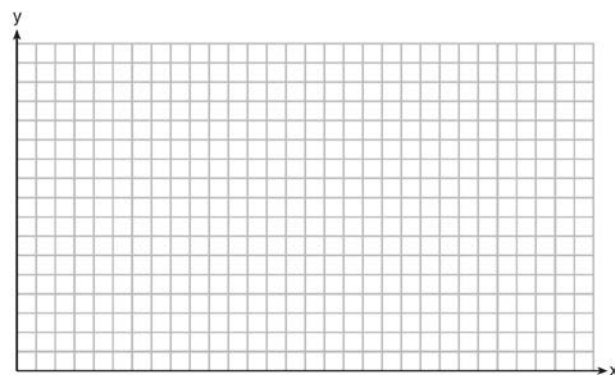
Determine the vertex of $y = h(x)$. Interpret the meaning of this vertex in the context of the problem. The goal post is 10 feet high and 45 yards away from the kick. Will the ball be high enough to pass over the goal post? Justify your answer.

114 The graph of the equation $y = ax^2$ is shown below.
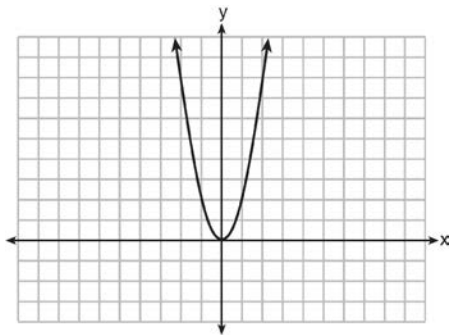
If a is multiplied by $-\frac{1}{2}$, the graph of the new

equation is
1   wider and opens downward
2   wider and opens upward
3   narrower and opens downward
4   narrower and opens upward

115 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.

116 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.]
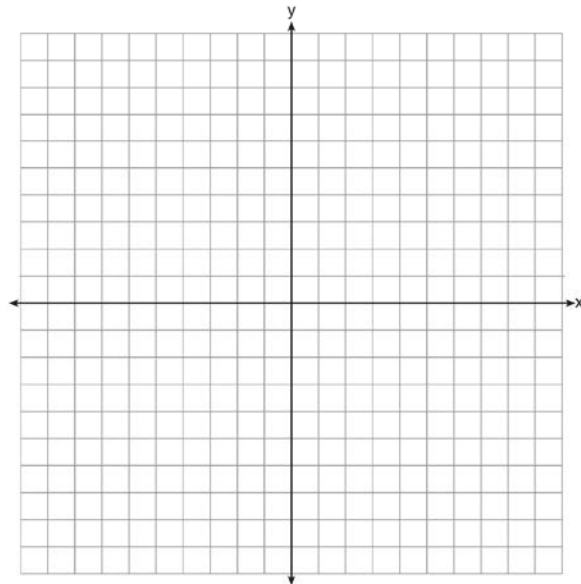
A.CED.1: MODELING QUADRATICS

117 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

118 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 $x^2 + 8^2 = (x + 2)^2$

119 Joe has a rectangular patio that measures 10 feet by 12 feet. He wants to increase the area by 50% and plans to increase each dimension by equal lengths, x. Which equation could be used to determine x?

1 $(10 + x)(12 + x) = 120$

2 $(10 + x)(12 + x) = 180$

3 $(15 + x)(18 + x) = 180$

4 $(15)(18) = 120 + x^2$

120 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*.

121 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.
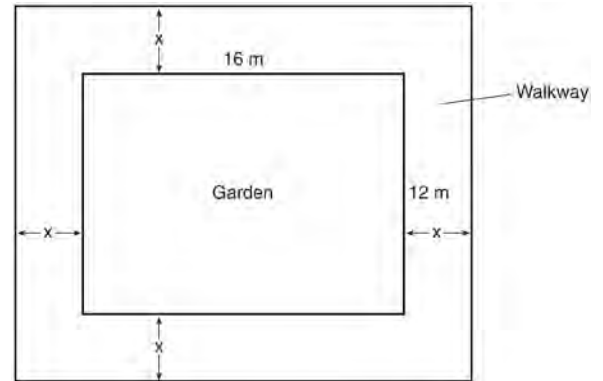
Write an equation that can be used to find x, the width of the walkway. Describe how your equation models the situation. Determine and state the width of the walkway, in meters.

122 A contractor has 48 meters of fencing that he is going to use as the perimeter of a rectangular garden. The length of one side of the garden is represented by x, and the area of the garden is 108 square meters. Determine, algebraically, the dimensions of the garden in meters.

123 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.

124 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.

125 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*.

<u>A.SSE.3, F.IF.8: VERTEX FORM OF A QUADRATIC</u>

126 In the function $f(x) = (x - 2)^2 + 4$, the minimum value occurs when x is
1   –2
2   2
3   –4
4   4

127 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

128 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.

SYSTEMS
<u>A.REI.5-6: SOLVING LINEAR SYSTEMS</u>

129 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   $6x + 6y = 48$
    $6x + 2y = 8$

130 Which pair of equations could *not* be used to solve the following equations for x and y?
$$4x + 2y = 22$$
$$-2x + 2y = -8$$

1 $4x + 2y = 22$
   $2x - 2y = 8$

2 $4x + 2y = 22$
   $-4x + 4y = -16$

3 $12x + 6y = 66$
   $6x - 6y = 24$

4 $8x + 4y = 44$
   $-8x + 8y = -8$

131 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.

132 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.

<u>A.CED.3: MODELING LINEAR SYSTEMS</u>

133 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 $m + f = 3.95$
   $f + 0.005 = m$

134 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

135 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

28

136 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*.

137 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?

A.REI.6: GRAPHING LINEAR SYSTEMS

138 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.

139 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.
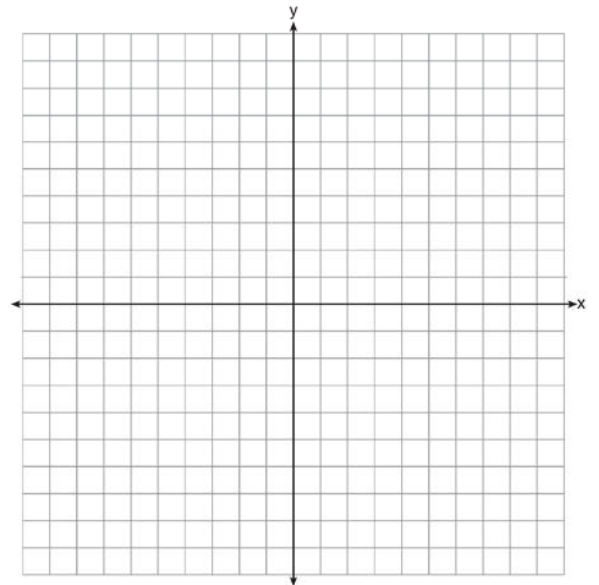
140 A local business was looking to hire a landscaper to work on their property. They narrowed their choices to two companies. Flourish Landscaping Company charges a flat rate of $120 per hour. Green Thumb Landscapers charges $70 per hour plus a $1600 equipment fee. Write a system of equations representing 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.
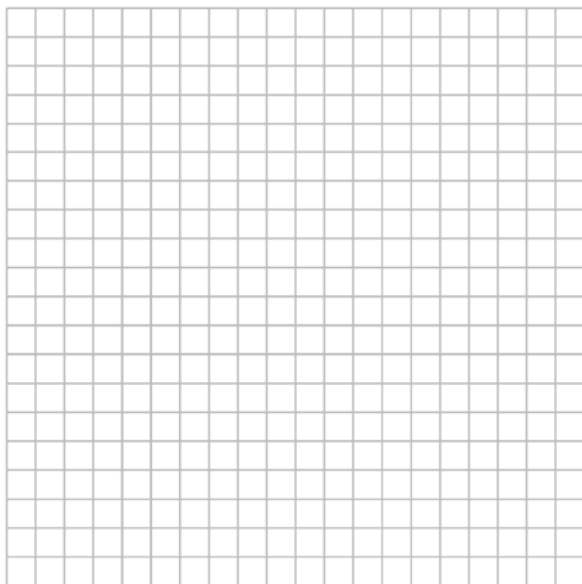
A.CED.3: MODELING SYSTEMS OF LINEAR INEQUALITIES

141 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.

142 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.
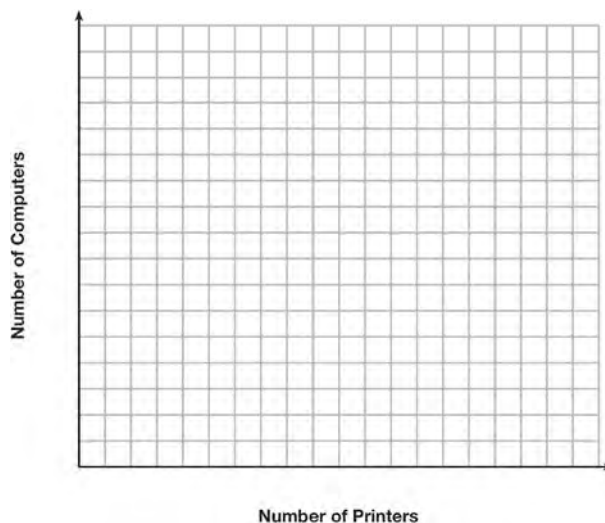
Determine a combination of printers and computers that would allow the electronics store to meet all of the constraints. Explain how you obtained your answer.

143 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.
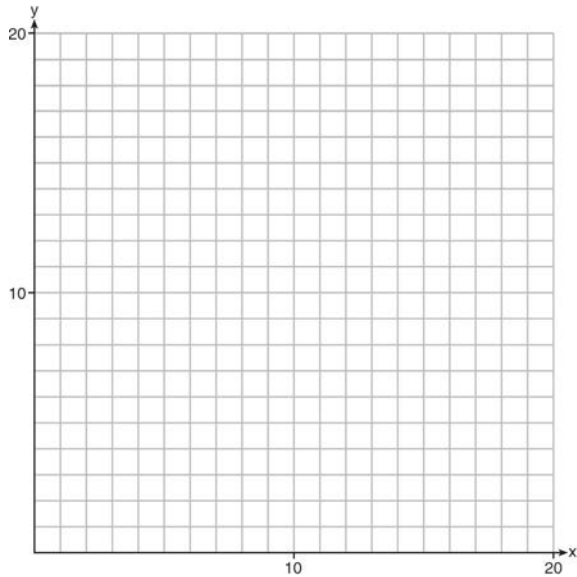
Determine and state one combination of hours that will allow Edith to earn *at least* $80 per week while working *no more than* 15 hours.

