JMAP
REGENTS BY STATE STANDARD: TOPIC

NY Algebra I Regents Exam Questions from Spring 2013 to August 2019 Sorted by State Standard: Topic

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Algebra I Regents Exam Questions by State Standard: Topic

NUMBERS, OPERATIONS AND PROPERTIES
A.REI.A.1: IDENTIFYING PROPERTIES

1 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

2 A part of Jennifer's work to solve the equation $2(6x^2 - 3) = 11x^2 - x$ is shown below.

Given: $2(6x^2 - 3) = 11x^2 - x$

Step 1: $12x^2 - 6 = 11x^2 - x$

Which property justifies her first step?
1) identity property of multiplication
2) multiplication property of equality
3) commutative property of multiplication
4) distributive property of multiplication over subtraction

3 When solving the equation $12x^2 - 7x = 6 - 2(x^2 - 1)$, Evan wrote $12x^2 - 7x = 6 - 2x^2 + 2$ as his first step. Which property justifies this step?
1) subtraction property of equality
2) multiplication property of equality
3) associative property of multiplication
4) distributive property of multiplication over subtraction

4 Britney is solving a quadratic equation. Her first step is shown below.

Problem: $3x^2 - 8 - 10x = 3(2x + 3)$

Step 1: $3x^2 - 10x - 8 = 6x + 9$

Which two properties did Britney use to get to step 1?
   I. addition property of equality
   II. commutative property of addition
   III. multiplication property of equality
   IV. distributive property of multiplication over addition
1) I and III
2) I and IV
3) II and III
4) II and IV

5 When solving $p^2 + 5 = 8p - 7$, Kate wrote $p^2 + 12 = 8p$. The property she used is
1) the associative property
2) the commutative property
3) the distributive property
4) the addition property of equality

6 A student is in the process of solving an equation. The original equation and the first step are shown below.

Original: $3a + 6 = 2 - 5a + 7$

Step one: $3a + 6 = 2 + 7 - 5a$

Which property did the student use for the first step? Explain why this property is correct.

EXPRESSIONS AND EQUATIONS

A.SSE.A.1: DEPENDENT AND INDEPENDENT VARIABLES

7   The formula for the surface area of a right rectangular prism is $A = 2lw + 2hw + 2lh$, where *l*, *w*, and *h* represent the length, width, and height, respectively. Which term of this formula is *not* dependent on the height?
1) A
2) $2lw$
3) $2hw$
4) $2lh$

A.SSE.A.1: MODELING EXPRESSIONS

8   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) $3.00a + 1.50s$

9   Andy has $310 in his account. Each week, *w*, he withdraws $30 for his expenses. Which expression could be used if he wanted to find out how much money he had left after 8 weeks?
1) $310 - 8w$
2) $280 + 30(w - 1)$
3) $310w - 30$
4) $280 - 30(w - 1)$

10   Bryan's hockey team is purchasing jerseys. The company charges $250 for a onetime set-up fee and $23 for each printed jersey. Which expression represents the total cost of *x* number of jerseys for the team?
1) $23x$
2) $23 + 250x$
3) $23x + 250$
4) $23(x + 250)$

11   Konnor wants to burn 250 Calories while exercising for 45 minutes at the gym. On the treadmill, he can burn 6 Cal/min. On the stationary bike, he can burn 5 Cal/min. If *t* represents the number of minutes on the treadmill and *b* represents the number of minutes on the stationary bike, which expression represents the number of Calories that Konnor can burn on the stationary bike?
1) b
2) $5b$
3) $45 - b$
4) $250 - 5b$

12   An expression of the fifth degree is written with a leading coefficient of seven and a constant of six. Which expression is correctly written for these conditions?
1) $6x^5 + x^4 + 7$
2) $7x^6 - 6x^4 + 5$
3) $6x^7 - x^5 + 5$
4) $7x^5 + 2x^2 + 6$

13 Mrs. Allard asked her students to identify which of the polynomials below are in standard form and explain why.

   I. $15x^4 - 6x + 3x^2 - 1$

   II. $12x^3 + 8x + 4$

   III. $2x^5 + 8x^2 + 10x$

Which student's response is correct?
1) Tyler said I and II because the coefficients are decreasing.
2) Susan said only II because all the numbers are decreasing.
3) Fred said II and III because the exponents are decreasing.
4) Alyssa said II and III because they each have three terms.

14 Students were asked to write $6x^5 + 8x - 3x^3 + 7x^7$ in standard form. Shown below are four student responses.

   Anne: $7x^7 + 6x^5 - 3x^3 + 8x$

   Bob: $-3x^3 + 6x^5 + 7x^7 + 8x$

   Carrie: $8x + 7x^7 + 6x^5 - 3x^3$

   Dylan: $8x - 3x^3 + 6x^5 + 7x^7$

Which student is correct?
1) Anne
2) Bob
3) Carrie
4) Dylan

15 When $(x)(x-5)(2x+3)$ is expressed as a polynomial in standard form, which statement about the resulting polynomial is true?
1) The constant term is 2.
2) The leading coefficient is 2.
3) The degree is 2.
4) The number of terms is 2.

16 When multiplying polynomials for a math assignment, Pat found the product to be $-4x + 8x^2 - 2x^3 + 5$. He then had to state the leading coefficient of this polynomial. Pat wrote down -4. Do you agree with Pat's answer? Explain your reasoning.

A.REI.B.3: SOLVING LINEAR EQUATIONS

17 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

18 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

19 An equation is given below.
$$4(x-7) = 0.3(x+2) + 2.11$$
The solution to the equation is
1) 8.3
2) 8.7
3) 3
4) -3

20 Which value of x satisfies the equation
$$\frac{5}{6}\left(\frac{3}{8} - x\right) = 16?$$
1) -19.575
2) -18.825
3) -16.3125
4) -15.6875

21 The value of x which makes
$$\frac{2}{3}\left(\frac{1}{4}x - 2\right) = \frac{1}{5}\left(\frac{4}{3}x - 1\right)$$ true is
1) -10
2) -2
3) $-9.\overline{09}$
4) $-11.\overline{3}$

22 The solution to $-2(1 - 4x) = 3x + 8$ is
1) $\frac{6}{11}$
2) 2
3) $-\frac{10}{7}$
4) -2

23 What is the solution to the equation
$$\frac{3}{5}\left(x + \frac{4}{3}\right) = 1.04?$$
1) $3.\overline{06}$
2) 0.4
3) $-0.4\overline{8}$
4) $-0.709\overline{3}$

24 The value of x that satisfies the equation
$$\frac{4}{3} = \frac{x + 10}{15}$$ is
1) -6
2) 5
3) 10
4) 30

25 Solve the equation below algebraically for the exact value of x.
$$6 - \frac{2}{3}(x + 5) = 4x$$

26 Solve algebraically for x:
$$-\frac{2}{3}(x + 12) + \frac{2}{3}x = -\frac{5}{4}x + 2$$

A.CED.A.1: MODELING LINEAR EQUATIONS

27 Nicci's sister is 7 years less than twice Nicci's age, a. The sum of Nicci's age and her sister's age is 41. Which equation represents this relationship?
1) $a + (7 - 2a) = 41$
2) $a + (2a - 7) = 41$
3) $2a - 7 = 41$
4) $a = 2a - 7$

28 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) $0.05(4x) + 0.10(x) = \$1.25$

29 A parking garage charges a base rate of $3.50 for up to 2 hours, and an hourly rate for each additional hour. The sign below gives the prices for up to 5 hours of parking.

Parking Rates	
2 hours	$3.50
3 hours	$9.00
4 hours	$14.50
5 hours	$20.00

Which linear equation can be used to find *x*, the additional hourly parking rate?
1) $9.00 + 3x = 20.00$
2) $9.00 + 3.50x = 20.00$
3) $2x + 3.50 = 14.50$
4) $2x + 9.00 = 14.50$

30 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.

31 Kendal bought *x* boxes of cookies to bring to a party. Each box contains 12 cookies. She decides to keep two boxes for herself. She brings 60 cookies to the party. Which equation can be used to find the number of boxes, *x*, Kendal bought?
1) $2x - 12 = 60$
2) $12x - 2 = 60$
3) $12x - 24 = 60$
4) $24 - 12x = 60$

32 Ian is borrowing $1000 from his parents to buy a notebook computer. He plans to pay them back at the rate of $60 per month. Ken is borrowing $600 from his parents to purchase a snowboard. He plans to pay his parents back at the rate of $20 per month. Write an equation that can be used to determine after how many months the boys will owe the same amount. Determine algebraically and state in how many months the two boys will owe the same amount. State the amount they will owe at this time. Ian claims that he will have his loan paid off 6 months after he and Ken owe the same amount. Determine and state if Ian is correct. Explain your reasoning.

33 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.]

5

A.CED.A.2: MODELING LINEAR EQUATIONS

34 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) $c = 60 + 0.05d$

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

36 Sandy programmed a website's checkout process with an equation to calculate the amount customers will be charged when they download songs. The website offers a discount. If one song is bought at the full price of $1.29, then each additional song is $.99. State an equation that represents the cost, C, when s songs are downloaded. Sandy figured she would be charged $52.77 for 52 songs. Is this the correct amount? Justify your answer.

A.CED.A.4: TRANSFORMING FORMULAS

37 The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. 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) $\dfrac{1}{3}\sqrt{\dfrac{V}{\pi h}}$

38 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) $r = \dfrac{V}{2\pi}$

39 Michael borrows money from his uncle, who is charging him simple interest using the formula $I = Prt$. 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) $\dfrac{Pt}{I}$

40 The distance a free falling object has traveled can be modeled by the equation $d = \frac{1}{2}at^2$, 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) $t = \left(\dfrac{2d}{a}\right)^2$

41 Boyle's Law involves the pressure and volume of gas in a container. It can be represented by the formula $P_1V_1 = P_2V_2$. When the formula is solved for P_2, the result is

1) $P_1V_1V_2$

2) $\dfrac{V_2}{P_1V_1}$

3) $\dfrac{P_1V_1}{V_2}$

4) $\dfrac{P_1V_2}{V_1}$

42 The formula for electrical power, P, is $P = I^2R$, where I is current and R is resistance. The formula for I in terms of P and R is

1) $I = \left(\dfrac{P}{R}\right)^2$

2) $I = \sqrt{\dfrac{P}{R}}$

3) $I = (P - R)^2$

4) $I = \sqrt{P - R}$

43 The formula for blood flow rate is given by $F = \dfrac{p_1 - p_2}{r}$, where F is the flow rate, p_1 the initial pressure, p_2 the final pressure, and r the resistance created by blood vessel size. Which formula can *not* be derived from the given formula?

1) $p_1 = Fr + p_2$

2) $p_2 = p_1 - Fr$

3) $r = F(p_2 - p_1)$

4) $r = \dfrac{p_1 - p_2}{F}$

44 Students were asked to write a formula for the length of a rectangle by using the formula for its perimeter, $p = 2\ell + 2w$. Three of their responses are shown below.

I. $\ell = \frac{1}{2}p - w$

II. $\ell = \frac{1}{2}(p - 2w)$

III. $\ell = \dfrac{p - 2w}{2}$

Which responses are correct?
1) I and II, only
2) II and III, only
3) I and III, only
4) I, II, and III

45 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.

46 Solve the equation below for x in terms of a.
$$4(ax + 3) - 3ax = 25 + 3a$$

7

47 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.

48 The formula for the sum of the degree measures of the interior angles of a polygon is $S = 180(n - 2)$. Solve for n, the number of sides of the polygon, in terms of S.

49 Using the formula for the volume of a cone, express r in terms of V, h, and π.

50 The formula $F_g = \dfrac{GM_1 M_2}{r^2}$ calculates the gravitational force between two objects where G is the gravitational constant, M_1 is the mass of one object, M_2 is the mass of the other object, and r is the distance between them. Solve for the positive value of r in terms of F_g, G, M_1, and M_2.

51 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:
$$K = \frac{5}{9}(F + 459.67)$$
Solve for F, in terms of K.

52 The formula for the volume of a cone is $V = \dfrac{1}{3}\pi r^2 h$. Solve the equation for h in terms of V, r, and π.

53 The formula $a = \dfrac{v_f - v_i}{t}$ is used to calculate acceleration as the change in velocity over the period of time. Solve the formula for the final velocity, v_f, in terms of initial velocity, v_i, acceleration, a, and time, t.

RATE
N.Q.A.1: CONVERSIONS

54 Dan took 12.5 seconds to run the 100-meter dash. He calculated the time to be approximately
1) 0.2083 minute
2) 750 minutes
3) 0.2083 hour
4) 0.52083 hour

55 Bamboo plants can grow 91 centimeters per day. What is the approximate growth of the plant, in inches per hour?
1) 1.49
2) 3.79
3) 9.63
4) 35.83

56 The Utica Boilermaker is a 15-kilometer road race. Sara is signed up to run this race and has done the following training runs:
 I. 10 miles
 II. 44,880 feet
 III. 15,560 yards
Which run(s) are at least 15 kilometers?
1) I, only
2) II, only
3) I and III
4) II and III

57 Olivia entered a baking contest. As part of the contest, she needs to demonstrate how to measure a gallon of milk if she only has a teaspoon measure. She converts the measurement using the ratios below:

$$\frac{4\ quarts}{1\ gallon} \bullet \frac{2\ pints}{1\ quart} \bullet \frac{2\ cups}{1\ pint} \bullet \frac{\frac{1}{4}\ cup}{4\ tablespoons} \bullet \frac{3\ teaspoons}{1\ tablespoon}$$

Which ratio is *incorrectly* written in Olivia's conversion?

1) $\dfrac{4\ quarts}{1\ gallon}$

2) $\dfrac{2\ pints}{1\ quart}$

3) $\dfrac{\frac{1}{4}\ cup}{4\ tablespoons}$

4) $\dfrac{3\ teaspoons}{1\ tablespoon}$

58 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.

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

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

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

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

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

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

59 Faith wants to use the formula $C(f) = \dfrac{5}{9}(f - 32)$ to convert degrees Fahrenheit, f, to degrees Celsius, $C(f)$. If Faith calculated $C(68)$, what would her result be?
1) 20° Celsius
2) 20° Fahrenheit
3) 154° Celsius
4) 154° Fahrenheit

60 A construction worker needs to move 120 ft³ of dirt by using a wheelbarrow. One wheelbarrow load holds 8 ft³ of dirt and each load takes him 10 minutes to complete. One correct way to figure out the number of hours he would need to complete this job is

1) $\dfrac{120\ ft^3}{1} \bullet \dfrac{10\ min}{1\ load} \bullet \dfrac{60\ min}{1\ hr} \bullet \dfrac{1\ load}{8\ ft^3}$

2) $\dfrac{120\ ft^3}{1} \bullet \dfrac{60\ min}{1\ hr} \bullet \dfrac{8\ ft^3}{10\ min} \bullet \dfrac{1}{1\ load}$

3) $\dfrac{120\ ft^3}{1} \bullet \dfrac{1\ load}{10\ min} \bullet \dfrac{8\ ft^3}{1\ load} \bullet \dfrac{1\ hr}{60\ min}$

4) $\dfrac{120\ ft^3}{1} \bullet \dfrac{1\ load}{8\ ft^3} \bullet \dfrac{10\ min}{1\ load} \bullet \dfrac{1\ hr}{60\ min}$

61 The following conversion was done correctly:
$$\frac{3\ miles}{1\ hour} \bullet \frac{1\ hour}{60\ minutes} \bullet \frac{5280\ feet}{1\ mile} \bullet \frac{12\ inches}{1\ foot}$$
What were the final units for this conversion?
1) minutes per foot
2) minutes per inch
3) feet per minute
4) inches per minute

62 A typical marathon is 26.2 miles. Allan averages 12 kilometers per hour when running in marathons. Determine how long it would take Allan to complete a marathon, to the *nearest tenth of an hour*. Justify your answer.

N.Q.A.2: USING RATE

63 Patricia is trying to compare the average rainfall of New York to that of Arizona. A comparison between these two states for the months of July through September would be best measured in
1) feet per hour
2) inches per hour
3) inches per month
4) feet per month

64 The owner of a landscaping business wants to know how much time, on average, his workers spend mowing one lawn. Which is the most appropriate rate with which to calculate an answer to his question?
1) lawns per employee
2) lawns per day
3) employee per lawns
4) hours per lawn

65 A two-inch-long grasshopper can jump a horizontal distance of 40 inches. An athlete, who is five feet nine, wants to cover a distance of one mile by jumping. If this person could jump at the same ratio of body-length to jump-length as the grasshopper, determine, to the *nearest jump*, how many jumps it would take this athlete to jump one mile.

A.CED.A.2: SPEED

66 An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles. Determine the speed of the plane, at cruising altitude, in miles per minute. Write an equation to represent the number of miles the plane has flown, *y*, during *x* minutes at cruising altitude, only. Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

67 Loretta and her family are going on vacation. Their destination is 610 miles from their home. Loretta is going to share some of the driving with her dad. Her average speed while driving is 55 mph and her dad's average speed while driving is 65 mph. The plan is for Loretta to drive for the first 4 hours of the trip and her dad to drive for the remainder of the trip. Determine the number of hours it will take her family to reach their destination. After Loretta has been driving for 2 hours, she gets tired and asks her dad to take over. Determine, to the *nearest tenth of an hour*, how much time the family will save by having Loretta's dad drive for the remainder of the trip.

68 The distance traveled is equal to the rate of speed multiplied by the time traveled. If the distance is measured in feet and the time is measured in minutes, then the rate of speed is expressed in which units? Explain how you arrived at your answer.

F.IF.B.6: RATE OF CHANGE

69 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

70 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

71 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

72 The table below shows the year and the number of households in a building that had high-speed broadband internet access.

Number of Households	11	16	23	33	42	47
Year	2002	2003	2004	2005	2006	2007

For which interval of time was the average rate of change the *smallest*?
1) 2002 - 2004
2) 2003 - 2005
3) 2004 - 2006
4) 2005 - 2007

73 The graph below shows the distance in miles, m, hiked from a camp in h hours.

Which hourly interval had the greatest rate of change?
1) hour 0 to hour 1
2) hour 1 to hour 2
3) hour 2 to hour 3
4) hour 3 to hour 4

74 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

75 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.
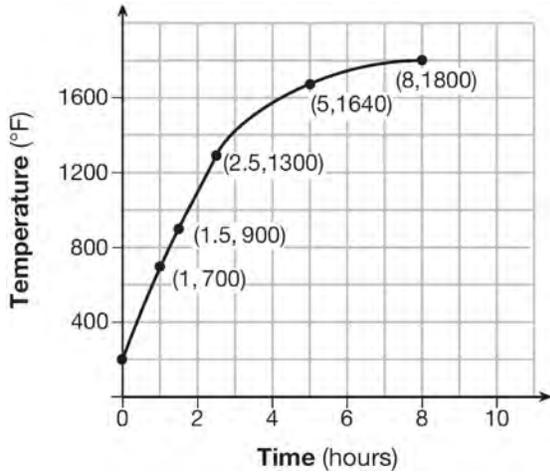
During which time interval did the temperature in the kiln show the greatest average rate of change?
1)   0 to 1 hour
2)   1 hour to 1.5 hours
3)   2.5 hours to 5 hours
4)   5 hours to 8 hours

76 The graph below models the height of a remote-control helicopter over 20 seconds during flight.
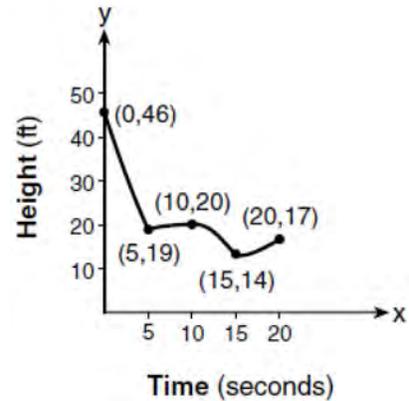
Over which interval does the helicopter have the *slowest* average rate of change?
1)   0 to 5 seconds
2)   5 to 10 seconds
3)   10 to 15 seconds
4)   15 to 20 seconds

77 A graph of average resting heart rates is shown below. The average resting heart rate for adults is 72 beats per minute, but doctors consider resting rates from 60-100 beats per minute within normal range.

Average Resting Heart Rate by Age
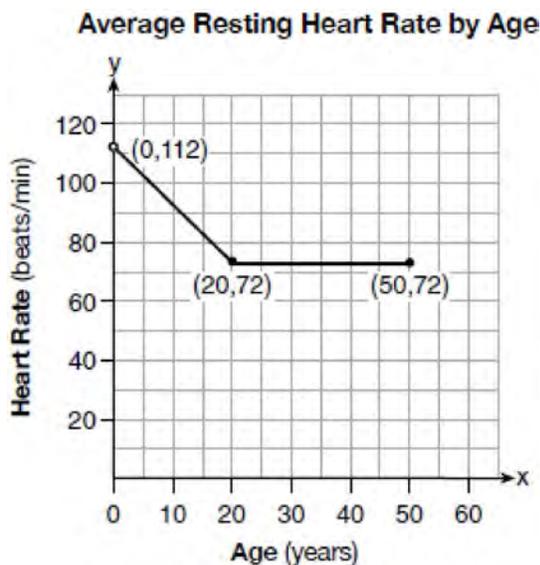
Which statement about average resting heart rates is *not* supported by the graph?
1) A 10-year-old has the same average resting heart rate as a 20-year-old.
2) A 20-year-old has the same average resting heart rate as a 30-year-old.
3) A 40-year-old may have the same average resting heart rate for ten years.
4) The average resting heart rate for teenagers steadily decreases.

78 Voting rates in presidential elections from 1996-2012 are modeled below.
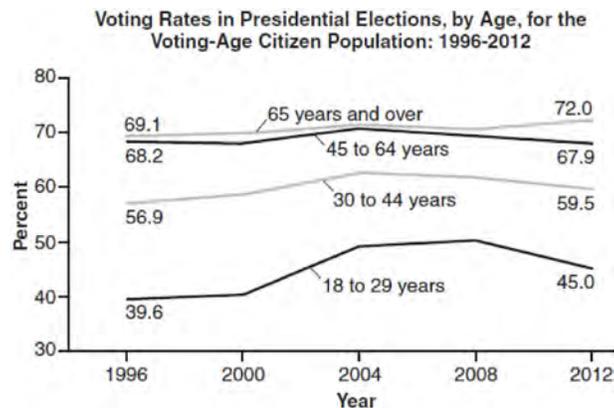
Which statement does *not* correctly interpret voting rates by age based on the given graph?
1) For citizens 18-29 years of age, the rate of change in voting rate was greatest between years 2000-2004.
2) From 1996-2012, the average rate of change was positive for only two age groups.
3) About 70% of people 45 and older voted in the 2004 election.
4) The voting rates of eligible age groups lies between 35 and 75 percent during presidential elections every 4 years from 1996-2012.

79 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

14

80 A family is traveling from their home to a vacation resort hotel. The table below shows their distance from home as a function of time.

Time (hrs)	0	2	5	7
Distance (mi)	0	140	375	480

Determine the average rate of change between hour 2 and hour 7, including units.

81 The table below represents the height of a bird above the ground during flight, with $P(t)$ representing height in feet and t representing time in seconds.

t	P(t)
0	6.71
3	6.26
4	6
9	3.41

Calculate the average rate of change from 3 to 9 seconds, in feet per second.

82 A blizzard occurred on the East Coast during January, 2016. Snowfall totals from the storm were recorded for Washington, D.C. and are shown in the table below.

Washington, D.C.	
Time	Snow (inches)
1 a.m.	1
3 a.m.	5
6 a.m.	11
12 noon	33
3 p.m.	36

Which interval, 1 a.m. to 12 noon or 6 a.m. to 3 p.m., has the greater rate of snowfall, in inches per hour? Justify your answer.

83 The graph of $f(t)$ models the height, in feet, that a bee is flying above the ground with respect to the time it traveled in t seconds.
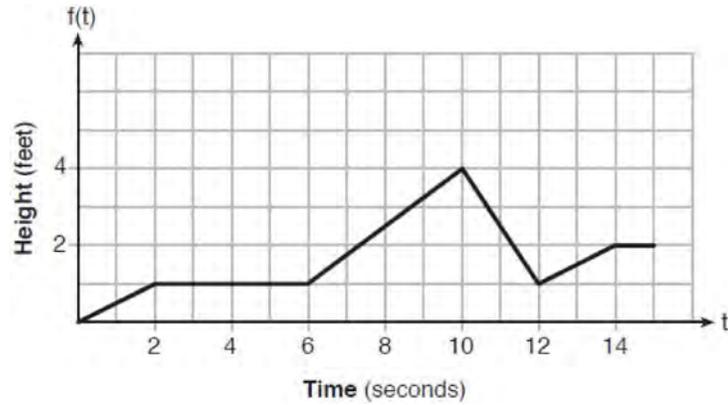
State all time intervals when the bee's rate of change is zero feet per second. Explain your reasoning.

84 The graph below shows the variation in the average temperature of Earth's surface from 1950-2000, according to one source.

Variation of Earth's Surface Temperature Over 50 Years
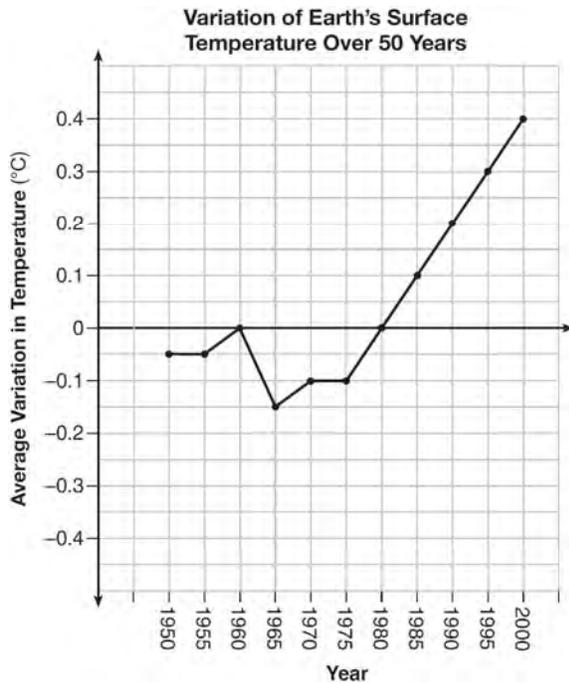
During which years did the temperature variation change the most per unit time? Explain how you determined your answer.

85 A manager wanted to analyze the online shoe sales for his business. He collected data for the number of pairs of shoes sold each hour over a 14-hour time period. He created a graph to model the data, as shown below.
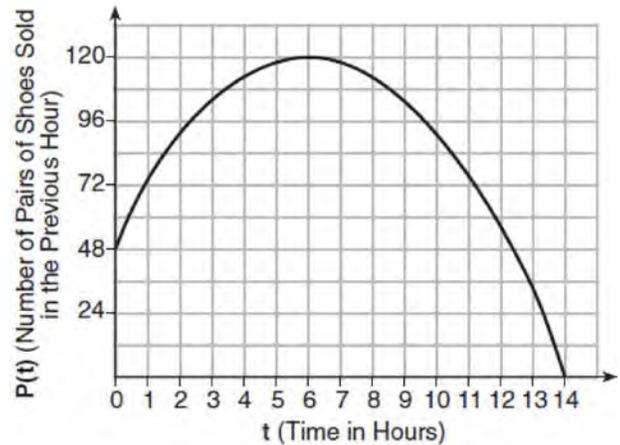
The manager believes the set of integers would be the most appropriate domain for this model. Explain why he is *incorrect*. State the entire interval for which the number of pairs of shoes sold is increasing. Determine the average rate of change between the sixth and fourteenth hours, and explain what it means in the context of the problem.

86 A population of rabbits in a lab, $p(x)$, can be modeled by the function $p(x) = 20(1.014)^x$, where x represents the number of days since the population was first counted. Explain what 20 and 1.014 represent in the context of the problem. Determine, to the *nearest tenth*, the average rate of change from day 50 to day 100.

17

LINEAR EQUATIONS
F.BF.A.1: MODELING LINEAR FUNCTIONS

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

88 Last weekend, Emma sold lemonade at a yard sale. The function $P(c) = .50c - 9.96$ represented the profit, $P(c)$, Emma earned selling c cups of lemonade. Sales were strong, so she raised the price for this weekend by 25 cents per cup. Which function represents her profit for this weekend?
1) $P(c) = .25c - 9.96$
2) $P(c) = .50c - 9.71$
3) $P(c) = .50c - 10.21$
4) $P(c) = .75c - 9.96$

89 Jim is a furniture salesman. His weekly pay is $300 plus 3.5% of his total sales for the week. Jim sells x dollars' worth of furniture during the week. Write a function, $p(x)$, which can be used to determine his pay for the week. Use this function to determine Jim's pay to the *nearest cent* for a week when his sales total is $8250.

90 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.

91 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.

92 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.

F.LE.A.2: MODELING LINEAR FUNCTIONS

93 Which chart could represent the function $f(x) = -2x + 6$?

1)

x	f(x)
0	6
2	10
4	14
6	18

2)

x	f(x)
0	4
2	6
4	8
6	10

3)

x	f(x)
0	8
2	10
4	12
6	14

4)

x	f(x)
0	6
2	2
4	-2
6	-6

94 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.

95 Tanya is making homemade greeting cards. The data table below represents the amount she spends in dollars, $f(x)$, in terms of the number of cards she makes, x.

x	f(x)
4	7.50
6	9
9	11.25
10	12

Write a linear function, $f(x)$, that represents the data. Explain what the slope and y-intercept of $f(x)$ mean in the given context.

F.LE.B.5: MODELING LINEAR FUNCTIONS

96 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

97 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.

98 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

99 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.

100 A car leaves Albany, NY, and travels west toward Buffalo, NY. The equation $D = 280 - 59t$ can be used to represent the distance, D, from Buffalo after t hours. In this equation, the 59 represents the
1) car's distance from Albany
2) speed of the car
3) distance between Buffalo and Albany
4) number of hours driving

101 A plumber has a set fee for a house call and charges by the hour for repairs. The total cost of her services can be modeled by $c(t) = 125t + 95$. Which statements about this function are true?
I. A house call fee costs $95.
II. The plumber charges $125 per hour.
III. The number of hours the job takes is represented by t.
1) I and II, only
2) I and III, only
3) II and III, only
4) I, II, and III

102 The amount Mike gets paid weekly can be represented by the expression $2.50a + 290$, where a is the number of cell phone accessories he sells that week. What is the constant term in this expression and what does it represent?
1) $2.50a$, the amount he is guaranteed to be paid each week
2) $2.50a$, the amount he earns when he sells a accessories
3) 290, the amount he is guaranteed to be paid each week
4) 290, the amount he earns when he sells a accessories

103 Each day, a local dog shelter spends an average of $2.40 on food per dog. The manager estimates the shelter's daily expenses, assuming there is at least one dog in the shelter, using the function $E(x) = 30 + 2.40x$. Which statements regarding the function $E(x)$ are correct?
I. x represents the number of dogs at the shelter per day.
II. x represents the number of volunteers at the shelter per day.
III. 30 represents the shelter's total expenses per day.
IV. 30 represents the shelter's nonfood expenses per day.
1) I and III
2) I and IV
3) II and III
4) II and IV

104 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.

S.ID.C.7: MODELING LINEAR FUNCTIONS

105 A student plotted the data from a sleep study as shown in the graph below.
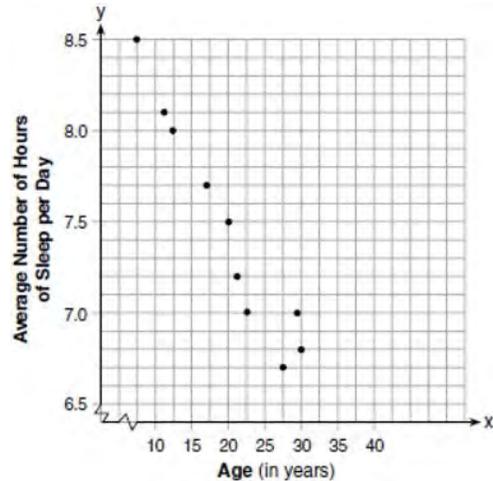
The student used the equation of the line $y = -0.09x + 9.24$ to model the data. What does the rate of change represent in terms of these data?
1) The average number of hours of sleep per day increases 0.09 hour per year of age.
2) The average number of hours of sleep per day decreases 0.09 hour per year of age.
3) The average number of hours of sleep per day increases 9.24 hours per year of age.
4) The average number of hours of sleep per day decreases 9.24 hours per year of age.

106 During physical education class, Andrew recorded the exercise times in minutes and heart rates in beats per minute (bpm) of four of his classmates. Which table best represents a linear model of exercise time and heart rate?

Student 1

Exercise Time (in minutes)	Heart Rate (bpm)
0	60
1	65
2	70
3	75
4	80

1)

Student 2

Exercise Time (in minutes)	Heart Rate (bpm)
0	62
1	70
2	83
3	88
4	90

2)

Student 3

Exercise Time (in minutes)	Heart Rate (bpm)
0	58
1	65
2	70
3	75
4	79

3)

Student 4

Exercise Time (in minutes)	Heart Rate (bpm)
0	62
1	65
2	66
3	73
4	75

4)

107   During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m. If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

A.CED.A.2: GRAPHING LINEAR FUNCTIONS

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

1)

2)

3)

4)

22
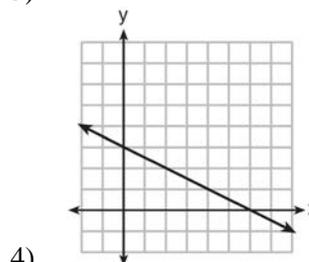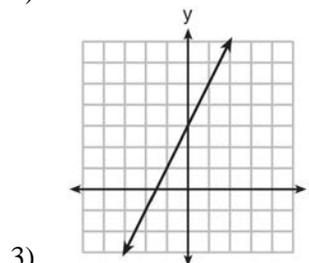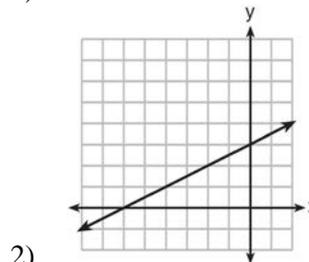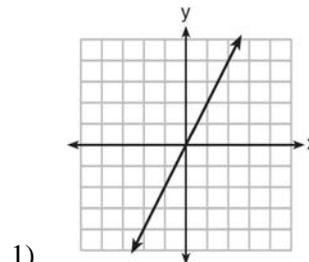
109 Max purchased a box of green tea mints. The nutrition label on the box stated that a serving of three mints contains a total of 10 Calories. On the axes below, graph the function, C, where $C(x)$ represents the number of Calories in x mints.
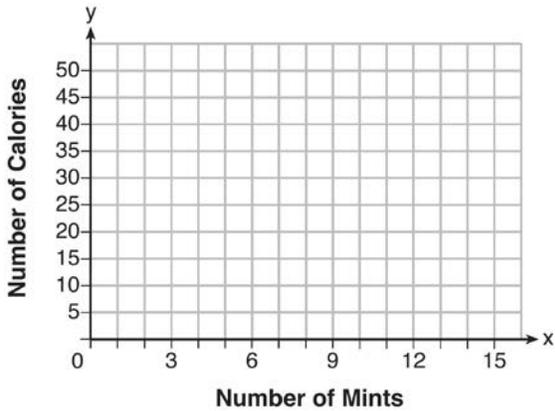
Write an equation that represents $C(x)$. A full box of mints contains 180 Calories. Use the equation to determine the total number of mints in the box.

110 The graph below was created by an employee at a gas station.
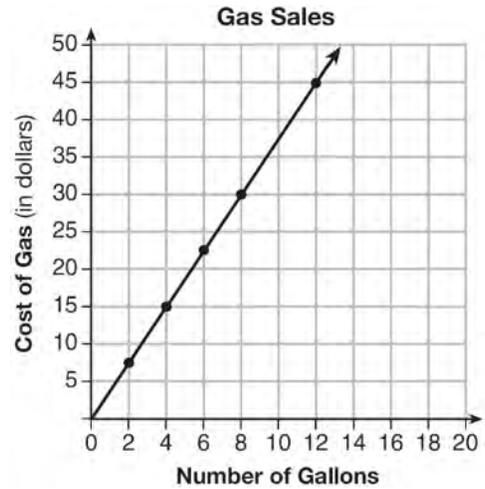
Which statement can be justified by using the graph?
1) If 10 gallons of gas was purchased, $35 was paid.
2) For every gallon of gas purchased, $3.75 was paid.
3) For every 2 gallons of gas purchased, $5.00 was paid.
4) If zero gallons of gas were purchased, zero miles were driven.

111 Zeke and six of his friends are going to a baseball game. Their combined money totals $28.50. At the game, hot dogs cost $1.25 each, hamburgers cost $2.50 each, and sodas cost $0.50 each. Each person buys one soda. They spend all $28.50 on food and soda. Write an equation that can determine the number of hot dogs, x, and hamburgers, y, Zeke and his friends can buy. Graph your equation on the grid below.
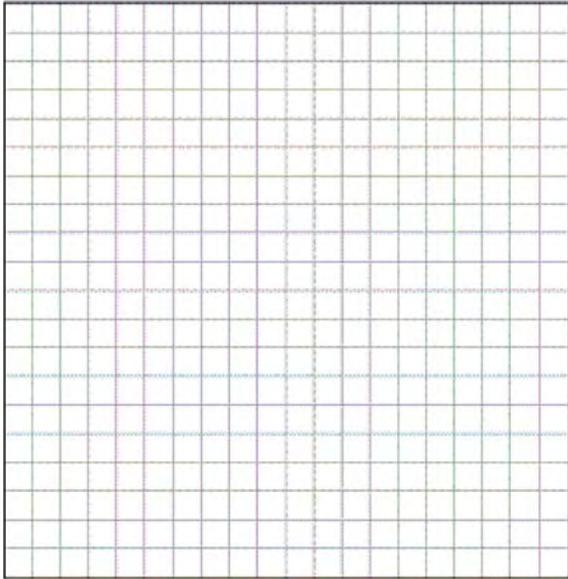

Determine how many different combinations, including those combinations containing zero, of hot dogs and hamburgers Zeke and his friends can buy, spending all $28.50. Explain your answer.

F.IF.B.4: GRAPHING LINEAR FUNCTIONS

112 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

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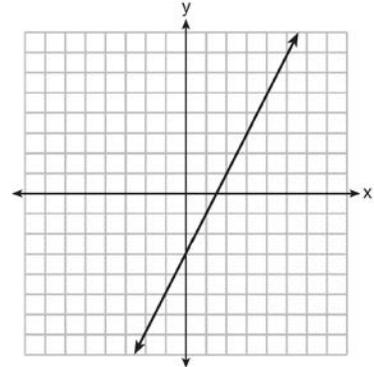

1) $y = \dfrac{12 - 6x}{4}$
2) $27 + 3y = 6x$
3) $6y + x = 18$
4) $y + 3 = 6x$

114 Samantha purchases a package of sugar cookies. The nutrition label states that each serving size of 3 cookies contains 160 Calories. Samantha creates the graph below showing the number of cookies eaten and the number of Calories consumed.
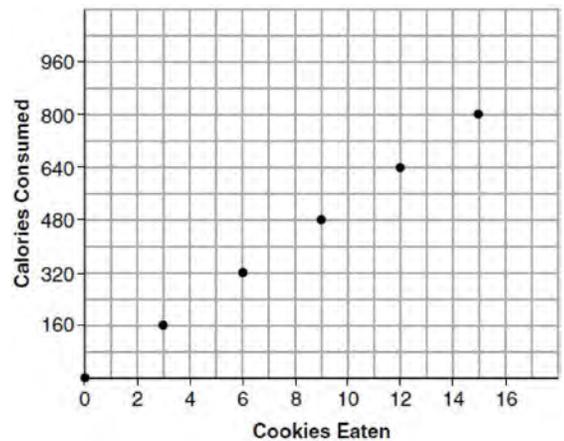
Explain why it is appropriate for Samantha to draw a line through the points on the graph.

115 On the set of axes below, graph the line whose equation is $2y = -3x - 2$.
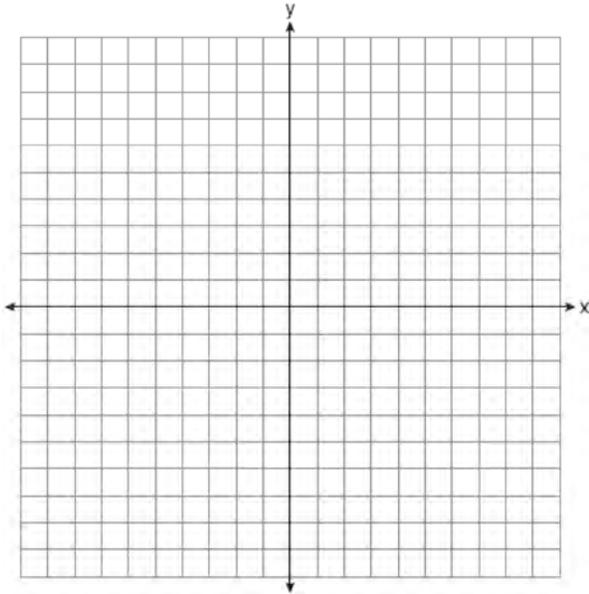
This linear equation contains the point $(2, k)$. State the value of k.

A.REI.D.10: WRITING LINEAR EQUATIONS

116 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) $(2, 9)$

117 How many of the equations listed below represent the line passing through the points $(2, 3)$ and $(4, -7)$?

$$5x + y = 13$$
$$y + 7 = -5(x - 4)$$
$$y = -5x + 13$$
$$y - 7 = 5(x - 4)$$

1) 1
2) 2
3) 3
4) 4

118 Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points $(-3, 4)$ and $(6, 1)$. Sue wrote $y - 4 = -\frac{1}{3}(x + 3)$ and Kathy wrote $y = -\frac{1}{3}x + 3$. Justify why both students are correct.