A.REI.12: GRAPHING SYSTEMS OF LINEAR INEQUALITIES

144 Which graph represents the solution of $y \leq x + 3$ and $y \geq -2x - 2$?

1

2

3

4
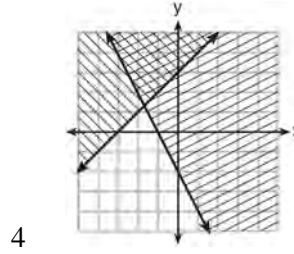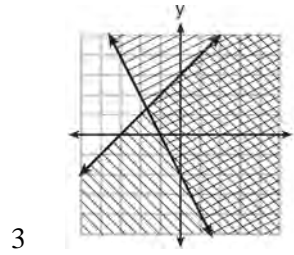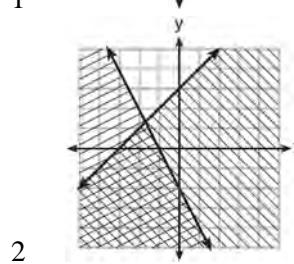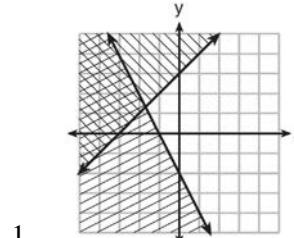
145 Given: $y + x > 2$

$y \le 3x - 2$

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

1

2

3

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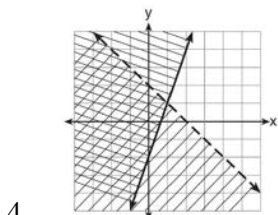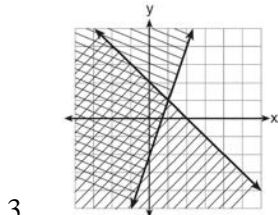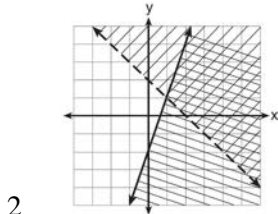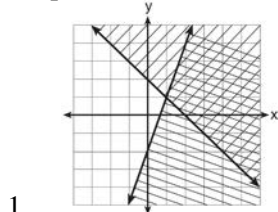
146 The graph of an inequality is shown below.
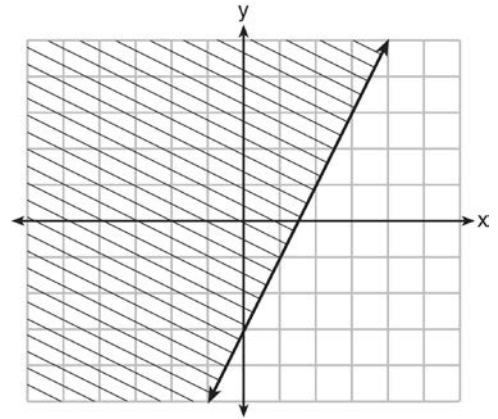
a) Write the inequality represented by the graph.
b) On the same set of axes, graph the inequality $x + 2y < 4$.
c) The two inequalities graphed on the set of axes form a system. Oscar thinks that the point $(2, 1)$ is in the solution set for this system of inequalities. Determine and state whether you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

147 The Reel Good Cinema is conducting a mathematical study. In its theater, there are 200 seats. Adult tickets cost $12.50 and child tickets cost $6.25. The cinema's goal is to sell at least $1500 worth of tickets for the theater. Write a system of linear inequalities that can be used to find the possible combinations of adult tickets, *x*, and child tickets, *y*, that would satisfy the cinema's goal. Graph the solution to this system of inequalities on the set of axes below. Label the solution with an *S*. Marta claims that selling 30 adult tickets and 80 child tickets will result in meeting the cinema's goal. Explain whether she is correct or incorrect, based on the graph drawn.
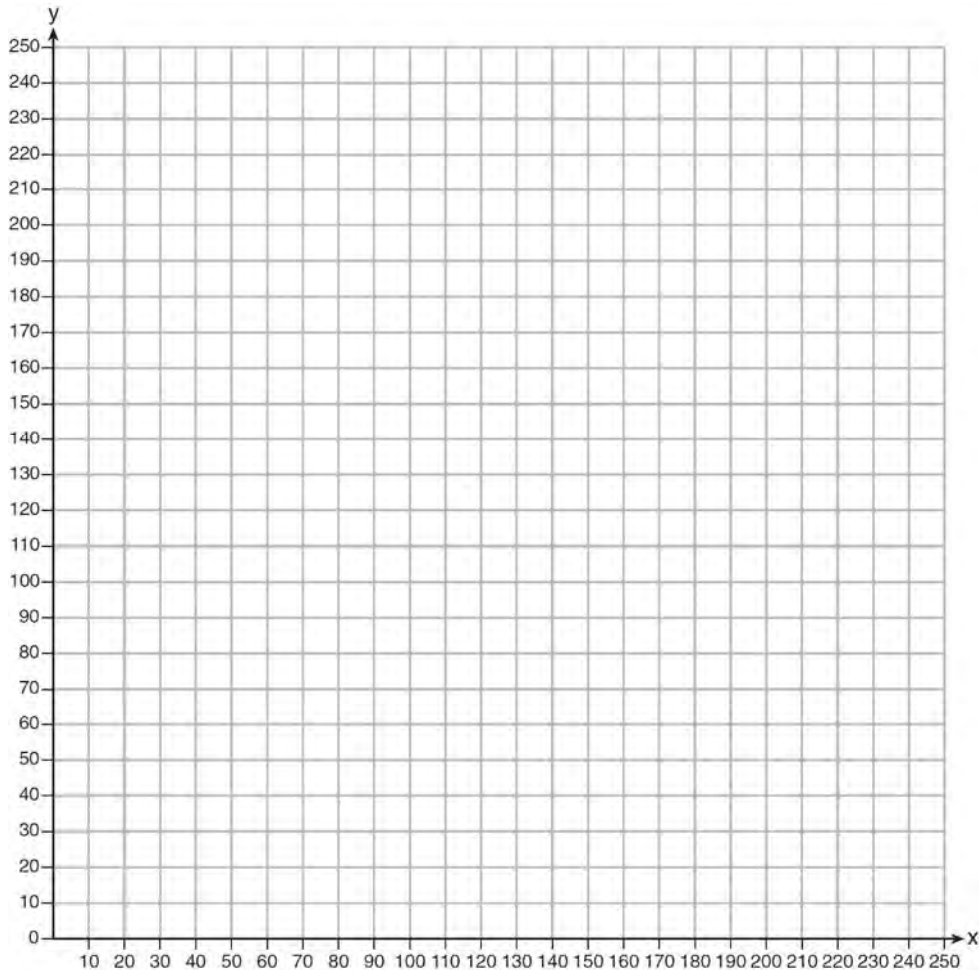
148 Which ordered pair is *not* in the solution set of

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

1   (5,3)
2   (4,3)
3   (3,4)
4   (4,4)
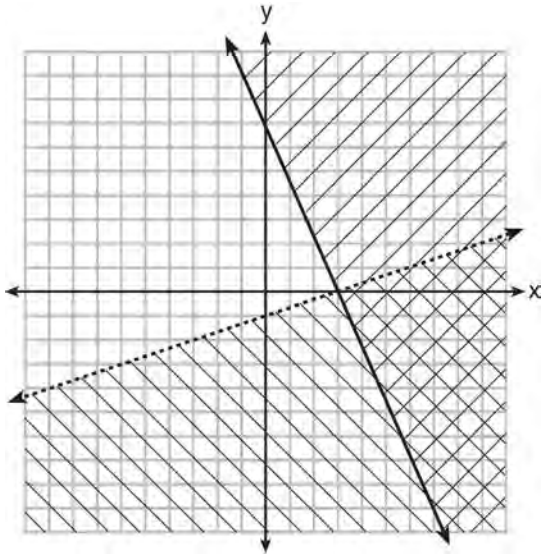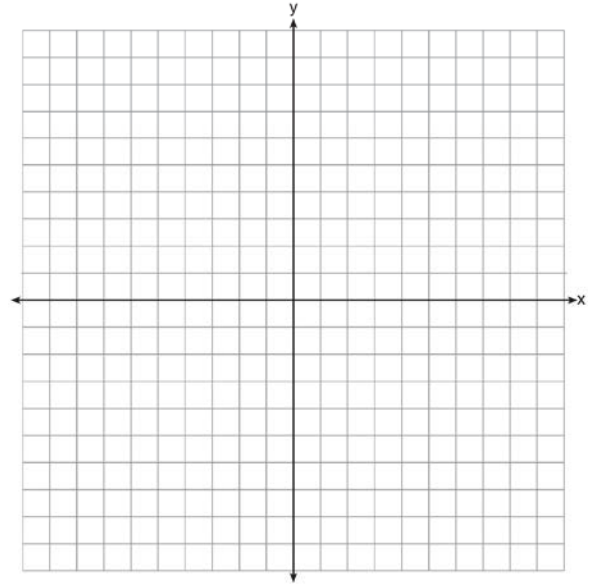
151 A company is considering building a manufacturing plant. They determine the weekly production cost at site A to be $A(x) = 3x^2$ while the production cost at site B is $B(x) = 8x + 3$, where x represents the number of products, *in hundreds*, and $A(x)$ and $B(x)$ are the production costs, *in hundreds of dollars*. Graph the production cost functions on the set of axes below and label them site A and site B.
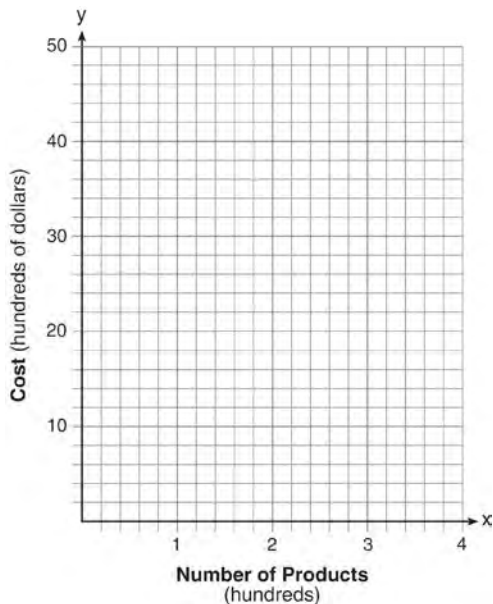
State the positive value(s) of x for which the production costs at the two sites are equal. Explain how you determined your answer. If the company plans on manufacturing 200 products per week, which site should they use? Justify your answer.

152 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

153 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.

A.REI.11: OTHER SYSTEMS

154 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.

155 Given the functions $h(x) = \frac{1}{2}x + 3$ and $j(x) = |x|$, which value of x makes $h(x) = j(x)$?
1   -2
2   2
3   3
4   -6

POLYNOMIALS
A.APR.1: OPERATIONS WITH POLYNOMIALS

156 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   $5x^2 - x + 1$

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

158 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   $3x^2 - 14x + 14$

159 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   $6x^2 - 6x - 11$

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

161 When $(2x - 3)^2$ is subtracted from $5x^2$, the result is
1   $x^2 - 12x - 9$
2   $x^2 - 12x + 9$
3   $x^2 + 12x - 9$
4   $x^2 + 12x + 9$

162 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?

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

A.SSE.2: FACTORING POLYNOMIALS

164 Four expressions are shown below.
    I $2(2x^2 - 2x - 60)$
    II $4(x^2 - x - 30)$
    III $4(x + 6)(x - 5)$
    IV $4x(x - 1) - 120$

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

165 When factored completely, $x^3 - 13x^2 - 30x$ is
1   $x(x + 3)(x - 10)$
2   $x(x - 3)(x - 10)$
3   $x(x + 2)(x - 15)$
4   $x(x - 2)(x + 15)$

166 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   $(x^2 + 6)(x^2 - 6)$

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

168 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    $(x^4 + y)(x - 9y)$

169 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    $(p + 3)(p - 3)(p + 3)(p - 3)$

A.APR.3: ZEROS OF POLYNOMIALS

170 The graphs below represent functions defined by polynomials. For which function are the zeros of the polynomials 2 and −3?
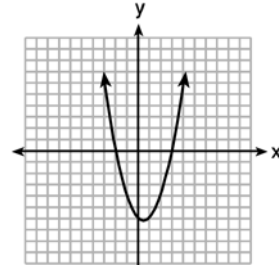
1
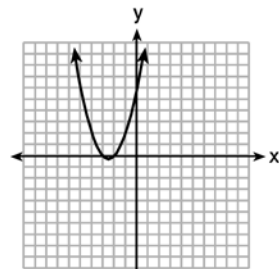
2
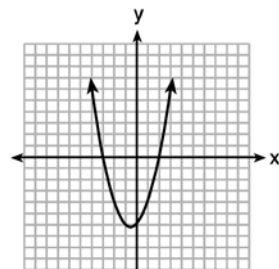
3
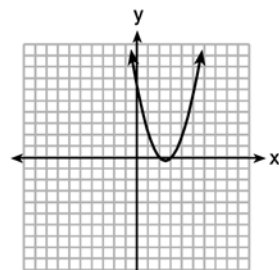
4

171 A polynomial function contains the factors x, $x - 2$, and $x + 5$. Which graph(s) below could represent the graph of this function?
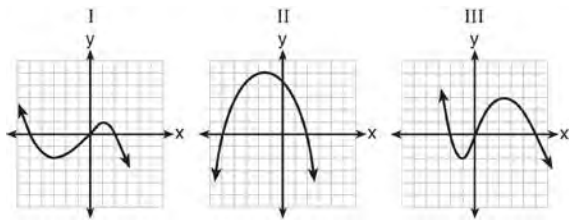
1   I, only
2   II, only
3   I and III
4   I, II, and III

172 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

173 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

174 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   $y = x^2 - 10x + 24$

175 The graph of $f(x)$ is shown below.
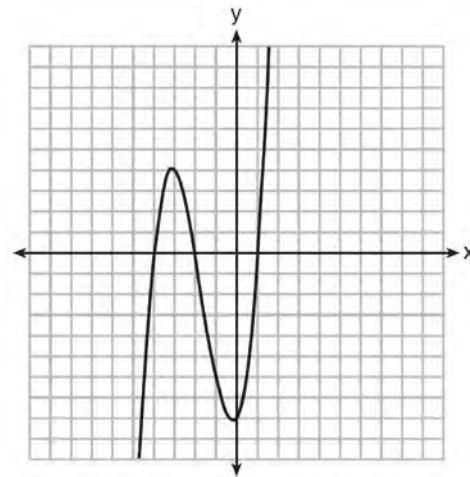
Which function could represent the graph of $f(x)$?
1   $f(x) = (x + 2)(x^2 + 3x - 4)$
2   $f(x) = (x - 2)(x^2 + 3x - 4)$
3   $f(x) = (x + 2)(x^2 + 3x + 4)$
4   $f(x) = (x - 2)(x^2 + 3x + 4)$

176 Which equation(s) represent the graph below?

I $y = (x + 2)(x^2 - 4x - 12)$

II $y = (x - 3)(x^2 + x - 2)$

III $y = (x - 1)(x^2 - 5x - 6)$
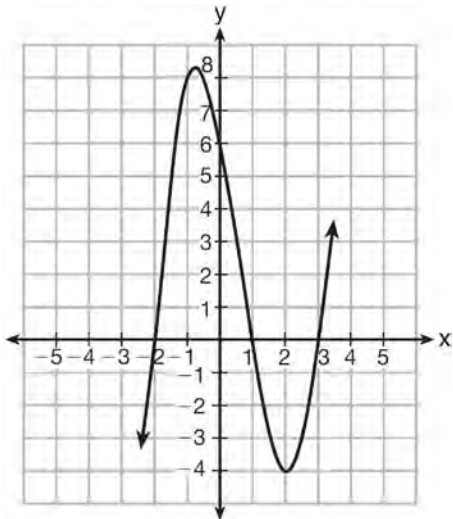
1   I, only
2   II, only
3   I and II
4   II and III

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

177 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.

178 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%

179 The equation $A = 1300(1.02)^7$ is being used to calculate the amount of money in a savings account. What does 1.02 represent in this equation?
1   0.02% decay
2   0.02% growth
3   2% decay
4   2% growth

180 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.

181 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   $3000(1 - 0.02)^{18}$

182 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

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

184 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.

185 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: EXPONENTIAL EQUATIONS

186 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

187 Jacob and Jessica are studying the spread of dandelions. Jacob discovers that the growth over t weeks can be defined by the function $f(t) = (8) \cdot 2^t$. Jessica finds that the growth function over t weeks is $g(t) = 2^{t+3}$. Calculate the number of dandelions that Jacob and Jessica will each have after 5 weeks. Based on the growth from both functions, explain the relationship between $f(t)$ and $g(t)$.

RADICALS
F.IF.7: GRAPHING ROOT FUNCTIONS

188 Draw the graph of $y = \sqrt{x} - 1$ on the set of axes below.
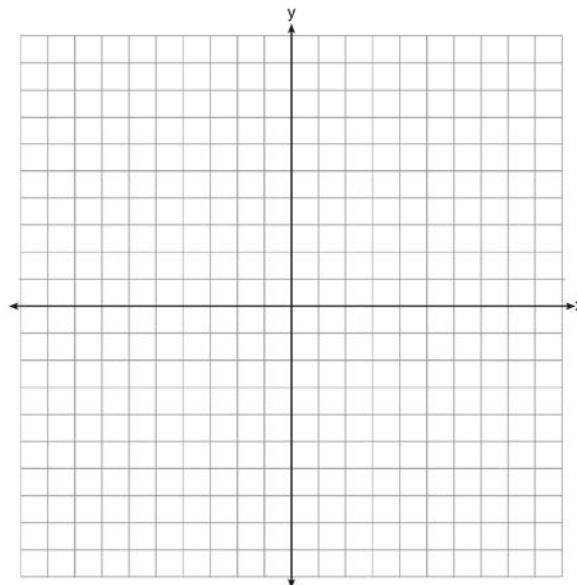
189 On the set of axes below, graph the function represented by $y = \sqrt[3]{x-2}$ for the domain $-6 \le x \le 10$.
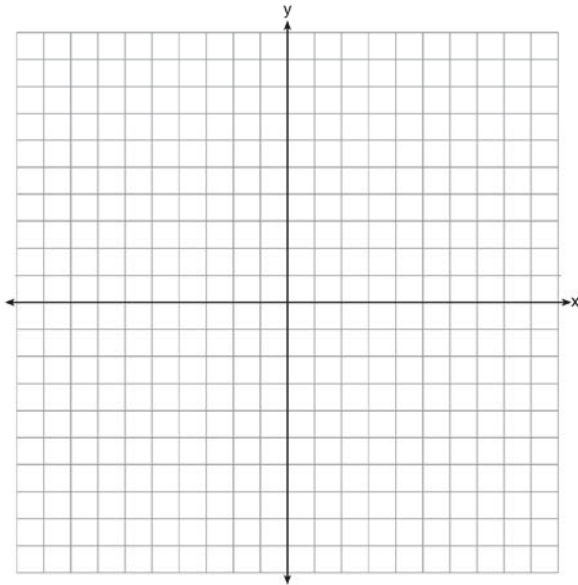
FUNCTIONS
F.IF.2: FUNCTIONAL NOTATION, EVALUATING FUNCTIONS

190 The graph of $y = f(x)$ is shown below.
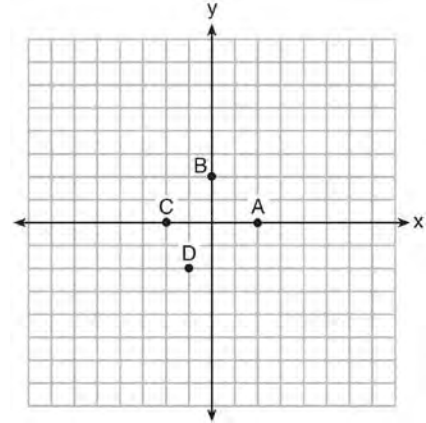
Which point could be used to find $f(2)$?
1 A
2 B
3 C
4 D

191 If $f(x) = \dfrac{\sqrt{2x+3}}{6x-5}$, then $f\left(\dfrac{1}{2}\right) =$
1 1
2 −2
3 −1
4 $-\dfrac{13}{3}$

192 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

193 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.

194 For a recently released movie, the function $y = 119.67(0.61)^x$ models the revenue earned, y, in millions of dollars each week, x, for several weeks after its release. Based on the equation, how much more money, in millions of dollars, was earned in revenue for week 3 than for week 5?
1   37.27
2   27.16
3   17.06
4   10.11

F.IF.2, 5: DOMAIN AND RANGE

195 The graph of the function $f(x) = \sqrt{x+4}$ is shown below.
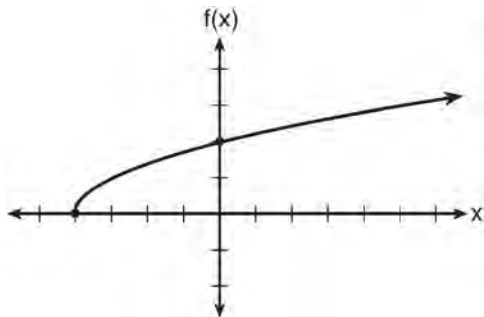
The domain of the function is
1    $\{x \mid x > 0\}$
2    $\{x \mid x \ge 0\}$
3    $\{x \mid x > -4\}$
4    $\{x \mid x \ge -4\}$

196 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    $-\infty < y < \infty$

197 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 $f(x) > 0$.

198 The range of the function defined as $y = 5^x$ is
1    $y < 0$
2    $y > 0$
3    $y \le 0$
4    $y \ge 0$

199 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

200 A construction company uses the function $f(p)$, where p is the number of people working on a project, to model the amount of money it spends to complete a project. A reasonable domain for this function would be
1   positive integers
2   positive real numbers
3   both positive and negative integers
4   both positive and negative real numbers

201 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 $\{0,1,2,3,\ldots\}$

202 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

A.REI.10: IDENTIFYING SOLUTIONS

203 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 $(2,9)$

204 Which point is *not* on the graph represented by $y = x^2 + 3x - 6$?
 1 $(-6,12)$
 2 $(-4,-2)$
 3 $(2,4)$
 4 $(3,-6)$

205 On the set of axes below, draw the graph of the equation $y = -\frac{3}{4}x + 3$.
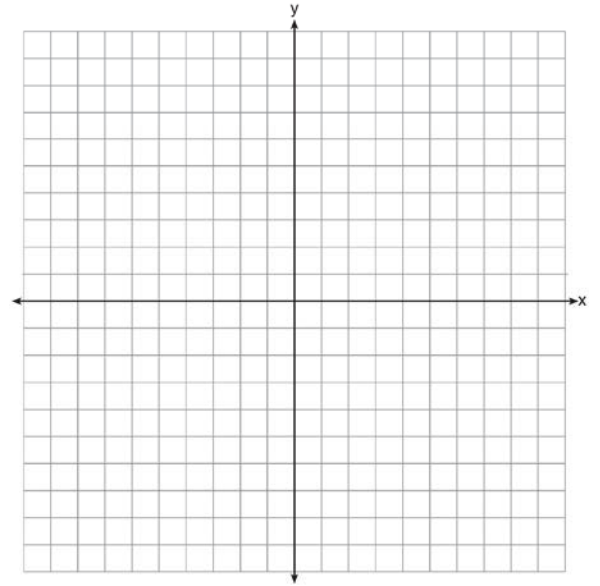
Is the point $(3,2)$ a solution to the equation? Explain your answer based on the graph drawn.

43

F.LE.1-3: FAMILIES OF FUNCTIONS

206 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

207 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

208 Grisham is considering the three situations below.
I. For the first 28 days, a sunflower grows at a rate of 3.5 cm per day.
II. The value of a car depreciates at a rate of 15% per year after it is purchased.
III. The amount of bacteria in a culture triples every two days during an experiment.
Which of the statements describes a situation with an equal difference over an equal interval?
1 I, only
2 II, only
3 I and III
4 II and III

209 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

210 The function, $t(x)$, is shown in the table below.

x	t(x)
−3	10
−1	7.5
1	5
3	2.5
5	0

Determine whether $t(x)$ is linear or exponential. Explain your answer.

211 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.