INEQUALITIES
A.REI.B.3: SOLVING LINEAR INEQUALITIES

119 When $3x + 2 \leq 5(x - 4)$ is solved for x, the solution is
1) $x \leq 3$
2) $x \geq 3$
3) $x \leq -11$
4) $x \geq 11$

120 What is the solution to $2h + 8 > 3h - 6$
1) $h < 14$
2) $h < \frac{14}{5}$
3) $h > 14$
4) $h > \frac{14}{5}$

121 The solution to $4p + 2 < 2(p + 5)$ is
1) $p > -6$
2) $p < -6$
3) $p > 4$
4) $p < 4$

122 The inequality $7 - \frac{2}{3}x < x - 8$ is equivalent to
1) $x > 9$
2) $x > -\frac{3}{5}$
3) $x < 9$
4) $x < -\frac{3}{5}$

123 What is the solution to the inequality
$2 + \frac{4}{9}x \geq 4 + x$?
1) $x \leq -\frac{18}{5}$
2) $x \geq -\frac{18}{5}$
3) $x \leq \frac{54}{5}$
4) $x \geq \frac{54}{5}$

124 When $3a + 7b > 2a - 8b$ is solved for a, the result is
1) $a > -b$
2) $a < -b$
3) $a < -15b$
4) $a > -15b$

125 Solve algebraically for x:
$3600 + 1.02x < 2000 + 1.04x$

126 Solve the inequality below:
$$1.8 - 0.4y \geq 2.2 - 2y$$

127 Solve $\frac{3}{5}x + \frac{1}{3} < \frac{4}{5}x - \frac{1}{3}$ for x.

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

A.REI.B.3: INTERPRETING SOLUTIONS

129 Which value would be a solution for x in the inequality $47 - 4x < 7$?
1) -13
2) -10
3) 10
4) 11

130 Given the set $\{x \mid -2 \leq x \leq 2, \text{where } x \text{ is an integer}\}$, what is the solution of $-2(x - 5) < 10$?
1) $0, 1, 2$
2) $1, 2$
3) $-2, -1, 0$
4) $-2, -1$

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

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

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

134 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.

A.CED.A.1: MODELING LINEAR INEQUALITIES

135 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

136 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) $750 < p < 1500$

137 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) $0.75(7) + 1.25b \leq 22$

138 Joy wants to buy strawberries and raspberries to bring to a party. Strawberries cost $1.60 per pound and raspberries cost $1.75 per pound. If she only has $10 to spend on berries, which inequality represents the situation where she buys x pounds of strawberries and y pounds of raspberries?
1) $1.60x + 1.75y \leq 10$
2) $1.60x + 1.75y \geq 10$
3) $1.75x + 1.60y \leq 10$
4) $1.75x + 1.60y \geq 10$

139 David wanted to go on an amusement park ride. A sign posted at the entrance read "You must be greater than 42 inches tall and no more than 57 inches tall for this ride." Which inequality would model the height, x, required for this amusement park ride?
1) $42 < x \leq 57$
2) $42 > x \geq 57$
3) $42 < x$ or $x \leq 57$
4) $42 > x$ or $x \geq 57$

140 The math department needs to buy new textbooks and laptops for the computer science classroom. The textbooks cost $116.00 each, and the laptops cost $439.00 each. If the math department has $6500 to spend and purchases 30 textbooks, how many laptops can they buy?
1) 6
2) 7
3) 11
4) 12

141 The acidity in a swimming pool is considered normal if the average of three pH readings, p, is defined such that $7.0 < p < 7.8$. If the first two readings are 7.2 and 7.6, which value for the third reading will result in an overall rating of normal?
1) 6.2
2) 7.3
3) 8.6
4) 8.8

142 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.

143 Sarah wants to buy a snowboard that has a total cost of $580, including tax. She has already saved $135 for it. At the end of each week, she is paid $96 for babysitting and is going to save three-quarters of that for the snowboard. Write an inequality that can be used to determine the minimum number of weeks Sarah needs to babysit to have enough money to purchase the snowboard. Determine and state the minimum number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

144 A school plans to have a fundraiser before basketball games selling shirts with their school logo. The school contacted two companies to find out how much it would cost to have the shirts made. Company A charges a $50 set-up fee and $5 per shirt. Company B charges a $25 set-up fee and $6 per shirt. Write an equation for Company A that could be used to determine the total cost, A, when x shirts are ordered. Write a second equation for Company B that could be used to determine the total cost, B, when x shirts are ordered. Determine algebraically and state the minimum number of shirts that must be ordered for it to be cheaper to use Company A.

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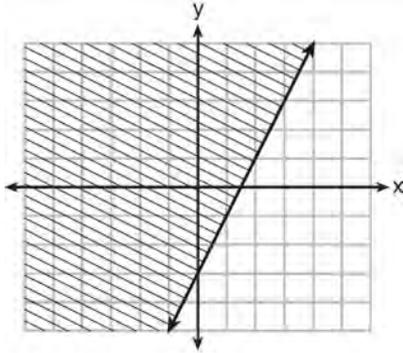
1) $y \leq 2x - 3$
2) $y \geq 2x - 3$
3) $y \leq -3x + 2$
4) $y \geq -3x + 2$

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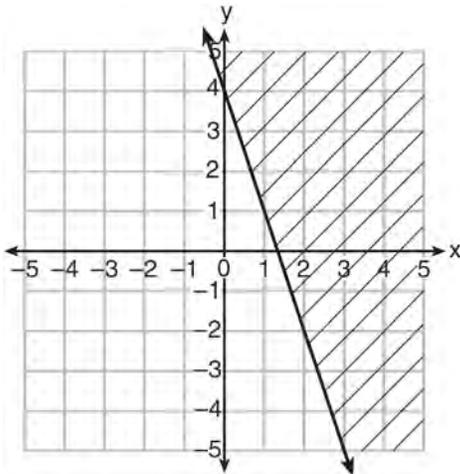
1) $y \geq -3x + 4$
2) $y \leq -3x + 4$
3) $y \geq -4x - 3$
4) $y \leq -4x - 3$

147 On the set of axes below, graph the inequality
$2x + y > 1$.
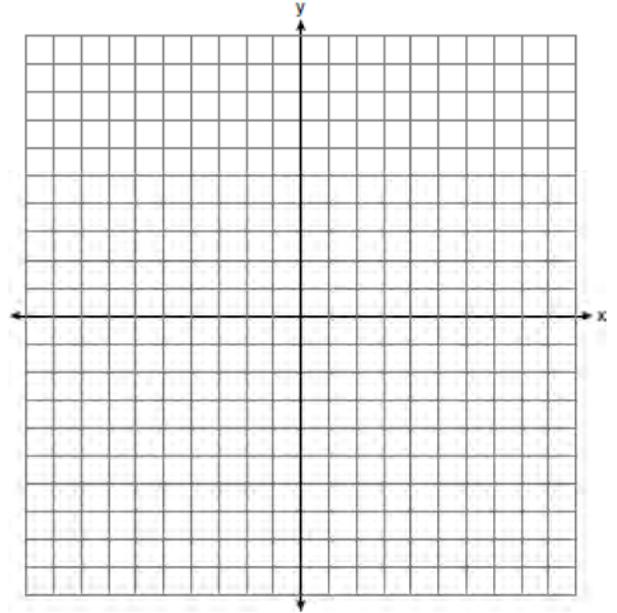
148 Graph the inequality $y > 2x - 5$ on the set of axes
below. State the coordinates of a point in its
solution.
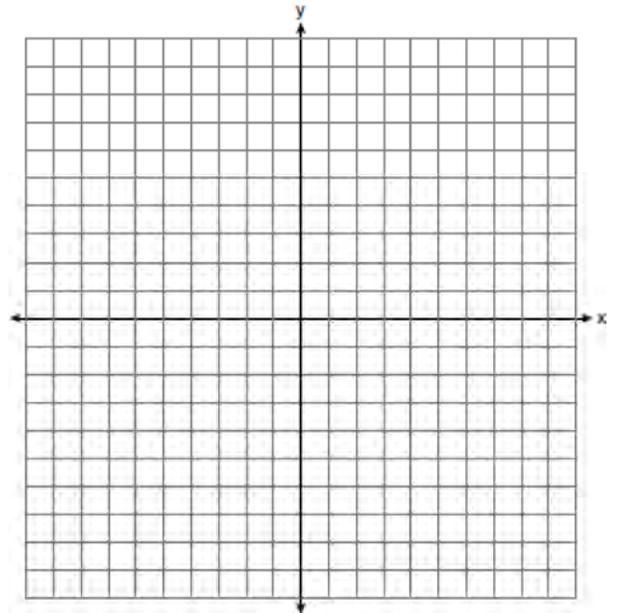
149 Graph the inequality $y + 4 < -2(x - 4)$ on the set of axes below.
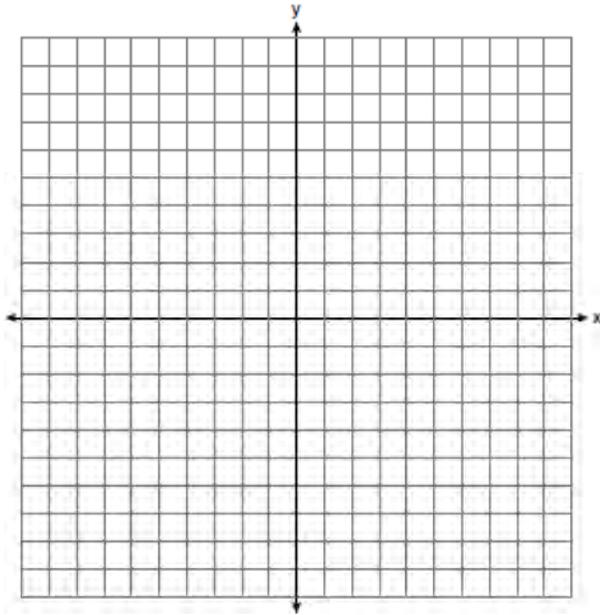
150 Shawn incorrectly graphed the inequality $-x - 2y \geq 8$ as shown below.
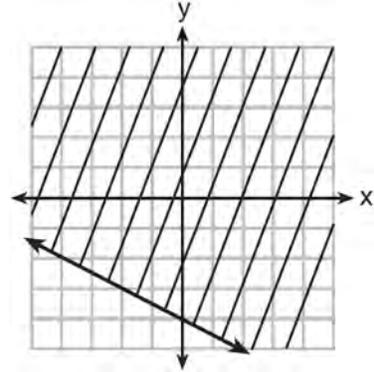
Explain Shawn's mistake. Graph the inequality correctly on the set of axes below.
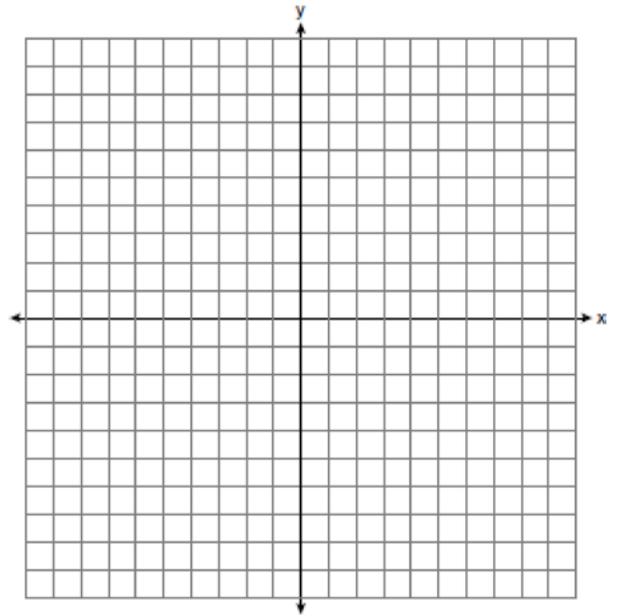
151 Myranda received a movie gift card for $100 to her local theater. Matinee tickets cost $7.50 each and evening tickets cost $12.50 each. If x represents the number of matinee tickets she could purchase, and y represents the number of evening tickets she could purchase, write an inequality that represents all the possible ways Myranda could spend her gift card on movies at the theater. On the set of axes below, graph this inequality.
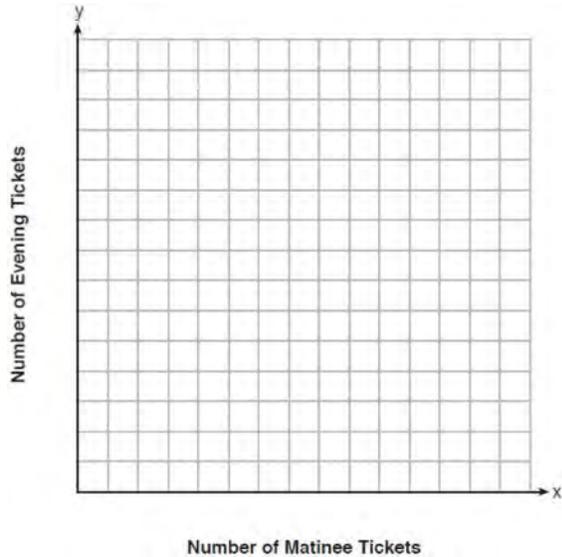
What is the maximum number of matinee tickets Myranda could purchase with her gift card? Explain your answer.

153 On the set of axes below, graph $f(x) = |x - 3| + 2$.

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

152 What is the *minimum* value of the function $y = |x + 3| - 2$?
1) −2
2) 2
3) 3
4) −3
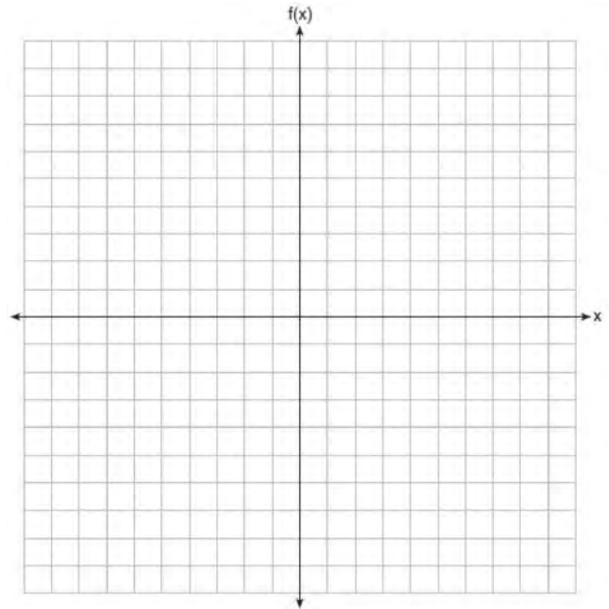
154 On the set of axes below, graph the function
$y = |x + 1|$.
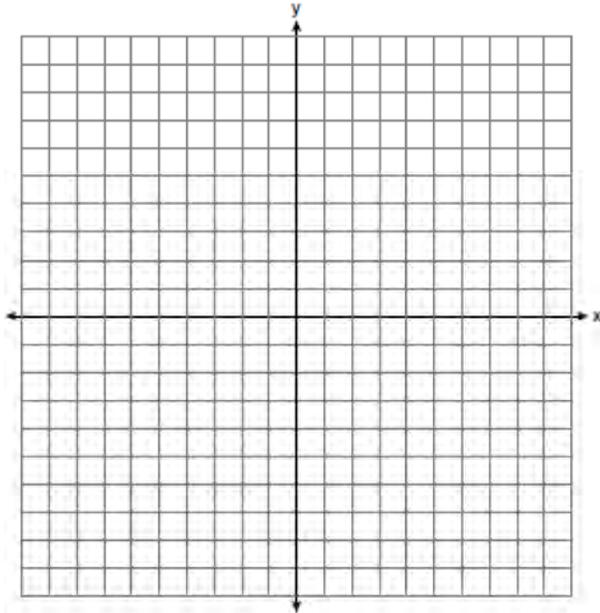
State the range of the function. State the domain over which the function is increasing.

### F.BF.B.3: GRAPHING ABSOLUTE VALUE FUNCTIONS

155 Describe the effect that each transformation below has on the function $f(x) = |x|$, where $a > 0$.
$g(x) = |x - a|$
$h(x) = |x| - a$

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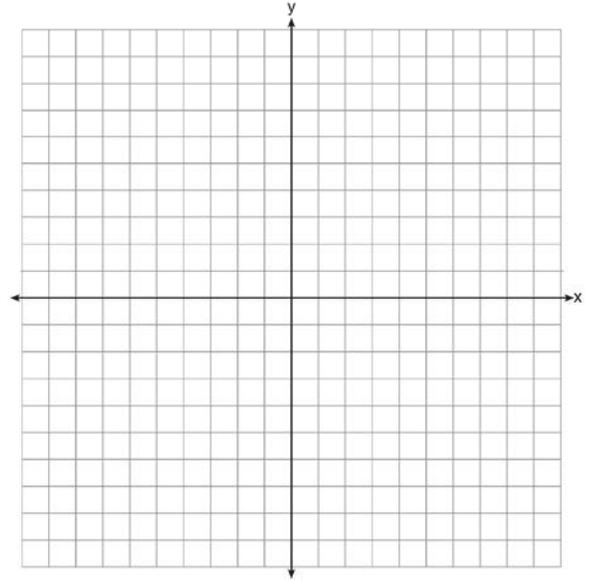
If $g(x) = f(x) - 2$, how is the graph of $f(x)$ translated to form the graph of $g(x)$? If $h(x) = f(x - 4)$, how is the graph of $f(x)$ translated to form the graph of $h(x)$?

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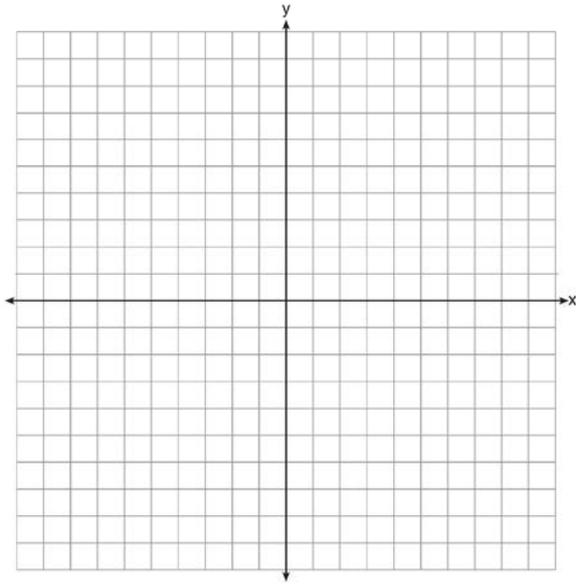
Explain how the graph of $y = |x - 3|$ has changed from the related graph $y = |x|$.

QUADRATICS

A.REI.B.4: SOLVING QUADRATICS

158 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) $9x^2 - 6x + 1 = 5$

159 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

160 What is the solution of the equation $2(x + 2)^2 - 4 = 28$?
1) 6, only
2) 2, only
3) 2 and -6
4) 6 and -2

161 Which value of x is a solution to the equation $13 - 36x^2 = -12$?
1) $\dfrac{36}{25}$
2) $\dfrac{25}{36}$
3) $-\dfrac{6}{5}$
4) $-\dfrac{5}{6}$

162 What are the solutions to the equation $3(x - 4)^2 = 27$?
1) 1 and 7
2) -1 and -7
3) $4 \pm \sqrt{24}$
4) $-4 \pm \sqrt{24}$

33

163 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) $-7 \pm \sqrt{3}$

167 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) $-2 \pm 4\sqrt{5}$

164 What are the solutions to the equation
$3x^2 + 10x = 8$?
1) $\frac{2}{3}$ and -4
2) $-\frac{2}{3}$ and 4
3) $\frac{4}{3}$ and -2
4) $-\frac{4}{3}$ and 2

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

165 What is the solution set of the equation
$(x - 2)(x - a) = 0$?
1) -2 and a
2) -2 and $-a$
3) 2 and a
4) 2 and $-a$

169 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) $x = -4 \pm 2\sqrt{2}$

166 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) $(2x + 3)(x - 1) = 0$

170 What are the solutions to the equation
$x^2 - 8x = 10$?
1) $4 \pm \sqrt{10}$
2) $4 \pm \sqrt{26}$
3) $-4 \pm \sqrt{10}$
4) $-4 \pm \sqrt{26}$

171 The quadratic equation $x^2 - 6x = 12$ is rewritten in the form $(x + p)^2 = q$, where q is a constant. What is the value of p?
1) -12
2) -9
3) -3
4) 9

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

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

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

175 The method of completing the square was used to solve the equation $2x^2 - 12x + 6 = 0$. Which equation is a correct step when using this method?
1) $(x - 3)^2 = 6$
2) $(x - 3)^2 = -6$
3) $(x - 3)^2 = 3$
4) $(x - 3)^2 = -3$

176 Which equation has the same solution as $x^2 + 8x - 33 = 0$?
1) $(x + 4)^2 = 49$
2) $(x - 4)^2 = 49$
3) $(x + 4)^2 = 17$
4) $(x - 4)^2 = 17$

177 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) $-3 \pm 4\sqrt{14}$

178 The roots of $x^2 - 5x - 4 = 0$ are
1) 1 and 4
2) $\dfrac{5 \pm \sqrt{41}}{2}$
3) -1 and -4
4) $\dfrac{-5 \pm \sqrt{41}}{2}$

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

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

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

182 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.

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

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

185 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*.

186 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and -6. Do you agree with Amy's solutions? Explain why or why not.

187 The height, H, in feet, of an object dropped from the top of a building after t seconds is given by $H(t) = -16t^2 + 144$. How many feet did the object fall between one and two seconds after it was dropped? Determine, algebraically, how many seconds it will take for the object to reach the ground.

188 Janice is asked to solve $0 = 64x^2 + 16x - 3$. She begins the problem by writing the following steps:

Line 1 $0 = 64x^2 + 16x - 3$
Line 2 $0 = B^2 + 2B - 3$
Line 3 $0 = (B+3)(B-1)$

Use Janice's procedure to solve the equation for x. Explain the method Janice used to solve the quadratic equation.

189 Solve the equation $x^2 - 6x = 15$ by completing the square.

190 Solve for x to the *nearest tenth*: $x^2 + x - 5 = 0$.

191 Solve the following equation by completing the square: $x^2 + 4x = 2$

192 Solve $x^2 - 8x - 9 = 0$ algebraically. Explain the first step you used to solve the given equation.

193 Solve the quadratic equation below for the exact values of x.
$$4x^2 - 5 = 75$$

194 Solve $5x^2 = 180$ algebraically.

195 Solve $6x^2 - 42 = 0$ for the exact values of x.

A.REI.B.4: USING THE DISCRIMINANT

196 How many real-number solutions does $4x^2 + 2x + 5 = 0$ have?
1) one
2) two
3) zero
4) infinitely many

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

198 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.
$$0 = 2x^2 + 3x - 10$$

A.CED.A.1: MODELING QUADRATICS

199 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) $j^2 - 2j = 783$

200 Abigail's and Gina's ages are consecutive integers. Abigail is younger than Gina and Gina's age is represented by x. If the difference of the square of Gina's age and eight times Abigail's age is 17, which equation could be used to find Gina's age?
1) $(x + 1)^2 - 8x = 17$
2) $(x - 1)^2 - 8x = 17$
3) $x^2 - 8(x + 1) = 17$
4) $x^2 - 8(x - 1) = 17$

A.CED.A.1: GEOMETRIC APPLICATIONS OF QUADRATICS

201 The length of a rectangular patio is 7 feet more than its width, w. The area of a patio, $A(w)$, can be represented by the function
1) $A(w) = w + 7$
2) $A(w) = w^2 + 7w$
3) $A(w) = 4w + 14$
4) $A(w) = 4w^2 + 28w$

202 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) $(15)(18) = 120 + x^2$

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

204 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.

205 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*.

206 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.

207 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.
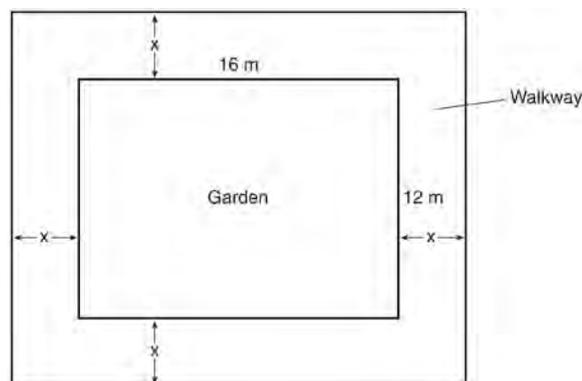
Write an equation that can be used to find x, the width of the walkway. Describe how your equation models the situation. Determine and state the width of the walkway, in meters.

208 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.

209 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*.

F.IF.C.8: VERTEX FORM OF A QUADRATIC

210 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

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

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

213 Which equation and ordered pair represent the correct vertex form and vertex for $j(x) = x^2 - 12x + 7$?
1) $j(x) = (x - 6)^2 + 43, \ (6,43)$
2) $j(x) = (x - 6)^2 + 43, \ (-6,43)$
3) $j(x) = (x - 6)^2 - 29, \ (6,-29)$
4) $j(x) = (x - 6)^2 - 29, \ (-6,-29)$

214 The function $f(x) = 3x^2 + 12x + 11$ can be written in vertex form as
1) $f(x) = (3x + 6)^2 - 25$
2) $f(x) = 3(x + 6)^2 - 25$
3) $f(x) = 3(x + 2)^2 - 1$
4) $f(x) = 3(x + 2)^2 + 7$

215 Which equation is equivalent to $y = x^2 + 24x - 18$?
1) $y = (x + 12)^2 - 162$
2) $y = (x + 12)^2 + 126$
3) $y = (x - 12)^2 - 162$
4) $y = (x - 12)^2 + 126$

216 Determine and state the vertex of $f(x) = x^2 - 2x - 8$ using the method of completing the square.

217 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.

F.IF.B.4: GRAPHING QUADRATIC FUNCTIONS

218 The height of a rocket, at selected times, is shown in the table below.

Time (sec)	0	1	2	3	4	5	6	7
Height (ft)	180	260	308	324	308	260	180	68

Based on these data, which statement is *not* a valid conclusion?
1) The rocket was launched from a height of 180 feet.
2) The maximum height of the rocket occurred 3 seconds after launch.
3) The rocket was in the air approximately 6 seconds before hitting the ground.
4) The rocket was above 300 feet for approximately 2 seconds.

219 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.
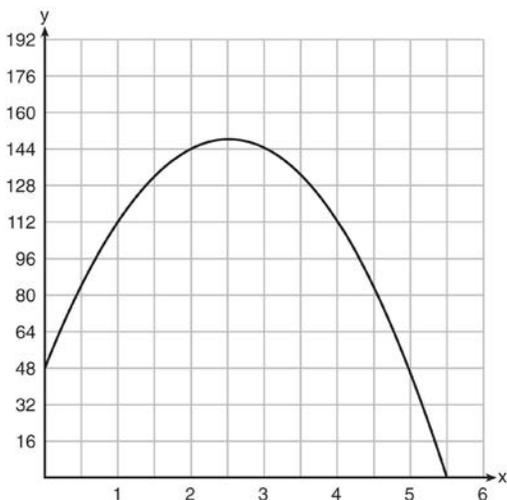
For which interval is the ball's height always *decreasing*?
1) $0 \le x \le 2.5$
2) $0 < x < 5.5$
3) $2.5 < x < 5.5$
4) $x \ge 2$

220 The graph of a quadratic function is shown below.
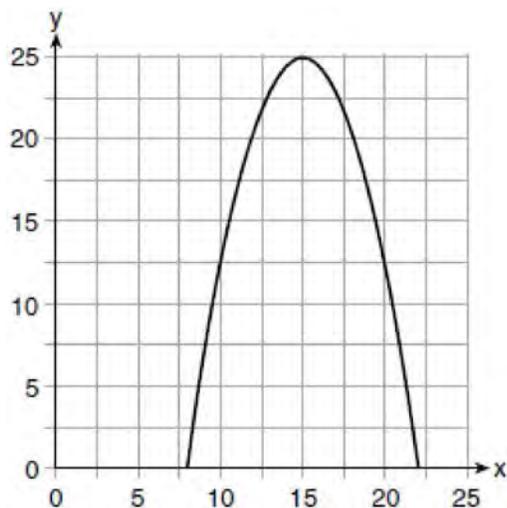
An equation that represents the function could be
1) $q(x) = \frac{1}{2}(x + 15)^2 - 25$
2) $q(x) = -\frac{1}{2}(x + 15)^2 - 25$
3) $q(x) = \frac{1}{2}(x - 15)^2 + 25$
4) $q(x) = -\frac{1}{2}(x - 15)^2 + 25$

221 Morgan throws a ball up into the air. The height of the ball above the ground, in feet, is modeled by the function $h(t) = -16t^2 + 24t$, where t represents the time, in seconds, since the ball was thrown. What is the appropriate domain for this situation?
1) $0 \leq t \leq 1.5$
2) $0 \leq t \leq 9$
3) $0 \leq h(t) \leq 1.5$
4) $0 \leq h(t) \leq 9$

222 The height of a ball Doreen tossed into the air can be modeled by the function $h(x) = -4.9x^2 + 6x + 5$, where x is the time elapsed in seconds, and $h(x)$ is the height in meters. The number 5 in the function represents
1) the initial height of the ball
2) the time at which the ball reaches the ground
3) the time at which the ball was at its highest point
4) the maximum height the ball attained when thrown in the air

223 A ball is thrown into the air from the top of a building. The height, $h(t)$, of the ball above the ground t seconds after it is thrown can be modeled by $h(t) = -16t^2 + 64t + 80$. How many seconds after being thrown will the ball hit the ground?
1) 5
2) 2
3) 80
4) 144

224 The expression $-4.9t^2 + 50t + 2$ represents the height, in meters, of a toy rocket t seconds after launch. The initial height of the rocket, in meters, is
1) 0
2) 2
3) 4.9
4) 50

225 Graph the function $f(x) = -x^2 - 6x$ on the set of axes below.
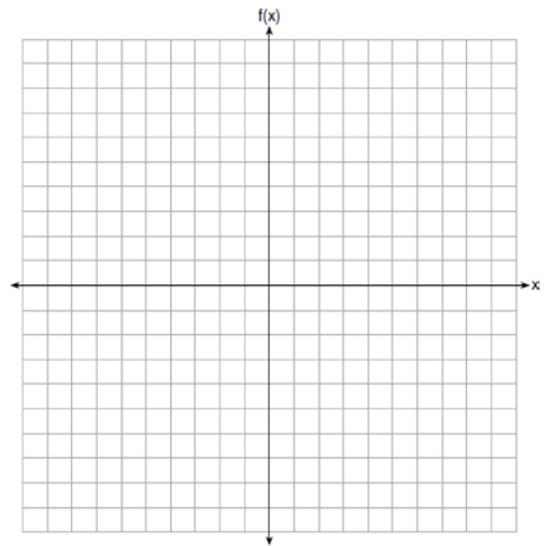
State the coordinates of the vertex of the graph.

226   On the set of axes below, draw the graph of
$y = x^2 - 4x - 1$.
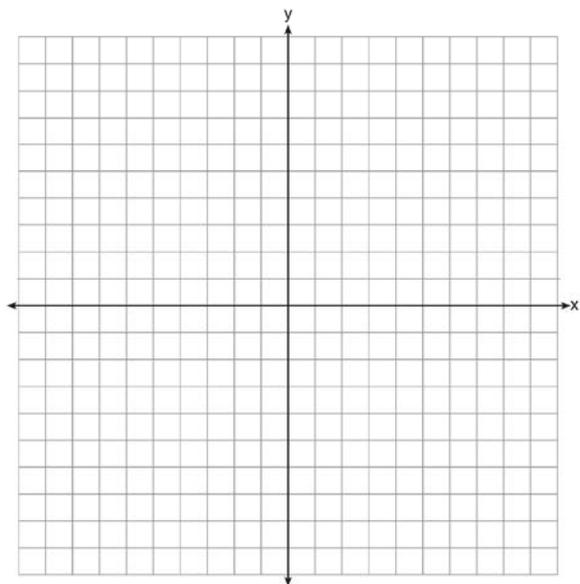
State the equation of the axis of symmetry.

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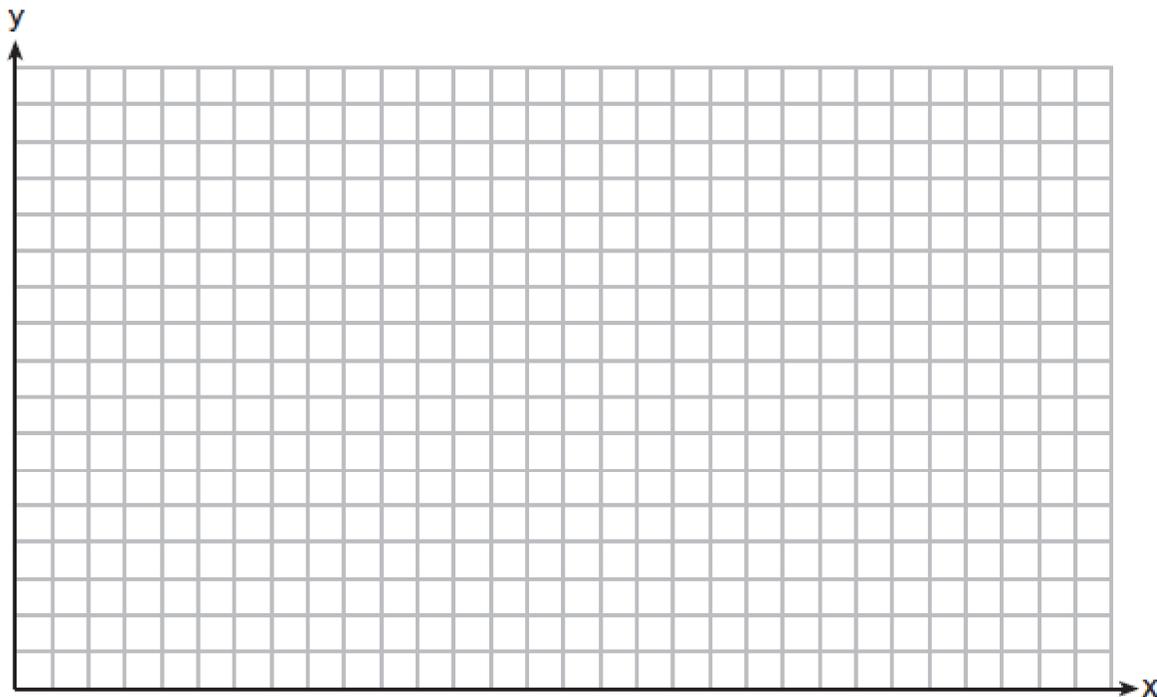

Determine the vertex of $y = h(x)$. Interpret the meaning of this vertex in the context of the problem. The goal post is 10 feet high and 45 yards away from the kick. Will the ball be high enough to pass over the goal post? Justify your answer.

228 Alex launched a ball into the air. The height of the ball can be represented by the equation $h = -8t^2 + 40t + 5$, where h is the height, in units, and t is the time, in seconds, after the ball was launched. Graph the equation from $t = 0$ to $t = 5$ seconds.
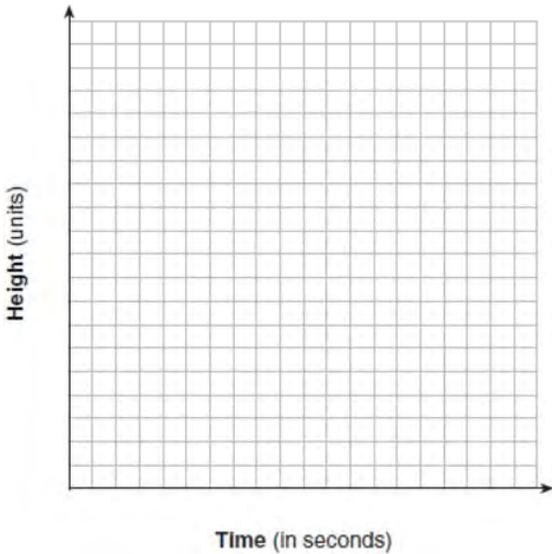
State the coordinates of the vertex and explain its meaning in the context of the problem.

229 Paul plans to have a rectangular garden adjacent to his garage. He will use 36 feet of fence to enclose three sides of the garden. The area of the garden, in square feet, can be modeled by $f(w) = w(36 - 2w)$, where w is the width in feet. On the set of axes below, sketch the graph of $f(w)$.
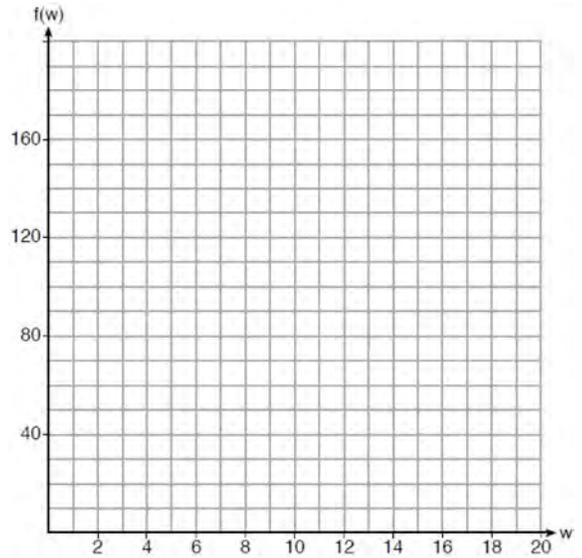

Explain the meaning of the vertex in the context of the problem.

230 If the zeros of a quadratic function, F, are -3 and 5, what is the equation of the axis of symmetry of F? Justify your answer.

231 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.

232 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.

233 An Air Force pilot is flying at a cruising altitude of 9000 feet and is forced to eject from her aircraft. The function $h(t) = -16t^2 + 128t + 9000$ models the height, in feet, of the pilot above the ground, where t is the time, in seconds, after she is ejected from the aircraft. Determine and state the vertex of $h(t)$. Explain what the second coordinate of the vertex represents in the context of the problem. After the pilot was ejected, what is the maximum number of feet she was above the aircraft's cruising altitude? Justify your answer.

234 When an apple is dropped from a tower 256 feet high, the function $h(t) = -16t^2 + 256$ models the height of the apple, in feet, after t seconds. Determine, algebraically, the number of seconds it takes the apple to hit the ground.

F.IF.C.7: GRAPHING QUADRATIC FUNCTIONS

235 The graph of the function $f(x) = ax^2 + bx + c$ is given below.
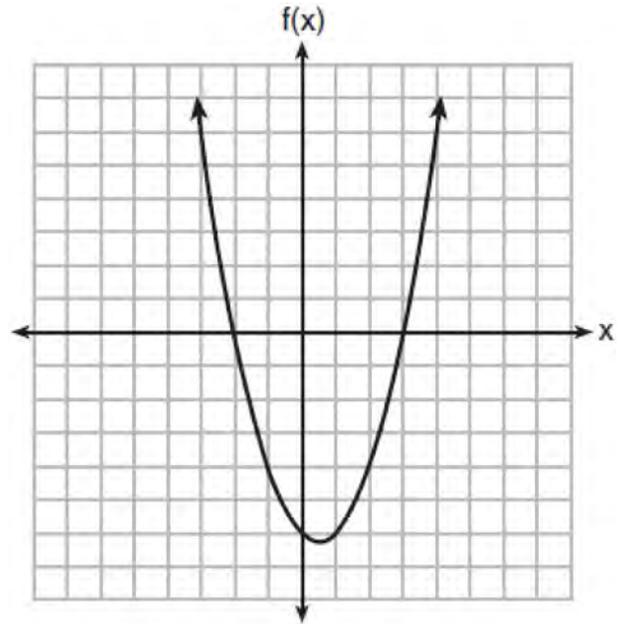
Could the factors of $f(x)$ be $(x + 2)$ and $(x - 3)$? Based on the graph, explain why or why *not*.

POWERS
A.SSE.B.3: MODELING EXPONENTIAL FUNCTIONS

236 Materials A and B decay over time. The function for the amount of material A is $A(t) = 1000(0.5)^{2t}$ and for the amount of material B is $B(t) = 1000(0.25)^t$, where t represents time in days. On which day will the amounts of material be equal?
1) initial day, only
2) day 2, only
3) day 5, only
4) every day

Algebra I Regents Exam Questions by State Standard: Topic

237 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

238 The growth of a certain organism can be modeled by $C(t) = 10(1.029)^{24t}$, where $C(t)$ is the total number of cells after t hours. Which function is approximately equivalent to $C(t)$?
1) $C(t) = 240(.083)^{24t}$
2) $C(t) = 10(.083)^{t}$
3) $C(t) = 10(1.986)^{t}$
4) $C(t) = 240(1.986)^{\frac{t}{24}}$

239 A computer application generates a sequence of musical notes using the function $f(n) = 6(16)^{n}$, where n is the number of the note in the sequence and $f(n)$ is the note frequency in hertz. Which function will generate the same note sequence as $f(n)$?
1) $g(n) = 12(2)^{4n}$
2) $h(n) = 6(2)^{4n}$
3) $p(n) = 12(4)^{2n}$
4) $k(n) = 6(8)^{2n}$

240 Mario's \$15,000 car depreciates in value at a rate of 19% per year. The value, V, after t years can be modeled by the function $V = 15,000(0.81)^{t}$. Which function is equivalent to the original function?
1) $V = 15,000(0.9)^{9t}$
2) $V = 15,000(0.9)^{2t}$
3) $V = 15,000(0.9)^{\frac{t}{9}}$
4) $V = 15,000(0.9)^{\frac{t}{2}}$

241 Nora inherited a savings account that was started by her grandmother 25 years ago. This scenario is modeled by the function $A(t) = 5000(1.013)^{t+25}$, where $A(t)$ represents the value of the account, in dollars, t years after the inheritance. Which function below is equivalent to $A(t)$?
1) $A(t) = 5000[(1.013^{t})]^{25}$
2) $A(t) = 5000[(1.013)^{t} + (1.013)^{25}]$
3) $A(t) = (5000)^{t}(1.013)^{25}$
4) $A(t) = 5000(1.013)^{t}(1.013)^{25}$

242 The number of bacteria grown in a lab can be modeled by $P(t) = 300 \bullet 2^{4t}$, where t is the number of hours. Which expression is equivalent to $P(t)$?
1) $300 \bullet 8^{t}$
2) $300 \bullet 16^{t}$
3) $300^{t} \bullet 2^{4}$
4) $300^{2t} \bullet 2^{2t}$

243 The population of a city can be modeled by $P(t) = 3810(1.0005)^{7t}$, where $P(t)$ is the population after t years. Which function is approximately equivalent to $P(t)$?