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

1

2

3

4
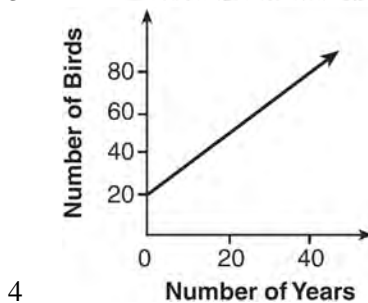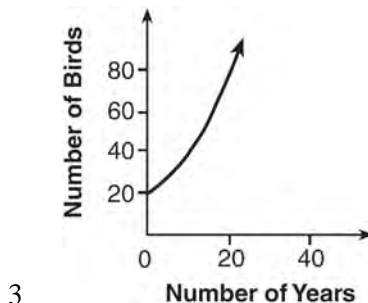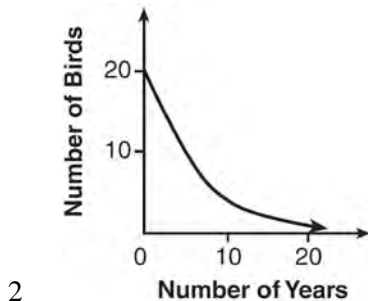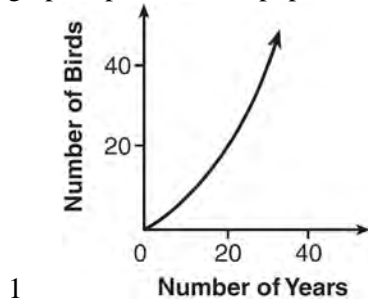
213 The table below represents the function F.

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 $F(x) = 2x + 3$

214 Which function is shown in the table below?

x	f(x)
−2	$\frac{1}{9}$
−1	$\frac{1}{3}$
0	1
1	3
2	9
3	27

1 $f(x) = 3x$

2 $f(x) = x + 3$

3 $f(x) = -x^3$

4 $f(x) = 3^x$

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

216 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

217 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

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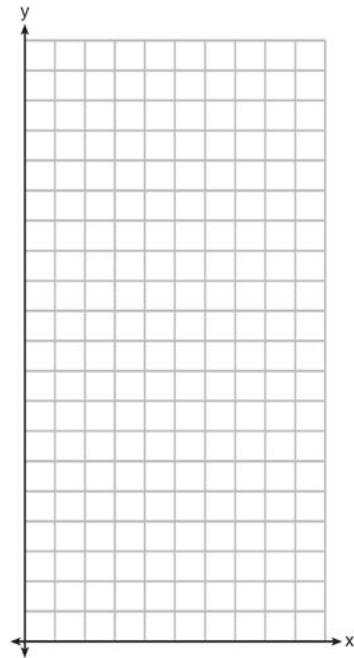
State which function, $f(x)$ or $g(x)$, has a greater value when $x = 20$. Justify your reasoning.

F.BF.3: TRANSFORMATIONS WITH FUNCTIONS

219 The graph of $y = f(x)$ is shown below.
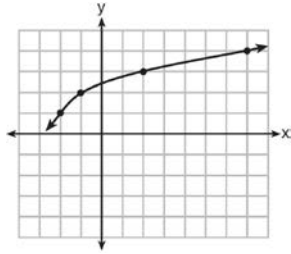
What is the graph of $y = f(x+1) - 2$?

1

2

3

4
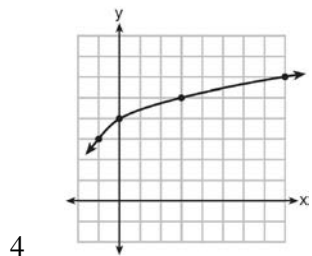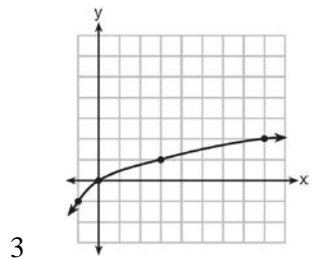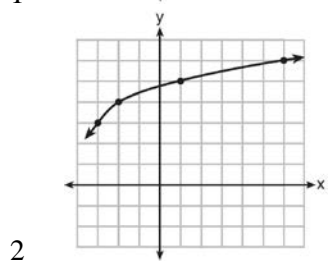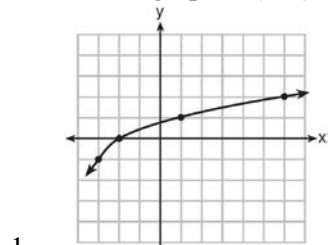
F.IF.9: COMPARING FUNCTIONS

220 Which quadratic function has the largest maximum?

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

2

x	f(x)
−1	−3
0	5
1	9
2	9
3	5
4	−3

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

4
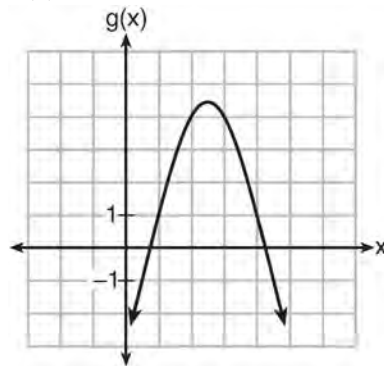
221 The graph representing a function is shown below.
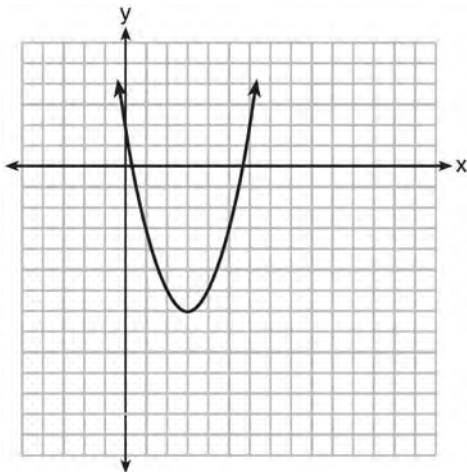
Which function has a minimum that is *less* than the one shown in the graph?

1 $y = x^2 - 6x + 7$
2 $y = |x + 3| - 6$
3 $y = x^2 - 2x - 10$
4 $y = |x - 8| + 2$

222 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 $-1 \leq x \leq 1$, 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 $g(x) = 0$.

223 Let f be the function represented by the graph below.
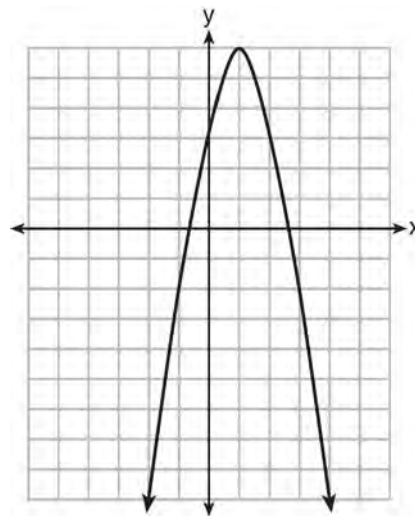
Let g be a function such that $g(x) = -\frac{1}{2}x^2 + 4x + 3$.

Determine which function has the larger maximum value. Justify your answer.

F.IF.1: DEFINING FUNCTIONS

224 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

225 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.

226 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.

227 Which representations are functions?

I
x	y
2	6
3	−12
4	7
5	5
2	−6

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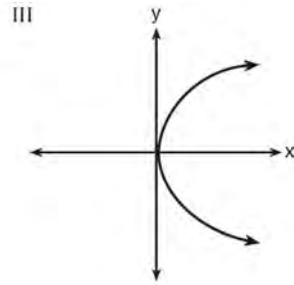
II $\{(1,1),(2,1),(3,2),(4,3),(5,5),(6,8),(7,13)\}$ IV $y = 2x + 1$

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

228 Marcel claims that the graph below represents a function.
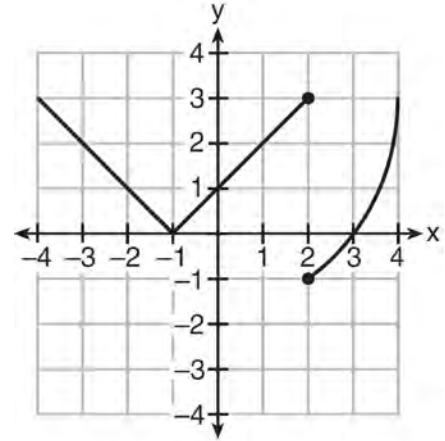
State whether Marcel is correct. Justify your answer.

F.IF.4: RELATING GRAPHS TO EVENTS

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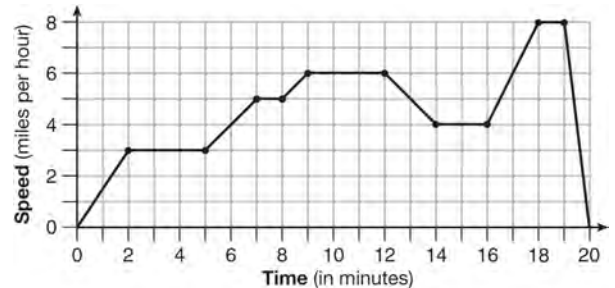
Which statement best describes what the jogger was doing during the $9 − 12$ minute interval of her jog?
1   She was standing still.
2   She was increasing her speed.
3   She was decreasing her speed.
4   She was jogging at a constant rate.

230 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.
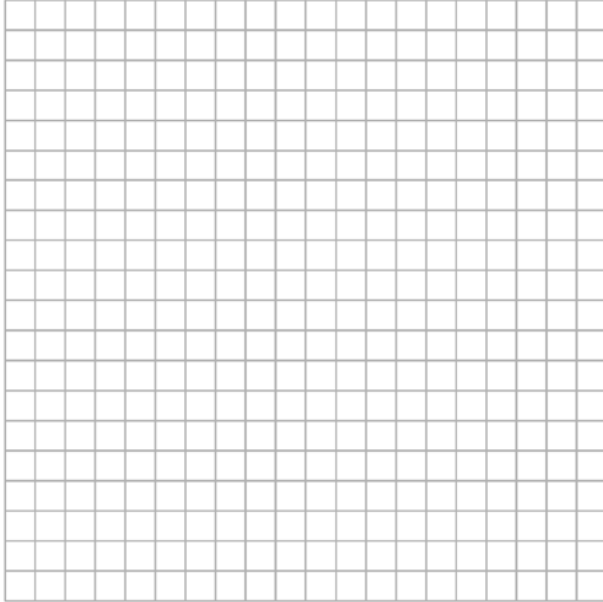
b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

231 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.
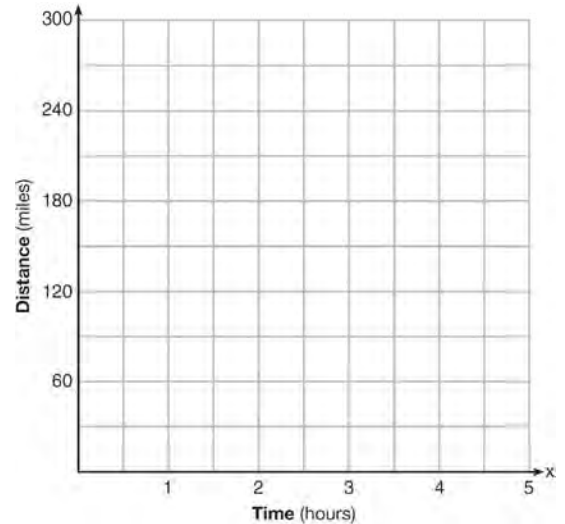
F.IF.7: GRAPHING PIECEWISE-DEFINED
FUNCTIONS

232 Which graph represents $f(x) = \begin{cases} |x| & x < 1 \\ \sqrt{x} & x \geq 1 \end{cases}$?

1

2

3

4
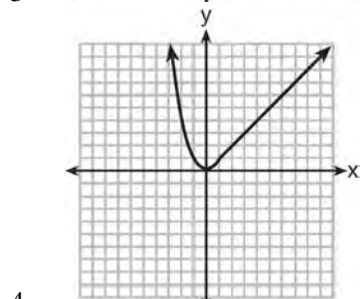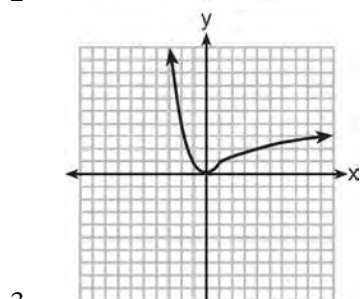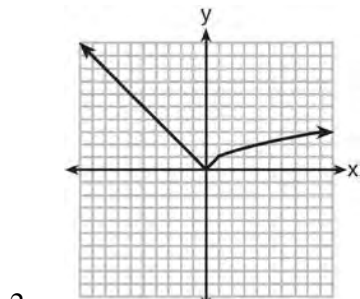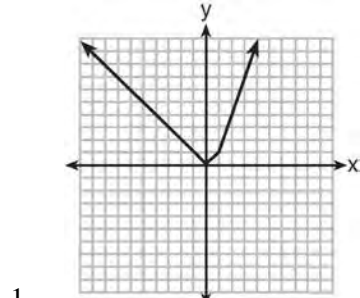
233 A function is graphed on the set of axes below.
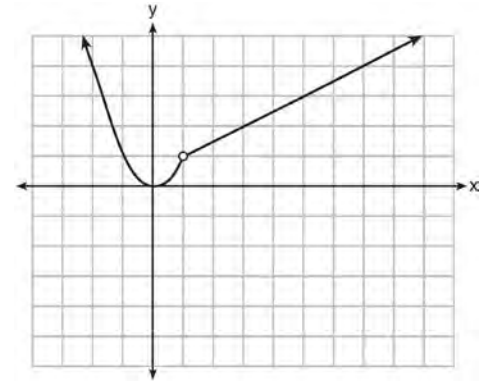
Which function is related to the graph?

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

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

$$f(x) = \begin{cases} |x|, & -3 \leq x < 1 \\ 4, & 1 \leq x \leq 8 \end{cases}$$

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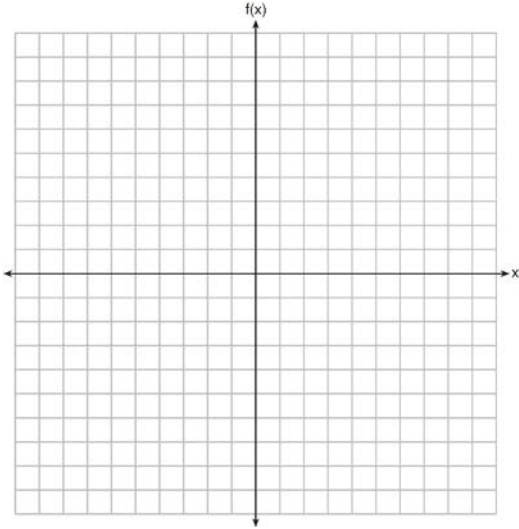
235 At an office supply store, if a customer purchases fewer than 10 pencils, the cost of each pencil is $1.75. If a customer purchases 10 or more pencils, the cost of each pencil is $1.25. Let c be a function for which $c(x)$ is the cost of purchasing x pencils, where x is a whole number.

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

Create a graph of c on the axes below.

y

Cost in Dollars
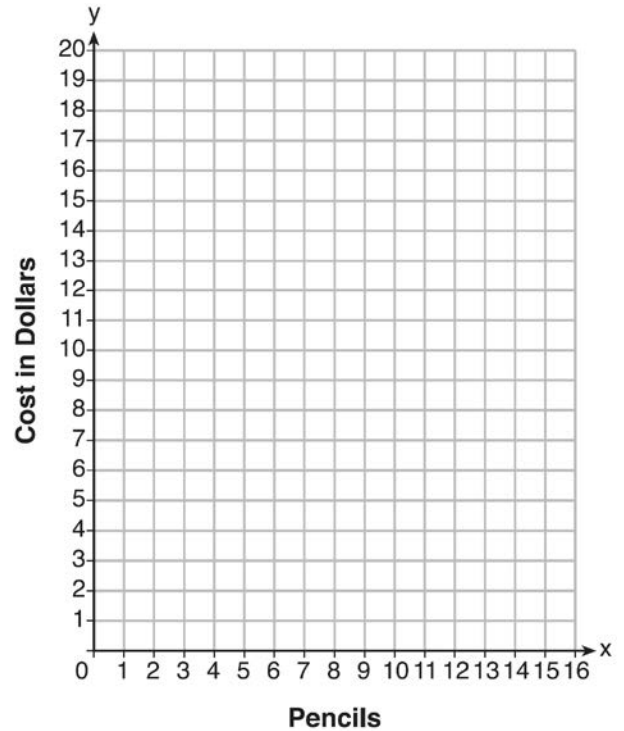
Pencils

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.

53

F.IF.7: GRAPHING STEP FUNCTIONS

236 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
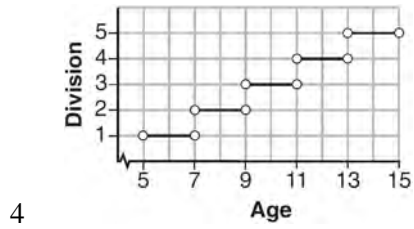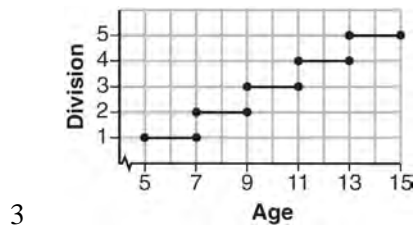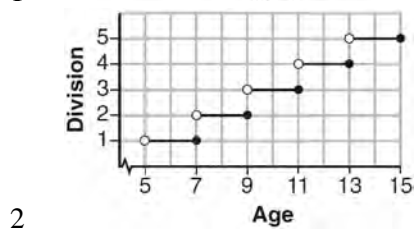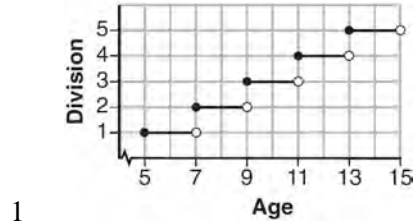
237 The table below lists the total cost for parking for a period of time on a street in Albany, N.Y. The total cost is for any length of time up to and including the hours parked. For example, parking for up to and including 1 hour would cost $1.25; parking for 3.5 hours would cost $5.75.

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.
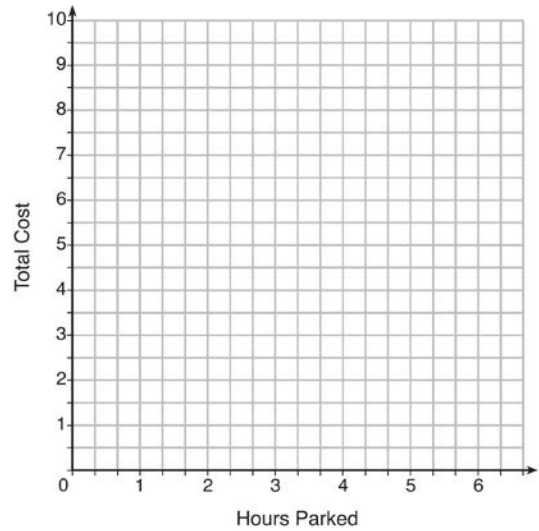
Explain how the cost per hour to park changes over the six-hour period.

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

238 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

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

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

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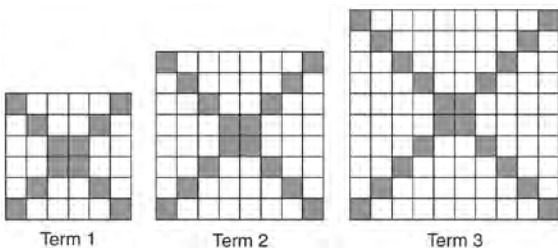
Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the nth term?
1   $a_n = 4n + 12$
2   $a_n = 4n + 8$
3   $a_n = 4n + 4$
4   $a_n = 4n + 2$

241 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   $f(1) = 4$
    $f(x) = 10f(x - 1)$

242 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   $a_n = 16n - 38$

243 Which recursively defined function represents the sequence $3, 7, 15, 31, \ldots$?
1   $f(1) = 3, \ f(n + 1) = 2^{f(n)} + 3$
2   $f(1) = 3, \ f(n + 1) = 2^{f(n)} - 1$
3   $f(1) = 3, \ f(n + 1) = 2f(n) + 1$
4   $f(1) = 3, \ f(n + 1) = 3f(n) - 2$

244 A pattern of blocks is shown below.

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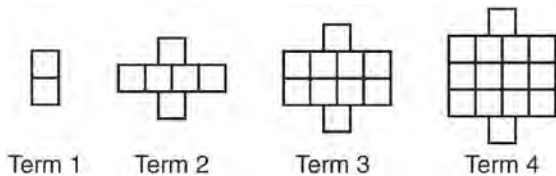
If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the nth term?

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

245 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

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

1 ANS: 3

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

PTS: 2   REF: 061413ai   NAT: N.RN.3   TOP: Classifying Numbers

2 ANS: 2

$\frac{1}{\sqrt{4}} + \frac{1}{\sqrt{9}} = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

PTS: 2   REF: 081522ai   NAT: N.RN.3   TOP: Classifying Numbers

3 ANS: 1   PTS: 2   REF: 011604ai   NAT: N.RN.3
TOP: Classifying Numbers

4 ANS: 1   PTS: 2   REF: 081401ai   NAT: N.RN.3
TOP: Classifying Numbers

5 ANS: 2   PTS: 2   REF: 061508ai   NAT: N.RN.3
TOP: Classifying Numbers

6 ANS:
Correct. The sum of a rational and irrational is irrational.

PTS: 2   REF: 011525ai   NAT: N.RN.3   TOP: Classifying Numbers

7 ANS: 1   PTS: 2   REF: 061401ai   NAT: A.REI.1
TOP: Identifying Properties

8 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

9 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

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

11 ANS: 1

$A: \overline{x} = 6; \sigma_x = 3.16$ $B: \overline{x} = 6.875; \sigma_x = 3.06$

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

12 ANS: 3
Median remains at 1.4.

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

13 ANS:

$$\frac{m}{351} = \frac{70}{70+35}$$

$$105m = 24570$$

$$m = 234$$

PTS: 2   REF: 011630ai   NAT: S.ID.5   TOP: Frequency Tables

14 ANS:

$$\frac{33+12}{180} = 25\%$$

PTS: 2   REF: 011526ai   NAT: S.ID.5   TOP: Frequency Tables

15 ANS:
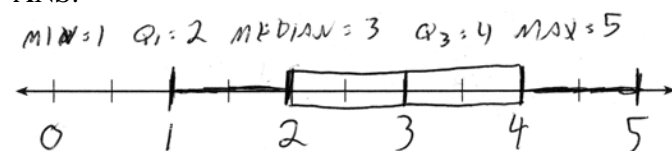
PTS: 2   REF: 061432ai   NAT: S.ID.1   TOP: Box Plots
KEY: represent

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

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

18 ANS:
$y = 0.05x - 0.92$

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

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:
$f(t) = -58t + 6182$ $r = -.94$ This indicates a strong linear relationship because r is close to -1.

PTS: 4   REF: 011635ai   NAT: S.ID.6   TOP: Regression
KEY: linear

21 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

22 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

23 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
KEY: choose model

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

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

26 ANS: 3

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: 011624ai   NAT: S.ID.6   TOP: Correlation Coefficient and Residuals

27 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

28 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

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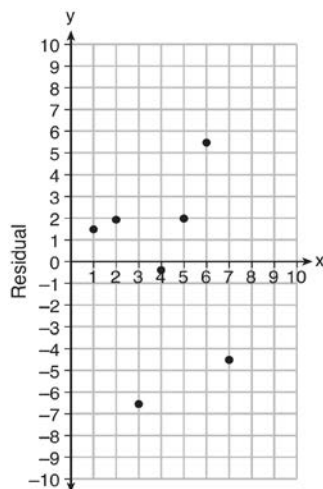
$y = 6.32x + 22.43$ Based on the residual plot, the equation is a good fit for the data because the residual values are scattered without a pattern and are fairly evenly distributed above and below the *x*-axis.