1) $P(t) = 3810(0.1427)^t$
2) $P(t) = 3810(1.0035)^t$
3) $P(t) = 26,670(0.1427)^t$
4) $P(t) = 26,670(1.0035)^t$

244 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 $g(t)$.

A.CED.A.1: MODELING EXPONENTIAL FUNCTIONS

245 The Ebola virus has an infection rate of 11% per day as compared to the SARS virus, which has a rate of 4% per day. If there were one case of Ebola and 30 cases of SARS initially reported to authorities and cases are reported each day, which statement is true?

1) At day 10 and day 53 there are more Ebola cases.
2) At day 10 and day 53 there are more SARS cases.
3) At day 10 there are more SARS cases, but at day 53 there are more Ebola cases.
4) At day 10 there are more Ebola cases, but at day 53 there are more SARS cases.

246 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.

247 A car was purchased for $25,000. Research shows that the car has an average yearly depreciation rate of 18.5%. Create a function that will determine the value, $V(t)$, of the car t years after purchase. Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

248 Marilyn collects old dolls. She purchases a doll for $450. Research shows this doll's value will increase by 2.5% each year. Write an equation that determines the value, V, of the doll t years after purchase. Assuming the doll's rate of appreciation remains the same, will the doll's value be doubled in 20 years? Justify your reasoning.

249 On the day Alexander was born, his father invested $5000 in an account with a 1.2% annual growth rate. Write a function, $A(t)$, that represents the value of this investment t years after Alexander's birth. Determine, to the *nearest dollar*, how much more the investment will be worth when Alexander turns 32 than when he turns 17.

F.BF.A.1: MODELING EXPONENTIAL FUNCTIONS

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

251 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) $3000(1 - 0.02)^{18}$

252 A student invests $500 for 3 years in a savings account that earns 4% interest per year. No further deposits or withdrawals are made during this time. Which statement does not yield the correct balance in the account at the end of 3 years?
1) $500(1.04)^3$
2) $500(1 -.04)^3$
3) $500(1 +.04)(1 +.04)(1 +.04)$
4) $500 + 500(.04) + 520(.04) + 540.8(.04)$

253 Anne invested $1000 in an account with a 1.3% annual interest rate. She made no deposits or withdrawals on the account for 2 years. If interest was compounded annually, which equation represents the balance in the account after the 2 years?
1) $A = 1000(1 - 0.013)^2$
2) $A = 1000(1 + 0.013)^2$
3) $A = 1000(1 - 1.3)^2$
4) $A = 1000(1 + 1.3)^2$

254 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.

F.LE.A.2: MODELING EXPONENTIAL FUNCTIONS

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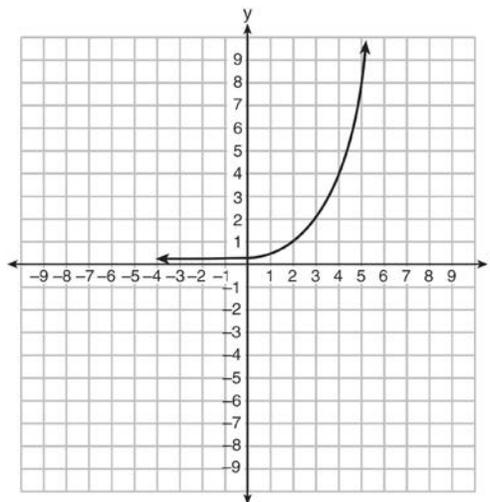
Explain how you determined the equation.

256 The table below shows the temperature, $T(m)$, of a cup of hot chocolate that is allowed to chill over several minutes, m.

Time, m (minutes)	0	2	4	6	8
Temperature, T(m) (°F)	150	108	78	56	41

Which expression best fits the data for $T(m)$?

1) $150(0.85)^m$

2) $150(1.15)^m$

3) $150(0.85)^{m-1}$

4) $150(1.15)^{m-1}$

257 Jill invests $400 in a savings bond. The value of the bond, $V(x)$, in hundreds of dollars after x years is illustrated in the table below.

x	V(x)
0	4
1	5.4
2	7.29
3	9.84

Which equation and statement illustrate the approximate value of the bond in hundreds of dollars over time in years?

1) $V(x) = 4(0.65)^x$ and it grows.

2) $V(x) = 4(0.65)^x$ and it decays.

3) $V(x) = 4(1.35)^x$ and it grows.

4) $V(x) = 4(1.35)^x$ and it decays.

258 Marc bought a new laptop for $1250. He kept track of the value of the laptop over the next three years, as shown in the table below.

Years After Purchase	Value in Dollars
1	1000
2	800
3	640

Which function can be used to determine the value of the laptop for x years after the purchase?

1) $f(x) = 1000(1.2)^x$

2) $f(x) = 1000(0.8)^x$

3) $f(x) = 1250(1.2)^x$

4) $f(x) = 1250(0.8)^x$

F.LE.B.5: MODELING EXPONENTIAL FUNCTIONS

259 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

260 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%

261 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

262 Milton has his money invested in a stock portfolio. The value, $v(x)$, of his portfolio can be modeled with the function $v(x) = 30,000(0.78)^x$, where x is the number of years since he made his investment. Which statement describes the rate of change of the value of his portfolio?
1) It decreases 78% per year.
2) It decreases 22% per year.
3) It increases 78% per year.
4) It increases 22% per year.

263 The 2014 winner of the Boston Marathon runs as many as 120 miles per week. During the last few weeks of his training for an event, his mileage can be modeled by $M(w) = 120(.90)^{w-1}$, where w represents the number of weeks since training began. Which statement is true about the model $M(w)$?
1) The number of miles he runs will increase by 90% each week.
2) The number of miles he runs will be 10% of the previous week.
3) $M(w)$ represents the total mileage run in a given week.
4) w represents the number of weeks left until his marathon.

264 A population of bacteria can be modeled by the function $f(t) = 1000(0.98)^t$, where t represents the time since the population started decaying, and $f(t)$ represents the population of the remaining bacteria at time t. What is the rate of decay for this population?
1) 98%
2) 2%
3) 0.98%
4) 0.02%

265 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.

266 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.

267 The value, $v(t)$, of a car depreciates according to the function $v(t) = P(.85)^t$, where P is the purchase price of the car and t is the time, in years, since the car was purchased. State the percent that the value of the car *decreases* by each year. Justify your answer.

F.IF.C.7: GRAPHING EXPONENTIAL FUNCTIONS

268 Graph the function $f(x) = 2^x - 7$ on the set of axes below.
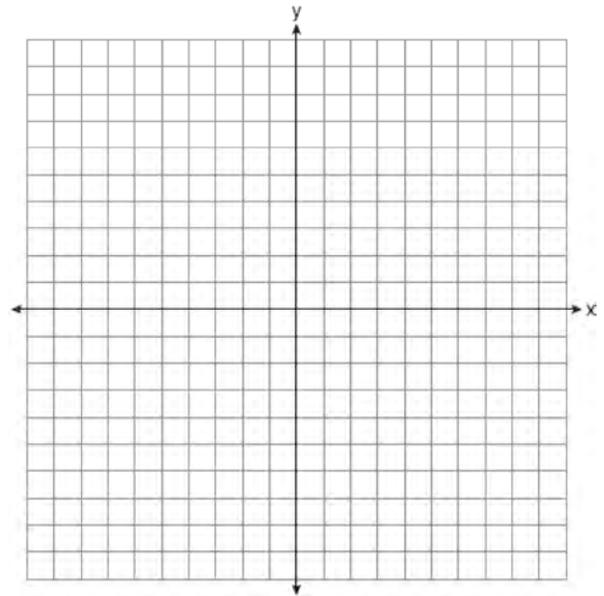
If $g(x) = 1.5x - 3$, determine if $f(x) > g(x)$ when $x = 4$. Justify your answer.

POLYNOMIALS
A.REI.D.10: IDENTIFYING SOLUTIONS

269 The solution of an equation with two variables, x and y, is
1) the set of all x values that make $y = 0$
2) the set of all y values that make $x = 0$
3) the set of all ordered pairs, (x,y), that make the equation true
4) the set of all ordered pairs, (x,y), where the graph of the equation crosses the y-axis

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

271 Which ordered pair below is *not* a solution to
$f(x) = x^2 - 3x + 4$?
1) $(0, 4)$
2) $(1.5, 1.75)$
3) $(5, 14)$
4) $(-1, 6)$

272 Which point is *not* in the solution set of the
equation $3y + 2 = x^2 - 5x + 17$?
1) $(-2, 10)$
2) $(-1, 7)$
3) $(2, 3)$
4) $(5, 5)$

273 Which ordered pair does *not* represent a point on
the graph of $y = 3x^2 - x + 7$?
1) $(-1.5, 15.25)$
2) $(0.5, 7.25)$
3) $(1.25, 10.25)$
4) $(2.5, 23.25)$

274 Which ordered pair would *not* be a solution to
$y = x^3 - x$?
1) $(-4, -60)$
2) $(-3, -24)$
3) $(-2, -6)$
4) $(-1, -2)$

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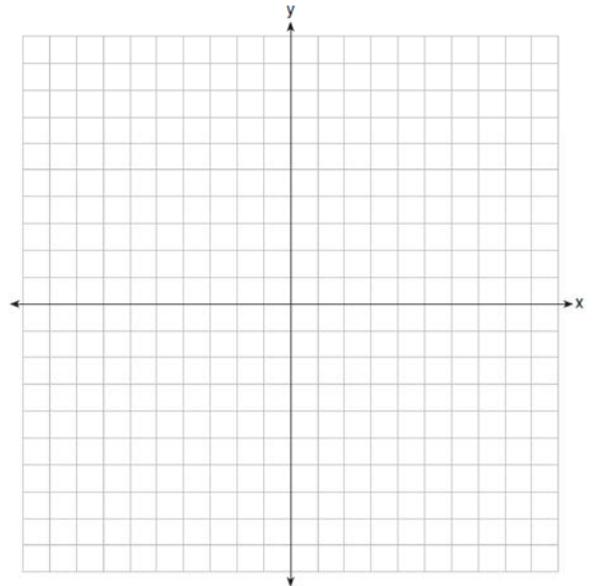
Is the point $(3, 2)$ a solution to the equation?
Explain your answer based on the graph drawn.

A.APR.A.1: OPERATIONS WITH POLYNOMIALS

276 If $C = 2a^2 - 5$ and $D = 3 - a$, then $C - 2D$ equals
1) $2a^2 + a - 8$
2) $2a^2 - a - 8$
3) $2a^2 + 2a - 11$
4) $2a^2 - a - 11$

277 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) $5x^2 - x + 1$

278 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) $3x^2 - 14x + 14$

279 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) $x^2 + 12x + 9$

280 The expression $3(x^2 - 1) - (x^2 - 7x + 10)$ is
equivalent to
1) $2x^2 - 7x + 7$
2) $2x^2 + 7x - 13$
3) $2x^2 - 7x + 9$
4) $2x^2 + 7x - 11$

281 What is the product of $2x + 3$ and $4x^2 - 5x + 6$?
1) $8x^3 - 2x^2 + 3x + 18$
2) $8x^3 - 2x^2 - 3x + 18$
3) $8x^3 + 2x^2 - 3x + 18$
4) $8x^3 + 2x^2 + 3x + 18$

282 Which expression is equivalent to
$2(3g - 4) - (8g + 3)$?
1) $-2g - 1$
2) $-2g - 5$
3) $-2g - 7$
4) $-2g - 11$

283 Which polynomial is twice the sum of $4x^2 - x + 1$
and $-6x^2 + x - 4$?
1) $-2x^2 - 3$
2) $-4x^2 - 3$
3) $-4x^2 - 6$
4) $-2x^2 + x - 5$

284 The expression $3(x^2 + 2x - 3) - 4(4x^2 - 7x + 5)$ is
equivalent to
1) $-13x - 22x + 11$
2) $-13x^2 + 34x - 29$
3) $19x^2 - 22x + 11$
4) $19x^2 + 34x - 29$

285 If $y = 3x^3 + x^2 - 5$ and $z = x^2 - 12$, which
polynomial is equivalent to $2(y + z)$?
1) $6x^3 + 4x^2 - 34$
2) $6x^3 + 3x^2 - 17$
3) $6x^3 + 3x^2 - 22$
4) $6x^3 + 2x^2 - 17$

286 Which expression is equivalent to
$2(x^2 - 1) + 3x(x - 4)$?
1) $5x^2 - 5$
2) $5x^2 - 6$
3) $5x^2 - 12x - 1$
4) $5x^2 - 12x - 2$

287 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) $6x^2 - 6x - 11$

288 The length, width, and height of a rectangular box are represented by $2x$, $3x + 1$, and $5x - 6$, respectively. When the volume is expressed as a polynomial in standard form, what is the coefficient of the 2nd term?
1) -13
2) 13
3) -26
4) 26

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

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

291 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?

292 Express in simplest form:
$(3x^2 + 4x - 8) - (-2x^2 + 4x + 2)$

293 Write the expression $5x + 4x^2(2x + 7) - 6x^2 - 9x$ as a polynomial in standard form.

294 If $C = G - 3F$, find the trinomial that represents C when $F = 2x^2 + 6x - 5$ and $G = 3x^2 + 4$.

A.SSE.A.2: FACTORING POLYNOMIALS

295 The trinomial $x^2 - 14x + 49$ can be expressed as
1) $(x - 7)^2$
2) $(x + 7)^2$
3) $(x - 7)(x + 7)$
4) $(x - 7)(x + 2)$

296 David correctly factored the expression $m^2 - 12m - 64$. Which expression did he write?
1) $(m - 8)(m - 8)$
2) $(m - 8)(m + 8)$
3) $(m - 16)(m + 4)$
4) $(m + 16)(m - 4)$

297 Which expression is *not* equivalent to $2x^2 + 10x + 12$?
1) $(2x + 4)(x + 3)$
2) $(2x + 6)(x + 2)$
3) $(2x + 3)(x + 4)$
4) $2(x + 3)(x + 2)$

298 When written in factored form, $4w^2 - 11w - 3$ is equivalent to
1) $(2w + 1)(2w - 3)$
2) $(2w - 1)(2w + 3)$
3) $(4w + 1)(w - 3)$
4) $(4w - 1)(w + 3)$

299 The area of a rectangle is represented by $3x^2 - 10x - 8$. Which expression can also be used to represent the area of the same rectangle?
1) $(3x + 2)(x - 4)$
2) $(3x + 2)(x + 4)$
3) $(3x + 4)(x - 2)$
4) $(3x - 4)(x + 2)$

300 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

301 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) $x(x - 2)(x + 15)$

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

A.SSE.A.2: FACTORING THE DIFFERENCE OF PERFECT SQUARES

303 The expression $4x^2 - 25$ is equivalent to
1) $(4x - 5)(x + 5)$
2) $(4x + 5)(x - 5)$
3) $(2x + 5)(2x - 5)$
4) $(2x - 5)(2x - 5)$

304 Which expression is equivalent to $36x^2 - 100$?
1) $4(3x - 5)(3x - 5)$
2) $4(3x + 5)(3x - 5)$
3) $2(9x - 25)(9x - 25)$
4) $2(9x + 25)(9x - 25)$

305 Which expression is equivalent to $16x^2 - 36$?
1) $4(2x - 3)(2x - 3)$
2) $4(2x + 3)(2x - 3)$
3) $(4x - 6)(4x - 6)$
4) $(4x + 6)(4x + 6)$

306 The expression $16x^2 - 81$ is equivalent to
1) $(8x - 9)(8x + 9)$
2) $(8x - 9)(8x - 9)$
3) $(4x - 9)(4x + 9)$
4) $(4x - 9)(4x - 9)$

307 The expression $49x^2 - 36$ is equivalent to
1) $(7x - 6)^2$
2) $(24.5x - 18)^2$
3) $(7x - 6)(7x + 6)$
4) $(24.5x - 18)(24.5x + 18)$

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

309 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) $(p + 3)(p - 3)(p + 3)(p - 3)$

310 The expression $x^4 - 16$ is equivalent to
1) $(x^2 + 8)(x^2 - 8)$
2) $(x^2 - 8)(x^2 - 8)$
3) $(x^2 + 4)(x^2 - 4)$
4) $(x^2 - 4)(x^2 - 4)$

311 Which expression is equivalent to $y^4 - 100$?
1) $(y^2 - 10)^2$
2) $(y^2 - 50)^2$
3) $(y^2 + 10)(y^2 - 10)$
4) $(y^2 + 50)(y^2 - 50)$

312 The expression $w^4 - 36$ is equivalent to
1) $(w^2 - 18)(w^2 - 18)$
2) $(w^2 + 18)(w^2 - 18)$
3) $(w^2 - 6)(w^2 - 6)$
4) $(w^2 + 6)(w^2 - 6)$

313 Which expression is equivalent to $16x^4 - 64$?
1) $(4x^2 - 8)^2$
2) $(8x^2 - 32)^2$
3) $(4x^2 + 8)(4x^2 - 8)$
4) $(8x^2 + 32)(8x^2 - 32)$

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

A.APR.B.3: ZEROS OF POLYNOMIALS

315 Which function has zeros of -4 and 2?
1) $f(x) = x^2 + 7x - 8$
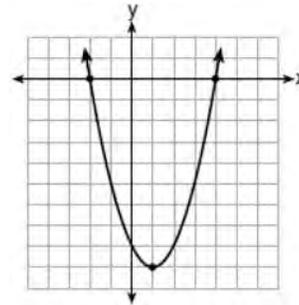
2)
3) $g(x) = x^2 - 7x - 8$
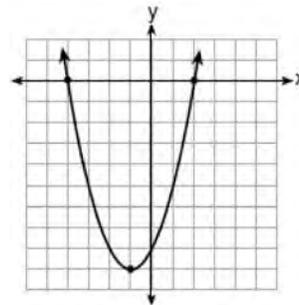
4)

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

1)

2)

3)

4)
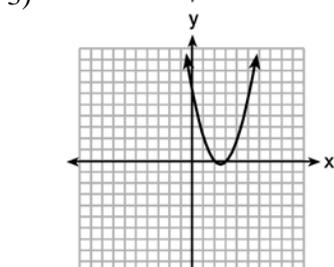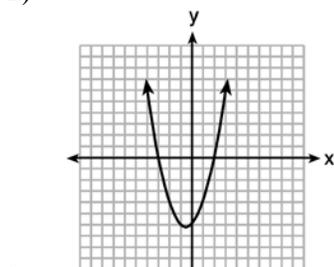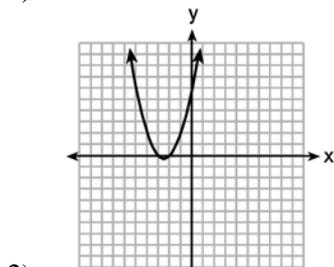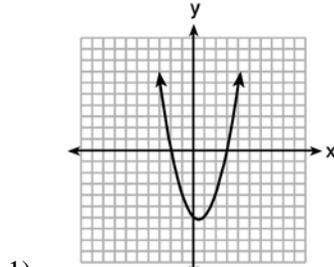
317 The graph of $y = \frac{1}{2}x^2 - x - 4$ is shown below. The points $A(-2,0)$, $B(0,-4)$, and $C(4,0)$ lie on this graph.
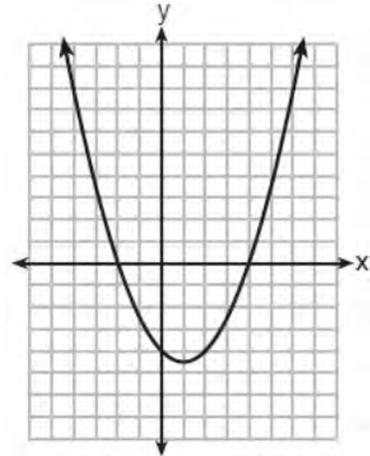
Which of these points can determine the zeros of the equation $y = \frac{1}{2}x^2 - x - 4$?

1) A, only
2) B, only
3) A and C, only
4) A, B, and C

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

319 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) $y = x^2 - 10x + 24$

320 Which polynomial function has zeros at −3, 0, and 4?
1) $f(x) = (x+3)(x^2+4)$
2) $f(x) = (x^2-3)(x-4)$
3) $f(x) = x(x+3)(x-4)$
4) $f(x) = x(x-3)(x+4)$

321 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

322 The zeros of the function $f(x) = x^2 - 5x - 6$ are
1) −1 and 6
2) 1 and −6
3) 2 and −3
4) −2 and 3

323 The zeros of the function $p(x) = x^2 - 2x - 24$ are
1) −8 and 3
2) −6 and 4
3) −4 and 6
4) −3 and 8

324 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

325 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

326 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

327 The zeros of the function $f(x) = 2x^3 + 12x - 10x^2$ are
1) {2,3}
2) {−1,6}
3) {0,2,3}
4) {0,−1,6}

328 If $f(x) = 2x^2 + x - 3$, which equation can be used to determine the zeros of the function?
1) $0 = (2x-3)(x+1)$
2) $0 = (2x+3)(x-1)$
3) $0 = 2x(x+1) - 3$
4) $0 = 2x(x-1) - 3(x+1)$

329 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.
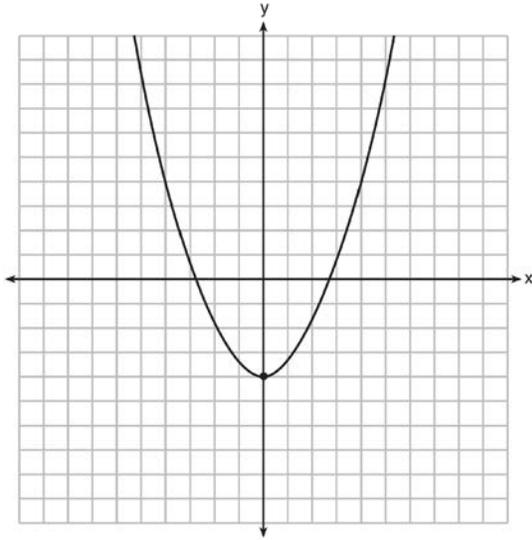
Find the zeros in simplest radical form.

330 Explain how to determine the zeros of
$f(x) = (x + 3)(x - 1)(x - 8)$. State the zeros of the
function.

331 Find the zeros of $f(x) = (x - 3)^2 - 49$, algebraically.

332 Determine all the zeros of $m(x) = x^2 - 4x + 3$,
algebraically.

333 Determine algebraically the zeros of
$f(x) = 3x^3 + 21x^2 + 36x$.

334 The function $r(x)$ is defined by the expression
$x^2 + 3x - 18$. Use factoring to determine the zeros
of $r(x)$. Explain what the zeros represent on the
graph of $r(x)$.

A.APR.B.3: GRAPHING POLYNOMIAL
FUNCTIONS

335 Which equation(s) represent the graph below?

I	$y = (x + 2)(x^2 - 4x - 12)$
II	$y = (x - 3)(x^2 + x - 2)$
III	$y = (x - 1)(x^2 - 5x - 6)$
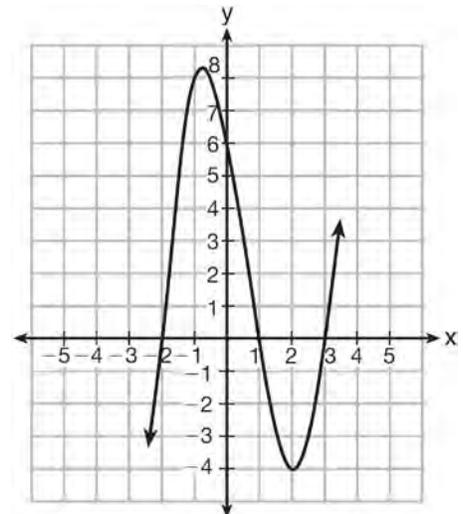
1) I, only
2) II, only
3) I and II
4) II and III

59

336 The graph of $f(x)$ is shown below.
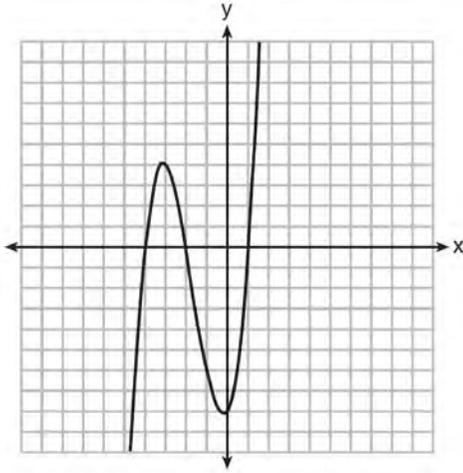
Which function could represent the graph of $f(x)$?

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

337 Based on the graph below, which expression is a possible factorization of $p(x)$?
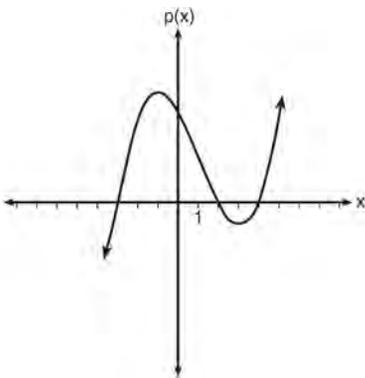
1) $(x+3)(x-2)(x-4)$
2) $(x-3)(x+2)(x+4)$
3) $(x+3)(x-5)(x-2)(x-4)$
4) $(x-3)(x+5)(x+2)(x+4)$

338 Wenona sketched the polynomial $P(x)$ as shown on the axes below.
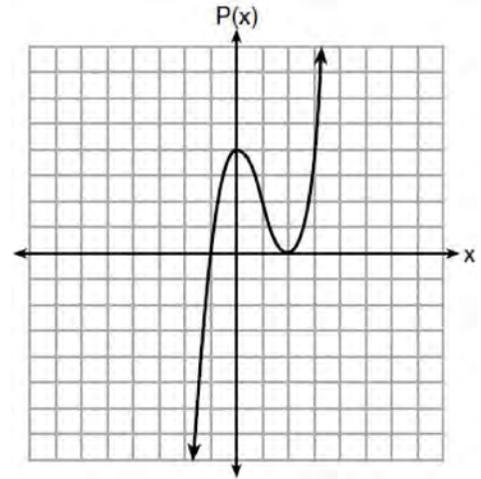
Which equation could represent $P(x)$?

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

60

339 A cubic function is graphed on the set of axes below.
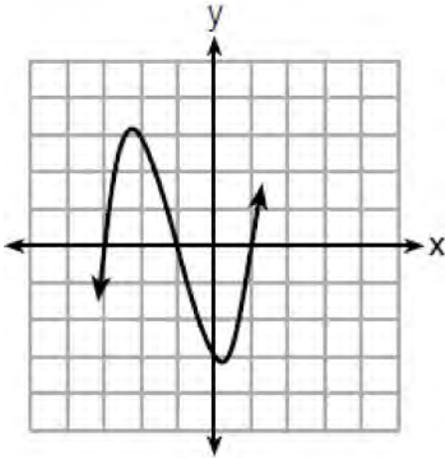
Which function could represent this graph?
1) $f(x) = (x-3)(x-1)(x+1)$
2) $g(x) = (x+3)(x+1)(x-1)$
3) $h(x) = (x-3)(x-1)(x+3)$
4) $k(x) = (x+3)(x+1)(x-3)$

340 A polynomial function is graphed below.
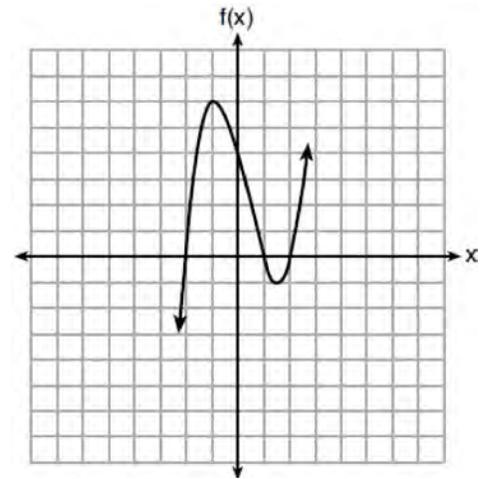

Which function could represent this graph?
1) $f(x) = (x+1)(x^2+2)$
2) $f(x) = (x-1)(x^2-2)$
3) $f(x) = (x-1)(x^2-4)$
4) $f(x) = (x+1)(x^2+4)$

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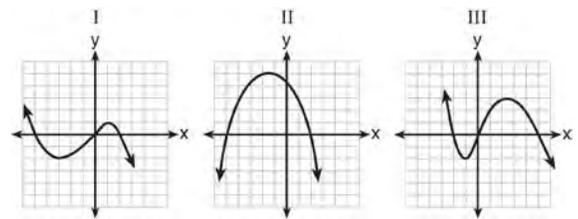
1) I, only
2) II, only
3) I and III
4) I, II, and III

61

F.BF.B.3: GRAPHING POLYNOMIAL FUNCTIONS

342 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

343 The graph of the equation $y = ax^2$ is shown below.
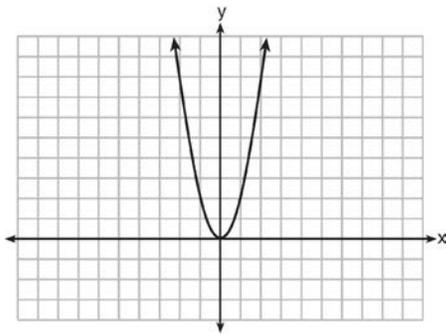
If a is multiplied by $-\dfrac{1}{2}$, the graph of the new equation is
1) wider and opens downward
2) wider and opens upward
3) narrower and opens downward
4) narrower and opens upward

344 When the function $f(x) = x^2$ is multiplied by the value a, where $a > 1$, the graph of the new function, $g(x) = ax^2$
1) opens upward and is wider
2) opens upward and is narrower
3) opens downward and is wider
4) opens downward and is narrower

345 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.

346 In the functions $f(x) = kx^2$ and $g(x) = |kx|$, k is a positive integer. If k is replaced by $\dfrac{1}{2}$, which statement about these new functions is true?
1) The graphs of both $f(x)$ and $g(x)$ become wider.
2) The graph of $f(x)$ becomes narrower and the graph of $g(x)$ shifts left.
3) The graphs of both $f(x)$ and $g(x)$ shift vertically.
4) The graph of $f(x)$ shifts left and the graph of $g(x)$ becomes wider.

347 If the original function $f(x) = 2x^2 - 1$ is shifted to the left 3 units to make the function $g(x)$, which expression would represent $g(x)$?
1) $2(x-3)^2 - 1$
2) $2(x+3)^2 - 1$
3) $2x^2 + 2$
4) $2x^2 - 4$

348 Compared to the graph of $f(x) = x^2$, the graph of $g(x) = (x-2)^2 + 3$ is the result of translating $f(x)$
1) 2 units up and 3 units right
2) 2 units down and 3 units up
3) 2 units right and 3 units up
4) 2 units left and 3 units right

349 Given: $f(x) = (x-2)^2 + 4$
$g(x) = (x-5)^2 + 4$
When compared to the graph of $f(x)$, the graph of $g(x)$ is
1) shifted 3 units to the left
2) shifted 3 units to the right
3) shifted 5 units to the left
4) shifted 5 units to the right

350 Josh graphed the function $f(x) = -3(x-1)^2 + 2$. He then graphed the function $g(x) = -3(x-1)^2 - 5$ on the same coordinate plane. The vertex of $g(x)$ is
1) 7 units below the vertex of $f(x)$
2) 7 units above the vertex of $f(x)$
3) 7 units to the right of the vertex of $f(x)$
4) 7 units to the left of the vertex of $f(x)$

351 Given the parent function $f(x) = x^3$, the function $g(x) = (x-1)^3 - 2$ is the result of a shift of $f(x)$
1) 1 unit left and 2 units down
2) 1 unit left and 2 units up
3) 1 unit right and 2 units down
4) 1 unit right and 2 units up

352 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.]
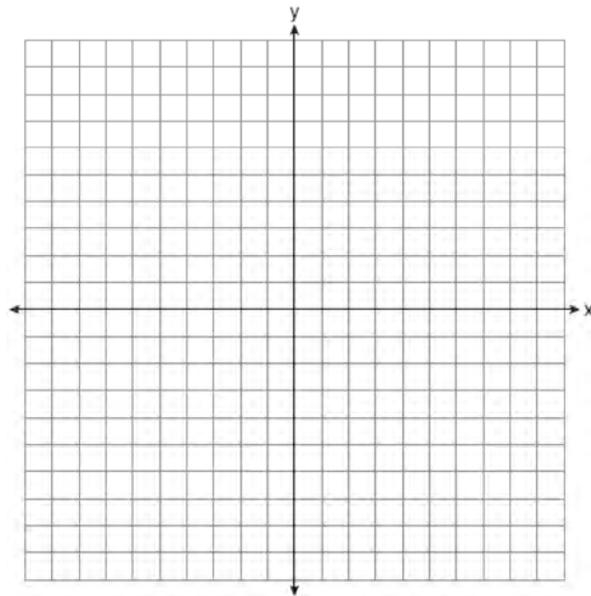
353 In the diagram below, $f(x) = x^3 + 2x^2$ is graphed.
Also graphed is $g(x)$, the result of a translation of
$f(x)$.
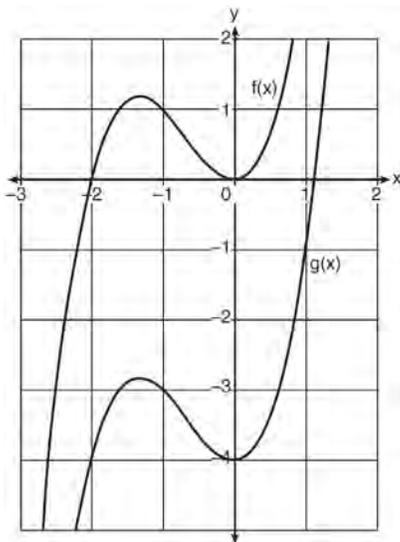
Determine an equation of $g(x)$. Explain your
reasoning.

RADICALS
N.RN.B.3: OPERATIONS WITH RADICALS

354 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.

355 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.

356 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) $P + L$

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

358 The product of $\sqrt{576}$ and $\sqrt{684}$ is
1) irrational because both factors are irrational
2) rational because both factors are rational
3) irrational because one factor is irrational
4) rational because one factor is rational

359 Which expression results in a rational number?
1) $\sqrt{121} - \sqrt{21}$
2) $\sqrt{25} \bullet \sqrt{50}$
3) $\sqrt{36} \div \sqrt{225}$
4) $3\sqrt{5} + 2\sqrt{5}$

360 Which expression results in a rational number?
1) $\sqrt{2} \cdot \sqrt{18}$
2) $5 \cdot \sqrt{5}$
3) $\sqrt{2} + \sqrt{2}$
4) $3\sqrt{2} + 2\sqrt{3}$

361 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

362 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.

363 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

364 Is the sum of $3\sqrt{2}$ and $4\sqrt{2}$ rational or irrational? Explain your answer.

365 Jakob is working on his math homework. He decides that the sum of the expression $\dfrac{1}{3} + \dfrac{6\sqrt{5}}{7}$ must be rational because it is a fraction. Is Jakob correct? Explain your reasoning.

366 State whether $7 - \sqrt{2}$ is rational or irrational. Explain your answer.

367 A teacher wrote the following set of numbers on the board:
$$a = \sqrt{20} \quad b = 2.5 \quad c = \sqrt{225}$$
Explain why $a + b$ is irrational, but $b + c$ is rational.

368 Is the product of $\sqrt{16}$ and $\dfrac{4}{7}$ rational or irrational? Explain your reasoning.

369 Is the product of two irrational numbers always irrational? Justify your answer.

<u>F.IF.C.7: GRAPHING ROOT FUNCTIONS</u>

370   Which graph represents $y = \sqrt{x-2}$?

1)

2)

3)

4)
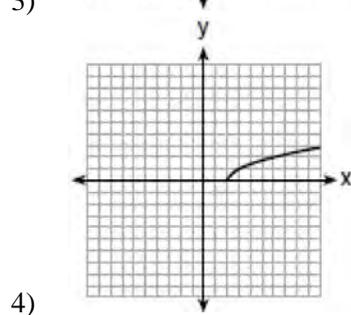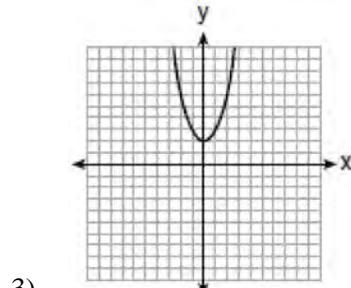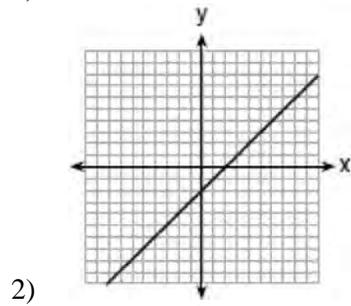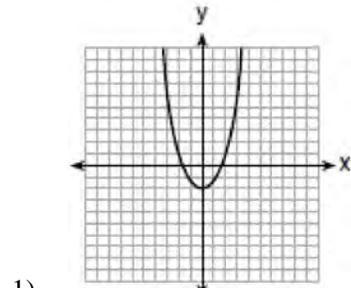
371   On the set of axes below, graph the function represented by $y = \sqrt[3]{x-2}$ for the domain $-6 \le x \le 10$.
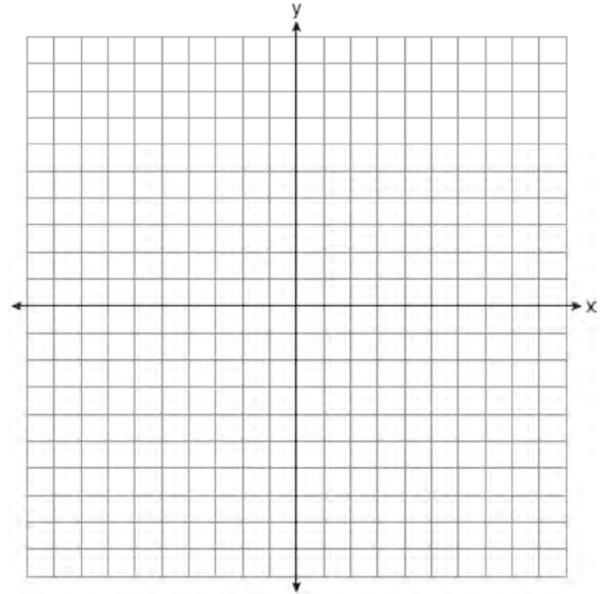
372   Draw the graph of $y = \sqrt{x} - 1$ on the set of axes below.
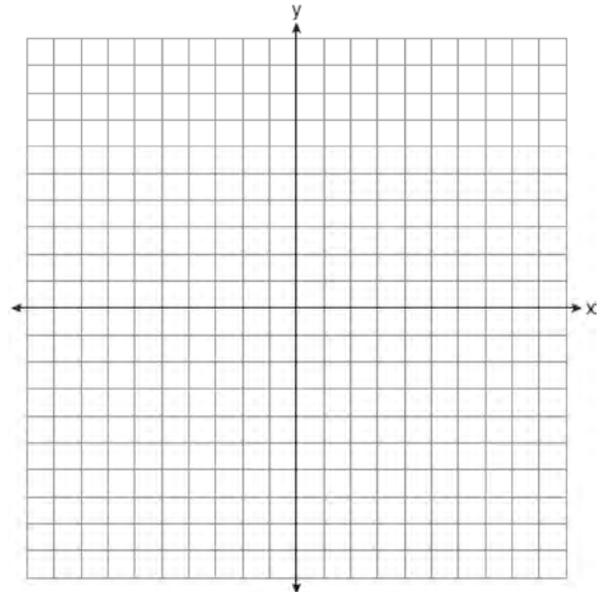
373 Graph the function $y = -\sqrt{x+3}$ on the set of axes below.

SYSTEMS
A.REI.6: SOLVING LINEAR SYSTEMS

375 A system of equations is shown below.

Equation A: $5x + 9y = 12$

Equation B: $4x - 3y = 8$

Which method eliminates one of the variables?
1) Multiply equation A by $-\frac{1}{3}$ and add the result to equation B.
2) Multiply equation B by 3 and add the result to equation A.
3) Multiply equation A by 2 and equation B by −6 and add the results together.
4) Multiply equation B by 5 and equation A by 4 and add the results together.

376 Using the substitution method, Vito is solving the following system of equations algebraically:
$$y + 3x = -4$$
$$2x - 3y = -21$$
Which equivalent equation could Vito use?
1) $2(-3x - 4) + 3x = -21$
2) $2(3x - 4) + 3x = -21$
3) $2x - 3(-3x - 4) = -21$
4) $2x - 3(3x - 4) = -21$

374 Graph $f(x) = \sqrt{x+2}$ over the domain $-2 \le x \le 7$.

377 What is the solution to the system of equations below?
$$y = 2x + 8$$
$$3(-2x + y) = 12$$
1) no solution
2) infinite solutions
3) $(-1, 6)$
4) $\left(\frac{1}{2}, 9\right)$

378 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) $6x + 6y = 48$
   $6x + 2y = 8$

379 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) $8x + 4y = 44$
   $-8x + 8y = -8$

380 A system of equations is given below.

$$x + 2y = 5$$
$$2x + y = 4$$

Which system of equations does *not* have the same solution?