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

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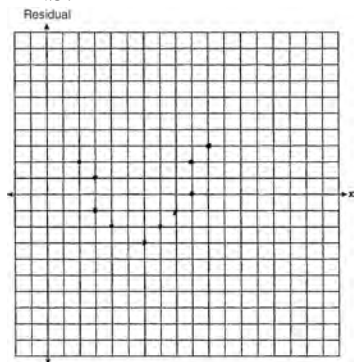
The line is a poor fit because the residuals form a pattern.

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

31 ANS: 1

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

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

32 ANS: 1

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

$$70 > 60$$

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

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

34 ANS: 4

(1) $\dfrac{6-1}{1971-1898} = \dfrac{5}{73} \approx .07$ (2) $\dfrac{14-6}{1985-1971} = \dfrac{8}{14} \approx .57$ (3) $\dfrac{24-14}{2006-1985} = \dfrac{10}{21} \approx .48$ (4) $\dfrac{35-24}{2012-2006} = \dfrac{11}{6} \approx 1.83$

PTS: 2   REF: 011613ai   NAT: F.IF.6   TOP: Rate of Change

35 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

36 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

37 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

38 ANS:
During 1960-1965 the graph has the steepest slope.

PTS: 2   REF: 011628ai   NAT: F.IF.6   TOP: Rate of Change

39 ANS: 2   PTS: 2   REF: 011502ai   NAT: N.Q.1
TOP: Conversions   KEY: dimensional analysis

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

41 ANS: 1

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

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

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

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

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

42 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

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

44 ANS:
$$15x + 36 = 10x + 48$$

$$5x = 12$$

$$x = 2.4$$

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

45 ANS: 4   PTS: 2   REF: 061422ai   NAT: A.CED.3
TOP: Modeling Linear Equations

46 ANS: 4   PTS: 2   REF: 081508ai   NAT: A.CED.3
TOP: Modeling Linear Equations

47 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

48 ANS: 4   PTS: 2   REF: 011523ai   NAT: F.BF.1
TOP: Modeling Linear Functions

49 ANS:
$$f(x) = 6.50x + 4(12)$$

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

50 ANS:
$$T(d) = 2d + 28 \quad T(6) = 2(6) + 28 = 40$$

PTS: 2   REF: 081532ai   NAT: F.BF.1   TOP: Modeling Linear Functions

51 ANS:
$$h(n) = 1.5(n - 1) + 3$$

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

52 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

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

54 ANS: 2   PTS: 2   REF: 011501ai   NAT: F.LE.5
TOP: Modeling Linear Functions

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

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

57 ANS:

The slope represents the amount paid each month and the *y*-intercept represents the initial cost of membership.

PTS: 2   REF: 011629ai   NAT: F.LE.5   TOP: Modeling Linear Functions

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

59 ANS: 2   PTS: 2   REF: 011602ai   NAT: A.CED.2
TOP: Graphing Linear Functions

60 ANS:
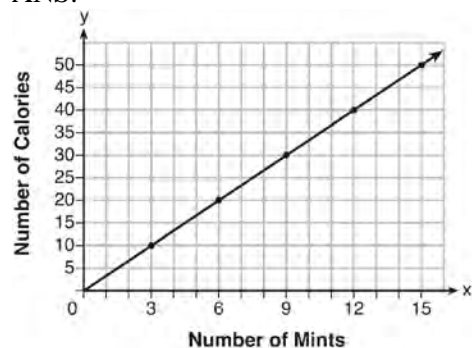
$C(x) = \dfrac{10}{3}x$ $180 = \dfrac{10}{3}x$

$$540 = 10x$$

$$54 = x$$

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

61 ANS: 2   PTS: 2   REF: 081501ai   NAT: F.BF.3
TOP: Graphing Linear Functions

62 ANS: 1
$4x - 5(0) = 40$

$4x = 40$

$x = 10$

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

63 ANS: 4
$y + 3 = 6(0)$

$y = -3$

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

64 ANS: 3　　　　　PTS: 2　　　　　REF: 011606ai　　　NAT: A.CED.4
TOP: Transforming Formulas

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

66 ANS: 1

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

$3V = \pi r^2 h$

$\dfrac{3V}{\pi h} = r^2$

$\sqrt{\dfrac{3V}{\pi h}} = r$

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

67 ANS: 2

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

$2d = at^2$

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

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

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

68 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

69 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

70 ANS: 1

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

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

$$9 < x$$

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

71 ANS:

$$b(x - 3) \geq ax + 7b$$

$$bx - 3b \geq ax + 7b$$

$$bx - ax \geq 10b$$

$$x(b - a) \geq 10b$$

$$x \leq \frac{10b}{b - a}$$

PTS: 2　　　　REF: 011631ai　　NAT: A.REI.3　　TOP: Solving Linear Inequalities

72 ANS:

$$-3x + 7 - 5x < 15 \quad \text{0 is the smallest integer.}$$

$$-8x < 8$$

$$x > -1$$

PTS: 2　　　　REF: 061530ai　　NAT: A.REI.3　　TOP: Interpreting Solutions

9

73 ANS:
6. $3x + 9 \le 5x - 3$

$$12 \le 2x$$

$$6 \le x$$

PTS: 2   REF: 081430ai   NAT: A.REI.3   TOP: Interpreting Solutions

74 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: Interpreting Solutions

75 ANS:
$2(-1) + a(-1) - 7 > -12$ $a = 2$

$$-a - 9 > -12$$

$$-a > -3$$

$$a < 3$$

PTS: 2   REF: 061427ai   NAT: A.REI.3   TOP: Interpreting Solutions

76 ANS: 4

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

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

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

$$1500 > p$$

PTS: 2   REF: 061524ai   NAT: A.CED.1   TOP: Modeling Linear Inequalities

77 ANS: 4   PTS: 2   REF: 081505ai   NAT: A.CED.1
TOP: Modeling Linear Inequalities

78 ANS: 3   PTS: 2   REF: 011513ai   NAT: A.CED.1
TOP: Modeling Linear Inequalities

79 ANS:

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

$8x + 165 \geq 200$

$8x \geq 35$

$x \geq 4.375$

5 hours

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

80 ANS: 1   PTS: 2   REF: 061505ai   NAT: A.REI.12

    TOP: Graphing Linear Inequalities

81 ANS: 2   PTS: 2   REF: 011605ai   NAT: A.REI.12

    TOP: Graphing Linear Inequalities

82 ANS:
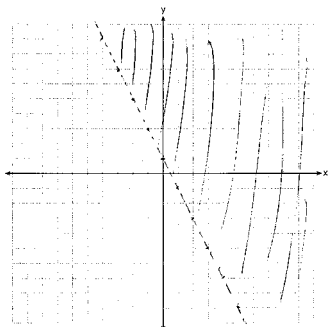
    PTS: 2   REF: 081526ai   NAT: A.REI.12   TOP: Graphing Linear Inequalities

83 ANS:
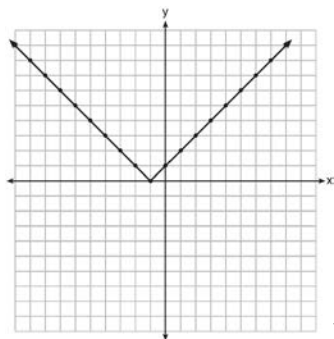
Range: $y \geq 0$. The function is increasing for $x > -1$.

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

84   ANS:
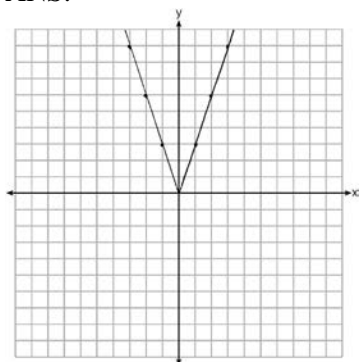
2 down. 4 right.

PTS: 4   REF: 081433ai   NAT: F.BF.3   TOP: Graphing Absolute Value Functions

85   ANS:
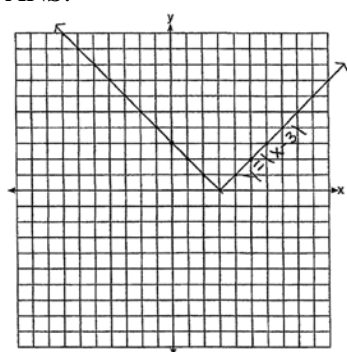
The graph has shifted three units to the right.

PTS: 2   REF: 061525ai   NAT: F.BF.3   TOP: Graphing Absolute Value Functions

86   ANS: 3   PTS: 2   REF: 061412ai   NAT: A.SSE.3
     TOP: Solving Quadratics   KEY: zeros of polynomials

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

88   ANS: 1

$$2x^2 - 4x - 6 = 0$$

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

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

$$x = 3, -1$$

PTS: 2   REF: 011609ai   NAT: A.SSE.3   TOP: Solving Quadratics
KEY: zeros of polynomials

89 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
KEY: zeros of polynomials

90 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
KEY: factoring

91 ANS:

$$x^2 + 10x + 24 = (x + 4)(x + 6) = (x + 6)(x + 4). \quad \text{6 and 4}$$

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

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

93 ANS: 1   PTS: 2   REF: 061521ai   NAT: A.REI.4
TOP: Solving Quadratics   KEY: taking square roots

94 ANS: 3   PTS: 2   REF: 081523ai   NAT: A.REI.4
TOP: Solving Quadratics   KEY: taking square roots

95 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

96 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

97 ANS:

$$y^2 - 6y + 9 = 4y - 12$$

$$y^2 - 10y + 21 = 0$$

$$(y - 7)(y - 3) = 0$$

$$y = 7, 3$$

PTS: 2   REF: 011627ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: factoring

98 ANS:

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

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

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

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

99 ANS: 2

$$x^2 - 8x = 7$$

$$x^2 - 8x + 16 = 7 + 16$$

$$(x - 4)^2 = 23$$

PTS: 2   REF: 011614ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: completing the square

100 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

101 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

102 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

103 ANS: 4

$$y - 34 = x^2 - 12x$$

$$y = x^2 - 12x + 34$$

$$y = x^2 - 12x + 36 - 2$$

$$y = (x - 6)^2 - 2$$

PTS: 2　　　　　REF: 011607ai　　　NAT: A.REI.4　　　TOP: Solving Quadratics
KEY: completing the square

104 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

105 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

106 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

107 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: quadratic formula

108 ANS:
Two of the following: quadratic formula, complete the square, factor by grouping or graphically.

$$x = \frac{-16 \pm \sqrt{16^2 - 4(4)(9)}}{2(4)} = \frac{-16 \pm \sqrt{112}}{8} \approx -0.7, -3.3$$

PTS: 4   REF: 011634ai   NAT: A.REI.4   TOP: Solving Quadratics
KEY: quadratic formula

109 ANS:
$$b^2 - 4ac = (-2)^2 - 4(1)(5) = 4 - 20 = -16 \text{ None}$$

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

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

111 ANS:
$$-16t^2 + 64t = 0 \quad 0 \le t \le 4 \text{ The rocket launches at } t = 0 \text{ and lands at } t = 4$$

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

$$t = 0, 4$$

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

112 ANS:
$$t = \frac{-b}{2a} = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2 \text{ seconds. The height decreases after reaching its maximum at } t = 2 \text{ until it lands at}$$

$$t = 5 \; -16t^2 + 64t + 80 = 0$$

$$t^2 - 4t - 5 = 0$$

$$(t - 5)(t + 1) = 0$$

$$t = 5$$

PTS: 4   REF: 011633ai   NAT: F.IF.4   TOP: Graphing Quadratic Functions

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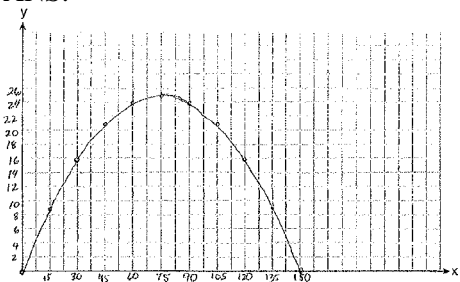
$$x = \frac{-\frac{2}{3}}{2\left(-\frac{1}{225}\right)} = -\frac{2}{3} \cdot -\frac{225}{2} = 75 \quad y = -\frac{1}{225}(75)^2 + \frac{2}{3}(75) = -25 + 50 = 25$$

(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

114 ANS: 1   PTS: 2   REF: 081417ai   NAT: F.BF.3
     TOP: Graphing Quadratic Functions

115 ANS: 2   PTS: 2   REF: 011512ai   NAT: F.BF.3
     TOP: Graphing Quadratic Functions

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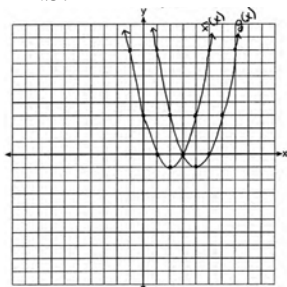
 $(4, -1)$. $f(x - 2)$ is a horizontal shift two units to the right.