1) $3x + 6y = 15$
   $2x + y = 4$
2) $4x + 8y = 20$
   $2x + y = 4$
3) $x + 2y = 5$
   $6x + 3y = 12$
4) $x + 2y = 5$
   $4x + 2y = 12$

381 Which system of equations does *not* have the same solution as the system below?

$$4x + 3y = 10$$
$$-6x - 5y = -16$$

1) $-12x - 9y = -30$
   $12x + 10y = 32$
2) $20x + 15y = 50$
   $-18x - 15y = -48$
3) $24x + 18y = 60$
   $-24x - 20y = -64$
4) $40x + 30y = 100$
   $36x + 30y = -96$

382 Which system of equations will yield the same solution as the system below?
$$x - y = 3$$
$$2x - 3y = -1$$
1) $-2x - 2y = -6$
   $2x - 3y = -1$
2) $-2x + 2y = 3$
   $2x - 3y = -1$
3) $2x - 2y = 6$
   $2x - 3y = -1$
4) $3x + 3y = 9$
   $2x - 3y = -1$

383 Which system of linear equations has the same solution as the one shown below?
$$x - 4y = -10$$
$$x + y = 5$$
1) $5x = 10$
   $x + y = 5$
2) $-5y = -5$
   $x + y = 5$
3) $-3x = -30$
   $x + y = 5$
4) $-5y = -5$
   $x - 4y = -10$

384 The line represented by the equation $4y + 2x = 33.6$ shares a solution point with the line represented by the table below.

x	y
−5	3.2
−2	3.8
2	4.6
4	5
11	6.4

The solution for this system is
1) $(-14.0, -1.4)$
2) $(-6.8, 5.0)$
3) $(1.9, 4.6)$
4) $(6.0, 5.4)$

385 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.

386 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.

387 In attempting to solve the system of equations $y = 3x - 2$ and $6x - 2y = 4$, John graphed the two equations on his graphing calculator. Because he saw only one line, John wrote that the answer to the system is the empty set. Is he correct? Explain your answer.

A.CED.A.3: MODELING LINEAR SYSTEMS

388 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) $m + f = 3.95$
   $f + 0.005 = m$

389 The Celluloid Cinema sold 150 tickets to a movie. Some of these were child tickets and the rest were adult tickets. A child ticket cost $7.75 and an adult ticket cost $10.25. If the cinema sold $1470 worth of tickets, which system of equations could be used to determine how many adult tickets, a, and how many child tickets, c, were sold?

1) $a + c = 150$
   $10.25a + 7.75c = 1470$
2) $a + c = 1470$
   $10.25a + 7.75c = 150$
3) $a + c = 150$
   $7.75a + 10.25c = 1470$
4) $a + c = 1470$
   $7.75a + 10.25c = 150$

390 Alicia purchased H half-gallons of ice cream for $3.50 each and P packages of ice cream cones for $2.50 each. She purchased 14 items and spent $43. Which system of equations could be used to determine how many of each item Alicia purchased?

1) $3.50H + 2.50P = 43$
   $H + P = 14$
2) $3.50P + 2.50H = 43$
   $P + H = 14$
3) $3.50H + 2.50P = 14$
   $H + P = 43$
4) $3.50P + 2.50H = 14$
   $P + H = 43$

391 Lizzy has 30 coins that total $4.80. All of her coins are dimes, D, and quarters, Q. Which system of equations models this situation?
1) $D + Q = 4.80$
   $.10D + .25Q = 30$
2) $D + Q = 30$
   $.10D + .25Q = 4.80$
3) $D + Q = 30$
   $.25D + .10Q = 4.80$
4) $D + Q = 4.80$
   $.25D + .10Q = 30$

392 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

393 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

394 The graph below models the cost of renting video games with a membership in Plan A and Plan B.
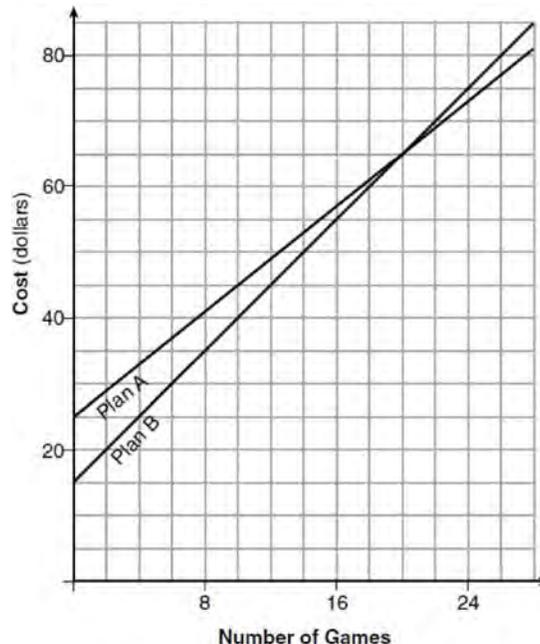
Explain why Plan B is the better choice for Dylan if he only has $50 to spend on video games, including a membership fee. Bobby wants to spend $65 on video games, including a membership fee. Which plan should he choose? Explain your answer.

395 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?

396 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.*

397 For a class picnic, two teachers went to the same store to purchase drinks. One teacher purchased 18 juice boxes and 32 bottles of water, and spent $19.92. The other teacher purchased 14 juice boxes and 26 bottles of water, and spent $15.76. Write a system of equations to represent the costs of a juice box, j, and a bottle of water, w. Kara said that the juice boxes might have cost 52 cents each and that the bottles of water might have cost 33 cents each. Use your system of equations to justify that Kara's prices are *not* possible. Solve your system of equations to determine the actual cost, in dollars, of each juice box and each bottle of water.

398 Two friends went to a restaurant and ordered one plain pizza and two sodas. Their bill totaled $15.95. Later that day, five friends went to the same restaurant. They ordered three plain pizzas and each person had one soda. Their bill totaled $45.90. Write and solve a system of equations to determine the price of one plain pizza. [Only an algebraic solution can receive full credit.]

399 At Bea's Pet Shop, the number of dogs, d, is initially five less than twice the number of cats, c. If she decides to add three more of each, the ratio of cats to dogs will be $\frac{3}{4}$. Write an equation or system of equations that can be used to find the number of cats and dogs Bea has in her pet shop. Could Bea's Pet Shop initially have 15 cats and 20 dogs? Explain your reasoning. Determine algebraically the number of cats and the number of dogs Bea initially had in her pet shop.

400 There are two parking garages in Beacon Falls. Garage A charges $7.00 to park for the first 2 hours, and each additional hour costs $3.00. Garage B charges $3.25 per hour to park. When a person parks for at least 2 hours, write equations to model the cost of parking for a total of x hours in Garage A and Garage B. Determine algebraically the number of hours when the cost of parking at both garages will be the same.

401 Dylan has a bank that sorts coins as they are dropped into it. A panel on the front displays the total number of coins inside as well as the total value of these coins. The panel shows 90 coins with a value of $17.55 inside of the bank. If Dylan only collects dimes and quarters, write a system of equations in two variables or an equation in one variable that could be used to model this situation. Using your equation or system of equations, algebraically determine the number of quarters Dylan has in his bank. Dylan's mom told him that she would replace each one of his dimes with a quarter. If he uses all of his coins, determine if Dylan would then have enough money to buy a game priced at $20.98 if he must also pay an 8% sales tax. Justify your answer.

402 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then. If *b* represents Mrs. Bee's age now and *s* represents her son's age now, write a system of equations that could be used to model this scenario. Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now. Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

403 When visiting friends in a state that has no sales tax, two families went to a fast-food restaurant for lunch. The Browns bought 4 cheeseburgers and 3 medium fries for $16.53. The Greens bought 5 cheeseburgers and 4 medium fries for $21.11. Using *c* for the cost of a cheeseburger and *f* for the cost of medium fries, write a system of equations that models this situation. The Greens said that since their bill was $21.11, each cheeseburger must cost $2.49 and each order of medium fries must cost $2.87 each. Are they correct? Justify your answer. Using your equations, algebraically determine both the cost of one cheeseburger and the cost of one order of medium fries.

404 Allysa spent $35 to purchase 12 chickens. She bought two different types of chickens. Americana chickens cost $3.75 each and Delaware chickens cost $2.50 each. Write a system of equations that can be used to determine the number of Americana chickens, *A*, and the number of Delaware chickens, *D*, she purchased. Determine algebraically how many of each type of chicken Allysa purchased. Each Americana chicken lays 2 eggs per day and each Delaware chicken lays 1 egg per day. Allysa only sells eggs by the full dozen for $2.50. Determine how much money she expects to take in at the end of the first week with her 12 chickens.

A.REI.C.6: GRAPHING LINEAR SYSTEMS

405 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.

406 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.
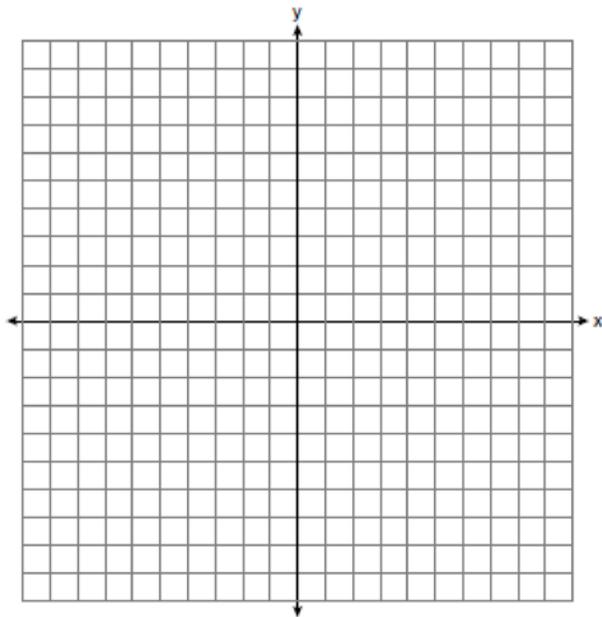
407 A local business was looking to hire a landscaper to work on their property. They narrowed their choices to two companies. Flourish Landscaping Company charges a flat rate of $120 per hour. Green Thumb Landscapers charges $70 per hour plus a $1600 equipment fee. Write a system of equations representing 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.
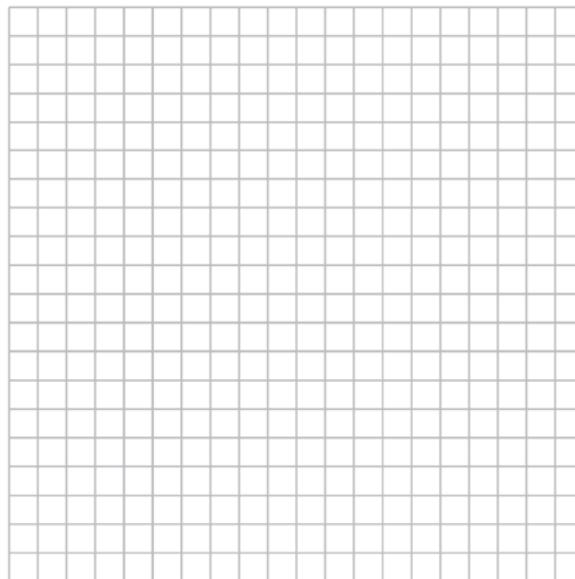
408 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let x equal the price of one package of cupcakes and y equal the price of one package of brownies. Write a system of equations that describes the given situation. On the set of axes below, graph the system of equations.
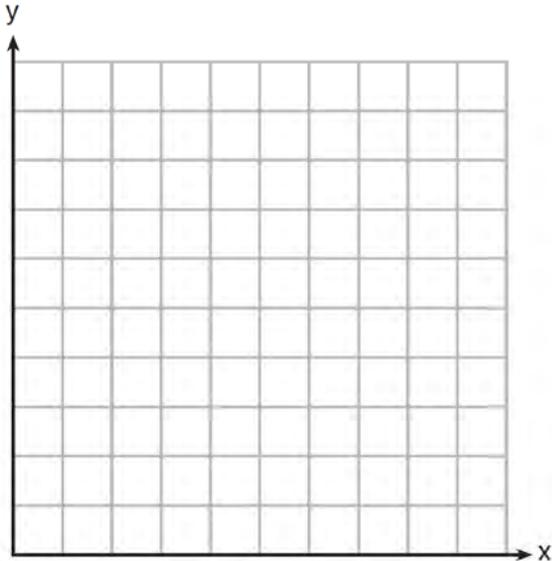
Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

409 Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year. Write a system of equations to model this situation, where x represents the number of years since 2010. Graph this system of equations on the set of axes below.
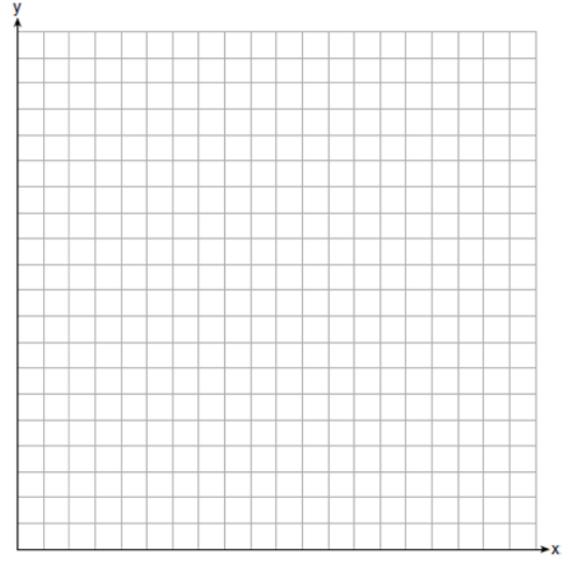
Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

410 A recreation center ordered a total of 15 tricycles and bicycles from a sporting goods store. The number of wheels for all the tricycles and bicycles totaled 38. Write a linear system of equations that models this scenario, where t represents the number of tricycles and b represents the number of bicycles ordered. On the set of axes below, graph this system of equations.
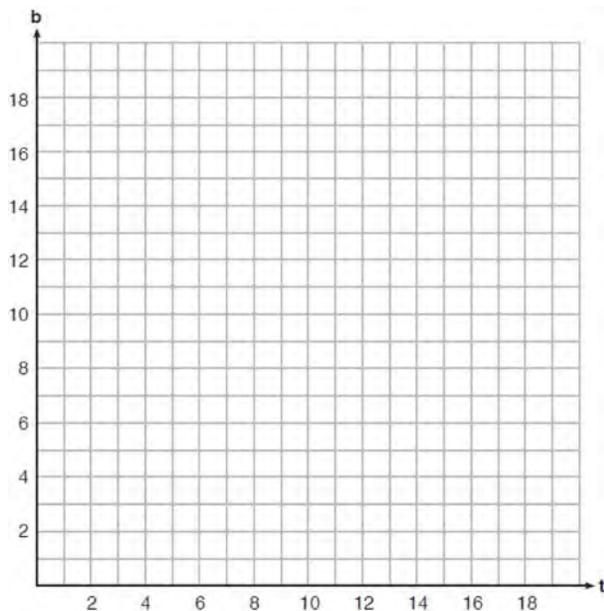
Based on your graph of this scenario, could the recreation center have ordered 10 tricycles? Explain your reasoning.

A.CED.A.3: MODELING SYSTEMS OF LINEAR INEQUALITIES

411 Jordan works for a landscape company during his summer vacation. He is paid $12 per hour for mowing lawns and $14 per hour for planting gardens. He can work a maximum of 40 hours per week, and would like to earn at least $250 this week. If m represents the number of hours mowing lawns and g represents the number of hours planting gardens, which system of inequalities could be used to represent the given conditions?

1) $m + g \leq 40$

   $12m + 14g \geq 250$

2) $m + g \geq 40$

 $12m + 14g \leq 250$

3) $m + g \leq 40$

   $12m + 14g \leq 250$

4) $m + g \geq 40$

   $12m + 14g \geq 250$

412 Gretchen has $50 that she can spend at the fair. Ride tickets cost $1.25 each and game tickets cost $2 each. She wants to go on a minimum of 10 rides and play at least 12 games. Which system of inequalities represents this situation when r is the number of ride tickets purchased and g is the number of game tickets purchased?

1) $1.25r + 2g < 50$

$r \leq 10$

$g > 12$

2) $1.25r + 2g \leq 50$

$r \geq 10$

$g \geq 12$

3) $1.25r + 2g \leq 50$

$r \geq 10$

$g > 12$

4) $1.25r + 2g < 50$

$r \leq 10$

$g \geq 12$

413 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.

414 A drama club is selling tickets to the spring musical. The auditorium holds 200 people. Tickets cost $12 at the door and $8.50 if purchased in advance. The drama club has a goal of selling at least $1000 worth of tickets to Saturday's show. Write a system of inequalities that can be used to model this scenario. If 50 tickets are sold in advance, what is the minimum number of tickets that must be sold at the door so that the club meets its goal? Justify your answer.

415 The drama club is running a lemonade stand to raise money for its new production. A local grocery store donated cans of lemonade and bottles of water. Cans of lemonade sell for $2 each and bottles of water sell for $1.50 each. The club needs to raise at least $500 to cover the cost of renting costumes. The students can accept a maximum of 360 cans and bottles. Write a system of inequalities that can be used to represent this situation. The club sells 144 cans of lemonade. What is the *least* number of bottles of water that must be sold to cover the cost of renting costumes? Justify your answer.

416 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.
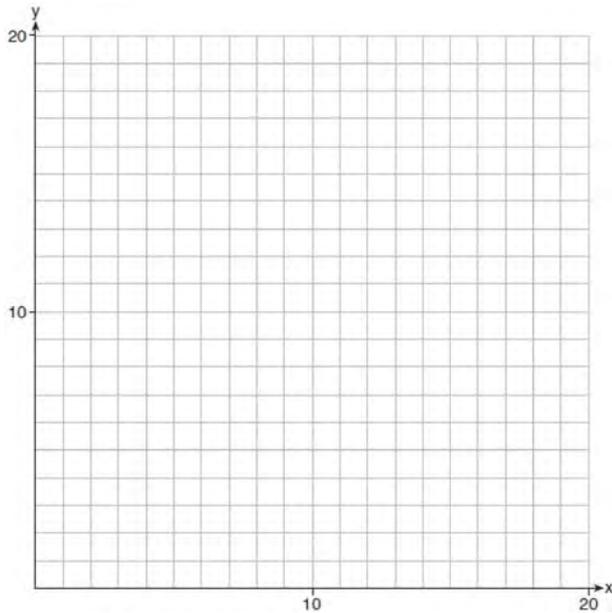
Determine and state one combination of hours that will allow Edith to earn *at least* $80 per week while working *no more than* 15 hours.

417 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.
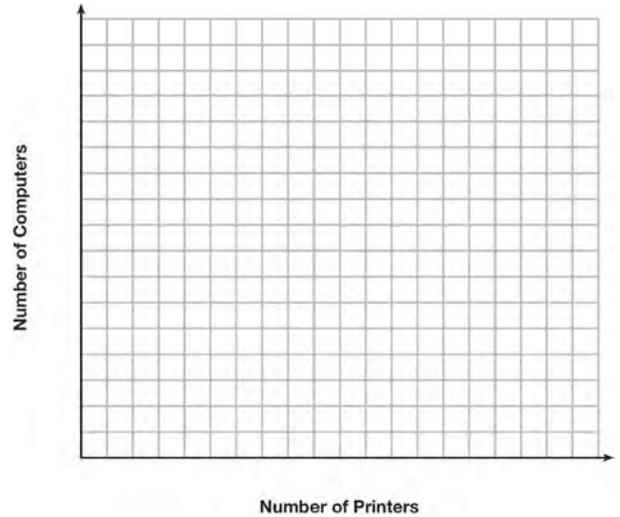
Determine a combination of printers and computers that would allow the electronics store to meet all of the constraints. Explain how you obtained your answer.

418 A system of inequalities is graphed on the set of axes below.
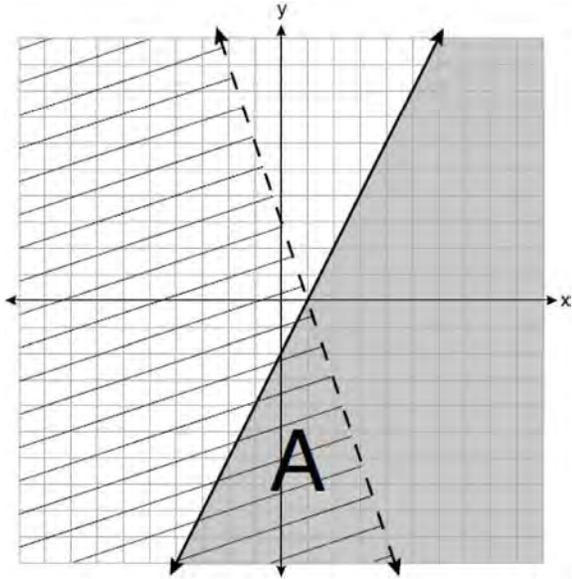
State the system of inequalities represented by the graph. State what region A represents. State what the entire gray region represents.

A.REI.D.12: GRAPHING SYSTEMS OF LINEAR INEQUALITIES

419 First consider the system of equations $y = -\frac{1}{2}x + 1$ and $y = x - 5$. Then consider the system of inequalities $y > -\frac{1}{2}x + 1$ and $y < x - 5$. When comparing the number of solutions in each of these systems, which statement is true?
1) Both systems have an infinite number of solutions.
2) The system of equations has more solutions.
3) The system of inequalities has more solutions.
4) Both systems have only one solution.

420 Which ordered pair is *not* in the solution set of $y > -\frac{1}{2}x + 5$ and $y \le 3x - 2$?
1) $(5,3)$
2) $(4,3)$
3) $(3,4)$
4) $(4,4)$

421 Which point is a solution to the system below?
$$2y < -12x + 4$$
$$y < -6x + 4$$
1) $\left(1, \frac{1}{2}\right)$
2) $(0,6)$
3) $\left(-\frac{1}{2}, 5\right)$
4) $(-3,2)$

422 Given: $y + x > 2$

$y \le 3x - 2$

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

1)

2)

3)

4)
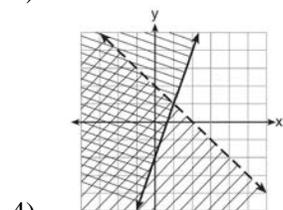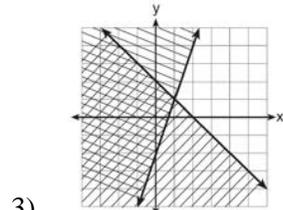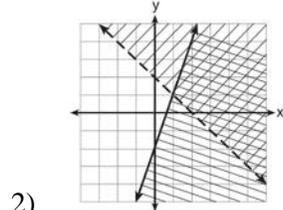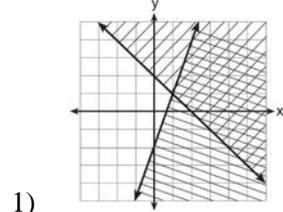
423 Which graph represents the solution of $y \le x + 3$ and $y \ge -2x - 2$?

1)

2)

3)

4)
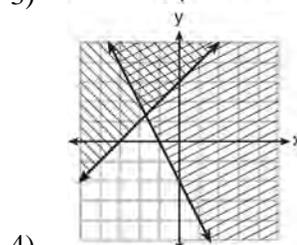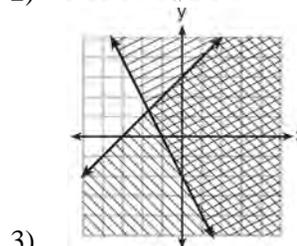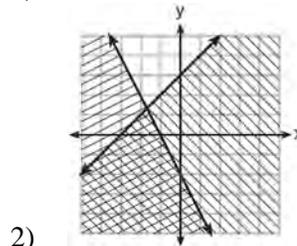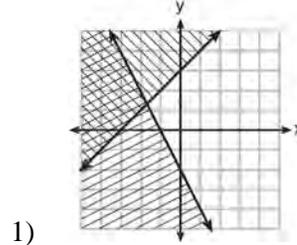
424 What is one point that lies in the solution set of the system of inequalities graphed below?
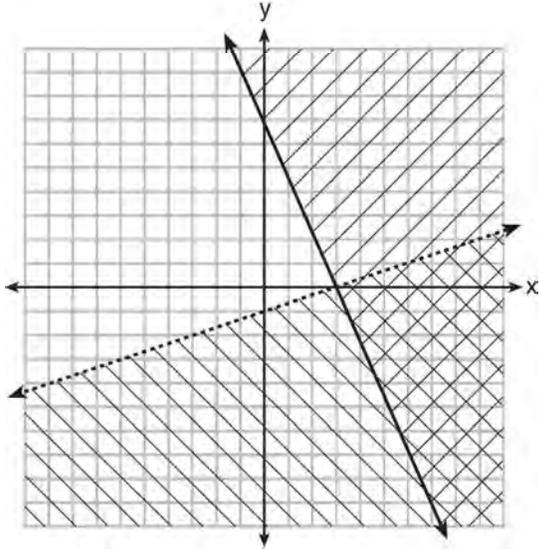

1) (7,0)
2) (3,0)
3) (0,7)
4) (−3,5)

425 Determine if the point (0,4) is a solution to the system of inequalities graphed below. Justify your answer.

$y \geq -2x + 4$
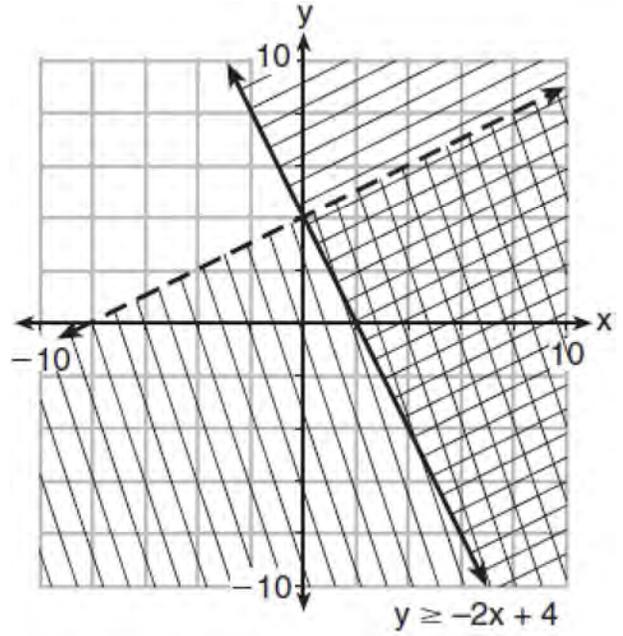
426 Solve the following system of inequalities graphically on the grid below and label the solution S.

$$3x + 4y > 20$$

$$x < 3y - 18$$
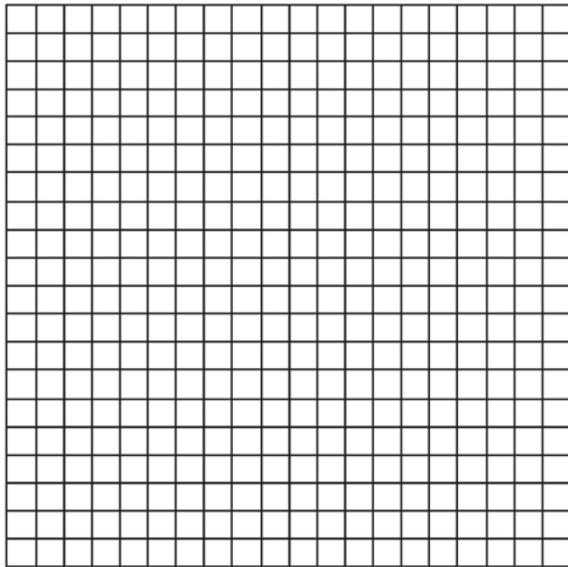
Is the point $(3,7)$ in the solution set? Explain your answer.

427 On the set of axes below, graph the following system of inequalities:

$$2y + 3x \leq 14$$

$$4x - y < 2$$
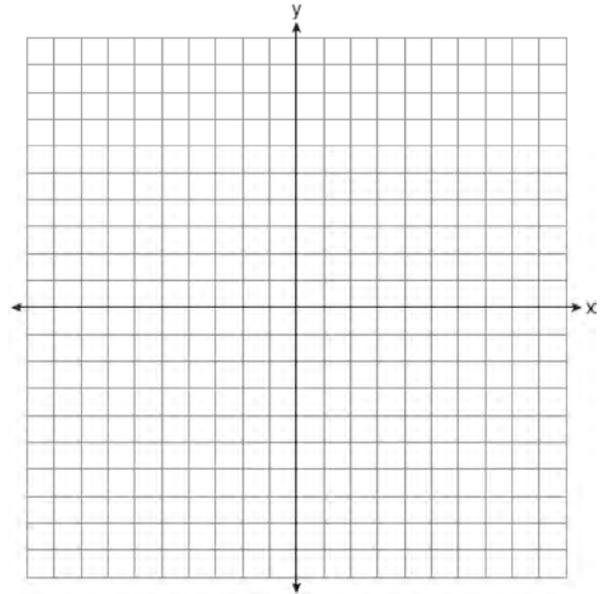
Determine if the point $(1,2)$ is in the solution set. Explain your answer.

428 Graph the following systems of inequalities on the set of axes below:

$$2y \geq 3x - 16$$

$$y + 2x > -5$$
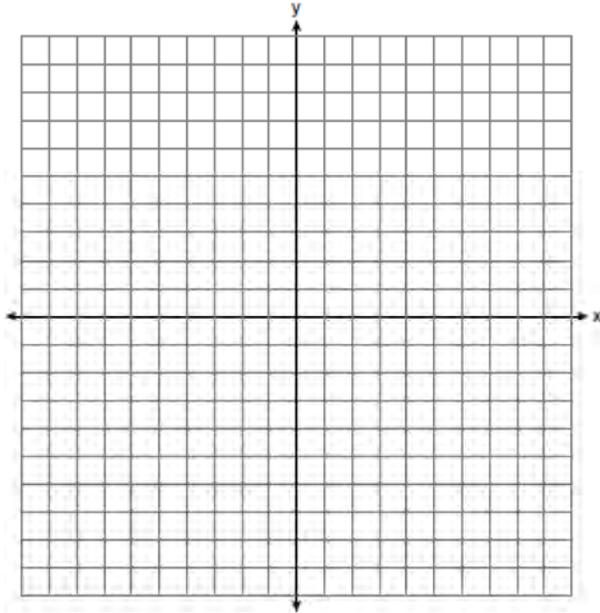
Based upon your graph, explain why $(6,1)$ is a solution to this system and why $(-6,7)$ is *not* a solution to this system.

429 On the set of axes below, graph the following system of inequalities:

$$2x + y \geq 8$$

$$y - 5 < 3x$$
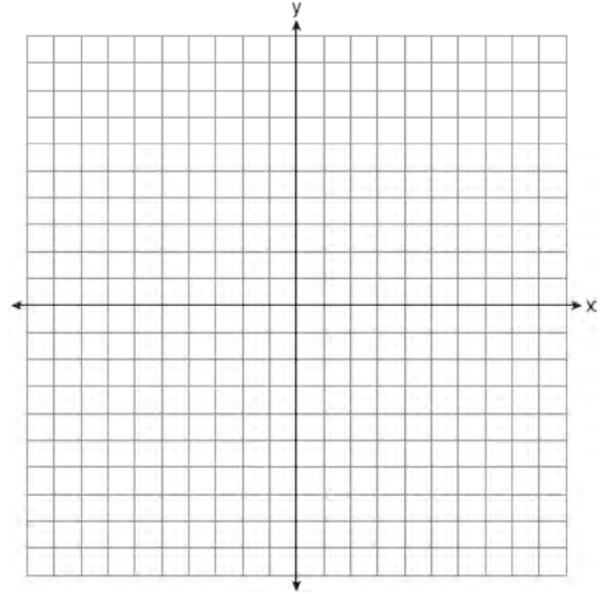
Determine if the point $(1,8)$ is in the solution set. Explain your answer.

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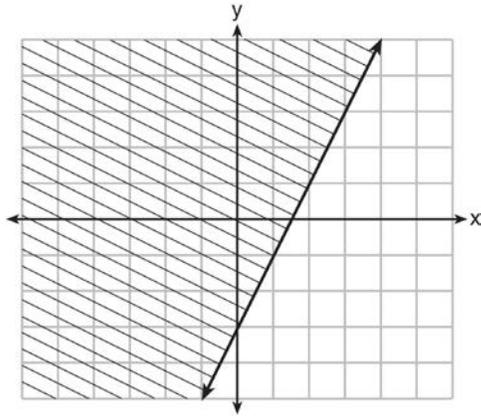
a) Write the inequality represented by the graph.
b) On the same set of axes, graph the inequality
$x + 2y < 4$.
c) The two inequalities graphed on the set of axes
form a system. Oscar thinks that the point $(2, 1)$ is
in the solution set for this system of inequalities.
Determine and state whether you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

431 The sum of two numbers, x and y, is more than 8.
When you double x and add it to y, the sum is less
than 14. Graph the inequalities that represent this
scenario on the set of axes below.
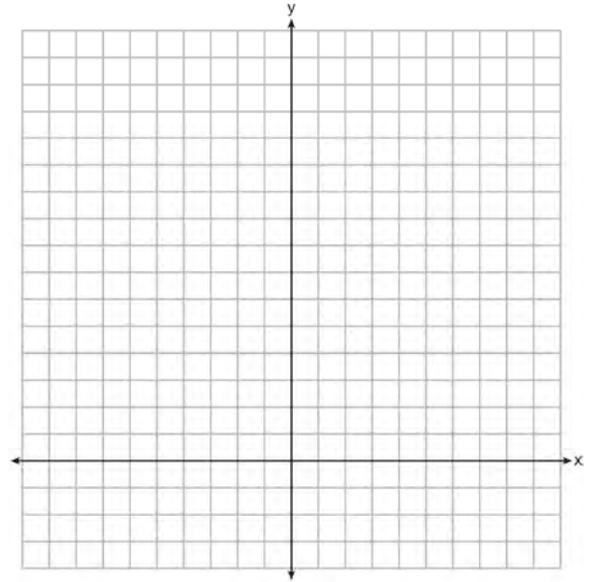
Kai says that the point $(6, 2)$ is a solution to this
system. Determine if he is correct and explain your
reasoning.

432 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.
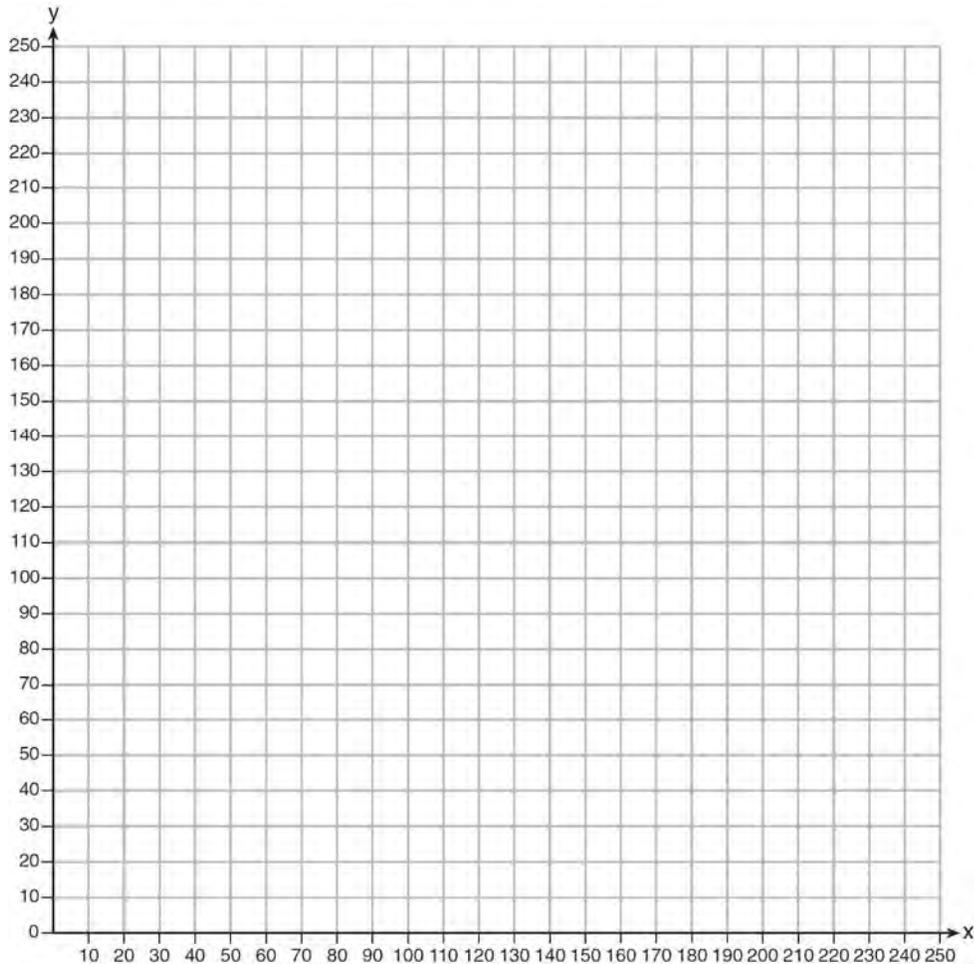
A.REI.C.7: QUADRATIC-LINEAR SYSTEMS

433 The graphs of $y = x^2 - 3$ and $y = 3x - 4$ intersect at approximately
1) $(0.38, -2.85)$, only
2) $(2.62, 3.85)$, only
3) $(0.38, -2.85)$ and $(2.62, 3.85)$
4) $(0.38, -2.85)$ and $(3.85, 2.62)$

A.REI.D.11: QUADRATIC-LINEAR SYSTEMS

434 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

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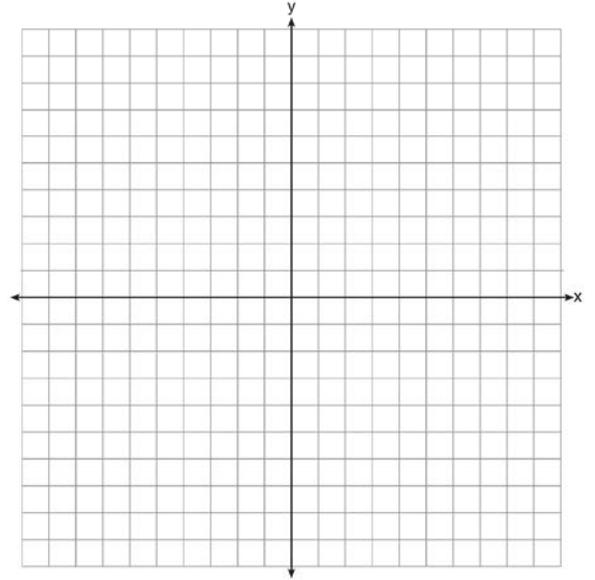
Using this graph, determine and state *all* values of x for which $f(x) = g(x)$.

436 Graph $y = f(x)$ and $y = g(x)$ on the set of axes below.

$$f(x) = 2x^2 - 8x + 3$$
$$g(x) = -2x + 3$$
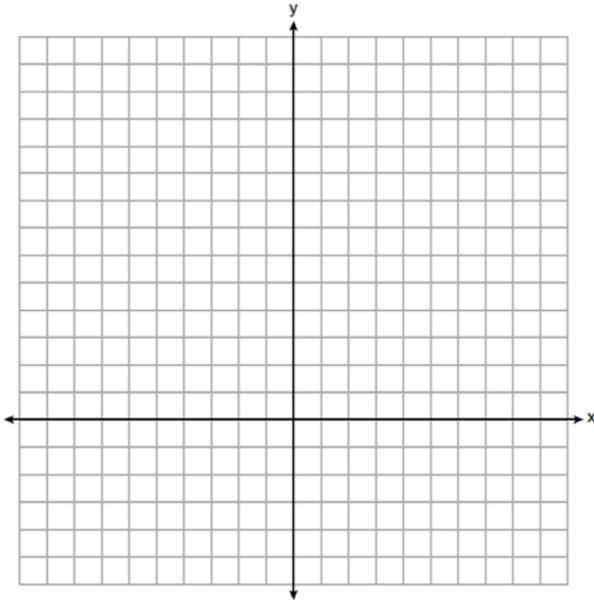
Determine and state all values of x for which $f(x) = g(x)$.

437 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.
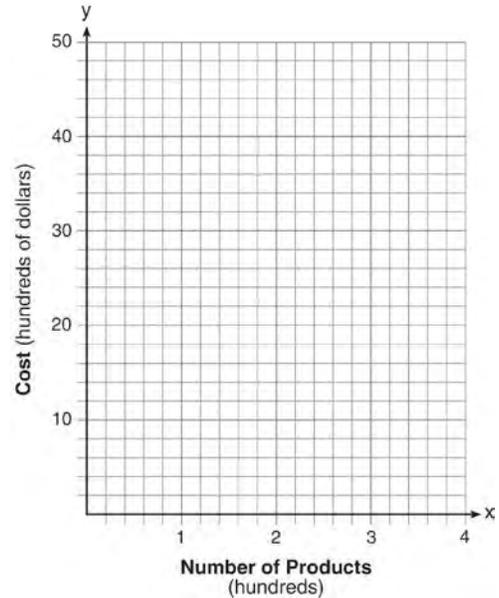
State the positive value(s) of x for which the production costs at the two sites are equal. Explain how you determined your answer. If the company plans on manufacturing 200 products per week, which site should they use? Justify your answer.

438 If $f(x) = x^2$ and $g(x) = x$, determine the value(s) of x that satisfy the equation $f(x) = g(x)$.

87

439 Given: $g(x) = 2x^2 + 3x + 10$

$$k(x) = 2x + 16$$

Solve the equation $g(x) = 2k(x)$ algebraically for x, to the *nearest tenth*. Explain why you chose the method you used to solve this quadratic equation.

440 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.D.11: OTHER SYSTEMS

441 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

442 Which value of x results in equal outputs for $j(x) = 3x - 2$ and $b(x) = |x + 2|$?
1) −2
2) 2
3) $\frac{2}{3}$
4) 4

443 Which pair of equations would have $(-1, 2)$ as a solution?
1) $y = x + 3$ and $y = 2^x$
2) $y = x - 1$ and $y = 2x$
3) $y = x^2 - 3x - 2$ and $y = 4x + 6$
4) $2x + 3y = -4$ and $y = -\frac{1}{2}x - \frac{3}{2}$

444 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.

445 The graphs of the functions $f(x) = |x - 3| + 1$ and $g(x) = 2x + 1$ are drawn. Which statement about these functions is true?
1) The solution to $f(x) = g(x)$ is 3.
2) The solution to $f(x) = g(x)$ is 1.
3) The graphs intersect when $y = 1$.
4) The graphs intersect when $x = 3$.

446 The functions $f(x)$ and $g(x)$ are graphed below.
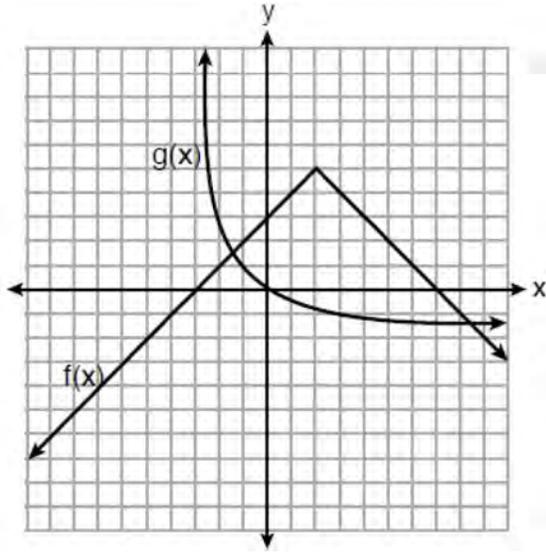
Based on the graph, the solutions to the equation $f(x) = g(x)$ are
1) the x-intercepts
2) the y-intercepts
3) the x-values of the points of intersection
4) the y-values of the points of intersection

447 The functions $f(x)$ and $g(x)$ are graphed on the set of axes below.
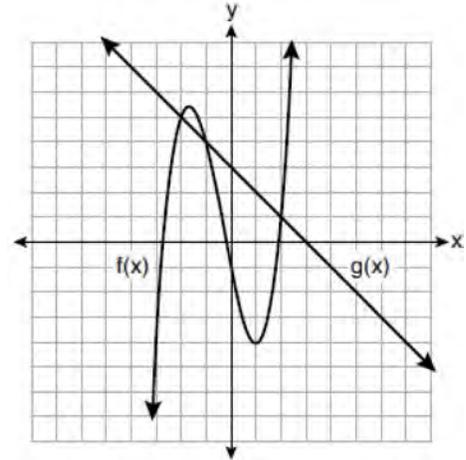
For which value of x is $f(x) \neq g(x)$?
1) −1
2) 2
3) 3
4) −2

448 The graph below shows two functions, $f(x)$ and $g(x)$. State all the values of x for which $f(x) = g(x)$.
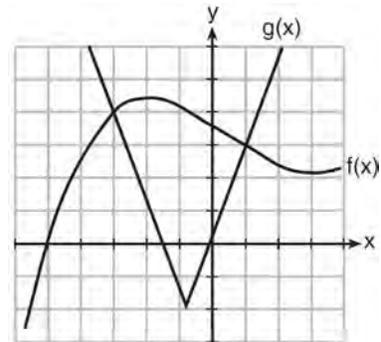
449 Graph $f(x) = |x|$ and $g(x) = -x^2 + 6$ on the grid below. Does $f(-2) = g(-2)$? Use your graph to explain why or why not.
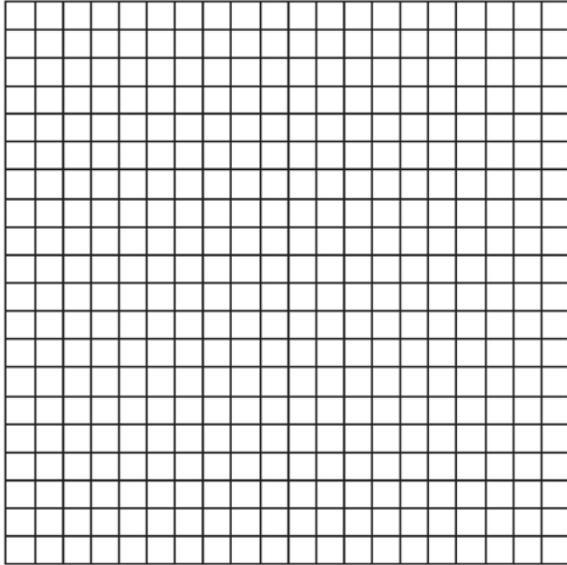
450 On the set of axes below, graph

$$g(x) = \frac{1}{2}x + 1$$

and

$$f(x) = \begin{cases} 2x + 1, & x \le -1 \\ 2 - x^2, & x > -1 \end{cases}$$
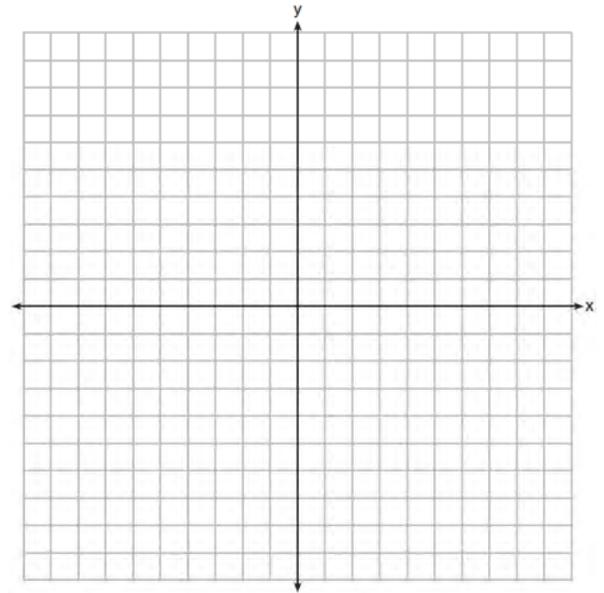
How many values of x satisfy the equation $f(x) = g(x)$? Explain your answer, using evidence from your graphs.

FUNCTIONS
F.IF.A.1: DEFINING FUNCTIONS

451 A function is defined as $\{(0,1),(2,3),(5,8),(7,2)\}$. Isaac is asked to create one more ordered pair for the function. Which ordered pair can he add to the set to keep it a function?
1) $(0,2)$
2) $(5,3)$
3) $(7,0)$
4) $(1,3)$

Algebra I Regents Exam Questions by State Standard: Topic

452 A relation is graphed on the set of axes below.
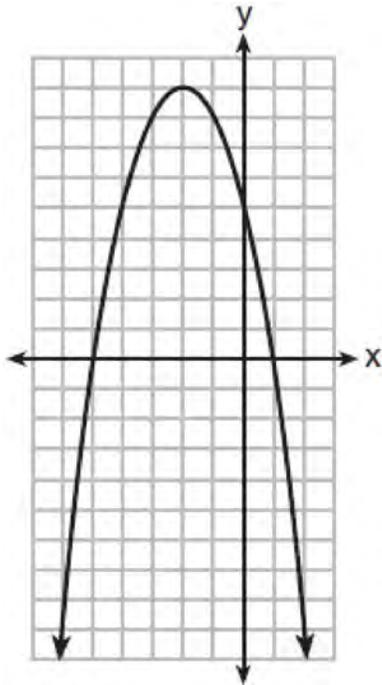
Based on this graph, the relation is
1) a function because it passes the horizontal line test
2) a function because it passes the vertical line test
3) not a function because it fails the horizontal line test
4) not a function because it fails the vertical line test

453 Which table represents a function?

1)

x	y
2	-3
3	0
4	-3
2	1

2)

x	y
1	2
1	3
1	4
1	5

3)

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

4)

x	y
-2	-4
0	2
2	4
4	6

454 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

455 A mapping is shown in the diagram below.
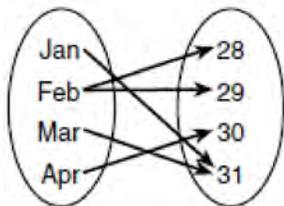
This mapping is
1) a function, because Feb has two outputs, 28 and 29
2) a function, because two inputs, Jan and Mar, result in the output 31
3) not a function, because Feb has two outputs, 28 and 29
4) not a function, because two inputs, Jan and Mar, result in the output 31

456 Which representations are functions?

I

x	y
2	6
3	−12
4	7
5	5
2	−6

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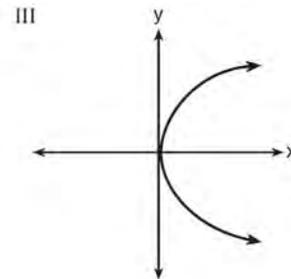
II $\{(1,1),(2,1),(3,2),(4,3),(5,5),(6,8),(7,13)\}$ IV $y = 2x + 1$

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

457 Which relation does *not* represent a function?

1)

x	1	2	3	4	5	6
y	3.2	4	5.1	6	7.4	8.8

2)

3) $y = 3\sqrt{x+1} - 2$

4)
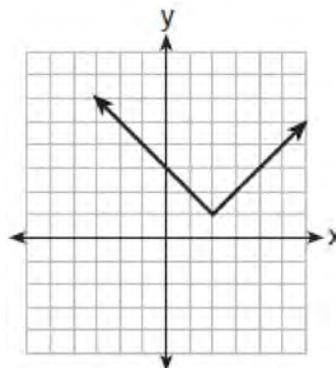
92
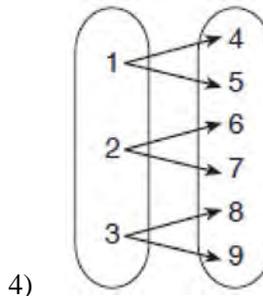
458 Which relation is *not* a function?

1)

x	y
−10	−2
−6	2
−2	6
1	9
5	13

2) $3x + 2y = 4$

3)
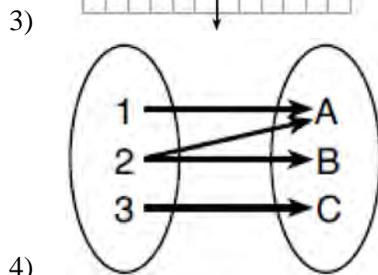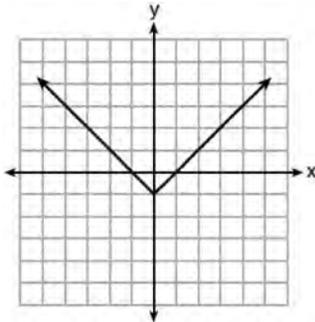
4)

459 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.

460 Nora says that the graph of a circle is a function because she can trace the whole graph without picking up her pencil. Mia says that a circle graph is *not* a function because multiple values of x map to the same y-value. Determine if either one is correct, and justify your answer completely.

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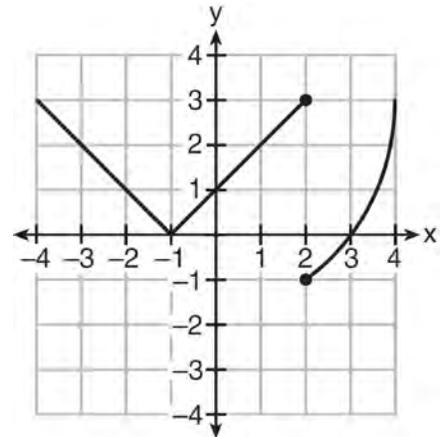
State whether Marcel is correct. Justify your answer.

462   Four relations are shown below.
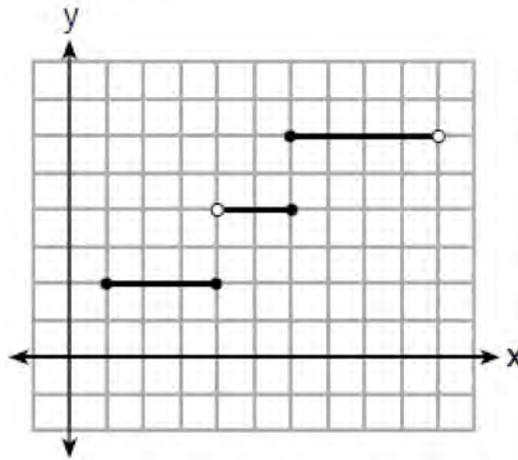
I

$$\{(1,2),(2,5),(3,8),(2,-5),(1,-2)\}$$
II

x	y
−4	1
0	3
4	5
6	6

III

$$y = x^2$$
IV

State which relation(s) are functions. Explain why the other relation(s) are *not* functions.

463 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.

F.IF.A.2: FUNCTIONAL NOTATION

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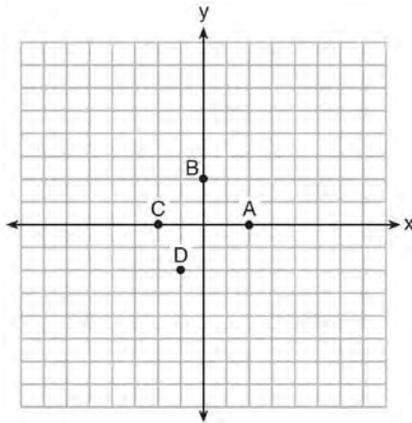
Which point could be used to find $f(2)$?
1) A
2) B
3) C
4) D

465 The graph of $f(x)$ is shown below.
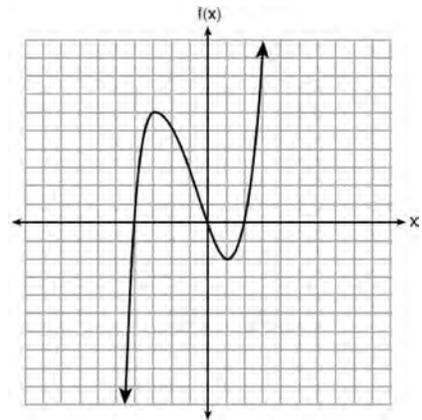
What is the value of $f(-3)$?
1) 6
2) 2
3) −2
4) −4

466 If $f(x) = 4x + 5$, what is the value of $f(-3)$?
1) −2
2) −7
3) 17
4) 4

467 The function $g(x)$ is defined as $g(x) = -2x^2 + 3x$.
The value of $g(-3)$ is
1) −27
2) −9
3) 27
4) 45

468 If $f(n) = (n-1)^2 + 3n$, which statement is true?
1) $f(3) = -2$
2) $f(-2) = 3$
3) $f(-2) = -15$
4) $f(-15) = -2$

469 If $f(x) = \frac{1}{2}x^2 - \left(\frac{1}{4}x + 3\right)$, what is the value of $f(8)$?
1) 11
2) 17
3) 27
4) 33

470 If $k(x) = 2x^2 - 3\sqrt{x}$, then $k(9)$ is
1) 315
2) 307
3) 159
4) 153

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

472 Lynn, Jude, and Anne were given the function $f(x) = -2x^2 + 32$, and they were asked to find $f(3)$. Lynn's answer was 14, Jude's answer was 4, and Anne's answer was ±4. Who is correct?
1) Lynn, only
2) Jude, only
3) Anne, only
4) Both Lynn and Jude

473 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

474 If $g(x) = -4x^2 - 3x + 2$, determine $g(-2)$.

475 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.

F.IF.A.2: EVALUATING FUNCTIONS

476 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.A.2: DOMAIN AND RANGE

477 The function $f(x)$ is graphed below.

f(x)
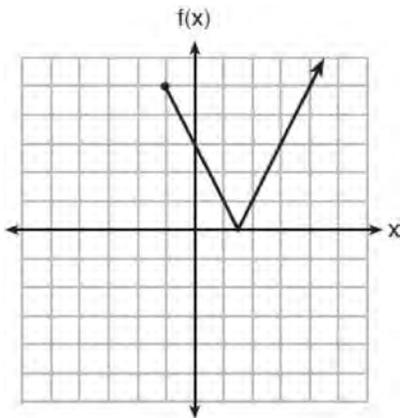
The domain of this function is
1) all positive real numbers
2) all positive integers
3) $x \geq 0$
4) $x \geq -1$

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

f(x)
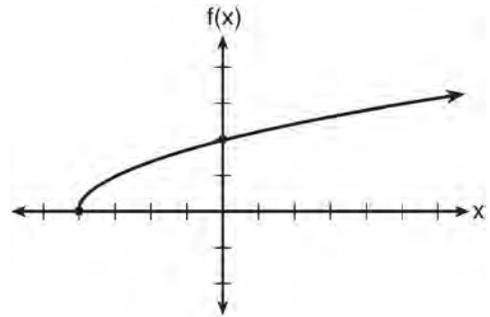
The domain of the function is
1) $\{x \mid x > 0\}$
2) $\{x \mid x \geq 0\}$
3) $\{x \mid x > -4\}$
4) $\{x \mid x \geq -4\}$

479 What is the domain of the relation shown below?
$$\{(4,2),(1,1),(0,0),(1,-1),(4,-2)\}$$
1) $\{0,1,4\}$
2) $\{-2,-1,0,1,2\}$
3) $\{-2,-1,0,1,2,4\}$
4) $\{-2,-1,0,0,1,1,1,2,4,4\}$

480 Let f be a function such that $f(x) = 2x - 4$ is defined on the domain $2 \leq x \leq 6$. The range of this function is
1) $0 \leq y \leq 8$
2) $0 \leq y < \infty$
3) $2 \leq y \leq 6$
4) $-\infty < y < \infty$

481 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 $f(x) > 0$.

482 If $f(x) = x^2 + 2$, which interval describes the range of this function?

1) $(-\infty, \infty)$
2) $[0, \infty)$
3) $[2, \infty)$
4) $(-\infty, 2]$

483 The range of the function $f(x) = x^2 + 2x - 8$ is all real numbers

1) less than or equal to -9
2) greater than or equal to -9
3) less than or equal to -1
4) greater than or equal to -1

484 Which interval represents the range of the function $h(x) = 2x^2 - 2x - 4$?

1) $(0.5, \infty)$
2) $(-4.5, \infty)$
3) $[0.5, \infty)$
4) $[-4.5, \infty)$

485 If the domain of the function $f(x) = 2x^2 - 8$ is $\{-2, 3, 5\}$, then the range is

1) $\{-16, 4, 92\}$
2) $\{-16, 10, 42\}$
3) $\{0, 10, 42\}$
4) $\{0, 4, 92\}$

486 If the function $f(x) = x^2$ has the domain $\{0, 1, 4, 9\}$, what is its range?

1) $\{0, 1, 2, 3\}$
2) $\{0, 1, 16, 81\}$
3) $\{0, -1, 1, -2, 2, -3, 3\}$
4) $\{0, -1, 1, -16, 16, -81, 81\}$

487 The function $f(x) = 2x^2 + 6x - 12$ has a domain consisting of the integers from -2 to 1, inclusive. Which set represents the corresponding range values for $f(x)$?

1) $\{-32, -20, -12, -4\}$
2) $\{-16, -12, -4\}$
3) $\{-32, -4\}$
4) $\{-16, -4\}$

488 The range of the function defined as $y = 5^x$ is

1) $y < 0$
2) $y > 0$
3) $y \leq 0$
4) $y \geq 0$

F.IF.B.5: DOMAIN AND RANGE

489 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) $\{0, 1, 2, 3, \ldots\}$

490 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

491 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

492 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

493 A store sells self-serve frozen yogurt sundaes. The function $C(w)$ represents the cost, in dollars, of a sundae weighing w ounces. An appropriate domain for the function would be
1) integers
2) rational numbers
3) nonnegative integers
4) nonnegative rational numbers

494 An online company lets you download songs for $0.99 each after you have paid a $5 membership fee. Which domain would be most appropriate to calculate the cost to download songs?
1) rational numbers greater than zero
2) whole numbers greater than or equal to one
3) integers less than or equal to zero
4) whole numbers less than or equal to one

495 The daily cost of production in a factory is calculated using $c(x) = 200 + 16x$, where x is the number of complete products manufactured. Which set of numbers best defines the domain of $c(x)$?
1) integers
2) positive real numbers
3) positive rational numbers
4) whole numbers

496 At an ice cream shop, the profit, $P(c)$, is modeled by the function $P(c) = 0.87c$, where c represents the number of ice cream cones sold. An appropriate domain for this function is
1) an integer ≤ 0
2) an integer ≥ 0
3) a rational number ≤ 0
4) a rational number ≥ 0

497 A grocery store sells packages of beef. The function $C(w)$ represents the cost, in dollars, of a package of beef weighing w pounds. The most appropriate domain for this function would be
1) integers
2) rational numbers
3) positive integers
4) positive rational numbers

498 A dolphin jumps out of the water and then back into the water. His jump could be graphed on a set of axes where x represents time and y represents distance above or below sea level. The domain for this graph is best represented using a set of
1) integers
2) positive integers
3) real numbers
4) positive real numbers

F.BF.A.1: OPERATIONS WITH FUNCTIONS

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

500 Given that $f(x) = 2x + 1$, find $g(x)$ if $g(x) = 2[f(x)]^2 - 1$.

F.LE.A.1: FAMILIES OF FUNCTIONS

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

1)

2)

3)

4)
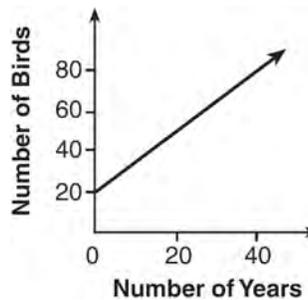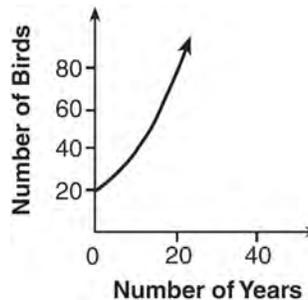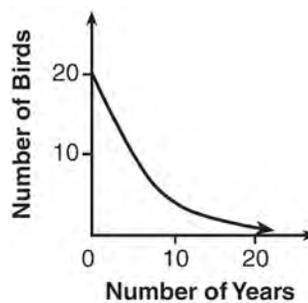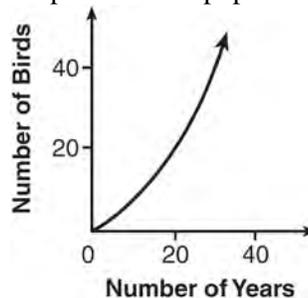
502 Which type of function is shown in the graph below?
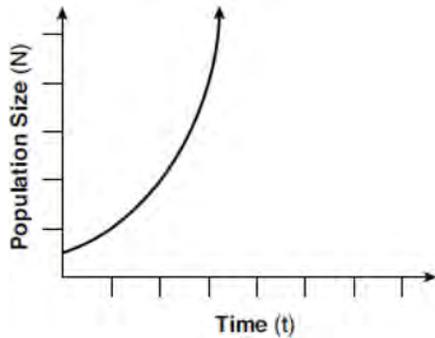
1) linear
2) exponential
3) square root
4) absolute value

503 Which table of values represents a linear relationship?

1)

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

3)

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

2)

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

4)

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

504   The tables below show the values of four different functions for given values of *x*.

x	f(x)		x	g(x)		x	h(x)		x	k(x)
1	12		1	−1		1	9		1	−2
2	19		2	1		2	12		2	4
3	26		3	5		3	17		3	14
4	33		4	13		4	24		4	28

Which table represents a linear function?·
1) $f(x)$ 3) $h(x)$
2) $g(x)$ 4) $k(x)$

505   The function *f* is shown in the table below.

x	f(x)
0	1
1	3
2	9
3	27

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

506 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

507 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

508 Sara was asked to solve this word problem: "The product of two consecutive integers is 156. What are the integers?" What type of equation should she create to solve this problem?
1) linear
2) quadratic
3) exponential
4) absolute value

509 The highest possible grade for a book report is 100. The teacher deducts 10 points for each day the report is late. Which kind of function describes this situation?
1) linear
2) quadratic
3) exponential growth
4) exponential decay

510 Ian is saving up to buy a new baseball glove. Every month he puts $10 into a jar. Which type of function best models the total amount of money in the jar after a given number of months?
1) linear
2) exponential
3) quadratic
4) square root

103

511 Which of the three situations given below is best modeled by an exponential function?
I. A bacteria culture doubles in size every day.
II. A plant grows by 1 inch every 4 days.
III. The population of a town declines by 5% every 3 years.
1) I, only
2) II, only
3) I and II
4) I and III

512 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

513 Which scenario represents exponential growth?
1) A water tank is filled at a rate of 2 gallons/minute.
2) A vine grows 6 inches every week.
3) A species of fly doubles its population every month during the summer.
4) A car increases its distance from a garage as it travels at a constant speed of 25 miles per hour.

514 One characteristic of all linear functions is that they change by
1) equal factors over equal intervals
2) unequal factors over equal intervals
3) equal differences over equal intervals
4) unequal differences over equal intervals

515 Which situation is *not* a linear function?
1) A gym charges a membership fee of $10.00 down and $10.00 per month.
2) A cab company charges $2.50 initially and $3.00 per mile.
3) A restaurant employee earns $12.50 per hour.
4) A $12,000 car depreciates 15% per year.

516 Which situation can be modeled by a linear function?
1) The population of bacteria triples every day.
2) The value of a cell phone depreciates at a rate of 3.5% each year.
3) An amusement park allows 50 people to enter every 30 minutes.
4) A baseball tournament eliminates half of the teams after each round.

517 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.

518 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.

519 Consider the pattern of squares shown below:

Which type of model, linear or exponential, should be used to determine how many squares are in the nth pattern?
Explain your answer.

520 Caleb claims that the ordered pairs shown in the table below are from a nonlinear function.

x	f(x)
0	2
1	4
2	8
3	16

State if Caleb is correct. Explain your reasoning.

521 The number of people who attended a school's last six basketball games increased as the team neared the state
sectional games. The table below shows the data.

Game	13	14	15	16	17	18
Attendance	348	435	522	609	696	783

State the type of function that best fits the given data. Justify your choice of a function type.

F.LE.A.2: FAMILIES OF FUNCTIONS

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

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

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

525 Vinny collects population data, $P(h)$, about a specific strain of bacteria over time in hours, h, as shown in the graph below.
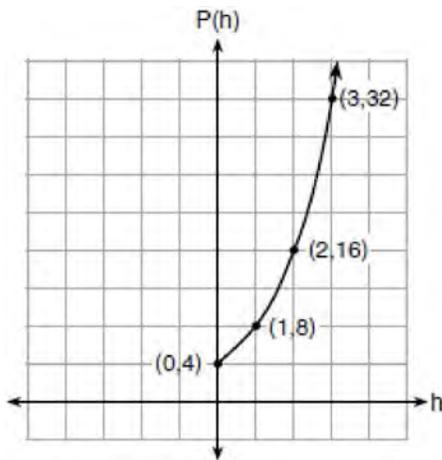
Which equation represents the graph of $P(h)$?

1) $P(h) = 4(2)^h$

2) $P(h) = \dfrac{46}{5}h + \dfrac{6}{5}$

3) $P(h) = 3h^2 + 0.2h + 4.2$

4) $P(h) = \dfrac{2}{3}h^3 - h^2 + 3h + 4$

526 If a population of 100 cells triples every hour, which function represents $p(t)$, the population after t hours?

1) $p(t) = 3(100)^t$

2) $p(t) = 100(3)^t$

3) $p(t) = 3t + 100$

4) $p(t) = 100t + 3$

F.LE.A.3: FAMILIES OF FUNCTIONS

527 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

528 What is the largest integer, x, for which the value of $f(x) = 5x^4 + 30x^2 + 9$ will be greater than the value of $g(x) = 3^x$?

1) 7

2) 8

3) 9

4) 10

529 As x increases beyond 25, which function will have the largest value?

1) $f(x) = 1.5^x$

2) $g(x) = 1.5x + 3$

3) $h(x) = 1.5x^2$

4) $k(x) = 1.5x^3 + 1.5x^2$

530 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

531 The table below shows the weights of Liam's pumpkin, $l(w)$, and Patricia's pumpkin, $p(w)$, over a four-week period where w represents the number of weeks. Liam's pumpkin grows at a constant rate. Patricia's pumpkin grows at a weekly rate of approximately 52%.

Weeks	Weight in Pounds	Weight in Pounds
w	l(w)	p(w)
6	2.4	2.5
7	5.5	3.8
8	8.6	5.8
9	11.7	8.8

Assume the pumpkins continue to grow at these rates through week 13. When comparing the weights of both Liam's and Patricia's pumpkins in week 10 and week 13, which statement is true?

1) Liam's pumpkin will weigh more in week 10 and week 13.

2) Patricia's pumpkin will weigh more in week 10 and week 13.

3) Liam's pumpkin will weigh more in week 10, and Patricia's pumpkin will weigh more in week 13.

4) Patricia's pumpkin will weigh more in week 10, and Liam's pumpkin will weigh more in week 13.

532 Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week. Write a function in terms of x to model each option of saving. Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

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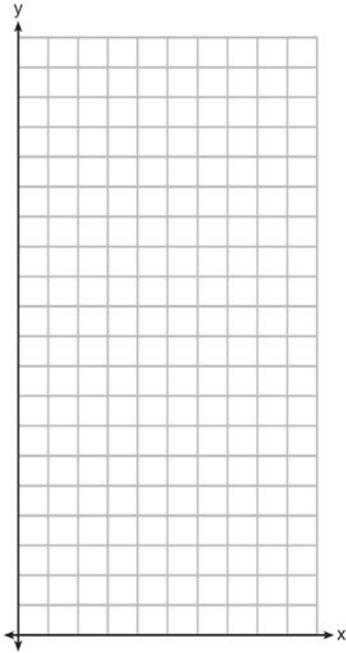
State which function, $f(x)$ or $g(x)$, has a greater value when $x = 20$. Justify your reasoning.

F.BF.B.3: TRANSFORMATIONS WITH FUNCTIONS

534   The graph of $y = f(x)$ is shown below.
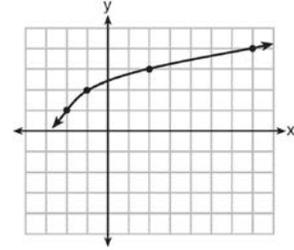
What is the graph of $y = f(x + 1) - 2$?
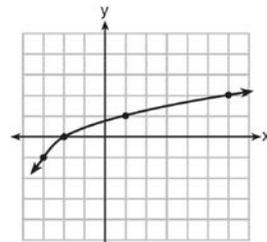
1)
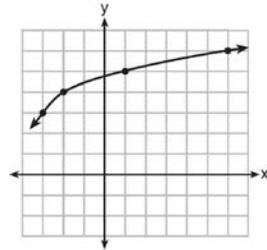
2)
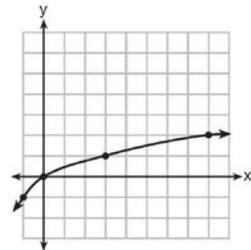
3)
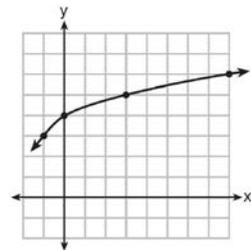
4)

535 The graph of the function $p(x)$ is represented below. On the same set of axes, sketch the function $p(x+2)$.
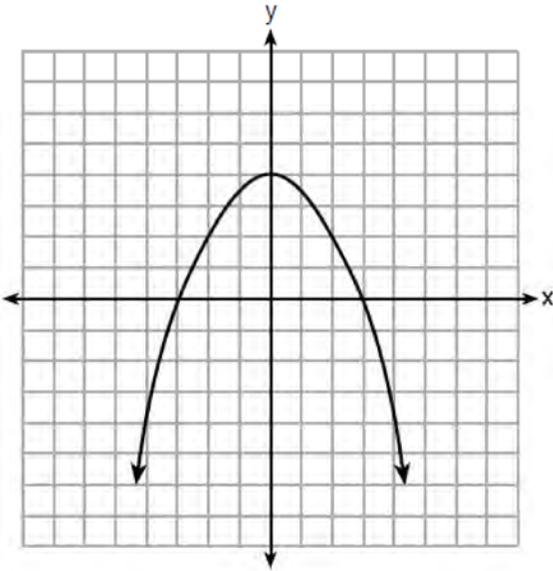
536 Richard is asked to transform the graph of $b(x)$ below.
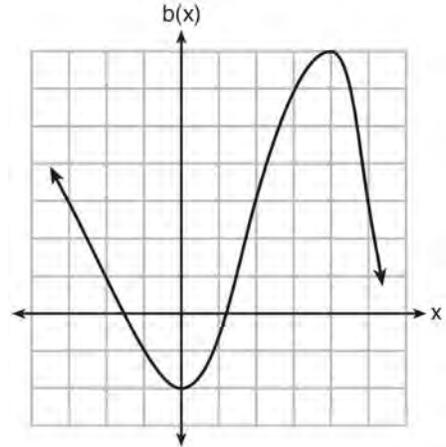
The graph of $b(x)$ is transformed using the equation $h(x) = b(x-2) - 3$. Describe how the graph of $b(x)$ changed to form the graph of $h(x)$.

F.IF.C.9: COMPARING FUNCTIONS

537 The quadratic functions $r(x)$ and $q(x)$ are given below.

x	$r(x)$
−4	−12
−3	−15
−2	−16
−1	−15
0	−12
1	7

$$q(x) = x^2 + 2x - 8$$

The function with the *smaller* minimum value is
1) $q(x)$, and the value is −9
2) $q(x)$, and the value is −1
3) $r(x)$, and the value is −16
4) $r(x)$, and the value is −2

538 Given the following quadratic functions:

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

and

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

Which statement about these functions is true?
1) Over the interval $-1 \le x \le 1$, the average rate of change for $n(x)$ is less than that for $g(x)$.
2) The y-intercept of $g(x)$ is greater than the y-intercept for $n(x)$.
3) The function $g(x)$ has a greater maximum value than $n(x)$.
4) The sum of the roots of $n(x) = 0$ is greater than the sum of the roots of $g(x) = 0$.

539 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
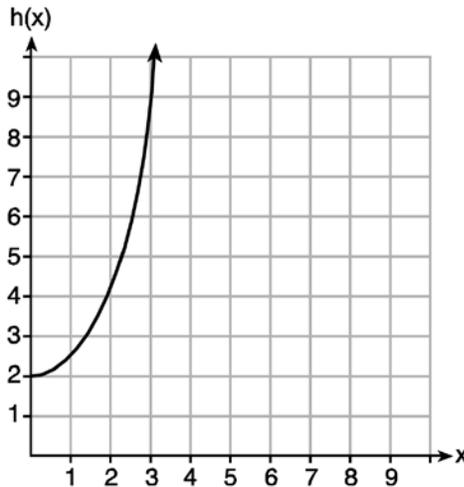
The correct list of functions ordered from greatest to least by average rate of change over the interval $0 \le x \le 3$ is
1) $f(x), g(x), h(x)$
2) $h(x), g(x), f(x)$
3) $g(x), f(x), h(x)$
4) $h(x), f(x), g(x)$

540 The function $h(x)$, which is graphed below, and the function $g(x) = 2|x+4| - 3$ are given.
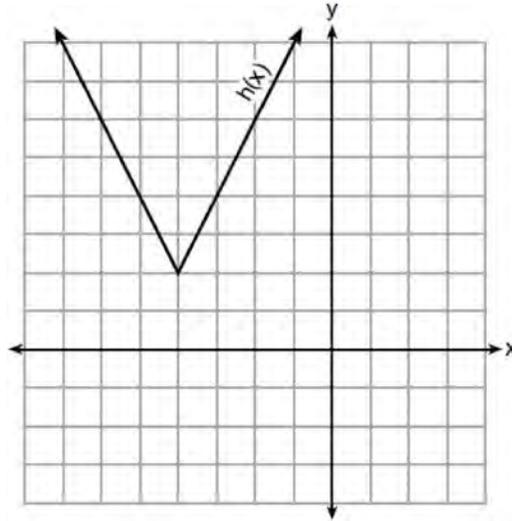
Which statements about these functions are true?
I. $g(x)$ has a lower minimum value than $h(x)$.
II.   For all values of x, $h(x) < g(x)$.
III. For any value of x, $g(x) \neq h(x)$.

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

541 Which statement is true about the quadratic functions $g(x)$, shown in the table below, and $f(x) = (x-3)^2 + 2$?

x	g(x)
0	4
1	−1
2	−4
3	−5
4	−4
5	−1
6	4

1) They have the same vertex.
2) They have the same zeros.
3) They have the same axis of symmetry.
4) They intersect at two points.

542 The functions $f(x)$, $q(x)$, and $p(x)$ are shown below.

f(x)
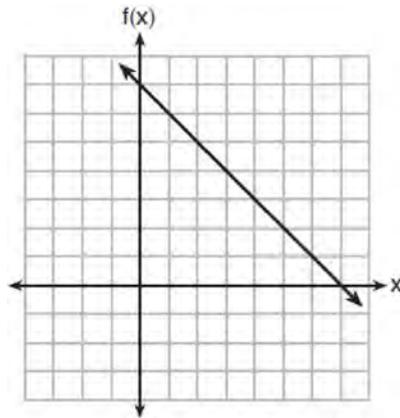
$$q(x) = (x-1)^2 - 6$$

x	p(x)
2	5
3	4
4	3
5	4
6	5

When the input is 4, which functions have the same output value?

1) $f(x)$ and $q(x)$, only   3) $q(x)$ and $p(x)$, only
2) $f(x)$ and $p(x)$, only   4) $f(x)$, $q(x)$, and $p(x)$

543 Which graph does *not* represent a function that is always increasing over the entire interval $-2 < x < 2$?

1)

2)

3)

4)
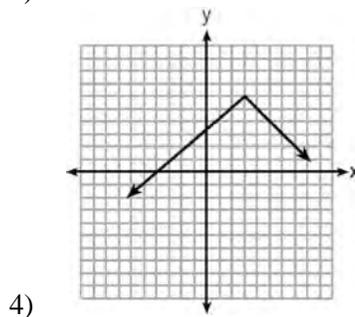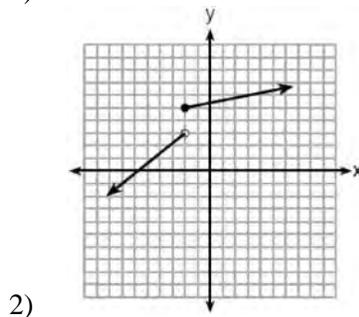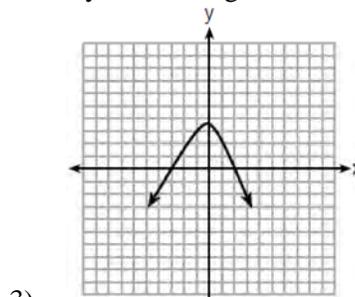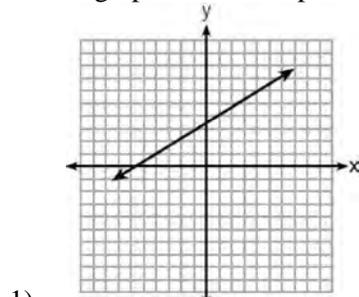
544 Which function has a constant rate of change equal to -3?

x	y
0	2
1	5
2	8
3	11

1)

2) $\{(1,5),(2,2),(3,-5),(4,4)\}$

3)
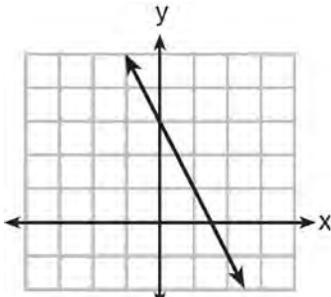
4) $2y = -6x + 10$

545 Which quadratic function has the largest maximum?

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

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

2)

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

g(x)

4)

114
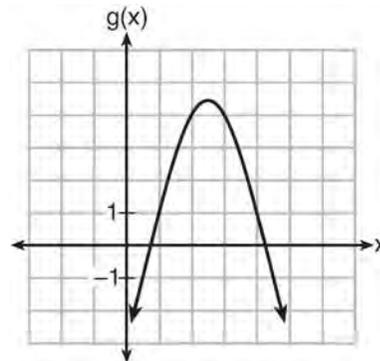
546 The graph representing a function is shown below.
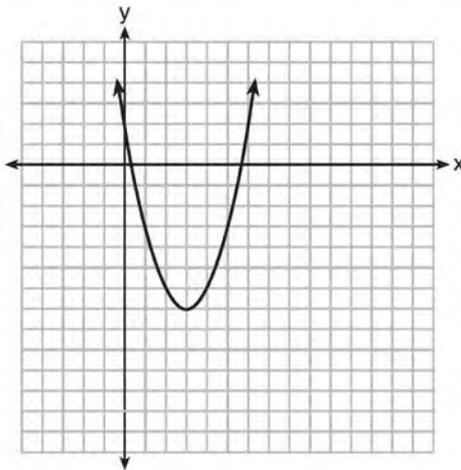
Which function has a minimum that is *less* than the one shown in the graph?