     PTS: 2   REF: 061428ai   NAT: F.BF.3   TOP: Graphing Quadratic Functions

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

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

119 ANS: 2   PTS: 2   REF: 011611ai   NAT: A.CED.1
     TOP: Geometric Applications of Quadratics

120 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

121 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

122 ANS:

$$108 = x(24 - x) \quad 18 \times 6$$

$$108 = 24x - x^2$$

$$x^2 - 24x + 108 = 0$$

$$(x - 18)(x - 6) = 0$$

$$x = 18, 6$$

PTS: 4   REF: 011636ai   NAT: A.CED.1   TOP: Geometric Applications of Quadratics

123 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

124 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

125 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

126 ANS: 2   PTS: 2   REF: 011601ai   NAT: A.SSE.3
    TOP: Vertex Form of a Quadratic

127 ANS: 1

$x^2 - 12x + 7$

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

$(x - 6)^2 - 29$

PTS: 2   REF: 081520ai   NAT: A.SSE.3   TOP: Vertex Form of a Quadratic

128 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: Vertex Form of a Quadratic

129 ANS: 2

$2(3x - y = 4)$

$6x - 2y = 8$

PTS: 2   REF: 061414ai   NAT: A.REI.5   TOP: Solving Linear Systems

130 ANS: 4   PTS: 2   REF: 011621ai   NAT: A.REI.5

TOP: Solving Linear Systems

131 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.5   TOP: Solving Linear Systems

132 ANS:

$185 + 0.03x = 275 + 0.025x$

$0.005x = 90$

$x = 18000$

PTS: 2   REF: 081427ai   NAT: A.REI.6   TOP: Solving Linear Systems

KEY: substitution

133 ANS: 4   PTS: 2   REF: 081419ai   NAT: A.CED.3

TOP: Modeling Linear Systems

134 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.CED.3 TOP: Modeling Linear Systems

135 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.CED.3 TOP: Modeling Linear Systems

136 ANS:

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

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

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

$$d = 2.25$$

PTS: 2 REF: 011533ai NAT: A.CED.3 TOP: Modeling Linear Systems

137 ANS:

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

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

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

$$-3.15c = -31.50$$

$$c = 10$$

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

138 ANS: 3

$15 > 5$

PTS: 2 REF: 081502ai NAT: A.REI.6 TOP: Graphing Linear Systems

139 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.

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

$$x = 7$$

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

140 ANS:
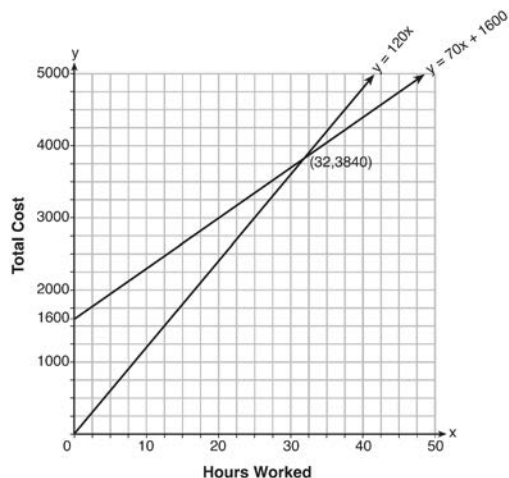
$y = 120x$ and $y = 70x + 1600$ $120x = 70x + 1600$

$$50x = 1600$$

$$x = 32$$

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

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

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

141 ANS:

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

$6p + 9d \ge 5000$ $2640 + 9d \ge 5000$

$$9d \ge 2360$$

$$d \ge 262.\overline{2}$$

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

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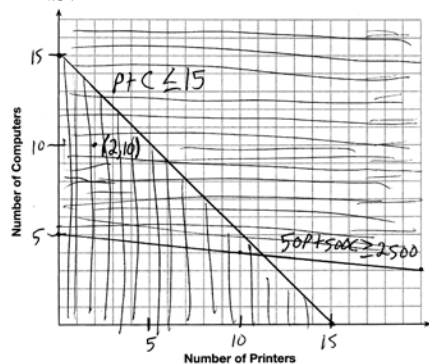
A combination of 2 printers and 10 computers meets all the constraints because $(2, 10)$ is in the solution set of the graph.

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

143 ANS:
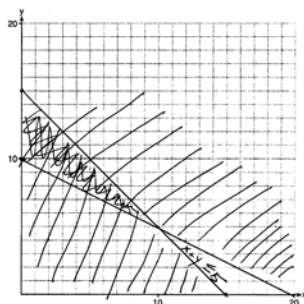
$x + y \le 15$ One hour at school and eleven hours at the library.

$4x + 8y \ge 80$

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

144 ANS: 3   PTS: 2   REF: 081506ai   NAT: A.REI.12

TOP: Graphing Systems of Linear Inequalities   KEY: graph

145 ANS: 2   PTS: 2   REF: 061404ai   NAT: A.REI.12

TOP: Graphing Systems of Linear Inequalities   KEY: bimodalgraph | graph

146 ANS:
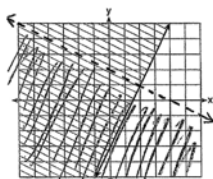
$y \ge 2x - 3$.   Oscar is wrong. $(2) + 2(1) < 4$ is not true.

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

KEY: graph

147 ANS:

$x + y \le 200$ Marta is incorrect because $12.5(30) + 6.25(80) < 1500$

$12.5x + 6.25y \ge 1500$ $375 + 500 < 1500$

                                                  $875 < 1500$
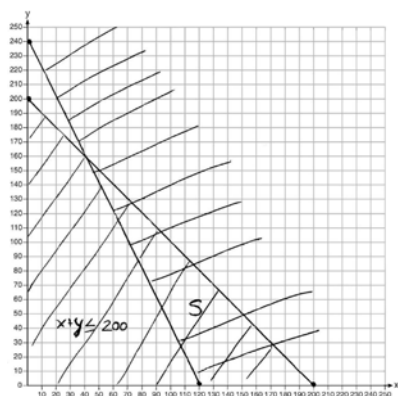
PTS: 6   REF: 011637ai   NAT: A.REI.12   TOP: Graphing Systems of Linear Inequalities

KEY: graph

148 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
KEY: solution set

149 ANS: 1   PTS: 2   REF: 081407ai   NAT: A.REI.12
TOP: Graphing Systems of Linear Inequalities   KEY: solution set

150 ANS:

$x = -2, 1$
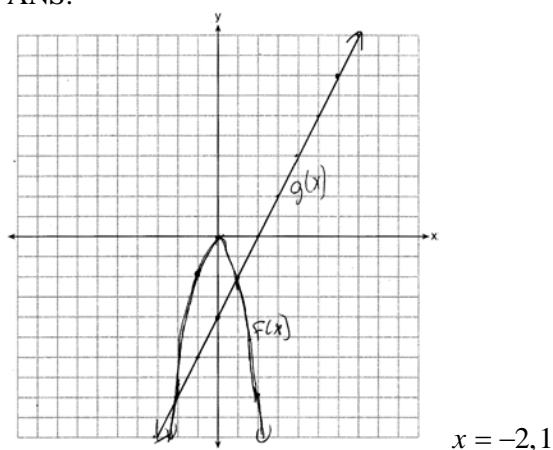
PTS: 4   REF: 081435ai   NAT: A.REI.7   TOP: Quadratic-Linear Systems
KEY: graphically

151 ANS:
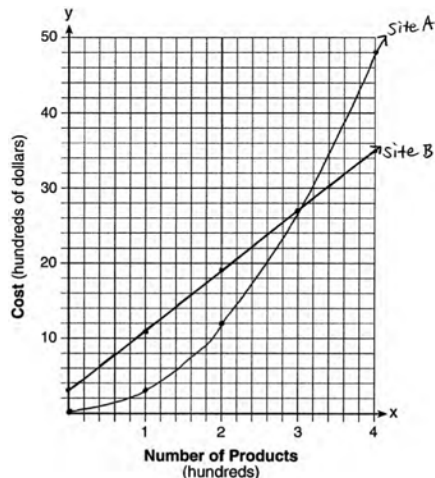
The graphs of the production costs intersect at $x = 3$. The company should use Site *A*, because the cost of Site *A* is lower at $x = 2$.

PTS: 6   REF: 061437ai   NAT: A.REI.7   TOP: Quadratic-Linear Systems
KEY: graphically

152 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

153 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

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

TOP: Other Systems

155 ANS: 1

$$\frac{1}{2}x + 3 = |x| \quad -\frac{1}{2}x - 3 = x$$

$$\frac{1}{2}x + 3 = x \qquad -x - 6 = 2x$$

$$\qquad\qquad\qquad -6 = 3x$$

$$x + 6 = 2x \qquad -2 = x$$

$$6 = x$$

PTS: 2   REF: 011617ai   NAT: A.REI.11   TOP: Other Systems

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

TOP: Operations with Polynomials   KEY: subtraction

157 ANS:

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

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

KEY: subtraction

158 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: multiplication

159 ANS: 2   PTS: 2   REF: 011510ai   NAT: A.APR.1
   TOP: Operations with Polynomials   KEY: multiplication
160 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
161 ANS: 3
   $$5x^2 - (4x^2 - 12x + 9) = x^2 + 12x - 9$$

   PTS: 2   REF: 011610ai   NAT: A.APR.1   TOP: Operations with Polynomials
   KEY: multiplication
162 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: multiplication
163 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: functional notation
164 ANS: 3   PTS: 2   REF: 081509ai   NAT: A.SSE.2
   TOP: Factoring Polynomials
165 ANS: 3   PTS: 2   REF: 011612ai   NAT: A.SSE.2
   TOP: Factoring Polynomials
166 ANS: 1   PTS: 2   REF: 081415ai   NAT: A.SSE.2
   TOP: Factoring Polynomials
167 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
168 ANS: 2   PTS: 2   REF: 061503ai   NAT: A.SSE.2
   TOP: Factoring the Difference of Perfect Squares
169 ANS: 3   PTS: 2   REF: 011522ai   NAT: A.SSE.2
   TOP: Factoring the Difference of Perfect Squares

170 ANS: 3   PTS: 2   REF: spr1302ai   NAT: A.APR.3
    TOP: Zeros of Polynomials
171 ANS: 1   PTS: 2   REF: 011524ai   NAT: A.APR.3
    TOP: Zeros of Polynomials
172 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
173 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
174 ANS: 2
    $(x + 4)(x + 6) = 0$