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

547 Which function has the greatest *y*-intercept?

1) $f(x) = 3x$
2) $2x + 3y = 12$
3) the line that has a slope of 2 and passes through $(1, -4)$

f(x)
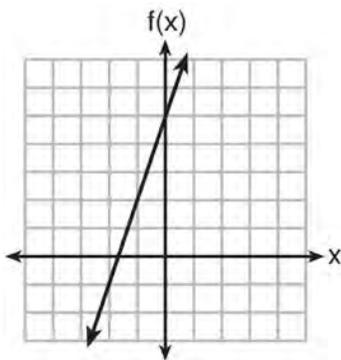
4)

548 Nancy works for a company that offers two types of savings plans. Plan *A* is represented on the graph below.

Plan A
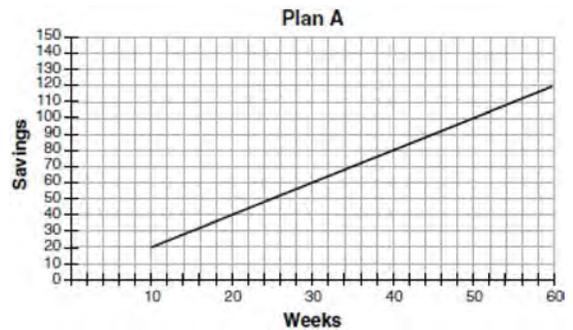
Plan *B* is represented by the function $f(x) = 0.01 + 0.05x^2$, where *x* is the number of weeks. Nancy wants to have the highest savings possible after a year. Nancy picks Plan *B*. Her decision is

1) correct, because Plan *B* is an exponential function and will increase at a faster rate
2) correct, because Plan *B* is a quadratic function and will increase at a faster rate
3) incorrect, because Plan *A* will have a higher value after 1 year
4) incorrect, because Plan *B* is a quadratic function and will increase at a slower rate

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549 Which quadratic function has the largest maximum over the set of real numbers?

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

2)

x	k(x)
−1	−1
0	3
1	5
2	5
3	3
4	−1

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

4)

x	h(x)
−2	−9
−1	−3
0	1
1	3
2	3
3	1

550 Which of the quadratic functions below has the *smallest* minimum value?

1) $h(x) = x^2 + 2x - 6$

2)

(2)

3) $k(x) = (x+5)(x+2)$

4)

x	f(x)
−1	−2
0	−5
1	−6
2	−5
3	−2

116
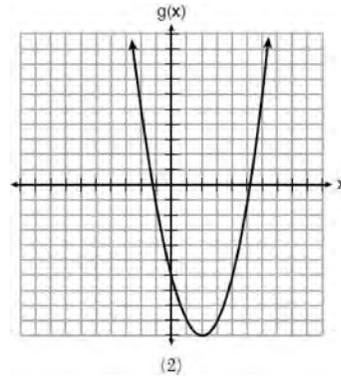
551   Three functions are shown below.

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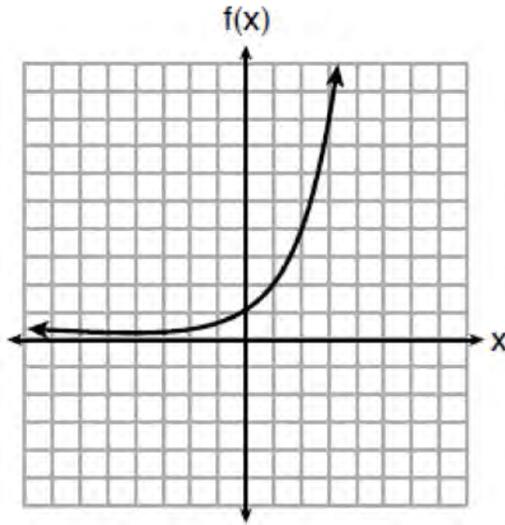
$$g(x) = 3^x + 2$$

x	h(x)
−5	30
−4	14
−3	6
−2	2
−1	0
0	−1
1	−1.5
2	−1.75

Which statement is true?
1) The *y*-intercept for $h(x)$ is greater than the *y*-intercept for $f(x)$.
2) The *y*-intercept for $f(x)$ is greater than the *y*-intercept for $g(x)$.
3) The *y*-intercept for $h(x)$ is greater than the *y*-intercept for both $g(x)$ and $f(x)$.
4) The *y*-intercept for $g(x)$ is greater than the *y*-intercept for both $f(x)$ and $h(x)$.

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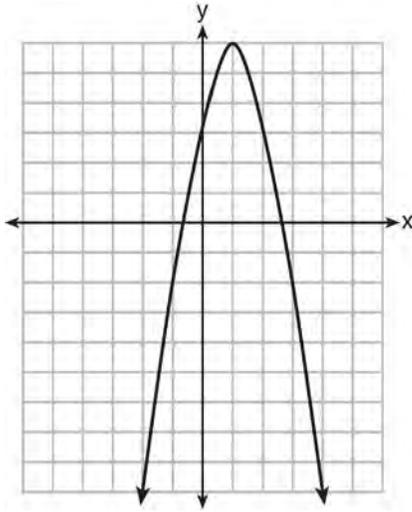
Let g be a function such that $g(x) = -\frac{1}{2}x^2 + 4x + 3$.

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

553 Three functions are shown below.

A: $g(x) = -\frac{3}{2}x + 4$

B: $f(x) = (x+2)(x+6)$
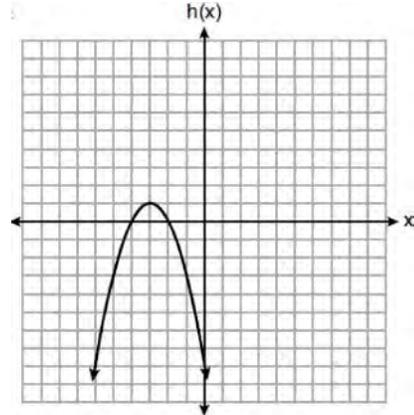
C:

Which statement is true?
1) B and C have the same zeros.
2) A and B have the same y-intercept.
3) B has a minimum and C has a maximum.
4) C has a maximum and A has a minimum.

F.IF.B.4: RELATING GRAPHS TO EVENTS

554 To keep track of his profits, the owner of a carnival booth decided to model his ticket sales on a graph. He found that his profits only declined when he sold between 10 and 40 tickets. Which graph could represent his profits?

1)

2)

3)

4)
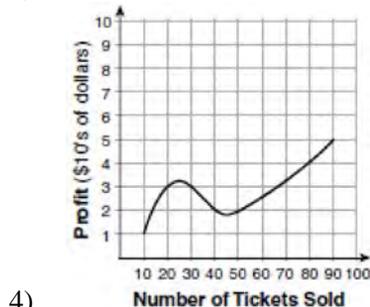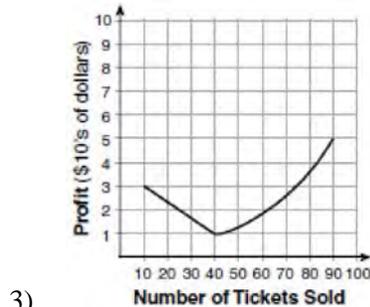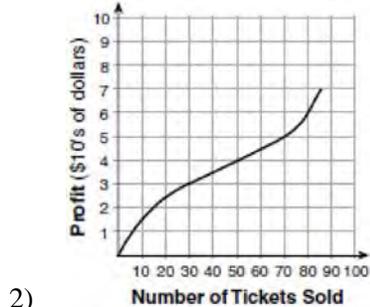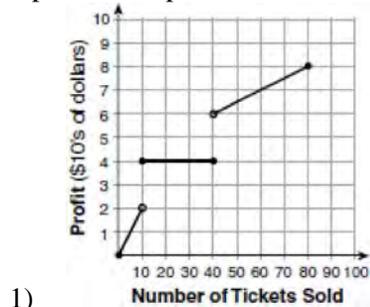
555 A child is playing outside. The graph below shows the child's distance, $d(t)$, in yards from home over a period of time, t, in seconds.
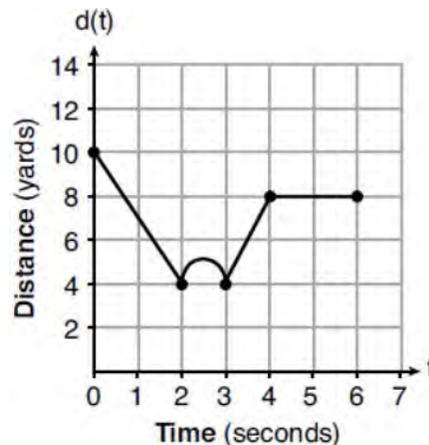
Which interval represents the child constantly moving closer to home?
1) $0 \le t \le 2$
2) $2 \le t \le 3$
3) $3 \le t \le 4$
4) $4 \le t \le 6$

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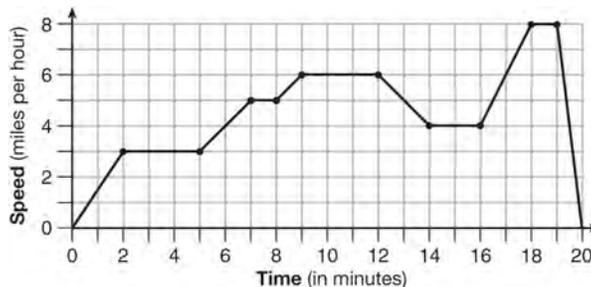
Which statement best describes what the jogger was doing during the $9 - 12$ minute interval of her jog?
1) She was standing still.
2) She was increasing her speed.
3) She was decreasing her speed.
4) She was jogging at a constant rate.

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557 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.
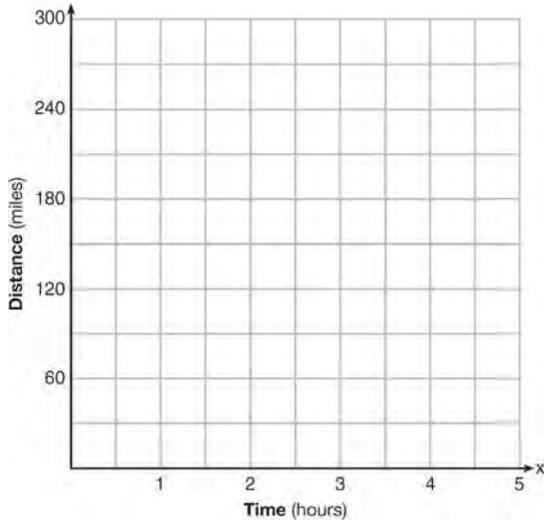
558 During a snowstorm, a meteorologist tracks the amount of accumulating snow. For the first three hours of the storm, the snow fell at a constant rate of one inch per hour. The storm then stopped for two hours and then started again at a constant rate of one-half inch per hour for the next four hours.
a) On the grid below, draw and label a graph that models the accumulation of snow over time using the data the meteorologist collected.
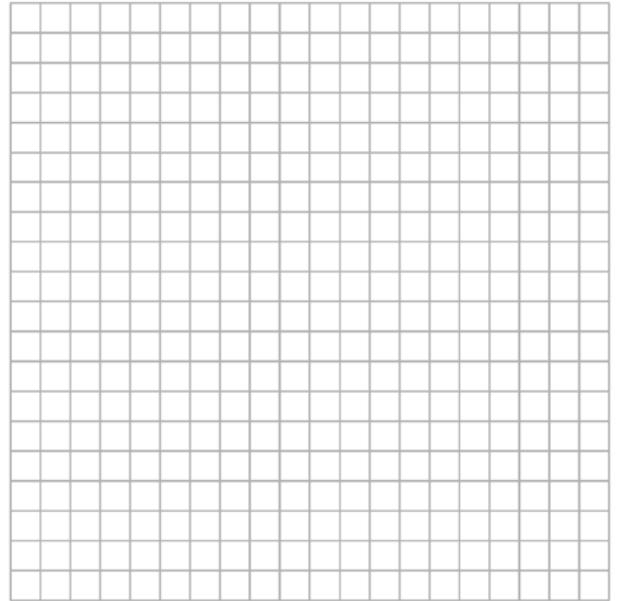
b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

559 The graph below models Craig's trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.
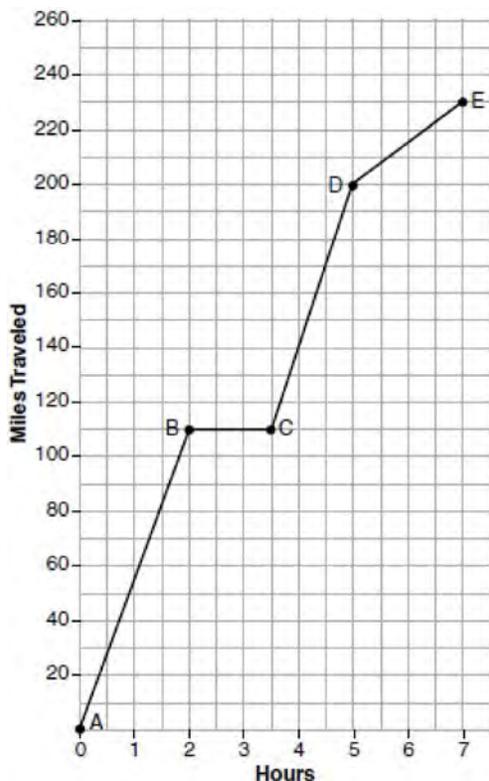
Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning. Explain what might have happened in the interval between *B* and *C*. Determine Craig's average speed, to the *nearest tenth of a mile per hour*, for his entire trip.

560 One spring day, Elroy noted the time of day and the temperature, in degrees Fahrenheit. His findings are stated below.

At 6 a.m., the temperature was 50°F. For the next 4 hours, the temperature rose 3° per hour. The next 6 hours, it rose 2° per hour. The temperature then stayed steady until 6 p.m. For the next 2 hours, the temperature dropped 1° per hour. The temperature then dropped steadily until the temperature was 56°F at midnight.
On the set of axes below, graph Elroy's data.
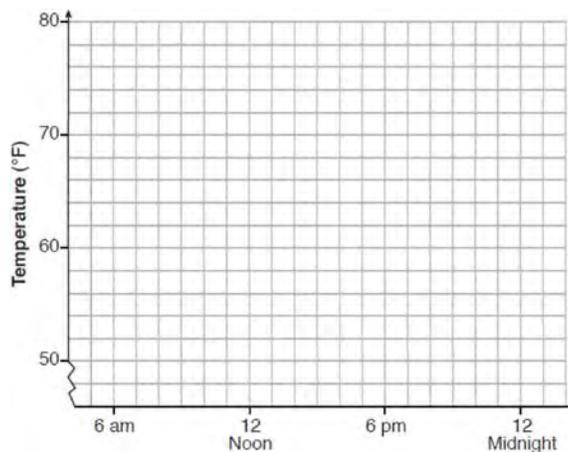
State the entire time interval for which the temperature was increasing. Determine the average rate of change, in degrees per hour, from 6:00 p.m. to midnight.

561 A snowstorm started at midnight. For the first 4 hours, it snowed at an average rate of one-half inch per hour. The snow then started to fall at an average rate of one inch per hour for the next 6 hours. Then it stopped snowing for 3 hours. Then it started snowing again at an average rate of one-half inch per hour for the next 4 hours until the storm was over. On the set of axes below, graph the amount of snow accumulated over the time interval of the storm.
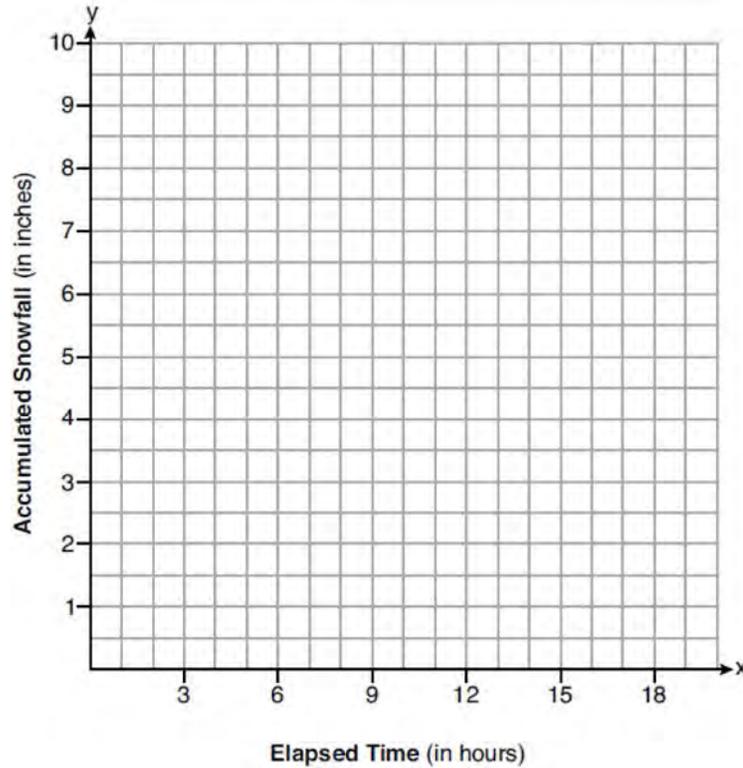
Determine the average rate of snowfall over the length of the storm. State the rate, to the *nearest hundredth of an inch per hour*.

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

562 When the function $g(x) = \begin{cases} 5x, x \le 3 \\ x^2 + 4, x > 3 \end{cases}$ is graphed correctly, how should the points be drawn on the graph for an x-value of 3?
1) open circles at $(3, 15)$ and $(3, 13)$
2) closed circles at $(3, 15)$ and $(3, 13)$
3) an open circle at $(3, 15)$ and a closed circle at $(3, 13)$
4) a closed circle at $(3, 15)$ and an open circle at $(3, 13)$

563 A function is graphed on the set of axes below.
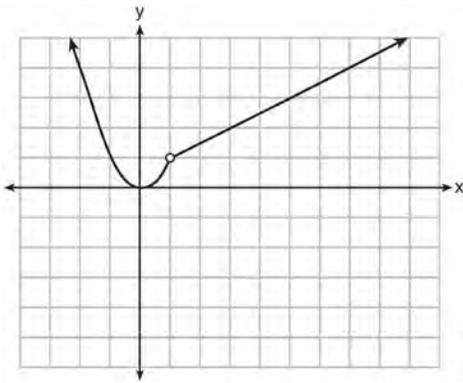
Which function is related to the graph?
1) $f(x) = \begin{cases} x^2, x < 1 \\ x - 2, x > 1 \end{cases}$
2) $f(x) = \begin{cases} x^2, x < 1 \\ \frac{1}{2}x + \frac{1}{2}, x > 1 \end{cases}$
3) $f(x) = \begin{cases} x^2, x < 1 \\ 2x - 7, x > 1 \end{cases}$
4) $f(x) = \begin{cases} x^2, x < 1 \\ \frac{3}{2}x - \frac{9}{2}, x > 1 \end{cases}$

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

1)

2)

3)

4)
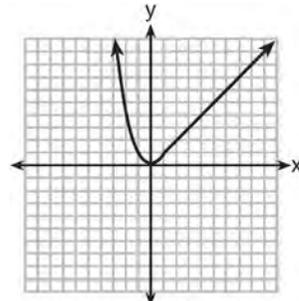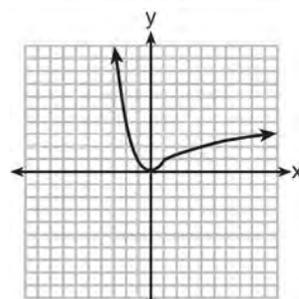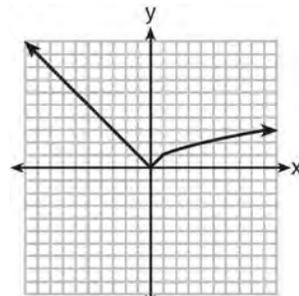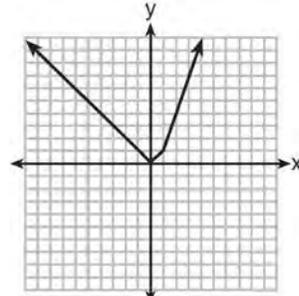
565 Graph the following function on the set of axes below.

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

f(x)
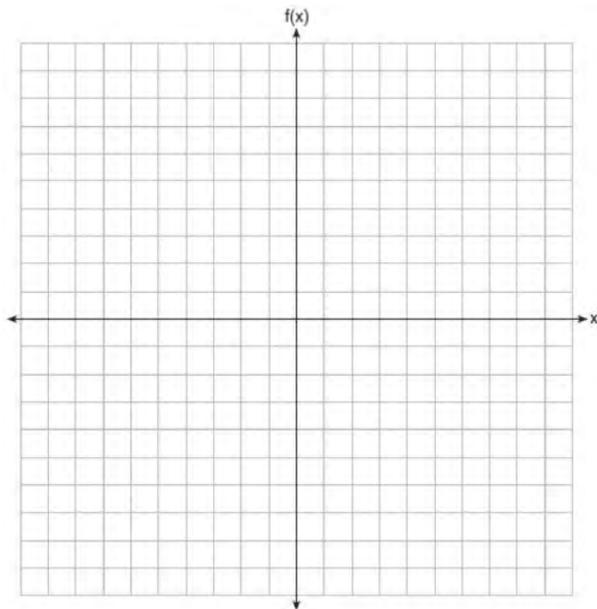
566 On the set of axes below, graph the piecewise function:

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

f(x)
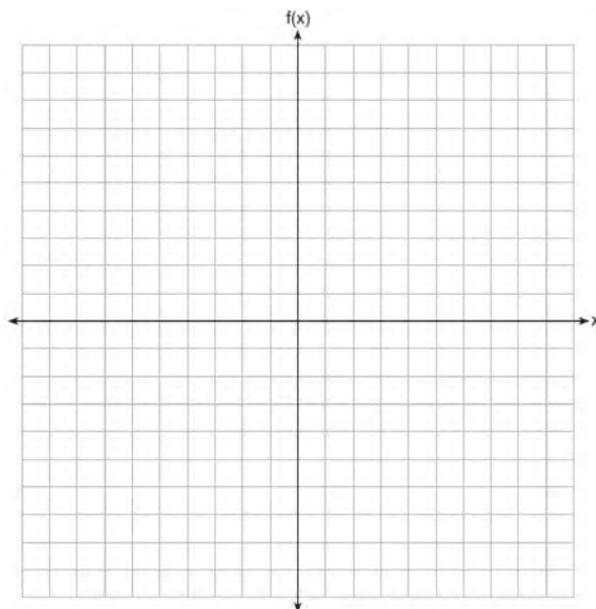
567 Graph the following piecewise function on the set of axes below.

$$f(x) = \begin{cases} |x|, & -5 \le x < 2 \\ -2x + 10, & 2 \le x \le 6 \end{cases}$$

f(x)
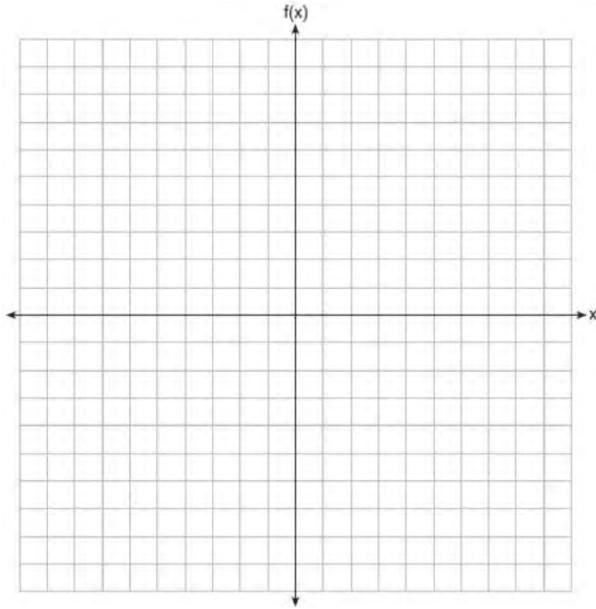
568 Graph the function: $h(x) = \begin{cases} 2x - 3, & x < 0 \\ x^2 - 4x - 5, & 0 \le x \le 5 \end{cases}$

y

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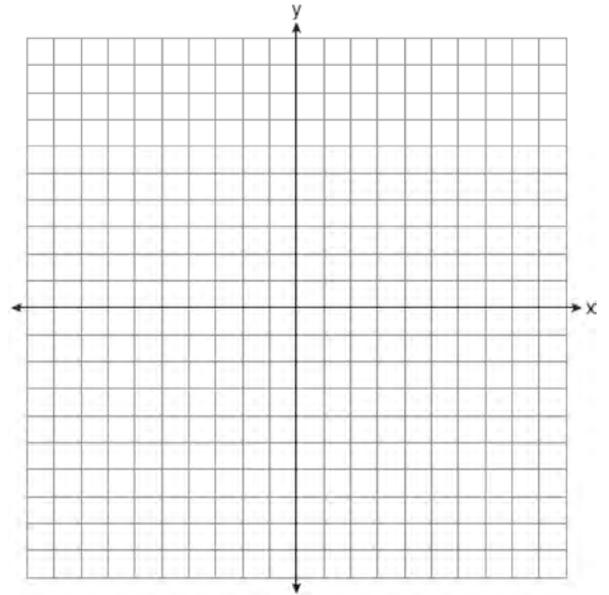
569 At an office supply store, if a customer purchases fewer than 10 pencils, the cost of each pencil is $1.75. If a customer purchases 10 or more pencils, the cost of each pencil is $1.25. Let c be a function for which $c(x)$ is the cost of purchasing x pencils, where x is a whole number.

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

Create a graph of c on the axes below.
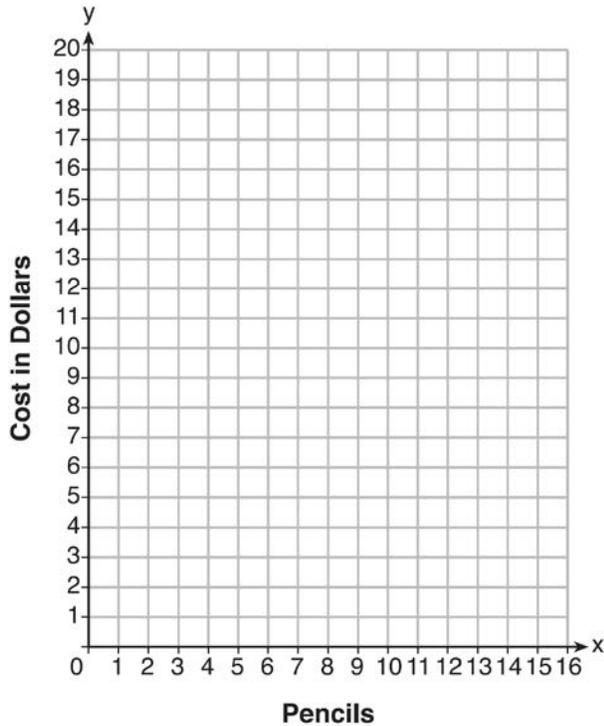
Pencils

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.

F.IF.C.7: GRAPHING STEP FUNCTIONS

570 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)

126
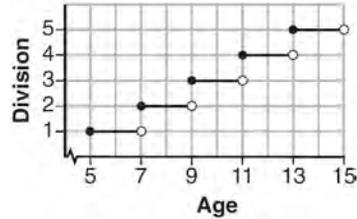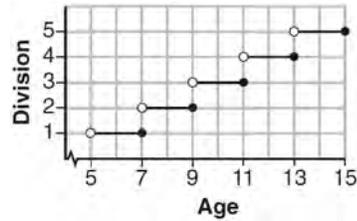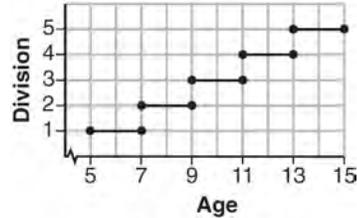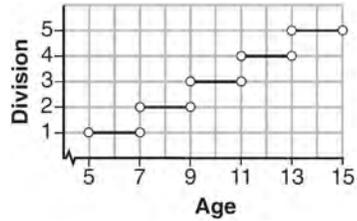
571 The table below lists the total cost for parking for a period of time on a street in Albany, N.Y. The total cost is for any length of time up to and including the hours parked. For example, parking for up to and including 1 hour would cost $1.25; parking for 3.5 hours would cost $5.75.

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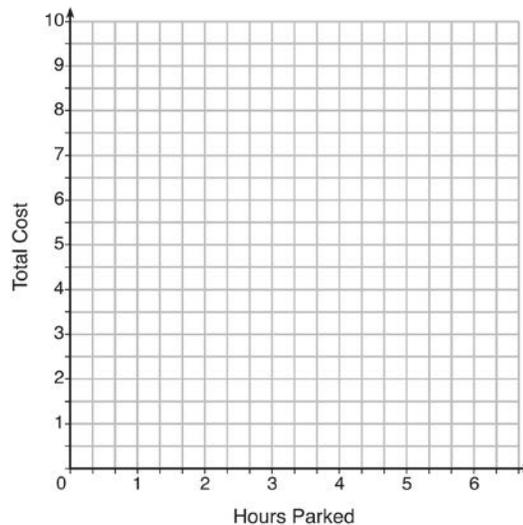
Explain how the cost per hour to park changes over the six-hour period.

SEQUENCES
F.IF.A.3: SEQUENCES

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

573 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

574 In a sequence, the first term is 4 and the common difference is 3. The fifth term of this sequence is
1) −11
2) −8
3) 16
4) 19

575 Given the function $f(n)$ defined by the following:
$$f(1) = 2$$
$$f(n) = -5f(n-1) + 2$$
Which set could represent the range of the function?
1) $\{2,4,6,8,\dots\}$
2) $\{2,-8,42,-208,\dots\}$
3) $\{-8,-42,-208,1042,\dots\}$
4) $\{-10,50,-250,1250,\dots\}$

576 If $a_n = n\left(a_{n-1}\right)$ and $a_1 = 1$, what is the value of a_5?
1) 5
2) 20
3) 120
4) 720

577 Given the following three sequences:
   I. $2,4,6,8,10\dots$
   II. $2,4,8,16,32\dots$
   III. $a, a+2, a+4, a+6, a+8\dots$
Which ones are arithmetic sequences?
1) I and II, only
2) I and III, only
3) II and III, only
4) I, II, and III

578 If $a_1 = 6$ and $a_n = 3 + 2(a_{n-1})^2$, then a_2 equals
1) 75
2) 147
3) 180
4) 900

579 What is a common ratio of the geometric sequence whose first term is 5 and third term is 245?
1) 7
2) 49
3) 120
4) 240

580 A sequence of blocks is shown in the diagram below.
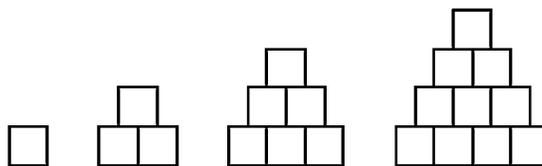
This sequence can be defined by the recursive function $a_1 = 1$ and $a_n = a_{n-1} + n$. Assuming the pattern continues, how many blocks will there be when $n = 7$?
1) 13
2) 21
3) 28
4) 36

581 On the main floor of the Kodak Hall at the Eastman Theater, the number of seats per row increases at a constant rate. Steven counts 31 seats in row 3 and 37 seats in row 6. How many seats are there in row 20?
1) 65
2) 67
3) 69
4) 71

582 Determine and state whether the sequence $1, 3, 9, 27, \ldots$ displays exponential behavior. Explain how you arrived at your decision.

583 Write the first five terms of the recursive sequence defined below.

$$a_1 = 0$$

$$a_n = 2\left(a_{n-1}\right)^2 - 1, \text{ for } n > 1$$

584 Given the recursive formula:

$$a_1 = 3$$

$$a_n = 2\left(a_{n-1} + 1\right)$$

State the values of a_2, a_3, and a_4 for the given recursive formula.

F.LE.A.2: SEQUENCES

585 A pattern of blocks is shown below.

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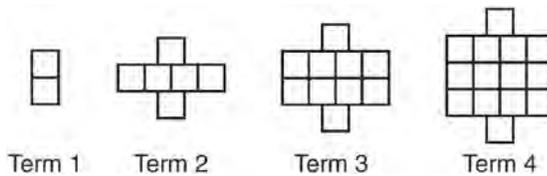
If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the nth term?

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

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

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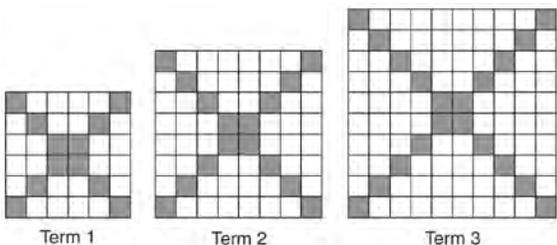
Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the nth term?
1) $a_n = 4n + 12$
2) $a_n = 4n + 8$
3) $a_n = 4n + 4$
4) $a_n = 4n + 2$

587 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

588 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) $a_n = 16n - 38$

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

590 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) $f(1) = 3, \ f(n + 1) = 3f(n) - 2$

591 Which function defines the sequence $-6, -10, -14, -18, \ldots$, where $f(6) = -26$?
1) $f(x) = -4x - 2$
2) $f(x) = 4x - 2$
3) $f(x) = -x + 32$
4) $f(x) = x - 26$

592 In 2014, the cost to mail a letter was 49¢ for up to one ounce. Every additional ounce cost 21¢. Which recursive function could be used to determine the cost of a 3-ounce letter, in cents?
1) $a_1 = 49; \ a_n = a_{n-1} + 21$
2) $a_1 = 0; \ a_n = 49a_{n-1} + 21$
3) $a_1 = 21; \ a_n = a_{n-1} + 49$
4) $a_1 = 0; \ a_n = 21a_{n-1} + 49$

593 If the pattern below continues, which equation(s) is a recursive formula that represents the number of squares in this sequence?

Design 1   Design 2   Design 3   Design 4

1) $y = 2x + 1$
2) $y = 2x + 3$
3) $a_1 = 3$
   $a_n = a_{n-1} + 2$
4) $a_1 = 1$
   $a_n = a_{n-1} + 2$

594 For the sequence $-27, -12, 3, 18, \ldots$, the expression that defines the nth term where $a_1 = -27$ is
1) $15 - 27n$
2) $15 - 27(n - 1)$
3) $-27 + 15n$
4) $-27 + 15(n - 1)$

595 Which function could be used to represent the sequence $8, 20, 50, 125, 312.5, \ldots$, given that $a_1 = 8$?
1) $a_n = a_{n-1} + a_1$
2) $a_n = 2.5(a_{n-1})$
3) $a_n = a_1 + 1.5(a_{n-1})$
4) $a_n = (a_1)(a_{n-1})$

GRAPHS AND STATISTICS
S.ID.A.2: CENTRAL TENDENCY AND DISPERSION

596 The following table shows the heights, in inches, of the players on the opening-night roster of the 2015-2016 New York Knicks.

84	80	87	75	77	79	80	74	76	80	80	82	82

The population standard deviation of these data is approximately
1) 3.5
2) 13
3) 79.7
4) 80

597 Santina is considering a vacation and has obtained high-temperature data from the last two weeks for Miami and Los Angeles.

Miami	76	75	83	73	60	66	76
	81	83	85	83	87	80	80

Los Angeles	74	63	65	67	65	65	65
	62	62	72	69	64	64	61

Which location has less variability in temperatures? Explain how you arrived at your answer.

598 The students in Mrs. Lankford's 4th and 6th period Algebra classes took the same test. The results of the scores are shown in the following table:

	$\bar{x}$	σ_x	n	min	Q_1	med	Q_3	max
4th Period	77.75	10.79	20	58	69	76.5	87.5	96
6th Period	78.4	9.83	20	59	71.5	78	88	96

Based on these data, which class has the larger spread of test scores? Explain how you arrived at your answer.

599 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.

132

600 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.
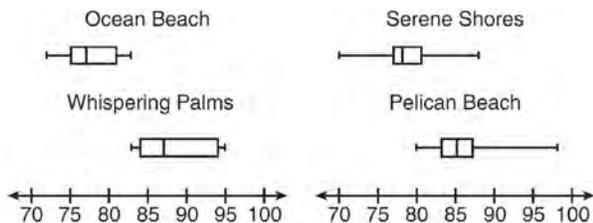
Which destination has a median temperature above 80 degrees and the smallest interquartile range?
1) Ocean Beach
2) Whispering Palms
3) Serene Shores
4) Pelican Beach

601 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.

602 Noah conducted a survey on sports participation. He created the following two dot plots to represent the number of students participating, by age, in soccer and basketball.

Which statement about the given data sets is correct?
1) The data for soccer players are skewed right.
2) The data for soccer players have less spread than the data for basketball players.
3) The data for basketball players have the same median as the data for soccer players.
4) The data for basketball players have a greater mean than the data for soccer players.

603 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

S.ID.A.3: CENTRAL TENDENCY AND DISPERSION

604 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.

605 The heights, in inches, of 12 students are listed below.

61,67,72,62,65,59,60,79,60,61,64,63

Which statement best describes the spread of these data?

1) The set of data is evenly spread.
2) The median of the data is 59.5.
3) The set of data is skewed because 59 is the only value below 60.
4) 79 is an outlier, which would affect the standard deviation of these data.

606 The 15 members of the French Club sold candy bars to help fund their trip to Quebec. The table below shows the number of candy bars each member sold.

Number of Candy Bars Sold				
0	35	38	41	43
45	50	53	53	55
68	68	68	72	120

When referring to the data, which statement is *false*?
1) The mode is the best measure of central tendency for the data.
2) The data have two outliers.
3) The median is 53.
4) The range is 120.

S.ID.B.5: FREQUENCY TABLES

607 A public opinion poll was taken to explore the relationship between age and support for a candidate in an election. The results of the poll are summarized in the table below.

Age	For	Against	No Opinion
21-40	30	12	8
41-60	20	40	15
Over 60	25	35	15

What percent of the 21-40 age group was for the candidate?
1) 15
2) 25
3) 40
4) 60

608 A radio station did a survey to determine what kind of music to play by taking a sample of middle school, high school, and college students. They were asked which of three different types of music they prefer on the radio: hip-hop, alternative, or classic rock. The results are summarized in the table below.

	Hip-Hop	Alternative	Classic Rock
Middle School	28	18	4
High School	22	22	6
College	16	20	14

What percentage of college students prefer classic rock?
1) 14%
2) 28%
3) 33%
4) 58%

609 Students were asked to name their favorite sport from a list of basketball, soccer, or tennis. The results are shown in the table below.

	Basketball	Soccer	Tennis
Girls	42	58	20
Boys	84	41	5

What percentage of the students chose soccer as their favorite sport?
1) 39.6%
2) 41.4%
3) 50.4%
4) 58.6%

610 Jenna took a survey of her senior class to see whether they preferred pizza or burgers. The results are summarized in the table below.

	Pizza	Burgers
Male	23	42
Female	31	26

Of the people who preferred burgers, approximately what percentage were female?
1) 21.3
2) 38.2
3) 45.6
4) 61.9

611 A survey was given to 12th-grade students of West High School to determine the location for the senior class trip. The results are shown in the table below.

	Niagara Falls	Darien Lake	New York City
Boys	56	74	103
Girls	71	92	88

To the *nearest percent*, what percent of the boys chose Niagara Falls?
1) 12
2) 24
3) 44
4) 56

612 An outdoor club conducted a survey of its members. The members were asked to state their preference between skiing and snowboarding. Each member had to pick one. Of the 60 males, 45 stated they preferred to snowboard. Twenty-two of the 60 females preferred to ski. What is the relative frequency that a male prefers to ski?
1) 0.125
2) 0.25
3) $0.\overline{333}$
4) $0.\overline{405}$

613 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?

614 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.

615 A survey of 100 students was taken. It was found that 60 students watched sports, and 34 of these students did not like pop music. Of the students who did *not* watch sports, 70% liked pop music. Complete the two-way frequency table.

	Watch Sports	Don't Watch Sports	Total
Like Pop			
Don't Like Pop			
Total			

S.ID.A.1: FREQUENCY HISTOGRAMS

616 The heights, in feet, of former New York Knicks basketball players are listed below.

6.4 6.9 6.3 6.2 6.3 6.0 6.1 6.3 6.8 6.2
6.5 7.1 6.4 6.3 6.5 6.5 6.4 7.0 6.4 6.3
6.2 6.3 7.0 6.4 6.5 6.5 6.5 6.0 6.2

Using the heights given, complete the frequency table below.

Interval	Frequency
6.0-6.1	
6.2-6.3	
6.4-6.5	
6.6-6.7	
6.8-6.9	
7.0-7.1	

Based on the frequency table created, draw and label a frequency histogram on the grid below.
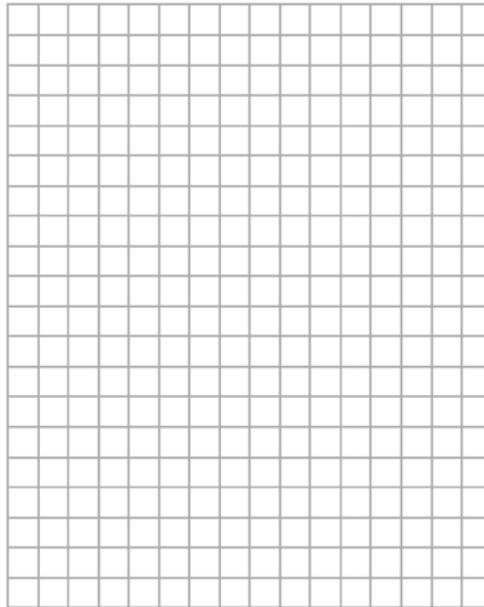
Determine and state which interval contains the upper quartile. Justify your response.

S.ID.A.1: BOX PLOTS

617 Which statistic can *not* be determined from a box plot representing the scores on a math test in Mrs. DeRidder's algebra class?
1) the lowest score
2) the median score
3) the highest score
4) the score that occurs most frequently

618 The box plot below summarizes the data for the average monthly high temperatures in degrees Fahrenheit for Orlando, Florida.
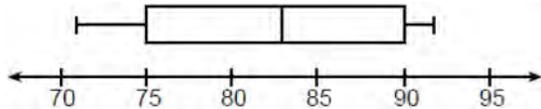
The third quartile is
1) 92
2) 90
3) 83
4) 71

619 What is the range of the box plot shown below?

1) 7
2) 2
3) 3
4) 4

620 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.A.1: DOT PLOTS

621 The dot plot shown below represents the number of pets owned by students in a class.
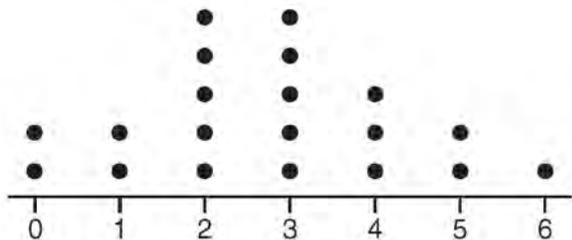
Which statement about the data is *not* true?
1) The median is 3.
2) The interquartile range is 2.
3) The mean is 3.
4) The data contain no outliers.

S.ID.B.6: SCATTER PLOTS

622 The scatter plot below shows the relationship between the number of members in a family and the amount of the family's weekly grocery bill.
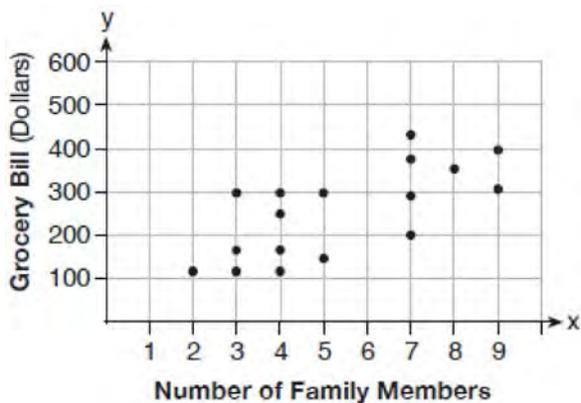
The most appropriate prediction of the grocery bill for a family that consists of six members is
1) $100
2) $300
3) $400
4) $500

S.ID.C.9: ANALYSIS OF DATA

623 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.
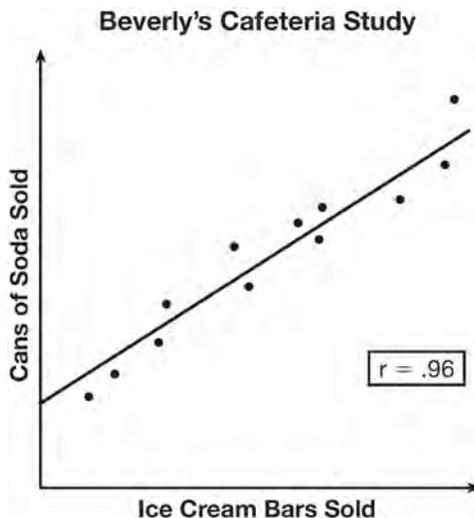
Given this information, which statement(s) can correctly be concluded?
I. Eating more ice cream causes a person to become thirsty.
II. Drinking more soda causes a person to become hungry.
III. There is a strong correlation between ice cream sales and soda sales.
1) I, only
2) III, only
3) I and III
4) II and III

624 What type of relationship exists between the number of pages printed on a printer and the amount of ink used by that printer?
1) positive correlation, but not causal
2) positive correlation, and causal
3) negative correlation, but not causal
4) negative correlation, and causal

625 Which situation does *not* describe a causal relationship?
1) The higher the volume on a radio, the louder the sound will be.
2) The faster a student types a research paper, the more pages the paper will have.
3) The shorter the distance driven, the less gasoline that will be used.
4) The slower the pace of a runner, the longer it will take the runner to finish the race.

626 The data obtained from a random sample of track athletes showed that as the foot size of the athlete decreased, the average running speed decreased. Which statement is best supported by the data?
1) Smaller foot sizes cause track athletes to run slower.
2) The sample of track athletes shows a causal relationship between foot size and running speed.
3) The sample of track athletes shows a correlation between foot size and running speed.
4) There is no correlation between foot size and running speed in track athletes.

S.ID.B.6: REGRESSION

627 The population of a small town over four years is recorded in the chart below, where 2013 is represented by $x = 0$. [Population is rounded to the nearest person]

Year	2013	2014	2015	2016
Population	3810	3943	4081	4224

The population, $P(x)$, for these years can be modeled by the function $P(x) = ab^x$, where b is rounded to the nearest thousandth. Which statements about this function are true?
     I. $a = 3810$
     II. $a = 4224$
     III. $b = 0.035$
     IV. $b = 1.035$
1) I and III
2) I and IV
3) II and III
4) II and IV

628 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) $y = 14.1x + 5.8$

629 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*.)

630 The data table below shows the median diameter of grains of sand and the slope of the beach for 9 naturally occurring ocean beaches.

Median Diameter of Grains of Sand, in Millimeters (x)	0.17	0.19	0.22	0.235	0.235	0.3	0.35	0.42	0.85
Slope of Beach, in Degrees (y)	0.63	0.7	0.82	0.88	1.15	1.5	4.4	7.3	11.3

Write the linear regression equation for this set of data, rounding all values to the *nearest thousandth*. Using this equation, predict the slope of a beach, to the *nearest tenth of a degree*, on a beach with grains of sand having a median diameter of 0.65 mm.

631   Omar has a piece of rope. He ties a knot in the rope and measures the new length of the rope. He then repeats this
process several times. Some of the data collected are listed in the table below.

Number of Knots	4	5	6	7	8
Length of Rope (cm)	64	58	49	39	31

State, to the *nearest tenth*, the linear regression equation that approximates the length, y, of the rope after tying x
knots. Explain what the y-intercept means in the context of the problem. Explain what the slope means in the
context of the problem.

632   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.

633   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.

634 The percentage of students scoring 85 or better on a mathematics final exam and an English final exam during a recent school year for seven schools is shown in the table below.

Percentage of Students Scoring 85 or Better	
Mathematics, x	English, y
27	46
12	28
13	45
10	34
30	56
45	67
20	42

Write the linear regression equation for these data, rounding all values to the *nearest hundredth*. State the correlation coefficient of the linear regression equation, to the *nearest hundredth*. Explain the meaning of this value in the context of these data.

635 The data given in the table below show some of the results of a study comparing the height of a certain breed of dog, based upon its mass.

Mass (kg)	4.5	5	4	3.5	5.5	5	5	4	4	6	3.5	5.5
Height (cm)	41	40	35	38	43	44	37	39	42	44	31	30

Write the linear regression equation for these data, where *x* is the mass and *y* is the height. Round all values to the *nearest tenth*. State the value of the correlation coefficient to the *nearest tenth*, and explain what it indicates.

636 The table below shows the number of hours ten students spent studying for a test and their scores.

Hours Spent Studying (x)	0	1	2	4	4	4	6	6	7	8
Test Scores (y)	35	40	46	65	67	70	82	88	82	95

Write the linear regression equation for this data set. Round all values to the *nearest hundredth*. State the correlation coefficient of this line, to the *nearest hundredth*. Explain what the correlation coefficient suggests in the context of the problem.

637   Stephen collected data from a travel website. The data included a hotel's distance from Times Square in Manhattan and the cost of a room for one weekend night in August. A table containing these data appears below.

Distance From Times Square (city blocks) (x)	0	0	1	1	3	4	7	11	14	19
Cost of a Room (dollars) (y)	293	263	244	224	185	170	219	153	136	111

Write the linear regression equation for this data set. Round all values to the *nearest hundredth*. State the correlation coefficient for this data set, to the *nearest hundredth*. Explain what the sign of the correlation coefficient suggests in the context of the problem.

638   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.

639   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.C.8: CORRELATION COEFFICIENT

640   The table below shows 6 students' overall averages and their averages in their math class.

Overall Student Average	92	98	84	80	75	82
Math Class Average	91	95	85	85	75	78

If a linear model is applied to these data, which statement best describes the correlation coefficient?
1)   It is close to −1.
2)   It is close to 1.
3)   It is close to 0.
4)   It is close to 0.5.

641   The scatterplot below compares the number of bags of popcorn and the number of sodas sold at each performance of the circus over one week.

Popcorn Sales and Soda Sales

Which conclusion can be drawn from the scatterplot?
1)   There is a negative correlation between popcorn sales and soda sales.
2)   There is a positive correlation between popcorn sales and soda sales.
3)   There is no correlation between popcorn sales and soda sales.
4)   Buying popcorn causes people to buy soda.
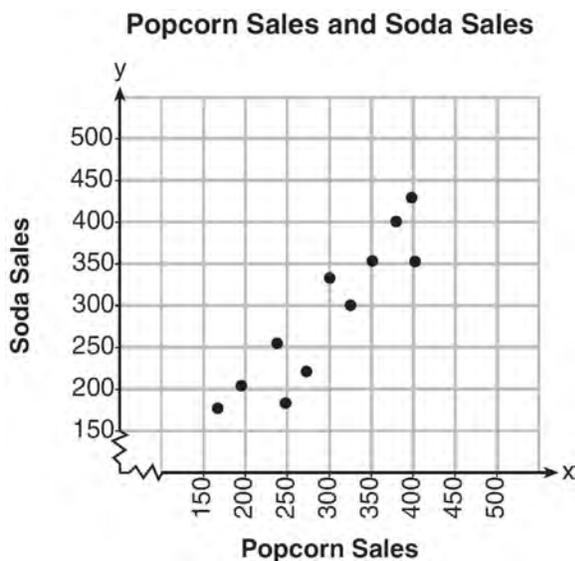
642   What is the correlation coefficient of the linear fit of the data shown below, to the *nearest hundredth*?

1)   1.00
2)   0.93
3)   −0.93
4)   −1.00

643 Bella recorded data and used her graphing calculator to find the equation for the line of best fit. She then used the correlation coefficient to determine the strength of the linear fit. Which correlation coefficient represents the strongest linear relationship?
1) 0.9
2) 0.5
3) -0.3
4) -0.8

644 Analysis of data from a statistical study shows a linear relationship in the data with a correlation coefficient of -0.524. Which statement best summarizes this result?
1) There is a strong positive correlation between the variables.
2) There is a strong negative correlation between the variables.
3) There is a moderate positive correlation between the variables.
4) There is a moderate negative correlation between the variables.

645 The results of a linear regression are shown below.
$$y = ax + b$$
$$a = -1.15785$$
$$b = 139.3171772$$
$$r = -0.896557832$$
$$r^2 = 0.8038159461$$
Which phrase best describes the relationship between x and y?
1) strong negative correlation
2) strong positive correlation
3) weak negative correlation
4) weak positive correlation

646 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.

647 At Mountain Lakes High School, the mathematics and physics scores of nine students were compared as shown in the table below.

Mathematics	55	93	89	60	90	45	64	76	89
Physics	66	89	94	52	84	56	66	73	92

State the correlation coefficient, to the *nearest hundredth*, for the line of best fit for these data. Explain what the correlation coefficient means with regard to the context of this situation.

S.ID.B.6: RESIDUALS

648 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)
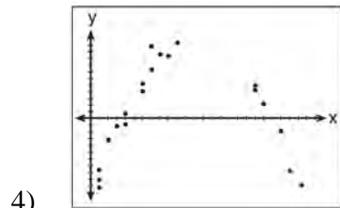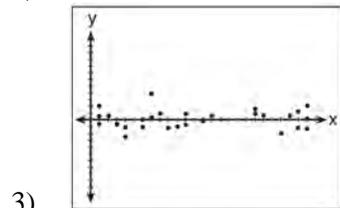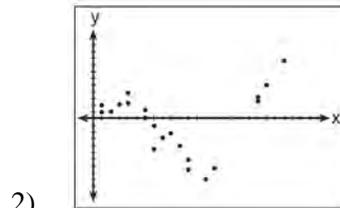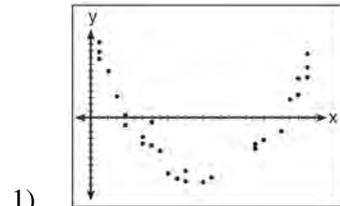
649 Which statistic would indicate that a linear function would *not* be a good fit to model a data set?

1) $r = -0.93$
2) $r = 1$

3)

4)

148
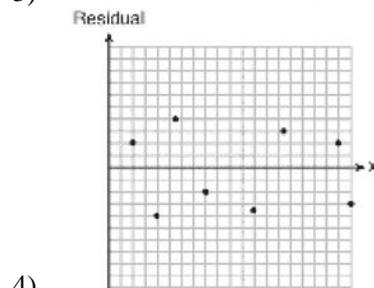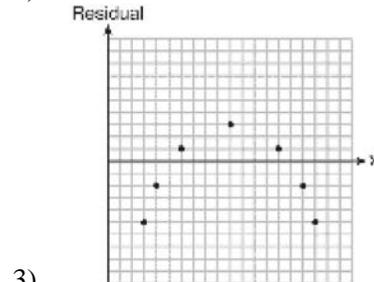
650   The residual plots from two different sets of
      bivariate data are graphed below.
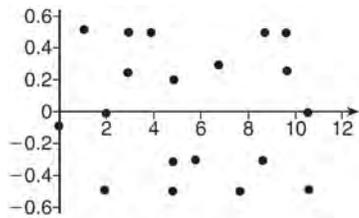

Graph A
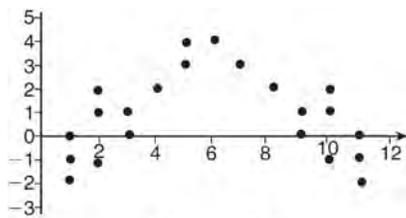
Graph B

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

651 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.
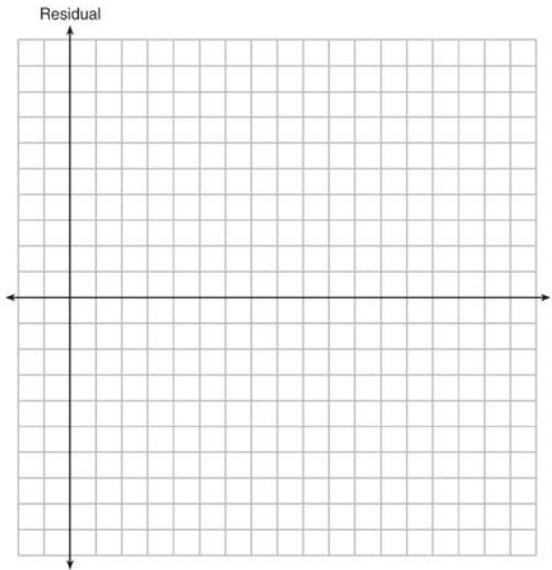
Using the plot, assess the fit of the line for these residuals and justify your answer.

652 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.
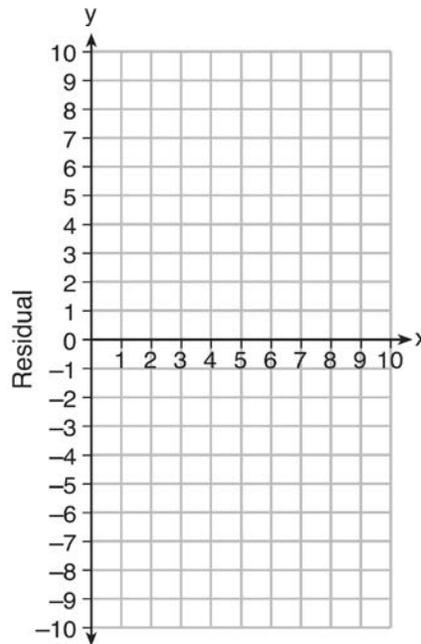
Based on the residual plot, state whether the equation is a good fit for the data. Justify your answer.

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

1 ANS: 1   REF: 061401ai   NAT: A.REI.A.1   TOP: Identifying Properties
2 ANS: 4   REF: 081701ai   NAT: A.REI.A.1   TOP: Identifying Properties
3 ANS: 4   REF: 011801ai   NAT: A.REI.A.1   TOP: Identifying Properties
4 ANS: 4   REF: 011908ai   NAT: A.REI.A.1   TOP: Identifying Properties
5 ANS: 4   REF: 061909ai   NAT: A.REI.A.1   TOP: Identifying Properties
6 ANS:
   Commutative, This property is correct because $x + y = y + x$.

   REF: 081926ai   NAT: A.REI.A.1   TOP: Identifying Properties
7 ANS: 2   REF: 061702ai   NAT: A.SSE.A.1   TOP: Dependent and Independent Variables
8 ANS: 4   REF: 081503ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
9 ANS: 4   REF: 011718ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
10 ANS: 3   REF: 081901ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
11 ANS: 2   REF: 081712ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
12 ANS: 4   REF: 061602ia   NAT: A.SSE.A.1   TOP: Modeling Expressions
13 ANS: 3   REF: 061819ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
14 ANS: 1   REF: 061905ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
15 ANS: 2
    $(x^2 - 5x)(2x + 3) = 2x^3 + 3x^2 - 10x^2 - 15x = 2x^3 - 7x^2 - 15x$

    REF: 081912ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
16 ANS:
    No, -2 is the coefficient of the term with the highest power.

    REF: 081628ai   NAT: A.SSE.A.1   TOP: Modeling Expressions
17 ANS: 1
$$\frac{7}{3}\left(x + \frac{9}{28}\right) = 20$$
$$\frac{7}{3}x + \frac{3}{4} = \frac{80}{4}$$
$$\frac{7}{3}x = \frac{77}{4}$$
$$x = \frac{33}{4} = 8.25$$

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

1

18 ANS: 1

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

$$6x - 12 = 12$$

$$6x = 24$$

$$x = 4$$

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

19 ANS: 1

$$4(x - 7) = 0.3(x + 2) + 2.11$$

$$4x - 28 = 0.3x + 0.6 + 2.11$$

$$3.7x - 28 = 2.71$$

$$3.7x = 30.71$$

$$x = 8.3$$

REF: 061719ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: decimals

20 ANS: 2

$$6\left(\frac{5}{6}\left(\frac{3}{8} - x \right) = 16 \right)$$

$$8\left(5\left(\frac{3}{8} - x \right) = 96 \right)$$

$$15 - 40x = 768$$

$$-40x = 753$$

$$x = -18.825$$

REF: 081713ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: fractional expressions

21 ANS: 4

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

$$10(3x - 24) = 3(16x - 12)$$

$$30x - 240 = 48x - 36$$

$$-204 = 18x$$

$$x = -11.\overline{3}$$

REF: 011822ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: fractional expressions

22 ANS: 2

$-2 + 8x = 3x + 8$

$$5x = 10$$

$$x = 2$$

REF: 081804ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: integral expressions

23 ANS: 2

$$\frac{3}{5}\left(x + \frac{4}{3}\right) = 1.04$$

$$3\left(x + \frac{4}{3}\right) = 5.2$$

$$3x + 4 = 5.2$$

$$3x = 1.2$$

$$x = 0.4$$

REF: 011905ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: decimals

24 ANS: 3

$$\frac{4}{3} = \frac{x + 10}{15}$$

$$3x + 30 = 60$$

$$x = 10$$

REF: 081904ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: fractional expressions

25 ANS:

$18 - 2(x + 5) = 12x$

$18 - 2x - 10 = 12x$

$$8 = 14x$$

$$x = \frac{8}{14} = \frac{4}{7}$$

REF: 061830ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: fractional expressions

26 ANS:

$$-12\left(-\frac{2}{3}(x+12)+\frac{2}{3}x=-\frac{5}{4}x+2\right)$$

$$8(x+12)-8x=15x-24$$

$$8x+96-8x=15x-24$$

$$120=15x$$

$$8=x$$

REF: 061925ai   NAT: A.REI.B.3   TOP: Solving Linear Equations
KEY: fractional expressions

27 ANS: 2   REF: 061915ai   NAT: A.CED.A.1   TOP: Modeling Linear Equations
28 ANS: 2   REF: 061416ai   NAT: A.CED.A.1   TOP: Modeling Linear Equations
29 ANS: 3   REF: 081614ai   NAT: A.CED.A.1   TOP: Modeling Linear Equations
30 ANS:

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

$$5x=12$$

$$x=2.4$$

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

31 ANS: 3   REF: 081616ai   NAT: A.CED.A.1   TOP: Modeling Linear Equations
32 ANS:

$1000-60x=600-20x$. $1000-60(10)=400$. Ian is incorrect because $I=1000-6(16)=40\neq 0$

$$40x=400$$

$$x=10$$

REF: 011737ai   NAT: A.CED.A.1   TOP: Modeling Linear Equations

33 ANS:

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

$$45x=15$$

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

REF: spr1305ai   NAT: A.CED.A.1   TOP: Modeling Linear Equations

34 ANS: 4   REF: 061422ai   NAT: A.CED.A.2   TOP: Modeling Linear Equations
35 ANS: 4   REF: 081508ai   NAT: A.CED.A.2   TOP: Modeling Linear Equations
36 ANS:

$C=1.29+.99(s-1)$ No, because $C=1.29+.99(52-1)=51.78$

REF: 011730ai   NAT: A.CED.A.2   TOP: Modeling Linear Equations

37 ANS: 1

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

$$3V = \pi r^2 h$$

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

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

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

38 ANS: 1   REF: 011516ai   NAT: A.CED.A.4   TOP: Transforming Formulas
39 ANS: 3   REF: 011606ai   NAT: A.CED.A.4   TOP: Transforming Formulas
40 ANS: 2

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

$$2d = at^2$$

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

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

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

41 ANS: 3   REF: 011704ai   NAT: A.CED.A.4   TOP: Transforming Formulas
42 ANS: 2

$$P = I^2 R$$

$$I^2 = \frac{P}{R}$$

$$I = \sqrt{\frac{P}{R}}$$

REF: 011920ai   NAT: A.CED.A.4   TOP: Transforming Formulas

43 ANS: 3   REF: 061723ai   NAT: A.CED.A.4   TOP: Transforming Formulas
44 ANS: 4   REF: 061823ai   NAT: A.CED.A.4   TOP: Transforming Formulas

45 ANS:

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

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

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

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

46 ANS:

$$4ax + 12 - 3ax = 25 + 3a$$

$$ax = 13 + 3a$$

$$x = \frac{13 + 3a}{a}$$

REF: 081632ai   NAT: A.CED.A.4   TOP: Transforming Formulas

47 ANS:

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

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

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

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

48 ANS:

$$\frac{S}{180} = n - 2$$

$$\frac{S}{180} + 2 = n$$

REF: 061631ai   NAT: A.CED.A.4   TOP: Transforming Formulas

49 ANS:

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

$$3V = \pi r^2 h$$

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

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

REF: 081727ai   NAT: A.CED.A.4   TOP: Transforming Formulas

50 ANS:

$$F_g = \frac{GM_1 M_2}{r^2}$$

$$r^2 = \frac{GM_1 M_2}{F_g}$$

$$r = \sqrt{\frac{GM_1 M_2}{F_g}}$$

REF: 011830ai   NAT: A.CED.A.4   TOP: Transforming Formulas

51 ANS:
$$9K = 5F + 2298.35$$

$$F = \frac{9K - 2298.35}{5}$$

REF: 081829ai   NAT: A.CED.A.4   TOP: Transforming Formulas

52 ANS:

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

$$3V = \pi r^2 h$$

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

REF: 061930ai   NAT: A.CED.A.4   TOP: Transforming Formulas

53 ANS:
$$at = v_f - v_i$$

$$at + v_i = v_f$$

REF: 081928ai   NAT: A.CED.A.4   TOP: Transforming Formulas

54 ANS: 1

$$12.5 \sec \times \frac{1 \min}{60 \sec} = 0.208\overline{3} \min$$

REF: 061608ai   NAT: N.Q.A.1   TOP: Conversions   KEY: dimensional analysis

55 ANS: 1

$$\frac{91 \text{ cm}}{\text{day}} \times \frac{1 \text{ day}}{24 \text{ hrs}} \times \frac{1 \text{ inch}}{2.54 \text{ cm}} \approx \frac{1.49 \text{ in}}{\text{hr}}$$

REF: 061924ai   NAT: N.Q.A.1   TOP: Conversions   KEY: dimensional analysis

56 ANS: 1

I. $10\,\text{mi}\left(\dfrac{1.609\,\text{km}}{1\,\text{mi}}\right) = 16.09\,\text{km}$; II. $44880\,\text{ft}\left(\dfrac{1\,\text{mi}}{5280\,\text{ft}}\right)\left(\dfrac{1.609\,\text{km}}{1\,\text{mi}}\right) \approx 13.6765\,\text{km}$; III.

$15560\,\text{yd}\left(\dfrac{3\,\text{ft}}{1\,\text{yd}}\right)\left(\dfrac{1\,\text{mi}}{5280\,\text{ft}}\right)\left(\dfrac{1.609\,\text{km}}{1\,\text{mi}}\right) \approx 14.225\,\text{km}$

REF: 061815ai   NAT: N.Q.A.1   TOP: Conversions   KEY: dimensional analysis

57 ANS: 3   REF: 081812ai   NAT: N.Q.A.1   TOP: Conversions
KEY: dimensional analysis

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

59 ANS: 1

$C(68) = \dfrac{5}{9}(68-32) = 20$

REF: 011710ai   NAT: N.Q.A.1   TOP: Conversions   KEY: formula

60 ANS: 4   REF: 061720ai   NAT: N.Q.A.1   TOP: Conversions
KEY: dimensional analysis

61 ANS: 4   REF: 011924ai   NAT: N.Q.A.1   TOP: Conversions
KEY: dimensional analysis

62 ANS:

$12\,\text{km}\left(\dfrac{0.62\,\text{m}}{1\,\text{km}}\right) = 7.44\,\text{m}$ $\dfrac{26.2\,\text{m}}{7.44\,\text{mph}} \approx 3.5\,\text{hours}$

REF: 011726ai   NAT: N.Q.A.1   TOP: Conversions   KEY: dimensional analysis

63 ANS: 3   REF: 081609ai   NAT: N.Q.A.2   TOP: Using Rate

64 ANS: 4   REF: 081909ai   NAT: N.Q.A.2   TOP: Using Rate

65 ANS:

$\dfrac{2}{40} = \dfrac{5.75}{x}$ $\dfrac{5280}{115} \approx 46$

$x = 115$

REF: 081730ai   NAT: N.Q.A.2   TOP: Using Rate

66 ANS:

$\dfrac{762-192}{92-32} = \dfrac{570}{60} = 9.5$ $y = 9.5x$ $T = 192 + 9.5(120-32) = 1028$

REF: 061635ai   NAT: A.CED.A.2   TOP: Speed

67 ANS:

$610 - 55(4) = 390$ $\dfrac{390}{65} = 6$ $4 + 6 = 10$ $610 - 55(2) = 500$ $\dfrac{500}{65} \approx 7.7$ $10 - (2 + 7.7) \approx 0.3$

REF: 081733ai   NAT: A.CED.A.2   TOP: Speed

68 ANS:

The rate of speed is expressed in $\dfrac{\text{feet}}{\text{minute}}$ because speed=$\dfrac{\text{distance}}{\text{time}}$.

REF: 011827ai   NAT: A.CED.A.2   TOP: Speed

69 ANS: 4

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

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

70 ANS: 3

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

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

71 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) $\dfrac{35-24}{2012-2006}=\dfrac{11}{6}\approx1.83$

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

72 ANS: 1   REF: 061603ai   NAT: F.IF.B.6   TOP: Rate of Change

73 ANS: 1

The graph is steepest between hour 0 and hour 1.

REF: 081601ai   NAT: F.IF.B.6   TOP: Rate of Change

74 ANS: 1

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

$\quad\quad 70>60$

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

75 ANS: 1   REF: 081515ai   NAT: F.IF.B.6   TOP: Rate of Change

76 ANS: 2

The slope of a line connecting $(5,19)$ and $(10,20)$ is lowest.

REF: 081705ai   NAT: F.IF.B.6   TOP: Rate of Change

77 ANS: 1   REF: 011721ai   NAT: F.IF.B.6   TOP: Rate of Change

78 ANS: 2

From 1996-2012, the average rate of change was positive for three age groups.

REF: 011824ai   NAT: F.IF.B.6   TOP: Rate of Change

79 ANS: 1

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

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

80 ANS:

$$\frac{480 - 140}{7 - 2} = 68 \text{ mph}$$

REF: 011731ai   NAT: F.IF.B.6   TOP: Rate of Change

81 ANS:

$$\frac{3.41 - 6.26}{9 - 3} = -0.475$$

REF: 081827ai   NAT: F.IF.B.6   TOP: Rate of Change

82 ANS:

$$\frac{33 - 1}{12 - 1} \approx 2.9 \quad \frac{36 - 11}{15 - 6} \approx 2.8$$ The interval 1 a.m. to 12 noon has the greater rate.

REF: 061929ai   NAT: F.IF.B.6   TOP: Rate of Change

83 ANS:

$2 < t < 6$ and $14 < t < 15$ because horizontal lines have zero slope.

REF: 011928ai   NAT: F.IF.B.6   TOP: Rate of Change

84 ANS:

During 1960-1965 the graph has the steepest slope.

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

85 ANS:

The set of integers includes negative numbers, so is not an appropriate domain for time; for $(0,6)$, the hourly rate is increasing, or for $(0,14)$, the total numbers of shoes is increasing; $\dfrac{120 - 0}{6 - 14} = -15$, 15 fewer shoes were sold each hour between the sixth and fourteenth hours.

REF: 011836ai   NAT: F.IF.B.6   TOP: Rate of Change

86 ANS:

There are 20 rabbits at $x = 0$ and they are growing 1.4% per day. $\dfrac{p(100) - p(50)}{100 - 50} \approx 0.8$

REF: 061833ai   NAT: F.IF.B.6   TOP: Rate of Change

87 ANS: 4   REF: 011523ai   NAT: F.BF.A.1   TOP: Modeling Linear Functions

88 ANS: 4

$P(c) = (.50 + .25)c - 9.96 = .75c - 9.96$

REF: 011807ai   NAT: F.BF.A.1   TOP: Modeling Linear Functions

89 ANS:

$p(x) = 0.035x + 300 \quad p(8250) = 0.035(8250) + 300 = 588.75$

REF: 011833ai   NAT: F.BF.A.1   TOP: Modeling Linear Functions

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

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

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

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

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

92 ANS:
$T(d) = 2d + 28$ $T(6) = 2(6) + 28 = 40$

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

93 ANS: 4   REF: 081604ai   NAT: F.LE.A.2   TOP: Modeling Linear Functions

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

REF: 081525ai   NAT: F.LE.A.2   TOP: Modeling Linear Functions

95 ANS:
$f(x) = 0.75x + 4.50$. Each card costs 75¢ and start-up costs were $4.50.

REF: 011735ai   NAT: F.LE.A.2   TOP: Modeling Linear Functions

96 ANS: 3   REF: 061407ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
97 ANS: 2   REF: 081402ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
98 ANS: 2   REF: 011501ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
99 ANS: 3   REF: 061501ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
100 ANS: 2   REF: 011709ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
101 ANS: 4   REF: 081709ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
102 ANS: 3   REF: 061817ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
103 ANS: 2   REF: 081817ai   NAT: F.LE.B.5   TOP: Modeling Linear Functions
104 ANS:
The slope represents the amount paid each month and the y-intercept represents the initial cost of membership.

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

105 ANS: 2   REF: 061704ai   NAT: S.ID.C.7   TOP: Modeling Linear Functions
106 ANS: 1   REF: 081802ai   NAT: S.ID.C.7   TOP: Modeling Linear Functions
107 ANS:
There is 2 inches of snow every 4 hours.

REF: 061630ai   NAT: S.ID.C.7   TOP: Modeling Linear Functions

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

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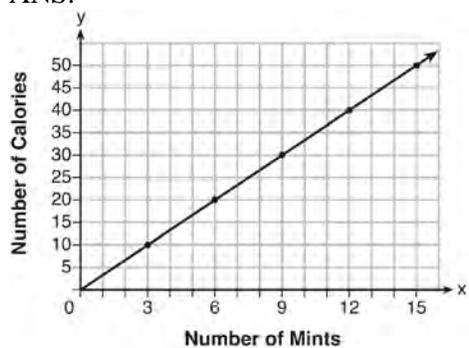
$$C(x) = \frac{10}{3}x \quad 180 = \frac{10}{3}x$$

$$540 = 10x$$

$$54 = x$$

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

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

111 ANS:
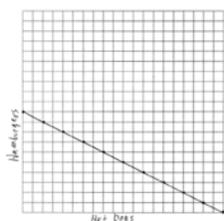
$$1.25x + 2.5y = 25$$

$$x + 2y = 20$$

There are 11 combinations, as each dot represents a possible combination.

REF: 081737ai   NAT: A.CED.A.2   TOP: Graphing Linear Functions

112 ANS: 1

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

$$4x = 40$$

$$x = 10$$

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

113 ANS: 4

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

$$y = -3$$

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

114 ANS:

The data is continuous, i.e. a fraction of a cookie may be eaten.

REF: 081729ai   NAT: F.IF.B.4   TOP: Graphing Linear Functions

115 ANS:
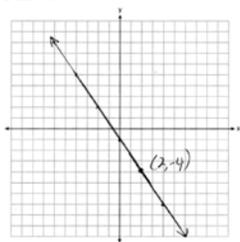
REF: 081929ai   NAT: F.IF.B.4   TOP: Graphing Linear Functions

116 ANS: 4

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

REF: 011511ai   NAT: A.REI.D.10   TOP: Writing Linear Equations
KEY: other forms

117 ANS: 3

$$m = \frac{3--7}{2-4} = -5 \quad 3 = (-5)(2) + b \quad y = -5x + 13 \text{ represents the line passing through the points } (2,3) \text{ and } (4,-7). \text{ The}$$
$$b = 13$$

fourth equation may be rewritten as $y = 5x - 13$, so is a different line.

REF: 081720ai   NAT: A.REI.D.10   TOP: Writing Linear Equations
KEY: other forms

118 ANS:

$$m = \frac{4-1}{-3-6} = \frac{3}{-9} = -\frac{1}{3} \quad y - y_1 = m(x - x_1)$$

$$4 = -\frac{1}{3}(-3) + b \qquad y - 4 = -\frac{1}{3}(x + 3)$$

$$4 = 1 + b$$

$$3 = b$$

$$y = -\frac{1}{3}x + 3$$

REF: 061629ai   NAT: A.REI.D.10   TOP: Writing Linear Equations
KEY: other forms

119 ANS: 4

$$3x + 2 \le 5x - 20$$
$$22 \le 2x$$
$$11 \le x$$

REF: 061609ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

120 ANS: 1

$2h + 8 > 3h - 6$

$\quad 14 > h$

$\quad h < 14$

REF: 081607ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

121 ANS: 4

$4p + 2 < 2p + 10$

$\quad 2p < 8$

$\quad p < 4$

REF: 061801ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

122 ANS: 1

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

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

$\quad 9 < x$

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

123 ANS: 1

$2 + \dfrac{4}{9}x \geq 4 + x$

$\quad -2 \geq \dfrac{5}{9}x$

$\quad x \leq -\dfrac{18}{5}$

REF: 081711ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

124 ANS: 4

$a + 7b > -8b$

$\quad a > -15b$

REF: 061913ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

125 ANS:

$3600 + 1.02x < 2000 + 1.04x$

$\quad 1600 < 0.02x$

$\quad 80000 < x$

REF: 011925ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

126 ANS:

$1.8 - 0.4y \geq 2.2 - 2y$

$\qquad 1.6y \geq 0.4$

$\qquad\quad y \geq 0.25$

REF: 011727ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

127 ANS:

$\dfrac{2}{3} < \dfrac{x}{5}$

$\dfrac{10}{3} < x$

REF: 081929ai   NAT: A.REI.B.3   TOP: Solving Linear Inequalities

128 ANS:

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

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

$bx - ax \geq 10b$

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

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

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

129 ANS: 4

$47 - 4x < 7$

$\quad -4x < -40$

$\qquad x > 10$

REF: 061713ai   NAT: A.REI.B.3   TOP: Interpreting Solutions

130 ANS: 2

$-2(x - 5) < 10$

$\quad x - 5 > -5$

$\qquad x > 0$

REF: 011817ai   NAT: A.REI.B.3   TOP: Interpreting Solutions

131 ANS:

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

$\qquad -a - 9 > -12$

$\qquad\quad -a > -3$

$\qquad\quad\ \ a < 3$

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

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

$$12 \le 2x$$

$$6 \le x$$

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

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

$$-8x < 8$$

$$x > -1$$

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

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

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

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

$$12 \le 2x$$

$$6 \le x$$

REF: 081534ai   NAT: A.REI.B.3   TOP: Interpreting Solutions

135 ANS: 3   REF: 011513ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

136 ANS: 4

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

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

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

$$1500 > p$$

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

137 ANS: 4   REF: 081505ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

138 ANS: 1   REF: 061806ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

139 ANS: 1   REF: 061910ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

140 ANS: 1
$$116(30) + 439L \le 6500$$

$$439L \le 3020$$

$$L \le 6.879$$

REF: 011904ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

141 ANS: 2

$$7 < \frac{7.2 + 7.6 + p_L}{3} \quad \text{and} \quad \frac{7.2 + 7.6 + p_H}{3} < 7.8$$

$$6.2 < p_L \qquad\qquad p_H < 8.6$$

REF: 061607ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

142 ANS:

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

$\qquad\qquad\qquad 8x + 165 \geq 200$

$\qquad\qquad\qquad 8x \geq 35$

$\qquad\qquad\qquad x \geq 4.375$

$\qquad\qquad\qquad 5\text{ hours}$

REF: fall1309ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

143 ANS:

$135 + 72x \geq 580 \quad 7$

$\qquad 72x \geq 445$

$\qquad\quad x \geq 6.2$

REF: 081833ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

144 ANS:

$A(x) = 5x + 50 \quad 5x + 50 < 6x + 25 \quad 26\text{ shirts}$

$B(x) = 6x + 25 \qquad\quad 25 < x$

REF: 061933ai   NAT: A.CED.A.1   TOP: Modeling Linear Inequalities

145 ANS: 2   REF: 011605ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

146 ANS: 1   REF: 061505ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

147 ANS:
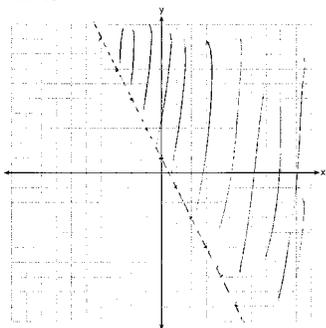
REF: 081526ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

148 ANS:
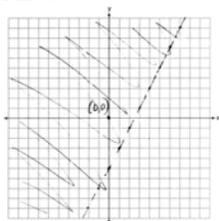
REF: 011729ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

149 ANS:
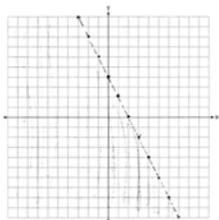
$y < -2x + 4$

REF: 061730ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

150 ANS:
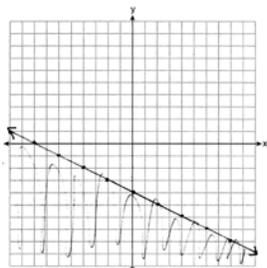
REF: 081634ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

151 ANS:
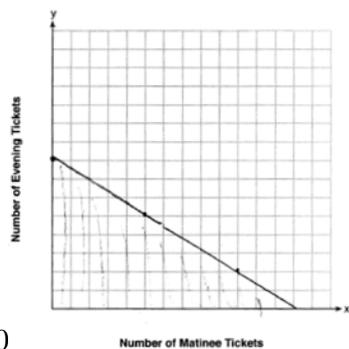
$7.5x + 12.5y \le 100$ 13, because $7.5(13) \le 100$ and $7.5(14) > 100$.

REF: 011935ai   NAT: A.REI.D.12   TOP: Graphing Linear Inequalities

152 ANS: 1   REF: 011712ai   NAT: F.IF.C.7   TOP: Graphing Absolute Value Functions

153 ANS:
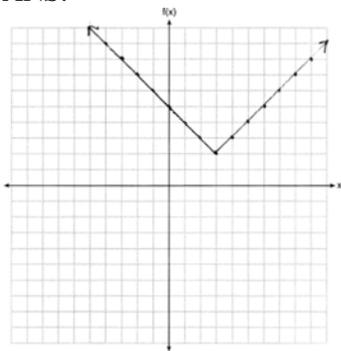
REF: 011825ai   NAT: F.IF.C.7   TOP: Graphing Absolute Value Functions

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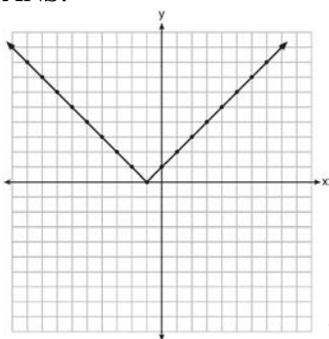
Range: $y \geq 0$. The function is increasing for $x > -1$.

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

155 ANS:

$g(x)$ is $f(x)$ shifted right by a, $h(x)$ is $f(x)$ shifted down by a.

REF: 061732ai   NAT: F.BF.B.3   TOP: Graphing Absolute Value Functions

156 ANS:
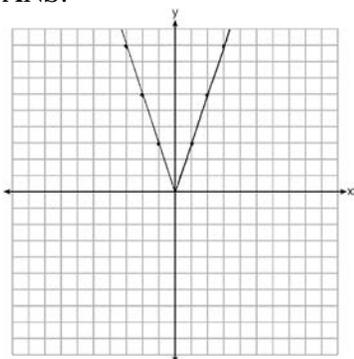
2 down. 4 right.

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

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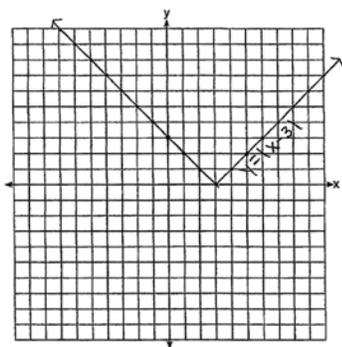
The graph has shifted three units to the right.