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

    PTS: 2   REF: spr1303ai   NAT: A.APR.3   TOP: Zeros of Polynomials
175 ANS: 1   PTS: 2   REF: 081504ai   NAT: A.APR.3
    TOP: Zeros of Polynomials
176 ANS: 2
    $y = (x - 3)(x + 2)(x - 1)$

    PTS: 2   REF: 061512ai   NAT: A.APR.3   TOP: Zeros of Polynomials
177 ANS:
    $A = 600(1.016)^2 \approx 619.35$

    PTS: 2   REF: 061529ai   NAT: A.CED.1   TOP: Modeling Exponential Functions
178 ANS: 2   PTS: 2   REF: 061517ai   NAT: A.SSE.1
    TOP: Modeling Exponential Functions
179 ANS: 4   PTS: 2   REF: 011608ai   NAT: A.SSE.1
    TOP: Modeling Exponential Functions
180 ANS:
    $B = 3000(1.042)^t$

    PTS: 2   REF: 081426ai   NAT: F.BF.1   TOP: Modeling Exponential Functions
181 ANS: 1   PTS: 2   REF: 011504ai   NAT: F.BF.1
    TOP: Modeling Exponential Functions
182 ANS: 3   PTS: 2   REF: 011515ai   NAT: F.IF.8
    TOP: Modeling Exponential Functions

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

184 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

185 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

186 ANS: 4
   $16^{2t} = n^{4t}$

   $16^2 = n^4$

   $256 = n^4$

   $4 = n$

   PTS: 2   REF: 011519ai   NAT: A.SSE.3   TOP: Exponential Equations
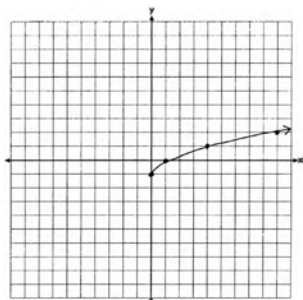
187 ANS:
   $f(5) = (8) \cdot 2^5 = 256$ $f(t) = g(t)$

   $g(5) = 2^{5+3} = 256$ $(8) \cdot 2^t = 2^{t+3}$

   $2^3 \cdot 2^t = 2^{t+3}$

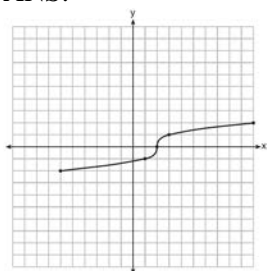 $2^{t+3} = 2^{t+3}$

   PTS: 2   REF: 011632ai   NAT: A.SSE.3   TOP: Exponential Equations

188 ANS:

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

189 ANS:

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

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

191 ANS: 3

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

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

192 ANS: 1
$25,000(0.86)^2 - 25,000(0.86)^3 = 18490 - 15901.40 = 2588.60$

PTS: 2 REF: 011508ai NAT: F.IF.2 TOP: Functional Notation

193 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

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

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

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

for x.

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

194 ANS: 3
$119.67(0.61)^5 - 119.67(0.61)^3 \approx 17.06$

PTS: 2 REF: 011603ai NAT: F.IF.2 TOP: Evaluating Functions

195 ANS: 4 PTS: 2 REF: 061509ai NAT: F.IF.2
TOP: Domain and Range KEY: graph

196 ANS: 1
$f(2) = 0$

$f(6) = 8$

PTS: 2 REF: 081411ai NAT: F.IF.2 TOP: Domain and Range
KEY: limited domain

197 ANS: 4   PTS: 2   REF: 061417ai   NAT: F.IF.2
     TOP: Domain and Range   KEY: real domain, linear
198 ANS: 2   PTS: 2   REF: 011619ai   NAT: F.IF.2
     TOP: Domain and Range   KEY: real domain, exponential
199 ANS: 2   PTS: 2   REF: 011506ai   NAT: F.IF.5
     TOP: Domain and Range
200 ANS: 1   PTS: 2   REF: 011615ai   NAT: F.IF.5
     TOP: Domain and Range
201 ANS: 4
There are no negative or fractional cars.

     PTS: 2   REF: 061402ai   NAT: F.IF.5   TOP: Domain and Range
202 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
203 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: Identifying Solutions
204 ANS: 4   PTS: 2   REF: 081405ai   NAT: A.REI.10
     TOP: Identifying Solutions
205 ANS:
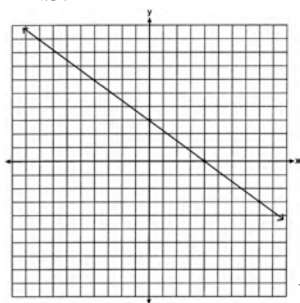
 No, because $(3,2)$ is not on the graph.

     PTS: 2   REF: 061429ai   NAT: A.REI.10   TOP: Identifying Solutions
206 ANS: 3   PTS: 2   REF: 011505ai   NAT: F.LE.1
     TOP: Families of Functions
207 ANS: 3   PTS: 2   REF: 081412ai   NAT: F.LE.1
     TOP: Families of Functions

208 ANS: 1   PTS: 2   REF: 011623ai   NAT: F.LE.1
    TOP: Families of Functions
209 ANS: 4   PTS: 2   REF: 061406ai   NAT: F.LE.1
    TOP: Families of Functions
210 ANS:
    Linear, because the function has a constant rate of change.

    PTS: 2   REF: 011625ai   NAT: F.LE.1   TOP: Families of Functions
211 ANS:
    Exponential, because the function does not grow at a constant rate.

    PTS: 2   REF: 081527ai   NAT: F.LE.1   TOP: Families of Functions
212 ANS: 3   PTS: 2   REF: 081410ai   NAT: F.LE.2
    TOP: Families of Functions   KEY: bimodalgraph
213 ANS: 3   PTS: 2   REF: 061415ai   NAT: F.LE.2
    TOP: Families of Functions
214 ANS: 4   PTS: 2   REF: 011616ai   NAT: F.LE.2
    TOP: Families of Functions
215 ANS: 2   PTS: 2   REF: 061513ai   NAT: F.LE.2
    TOP: Families of Functions
216 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

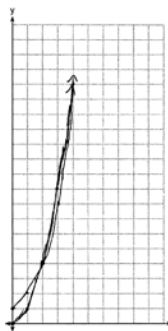   PTS: 2   REF: 081518ai   NAT: F.LE.3   TOP: Families of Functions
217 ANS: 1
    $f(-1) < g(-1)$

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

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

    PTS: 2   REF: 061515ai   NAT: F.LE.3   TOP: Families of Functions

218 ANS:

$g(x)$ has a greater value: $2^{20} > 20^2$

PTS: 4   REF: 081533ai   NAT: F.LE.3   TOP: Families of Functions

219 ANS: 1   PTS: 2   REF: 011620ai   NAT: F.BF.3
TOP: Transformations with Functions   KEY: bimodalgraph

220 ANS: 3

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

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

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

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

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

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

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

221 ANS: 3   PTS: 2   REF: 011622ai   NAT: F.IF.9
TOP: Comparing Functions

222 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: Comparing Functions

32

223 ANS:

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

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

PTS: 2   REF: 081429ai   NAT: F.IF.9   TOP: Comparing Functions
224 ANS: 3   PTS: 2   REF: 061504ai   NAT: F.IF.1
     TOP: Defining Functions   KEY: ordered pairs
225 ANS:
$(-4, 1)$, because then every element of the domain is not assigned one unique element in the range.

PTS: 2   REF: 011527ai   NAT: F.IF.1   TOP: Defining Functions
     KEY: ordered pairs
226 ANS:
Yes, because every element of the domain is assigned one unique element in the range.

PTS: 2   REF: 061430ai   NAT: F.IF.1   TOP: Defining Functions
     KEY: ordered pairs
227 ANS: 2   PTS: 2   REF: 081511ai   NAT: F.IF.1
     TOP: Defining Functions   KEY: mixed
228 ANS:
No, because the relation does not pass the vertical line test.
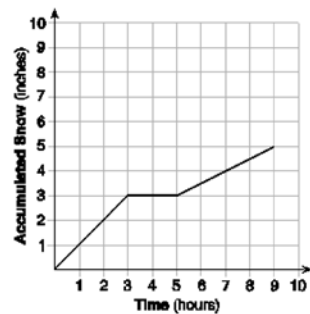
PTS: 2   REF: 011626ai   NAT: F.IF.1   TOP: Defining Functions
     KEY: graphs
229 ANS: 4   PTS: 2   REF: 061502ai   NAT: F.IF.4
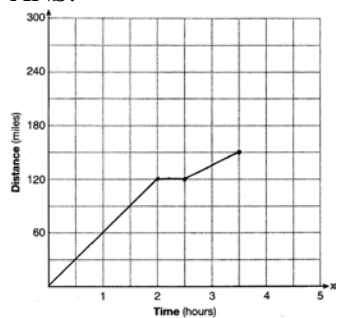   TOP: Relating Graphs to Events
230 ANS:

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

231 ANS:

PTS: 2   REF: 081528ai   NAT: F.IF.4   TOP: Relating Graphs to Events
232 ANS: 2   PTS: 2   REF: 081516ai   NAT: F.IF.7
     TOP: Graphing Piecewise-Defined Functions   KEY: bimodalgraph
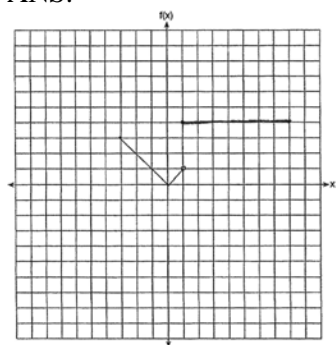233 ANS: 2   PTS: 2   REF: 081422ai   NAT: F.IF.7
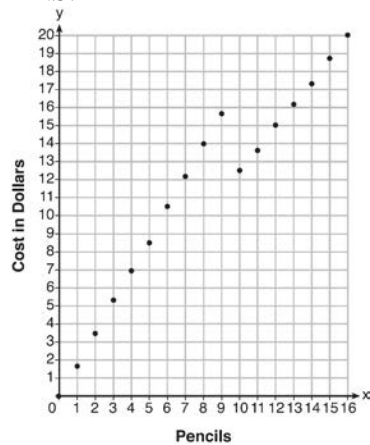   TOP: Graphing Piecewise-Defined Functions
234 ANS:

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

Since according to the graph, 8 pencils cost $14 and 10 pencils cost $12.50, the cashier is correct.
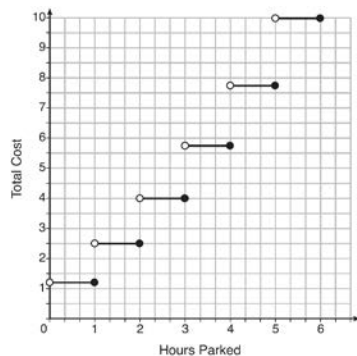
PTS: 4   REF: fall1312ai   NAT: F.IF.7   TOP: Graphing Piecewise-Defined Functions
236 ANS: 1   PTS: 2   REF: 061507ai   NAT: F.IF.7
     TOP: Graphing Step Functions   KEY: bimodalgraph

237 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

238 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

239 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

240 ANS: 2   PTS: 2   REF: 061424ai   NAT: F.LE.2

TOP: Sequences

241 ANS: 1   PTS: 2   REF: 081514ai   NAT: F.LE.2

TOP: Sequences

242 ANS: 2   PTS: 2   REF: 081416ai   NAT: F.LE.2

TOP: Sequences

243 ANS: 3   PTS: 2   REF: 011618ai   NAT: F.LE.2

TOP: Sequences

244 ANS: 3   PTS: 2   REF: 061522ai   NAT: F.BF.2

TOP: Sequences

245 ANS: 4   PTS: 2   REF: 061421ai   NAT: F.BF.2

TOP: Sequences