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

158 ANS: 1   REF: 061521ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

159 ANS: 3   REF: 081403ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

160 ANS: 3

$2(x+2)^2 = 32$

$(x+2)^2 = 16$

$x+2 = \pm 4$

$x = -6, 2$

REF: 061619ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

161 ANS: 4

$36x^2 = 25$

$x^2 = \dfrac{25}{36}$

$x = \pm\dfrac{5}{6}$

REF: 011715ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

162 ANS: 1

$3(x-4)^2 = 27$

$(x-4)^2 = 9$

$x-4 = \pm 3$

$x = 1, 7$

REF: 011814ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

163 ANS: 3   REF: 081523ai   NAT: A.REI.B.4   TOP: Solving Quadratics
    KEY: taking square roots

164 ANS: 1

$$3x^2 + 10x - 8 = 0$$

$$(3x - 2)(x + 4) = 0$$

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

    REF: 081619ai   NAT: A.REI.B.4   TOP: Solving Quadratics
    KEY: factoring

165 ANS: 3   REF: 011702ai   NAT: A.REI.B.4   TOP: Solving Quadratics
    KEY: factoring

166 ANS: 4   REF: 011503ai   NAT: A.REI.B.4   TOP: Solving Quadratics
    KEY: factoring

167 ANS: 2

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

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

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

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

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

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

168 ANS: 4

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

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

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

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

169 ANS: 1

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

$$(x - 4)^2 = 40$$

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

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

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

170 ANS: 2

$$x^2 - 8x + 16 = 10 + 16$$

$$(x-4)^2 = 26$$

$$x - 4 = \pm\sqrt{26}$$

$$x = 4 \pm \sqrt{26}$$

REF: 061722ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: completing the square

171 ANS: 3

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

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

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

REF: 061812ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: completing the square

172 ANS: 2

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

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

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

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

173 ANS: 4

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

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

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

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

174 ANS: 2

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

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

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

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

175 ANS: 1

$2(x^2 - 6x + 3) = 0$

$x^2 - 6x = -3$

$x^2 - 6x + 9 = -3 + 9$

$(x - 3)^2 = 6$

REF: 011722ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: completing the square

176 ANS: 1

$x^2 + 8x = 33$

$x^2 + 8x + 16 = 33 + 16$

$(x + 4)^2 = 49$

REF: 011915ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: completing the square

177 ANS: 1

$x^2 - 6x = 19$

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

$(x - 3)^2 = 28$

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

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

REF: fall1302ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: quadratic formula

178 ANS: 2

$$\frac{5 \pm \sqrt{(-5)^2 - 4(1)(-4)}}{2(1)} = \frac{5 \pm \sqrt{41}}{2}$$

REF: 061921ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: quadratic formula

179 ANS:

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

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

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

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

REF: fall1305ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: factoring

180 ANS:

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

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

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

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

181 ANS:

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

REF: 081425ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: factoring

182 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. $\left(\dfrac{6}{2}\right)^2 = 9$

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

183 ANS:

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

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

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

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

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

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

184 ANS:

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

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

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

$$y = 7, 3$$

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

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

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

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

186 ANS:

$2x^2 + 5x - 42 = 0$ Agree, as shown by solving the equation by factoring.

$(x + 6)(2x - 7) = 0$

$$x = -6, \frac{7}{2}$$

REF: 061628ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: factoring

187 ANS:

$H(1) - H(2) = -16(1)^2 + 144 - (-16(2)^2 + 144) = 128 - 80 = 48$

$-16t^2 = -144$

$t^2 = 9$

$t = 3$

REF: 061633ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

188 ANS:

$0 = (B + 3)(B - 1)$ Janice substituted B for $8x$, resulting in a simpler quadratic. Once factored, Janice substituted

$0 = (8x + 3)(8x - 1)$

$$x = -\frac{3}{8}, \frac{1}{8}$$

$8x$ for B.

REF: 081636ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: factoring

189 ANS:

$x^2 - 6x + 9 = 15 + 9$

$(x - 3)^2 = 24$

$x - 3 = \pm\sqrt{24}$

$x = 3 \pm 2\sqrt{6}$

REF: 081732ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: completing the square

190 ANS:

$$\frac{-1 \pm \sqrt{1^2 - 4(1)(-5)}}{2(1)} = \frac{-1 \pm \sqrt{21}}{2} \approx -2.8, 1.8$$

REF: 061827ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: quadratic formula

191 ANS:

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

$(x + 2)^2 = 6$

$x + 2 = \pm\sqrt{6}$

$x = -2 \pm \sqrt{6}$

REF: 081830ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: completing the square

192 ANS:

$x^2 - 8x - 9 = 0$ I factored the quadratic.

$(x - 9)(x + 1) = 0$

$x = 9, -1$

REF: 011927ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: factoring

193 ANS:

$4x^2 = 80$

$x^2 = 20$

$x = \pm\sqrt{20}$

REF: 011932ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

194 ANS:

$5x^2 = 180$

$x^2 = 36$

$x = \pm 6$

REF: 061928ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

195 ANS:

$6x^2 = 42$

$x^2 = 7$

$x = \pm\sqrt{7}$

REF: 081931ai   NAT: A.REI.B.4   TOP: Solving Quadratics
KEY: taking square roots

196 ANS: 3
$b^2 - 4ac = 2^2 - 4(4)(5) = -76$

REF: 061822ai   NAT: A.REI.B.4   TOP: Using the Discriminant

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

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

198 ANS:

Irrational, as 89 is not a perfect square. $3^2 - 4(2)(-10) = 89$

REF: 081828ai   NAT: A.REI.B.4   TOP: Using the Discriminant

199 ANS: 3   REF: 081409ai   NAT: A.CED.A.1   TOP: Modeling Quadratics

200 ANS: 4   REF: 081723ai   NAT: A.CED.A.1   TOP: Modeling Quadratics

201 ANS: 2
$w(w + 7) = w^2 + 7w$

REF: 081920ai   NAT: A.CED.A.1   TOP: Geometric Applications of Quadratics

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

203 ANS: 4   REF: spr1304ai   NAT: A.CED.A.1   TOP: Geometric Applications of Quadratics

204 ANS:

$w(w + 40) = 6000$

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

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

$w = 60, l = 100$

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

205 ANS:
$(2w)(w) = 34$

$w^2 = 17$

$w \approx 4.1$

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

206 ANS:

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

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

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

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

$$x = 18, 6$$

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

207 ANS:

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

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

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

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

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

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

$$x = 3 = \text{width}$$

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

208 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. $(x - 3)(2x) = 1.25x^2$ $1.25(8)^2 = 80$

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

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

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

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

$$x = 8$$

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

209 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. $x = \dfrac{-7 \pm \sqrt{7^2 - 4(1)(-13)}}{2(1)} = \dfrac{-7 + \sqrt{101}}{2} \approx 1.5$

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

210 ANS: 1

$$x^2 - 12x + 7$$

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

$$(x - 6)^2 - 29$$

REF: 081520ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

211 ANS: 2   REF: 011601ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

212 ANS: 4

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

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

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

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

REF: 011607ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

213 ANS: 3

$$j(x) = x^2 - 12x + 36 + 7 - 36$$

$$= (x - 6)^2 - 29$$

REF: 061616ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

214 ANS: 3

$$3(x^2 + 4x + 4) - 12 + 11$$

$$3(x + 2)^2 - 1$$

REF: 081621ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

215 ANS: 1

$$y = x^2 + 24x + 144 - 18 - 144$$

$$y = (x + 12)^2 - 162$$

REF: 081911ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

216 ANS:

$$f(x) = \left(x^2 - 2x + 1 \right) - 8 - 1 = (x - 1)^2 - 9 \quad (1, -9)$$

REF: 061932ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

217 ANS:

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

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

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

$$= -(x - 4)^2 + 25$$

REF: 011536ai   NAT: F.IF.C.8   TOP: Vertex Form of a Quadratic

218 ANS: 3

The rocket was in the air more than 7 seconds before hitting the ground.

REF: 081613ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

219 ANS: 3   REF: 061409ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

220 ANS: 4

Vertex $(15, 25)$, point $(10, 12.5)$ $12.5 = a(10 - 15)^2 + 25$

$$-12.5 = 25a$$

$$-\frac{1}{2} = a$$

REF: 061716ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: no context

221 ANS: 1

$0 = -16t^2 + 24t$

$0 = -8t(2t - 3)$

$t = 0, \frac{3}{2}$

REF: 061724ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

222 ANS: 1

$h(0) = -4.9(0)^2 + 6(0) + 5 = 5$

REF: 011913ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

223 ANS: 1

$$h(t) = 0$$

$$-16t^2 + 64t + 80 = 0$$

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

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

$$t = 5, -1$$

REF: 081910ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

224 ANS: 2

$$-4.9(0)^2 + 50(0) + 2$$

REF: 011811ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

225 ANS:
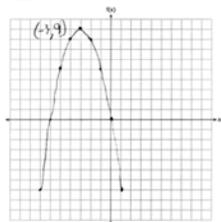
REF: 061726ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: no context

226 ANS:
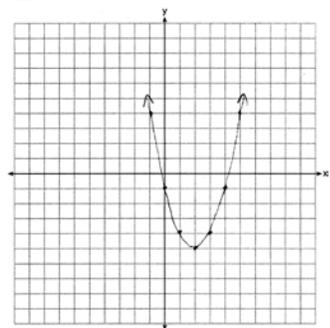
$$x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$$

REF: 061627ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: no context

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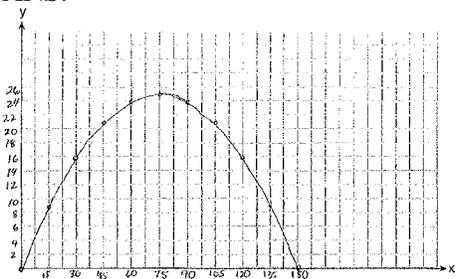
$x = \dfrac{-\dfrac{2}{3}}{2\left(-\dfrac{1}{225}\right)} = -\dfrac{2}{3} \cdot -\dfrac{225}{2} = 75$ $y = -\dfrac{1}{225}(75)^2 + \dfrac{2}{3}(75) = -25 + 50 = 25$

(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 $y = -\dfrac{1}{225}(135)^2 + \dfrac{2}{3}(135) = -81 + 90 = 9$

REF: 061537ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

228 ANS:
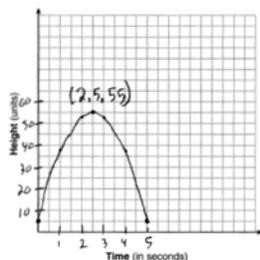
The ball reaches a maximum height of 55 units at 2.5 seconds.

REF: 011736ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

229 ANS:
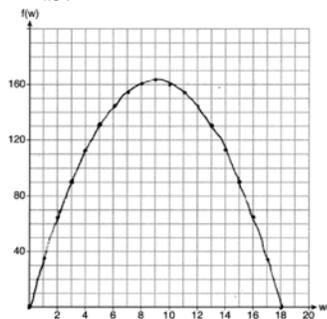
If the garden's width is 9 ft, its area is 162 ft^2.

REF: 081836ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

230 ANS:

$x = 1$ $\dfrac{-3+5}{2} = 1$

REF: 011829ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: no context

231 ANS:

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

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

$\qquad t = 0, 4$

REF: 081531ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

232 ANS:

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

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

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

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

$\qquad\qquad t = 5$

REF: 011633ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

233 ANS:

$x = \dfrac{-128}{2(-16)} = 4 \; h(4) = -16(4)^2 + 128(4) + 9000 = -256 + 512 + 9000 = 9256 \; (4, 9256).$ The y coordinate represents

the pilot's height above the ground after ejection. $9256 - 9000 = 256$

REF: 081736ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions
KEY: context

234 ANS:

$-16t^2 + 256 = 0$

$\qquad 16t^2 = 256$

$\qquad\quad t^2 = 16$

$\qquad\quad\; t = 4$

REF: 061829ai   NAT: F.IF.B.4   TOP: Graphing Quadratic Functions

235 ANS:

Yes, because from the graph the zeroes of $f(x)$ are -2 and 3.

REF: 011832ai   NAT: F.IF.C.7   TOP: Graphing Quadratic Functions

236 ANS: 4

$1000(0.5)^{2t} = 1000(0.5^2)^t = 1000(0.25)^t$

REF: 011923ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

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

237 ANS: 4

$$16^{2t} = n^{4t}$$

$$(16^2)^t = (n^4)^t$$

$$((4^2)^2)^t = ((n^2)^2)^t$$

REF: 011519ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

238 ANS: 3

$$C(t) = 10(1.029)^{24t} = 10(1.029^{24})^t \approx 10(1.986)^t$$

REF: 061614ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

239 ANS: 2   REF: 011714ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

240 ANS: 2

$$V = 15,000(0.81)^t = 15,000((0.9)^2)^t = 15,000(0.9)^{2t}$$

REF: 081716ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

241 ANS: 4   REF: 011821ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

242 ANS: 2   REF: 081801ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

243 ANS: 2

$$(1.0005)^7 \approx 1.0035$$

REF: 081913ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

244 ANS:

$$f(5) = (8) \cdot 2^5 = 256 \qquad f(t) = g(t)$$

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

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

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

REF: 011632ai   NAT: A.SSE.B.3   TOP: Modeling Exponential Functions

245 ANS: 3

$$E(10) = 1(1.11)^{10} \approx 3 \qquad S(10) = 30(1.04)^{10} \approx 44$$

$$E(53) = 1(1.11)^{53} \approx 252 \quad S(53) = 30(1.04)^{53} \approx 239$$

REF: 081721ai   NAT: A.CED.A.1   TOP: Modeling Exponential Functions

246 ANS:

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

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

247 ANS:

$V(t) = 25000(0.815)^t$ $V(3) - V(4) \approx 2503.71$

REF: 081834ai   NAT: A.CED.A.1   TOP: Modeling Exponential Functions
248 ANS:

$V = 450(1.025)^t$; No, $450(1.025)^{20} < 2 \cdot 450$

REF: 011933ai   NAT: A.CED.A.1   TOP: Modeling Exponential Functions
249 ANS:

$A(t) = 5000(1.012)^t$ $A(32) - A(17) \approx 1200$

REF: 081934ai   NAT: A.CED.A.1   TOP: Modeling Exponential Functions
250 ANS: 3   REF: 081507ai   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
251 ANS: 1   REF: 011504ai   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
252 ANS: 2   REF: 061617ai   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
253 ANS: 2   REF: 061712ai   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
254 ANS:

$B = 3000(1.042)^t$

REF: 081426ai   NAT: F.BF.A.1   TOP: Modeling Exponential Functions
255 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.

REF: 011532ai   NAT: F.LE.A.2   TOP: Modeling Exponential Functions
256 ANS: 1   REF: 081617ai   NAT: F.LE.A.2   TOP: Modeling Exponential Functions
257 ANS: 3

$\dfrac{5.4 - 4}{4} = 0.35$

REF: 011802ai   NAT: F.LE.A.2   TOP: Modeling Exponential Functions
258 ANS: 4   REF: 011912ai   NAT: F.LE.A.2   TOP: Modeling Exponential Functions
259 ANS: 3   REF: 011515ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions
260 ANS: 2   REF: 061517ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions
261 ANS: 4   REF: 011608ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions
262 ANS: 2   REF: 081624ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions
263 ANS: 3   REF: 011724ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions
264 ANS: 2   REF: 061923ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions
265 ANS:

0.5 represents the rate of decay and 300 represents the initial amount of the compound.

REF: 061426ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions

266 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.

REF: 081530ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions

267 ANS:

$1 - 0.85 = 0.15 = 15\%$ To find the rate of change of an equation in the form $y = ab^x$, subtract b from 1.

REF: 061728ai   NAT: F.LE.B.5   TOP: Modeling Exponential Functions

268 ANS:
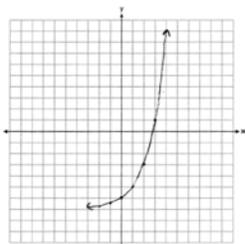
Yes, $f(4) > g(4)$ because $2^4 - 7 > 1.5(4) - 3$.

REF: 011929ai   NAT: F.IF.C.7   TOP: Graphing Exponential Functions

269 ANS: 3   REF: 081602ai   NAT: A.REI.D.10   TOP: Identifying Solutions

270 ANS: 4   REF: 081405ai   NAT: A.REI.D.10   TOP: Identifying Solutions

271 ANS: 4

$f(-1) = (-1)^2 - 3(-1) + 4 = 8$

REF: 061808ai   NAT: A.REI.D.10   TOP: Identifying Solutions

272 ANS: 1

$3(10) + 2 \ne (-2)^2 - 5(-2) + 17$

$\quad\quad 32 \ne 31$

REF: 081818ai   NAT: A.REI.D.10   TOP: Identifying Solutions

273 ANS: 3

$10.25 \ne 3(1.25)^2 - 1.25 + 7$

REF: 061918ai   NAT: A.REI.D.10   TOP: Identifying Solutions

274 ANS: 4

$-2 \ne (-1)^3 - (-1)$

$-2 \ne 0$

REF: 011806ai   NAT: A.REI.D.10   TOP: Identifying Solutions

ID: A

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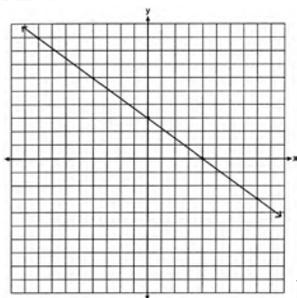
 No, because $(3,2)$ is not on the graph.

REF: 061429ai   NAT: A.REI.D.10   TOP: Identifying Solutions

276 ANS: 3
$2a^2 - 5 - 2(3 - a) = 2a^2 - 5 - 6 + 2a = 2a^2 + 2a - 11$

REF: 011911ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: subtraction

277 ANS: 2   REF: 061403ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: subtraction

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

REF: 081524ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: multiplication

279 ANS: 3
$5x^2 - (4x^2 - 12x + 9) = x^2 + 12x - 9$

REF: 011610ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: multiplication

280 ANS: 2
$3(x^2 - 1) - (x^2 - 7x + 10)$

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

$2x^2 + 7x - 13$

REF: 061610ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: subtraction

281 ANS: 3
$(2x + 3)(4x^2 - 5x + 6) = 8x^3 - 10x^2 + 12x + 12x^2 - 15x + 18 = 8x^3 + 2x^2 - 3x + 18$

REF: 081612ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: multiplication

282 ANS: 4
$2(3g - 4) - (8g + 3) = 6g - 8 - 8g - 3 = -2g - 11$

REF: 011707ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: subtraction

4

283 ANS: 3 REF: 011813ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: addition

284 ANS: 2
$3(x^2 + 2x - 3) - 4(4x^2 - 7x + 5) = 3x^2 + 6x - 9 - 16x^2 + 28x - 20 = -13x^2 + 34x - 29$

REF: 061803ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: subtraction

285 ANS: 1
$2\left(3x^3 + 2x^2 - 17\right)$

REF: 081813ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: addition

286 ANS: 4
$2(x^2 - 1) + 3x(x - 4) = 2x^2 - 2 + 3x^2 - 12x = 5x^2 - 12x - 2$

REF: 081903ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: addition

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

288 ANS: 3
$\left(6x^2 + 2x\right)(5x - 6) = 30x^3 - 36x^2 + 10x^2 - 12x = 30x^3 - 26x^2 - 12x$

REF: 081824ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: multiplication

289 ANS:
$$(2x^2 + 7x - 10)(x + 5)$$
$$2x^3 + 7x^2 - 10x + 10x^2 + 35x - 50$$
$$2x^3 + 17x^2 + 25x - 50$$

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

290 ANS:
$-2x^2 + 6x + 4$

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

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

REF: 061528ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: multiplication

292 ANS:

$5x^2 - 10$

REF: 061725ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: subtraction

293 ANS:

$5x + 4x^2(2x + 7) - 6x^2 - 9x = -4x + 8x^3 + 28x^2 - 6x^2 = 8x^3 + 22x^2 - 4x$

REF: 081731ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: multiplication

294 ANS:

$C = 3x^2 + 4 - 3\left(2x^2 + 6x - 5\right) = 3x^2 + 4 - 6x^2 - 18x + 15 = -3x^2 - 18x + 19$

REF: 061926ai   NAT: A.APR.A.1   TOP: Operations with Polynomials
KEY: subtraction

295 ANS: 1   REF: 061810ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: quadratic

296 ANS: 3   REF: 081803ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: quadratic

297 ANS: 3

$(2x + 3)(x + 4) = 2x^2 + 11x + 12$

REF: 081916ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: quadratic

298 ANS: 3   REF: 061917ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: quadratic

299 ANS: 1   REF: 011906ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: quadratic

300 ANS: 3   REF: 081509ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: quadratic

301 ANS: 3   REF: 011612ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: higher power

302 ANS: 1   REF: 081415ai   NAT: A.SSE.A.2   TOP: Factoring Polynomials
KEY: higher power

303 ANS: 3   REF: 081807ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: quadratic

304 ANS: 2

$36x^2 - 100 = 4(9x^2 - 25) = 4(3x + 5)(3x - 5)$

REF: 081608ai   NAT: A.SSE.A.2   TOP: Factoring the Difference of Perfect Squares
KEY: quadratic

305 ANS: 2

$16x^2 - 36 = 4(2x + 3)(2x - 3)$

REF: 011701ai   NAT: A.SSE.A.2   TOP: Factoring the Difference of Perfect Squares
KEY: quadratic

306 ANS: 3   REF: 081908ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: quadratic
307 ANS: 3   REF: 081703ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: quadratic
308 ANS: 2   REF: 061503ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: multivariable
309 ANS: 3   REF: 011522ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: higher power
310 ANS: 3   REF: 061601ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: higher power
311 ANS: 3   REF: 011809ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: higher power
312 ANS: 4   REF: 061901ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: higher power AI
313 ANS: 3   REF: 061706ai   NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares   KEY: higher power
314 ANS:

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

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

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

REF: 061431ai   NAT: A.SSE.A.2   TOP: Factoring the Difference of Perfect Squares
KEY: higher power
315 ANS: 4   REF: 011706ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials
316 ANS: 3   REF: spr1302ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials
317 ANS: 3   REF: 011909ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials
318 ANS: 3   REF: 061412ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials
319 ANS: 2
$$(x + 4)(x + 6) = 0$$

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

REF: spr1303ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials
320 ANS: 3   REF: 061710ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials
321 ANS: 4
$$(x + 2)^2 - 25 = 0$$

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

$$x = -7, 3$$

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

322 ANS: 1

$f(x) = x^2 - 5x - 6 = (x + 1)(x - 6) = 0$

$x = -1, 6$

REF: 061612ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

323 ANS: 3

$p(x) = x^2 - 2x - 24 = (x - 6)(x + 4) = 0$

$x = 6, -4$

REF: 061804ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

324 ANS: 4

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

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

$x = 15, -2$

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

325 ANS: 4

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

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

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

$x = 2, -1$

REF: 081513ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

326 ANS: 1

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

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

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

$x = 3, -1$

REF: 011609ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

327 ANS: 3

$2x^3 + 12x - 10x^2 = 0$

$2x(x^2 - 5x + 6) = 0$

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

$x = 0, 2, 3$

REF: 081719ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

328 ANS: 2   REF: 081816ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

329 ANS:

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

$$x^2 - 8 = 0$$

$$x^2 = 8$$

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

REF: fall1306ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

330 ANS:

Graph $f(x)$ and find x-intercepts. $-3, 1, 8$

REF: 081825ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

331 ANS:

$$(x-3)^2 - 49 = 0$$

$$(x-3)^2 = 49$$

$$x - 3 = \pm 7$$

$$x = -4, 10$$

REF: 081631ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

332 ANS:

$$x^2 - 4x + 3 = 0$$

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

$$x = 1, 3$$

REF: 011826ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

333 ANS:

$$3x^3 + 21x^2 + 36x = 0$$

$$3x(x^2 + 7x + 12) = 0$$

$$3x(x+4)(x+3) = 0$$

$$x = 0, -4, -3$$

REF: 011930ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

334 ANS:

$$x^2 + 3x - 18 = 0$$ The zeros are the x-intercepts of $r(x)$.

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

$$x = -6, 3$$

REF: 061733ai   NAT: A.APR.B.3   TOP: Zeros of Polynomials

335 ANS: 2
$y = (x - 3)(x + 2)(x - 1)$

REF: 061512ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
336 ANS: 1
$f(x) = (x + 2)(x + 4)(x - 1)$

REF: 081504ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
337 ANS: 1   REF: 081623ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
338 ANS: 1   REF: 081707ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
339 ANS: 2   REF: 061818ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
340 ANS: 3
$f(x) = (x - 1)(x^2 - 4) = (x - 1)(x - 2)(x + 2)$

REF: 061908ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
341 ANS: 1   REF: 011524ai   NAT: A.APR.B.3   TOP: Graphing Polynomial Functions
342 ANS: 2   REF: 081501ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
343 ANS: 1   REF: 081417ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
344 ANS: 2   REF: 011717ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
345 ANS: 2   REF: 011512ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
346 ANS: 1   REF: 081706ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
347 ANS: 2   REF: 011819ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
348 ANS: 3   REF: 081808ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
349 ANS: 2   REF: 061904ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
350 ANS: 1
$-5 - 2 = -7$

REF: 081905ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
351 ANS: 3   REF: 011910ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
352 ANS:
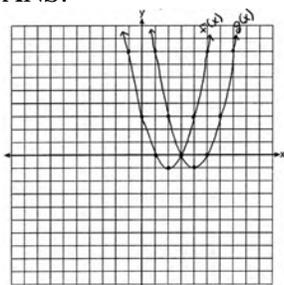
$(4, -1)$. $f(x - 2)$ is a horizontal shift two units to the right.

REF: 061428ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
353 ANS:
$g(x) = x^3 + 2x^2 - 4$, because $g(x)$ is a translation down 4 units.

REF: 061632ai   NAT: F.BF.B.3   TOP: Graphing Polynomial Functions
354 ANS: 1   REF: 081401ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

355 ANS: 2   REF: 061508ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

356 ANS: 3

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

    REF: 061413ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

357 ANS: 2

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

    REF: 081522ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

358 ANS: 3

$$\sqrt{576} = 24 \quad \sqrt{684} = 6\sqrt{19}$$

    REF: 011808ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

359 ANS: 3

$$\sqrt{36} \div \sqrt{225} = \frac{6}{15}$$ may be expressed as the ratio of two integers.

    REF: 011903ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

360 ANS: 1

$$\sqrt{2} \cdot \sqrt{18} = \sqrt{36} = \frac{6}{1}$$ may be expressed as the ratio of two integers.

    REF: 061907ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

361 ANS: 1

I. $-\frac{5}{8} + \frac{3}{5} = \frac{-1}{40}$;   III. $\left(\sqrt{5}\right) \cdot \left(\sqrt{5}\right) = \frac{5}{1}$;   IV. $3 \cdot \left(\sqrt{49}\right) = \frac{21}{1}$

    REF: 011604ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

362 ANS:

Correct. The sum of a rational and irrational is irrational.

    REF: 011525ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

363 ANS:

$3\sqrt{2} \cdot 8\sqrt{18} = 24\sqrt{36} = 144$ is rational, as it can be written as the ratio of two integers.

    REF: 061626ai   NAT: N.RN.B.3   TOP: Operations with Radicals
    KEY: classify

364 ANS:

$7\sqrt{2}$ is irrational because it can not be written as the ratio of two integers.

REF: 081629ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

365 ANS:

No. The sum of a rational and irrational is irrational.

REF: 011728ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

366 ANS:

$7 - \sqrt{2}$ is irrational because it can not be written as the ratio of two integers.

REF: 061727ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

367 ANS:

$a + b$ is irrational because it cannot be written as the ratio of two integers. $b + c$ is rational because it can be written as the ratio of two integers, $\dfrac{35}{2}$.

REF: 081725ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

368 ANS:

Rational, as $\sqrt{16} \cdot \dfrac{4}{7} = \dfrac{16}{7}$, which is the ratio of two integers.

REF: 061831ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

369 ANS:

No. The product of $\sqrt{8}$ and $\sqrt{2}$, which are both irrational numbers, is $\sqrt{16}$, which is rational.

REF: 081930ai   NAT: N.RN.B.3   TOP: Operations with Radicals
KEY: classify

370 ANS: 4   REF: 061703ai   NAT: F.IF.C.7   TOP: Graphing Root Functions
KEY: bimodalgraph

371 ANS:
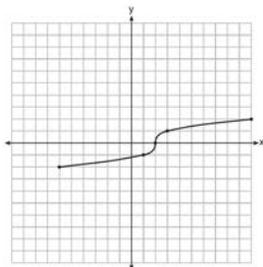
REF: fall1304ai   NAT: F.IF.C.7   TOP: Graphing Root Functions

372 ANS:
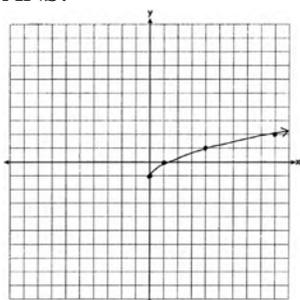
REF: 061425ai   NAT: F.IF.C.7   TOP: Graphing Root Functions

373 ANS:
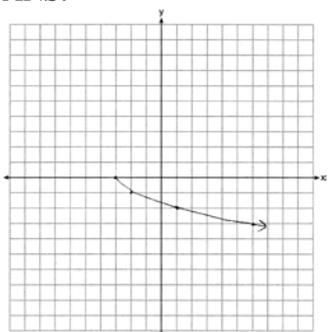
REF: 081625ai   NAT: F.IF.C.7   TOP: Graphing Root Functions

374 ANS:
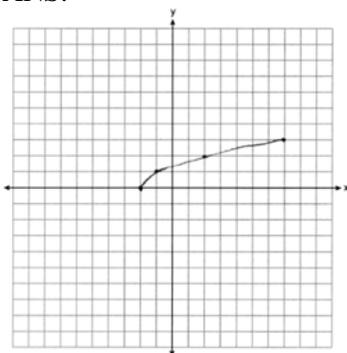
REF: 061825ai   NAT: F.IF.C.7   TOP: Graphing Root Functions

375 ANS: 2   REF: 011815ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

376 ANS: 3

$y = -3x - 4$

$2x - 3(-3x - 4) = -21$

REF: 011922ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

KEY: substitution

377 ANS: 1

$3(-2x + 2x + 8) = 12$

$\qquad 24 \neq 12$

REF: 061708ai   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: substitution

378 ANS: 2

$2(3x - y = 4)$

$\ 6x - 2y = 8$

REF: 061414ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

379 ANS: 4   REF: 011621ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

380 ANS: 4   REF: 081622ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

381 ANS: 4

$36x + 30y = 96$

REF: 081724ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

382 ANS: 3

$2(x - y = 3)$

$2x - 2y = 6$

REF: 081822ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

383 ANS: 1

$x - 4y = -10$ $\quad x + 3 = 5$ $\quad$ (1) $5x = 10$ $\quad 2 + y = 5$

$\ \underline{x + y = 5}\qquad\quad x = 2 \qquad\quad x = 2 \quad y = 3$

$\ \ -5y = -15$

$\ \ \ \ y = 3$

REF: 081922ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

384 ANS: 4
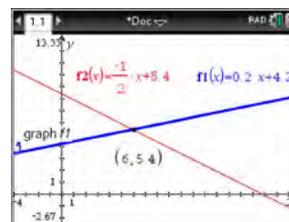
$m = \dfrac{5 - 4.6}{4 - 2} = \dfrac{.4}{2} = 0.2$ $\quad 4(0.2x + 4.2) + 2x = 33.6$ $\quad y = 0.2(6) + 4.2 = 5.4$

$\ 5 = .2(4) + b \qquad\qquad\quad 0.8x + 16.8 + 2x = 33.6$

$4.2 = b \qquad\qquad\qquad\qquad\quad 2.8x = 16.8$

$\ y = 0.2x + 4.2 \qquad\qquad\qquad\quad x = 6$

REF: 061618ai   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: substitution

385 ANS:

$24x + 27y = 144$ $-8.5y = -51$ Agree, as both systems have the same solution.

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

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

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

$8x + 9(6) = 48$

$8x = -6$ $x = -\dfrac{3}{4}$

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

REF: 061533ai   NAT: A.REI.C.6   TOP: Solving Linear Systems

386 ANS:

$185 + 0.03x = 275 + 0.025x$

$0.005x = 90$

$x = 18000$

REF: 081427ai   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: substitution

387 ANS:

No. There are infinite solutions.

REF: 011725ai   NAT: A.REI.C.6   TOP: Solving Linear Systems
KEY: substitution

388 ANS: 4   REF: 081419ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems
389 ANS: 1   REF: 061605ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems
390 ANS: 1   REF: 011803ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems
391 ANS: 2   REF: 081809ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems
392 ANS: 3

$a + p = 165$ $1.75(165 - p) + 2.5p = 337.5$

$1.75a + 2.5p = 337.5$ $288.75 - 1.75p + 2.5p = 337.5$

$0.75p = 48.75$

$p = 65$

REF: 061506ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

393 ANS: 2

$L + S = 20$ $27.98L + 10.98(20 - L) = 355.60$

$27.98L + 10.98S = 355.60$ $27.98L + 219.60 - 10.98L = 355.60$

$17L = 136$

$L = 8$

REF: 081510ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

394 ANS:
Plan *A*: $C = 2G + 25$, Plan *B*: $C = 2.5G + 15$. $50 = 2.5G + 15$ $50 = 2G + 25$ With Plan *B*, Dylan can rent 14

$$35 = 2.5G \qquad 25 = 2G$$

$$G = 14 \qquad G = 12.5$$

games, but with Plan *A*, Dylan can rent only 12. $65 = 2(20) + 25 = 2.5(20) + 15$ Bobby can choose either plan, as he could rent 20 games for $65 with both plans.

REF: 081728ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

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

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

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

$$-3.15c = -31.50$$

$$c = 10$$

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

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

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

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

$$d = 2.25$$

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

397 ANS:
$18j + 32w = 19.92$ $14(.52) + 26(.33) = 15.86 \neq 15.76$ $7(18j + 32w = 19.92)$ $18j + 32(.24) = 19.92$

$14j + 26w = 15.76$ $\qquad\qquad 9(14j + 26w = 15.76)$ $18j + 7.68 = 19.92$

$$126j + 224w = 139.44 \qquad 18j = 12.24$$

$$126j + 234w = 141.84 \qquad j = .68$$

$$10w = 2.4$$

$$w = .24$$

REF: 081637ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

398 ANS:
$p + 2s = 15.95$ $5p + 10s = 79.75$

$3p + 5s = 45.90$ $6p + 10s = 91.80$

$$p = 12.05$$

REF: 011734ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

399 ANS:

$d = 2c - 5$; $20 \ne 2(15) - 5$ 20 dogs is not five less than twice 15 cats; $\dfrac{c+3}{2c-5+3} = \dfrac{3}{4}$, $d = 2(9) - 5 = 13$

$\dfrac{c+3}{d+3} = \dfrac{3}{4}$ $20 \ne 25$

$$4c + 12 = 6c - 6$$
$$18 = 2c$$
$$c = 9$$

REF: 011837ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

400 ANS:

$A(x) = 7 + 3(x - 2)$ $7 + 3(x - 2) = 6.50 + 3.25(x - 2)$

$B(x) = 3.25x$ $7 + 3x - 6 = 3.25x$

$$1 = 0.25x$$
$$4 = x$$

REF: 061834ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

401 ANS:

$10d + 25q = 1755$, $10(90 - q) + 25q = 1755$, no, because $20.98 \cdot 1.08 > 90 \cdot 0.25$

$d + q = 90$ $900 - 10q + 25q = 1755$

$$15q = 855$$
$$q = 57$$

REF: 061837ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

402 ANS:

$b = 4s + 6$ $4s + 6 - 3 = 7s - 21$ $b = 4(8) + 6 = 38$ $38 + x = 3(8 + x)$

$b - 3 = 7(s - 3)$ $3s = 24$ $x + 38 = 24 + 3x$

             $s = 8$ $2x = 14$

                                     $x = 7$

REF: 081837ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

403 ANS:

$4c + 3f = 16.53$ No, because $5(2.49) + 4(2.87) \ne 21.11$. $16c + 12f = 66.12$ $4(2.79) + 3f = 16.53$

$5c + 4f = 21.11$ $\underline{15c + 12f = 63.33}$ $3f = 5.37$

                                          $c = 2.79$ $f = 1.79$

REF: 061937ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

404 ANS:

$$3.75A + 2.5D = 35 \quad 3.75(12 - D) + 2.5D = 35 \quad A + 8 = 12 \quad \frac{7((4)(2) + (8)(1))}{12} = 9\frac{1}{3} \quad 9 \cdot 2.5 = 22.50$$

$$A + D = 12 \quad 45 - 3.75D + 2.5D = 35 \quad A = 4$$

$$-1.25D = -10$$

$$D = 8$$

REF: 081937ai   NAT: A.CED.A.3   TOP: Modeling Linear Systems

405 ANS: 3

$15 > 5$

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

406 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.

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

                              $x = 7$

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

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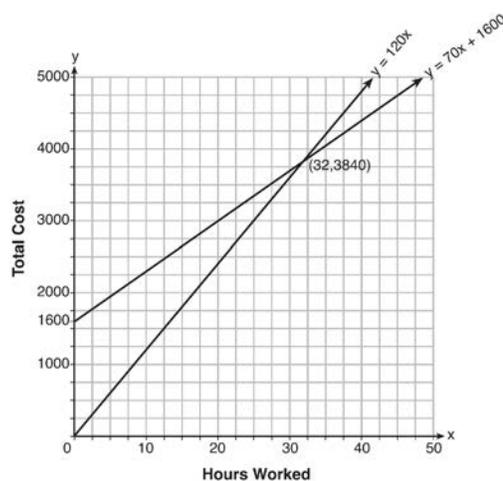
$y = 120x$ and $y = 70x + 1600$ $120x = 70x + 1600$

$50x = 1600$

$x = 32$

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

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

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

408 ANS:
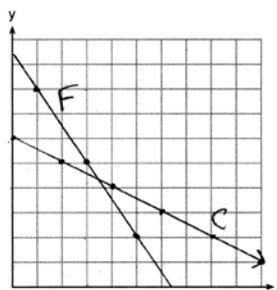
$3x + 2y = 19$ $6x + 4y = 38$ $2(3.50) + 4y = 24$

$2x + 4y = 24$ $2x + 4y = 24$ $7 + 4y = 24$

$4x = 14$ $4y = 17$

$x = 3.50$ $y = 4.25$

REF: 061637ai   NAT: A.REI.C.6   TOP: Graphing Linear Systems

409 ANS:
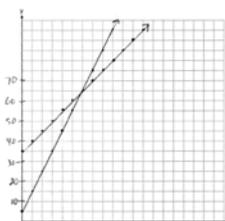
$y = 10x + 5$ In 2016, the swim team and chorus will each have 65 members.

$y = 5x + 35$

REF: 061737ai   NAT: A.REI.C.6   TOP: Graphing Linear Systems

410 ANS:
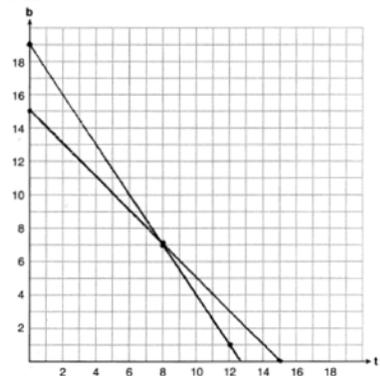
$t + b = 15$ No, because according to the graph, 8 tricycles were ordered.

$3t + 2b = 38$

REF: 011937ai   NAT: A.REI.C.6   TOP: Graphing Linear Systems

411 ANS: 1   REF: 061711ai   NAT: A.CED.A.3   TOP: Modeling Systems of Linear Inequalities

412 ANS: 2   REF: 081810ai   NAT: A.CED.A.3   TOP: Modeling Systems of Linear Inequalities

413 ANS:

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

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

$9d \ge 2360$

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

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

414 ANS:

$x + y \le 200$ $12x + 8.50(50) \ge 1000$

$12x + 8.50y \ge 1000$ $12x + 425 \ge 1000$

$12x \ge 575$

$x \ge \dfrac{575}{12}$

48

REF: 081635ai   NAT: A.CED.A.3   TOP: Modeling Systems of Linear Inequalities

415 ANS:

$2L + 1.5W \ge 500$ $2(144) + 1.5W = 500$ 142 bottles of water must be sold to cover the cost of renting costumes.

$L + W \le 360$ $1.5W = 212$

$W = 141.\overline{3}$

REF: 011835ai   NAT: A.CED.A.3   TOP: Modeling Systems of Linear Inequalities

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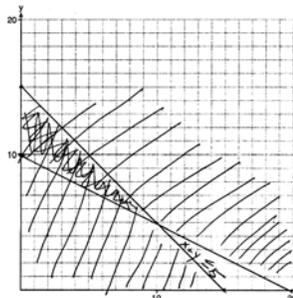
$x + y \le 15$ One hour at school and eleven hours at the library.

$4x + 8y \ge 80$

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

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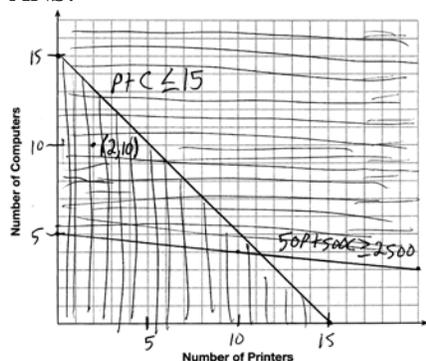
A combination of 2 printers and 10 computers meets all the constraints because $(2, 10)$ is in the solution set of the graph.

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

418 ANS:

$y < -3x + 3$ Region *A* represents the solution set of the system. The gray region represents the solution set of

$y \le 2x - 2$
$y \le 2x - 2$.

REF: 061936ai   NAT: A.CED.A.3   TOP: Modeling Systems of Linear Inequalities

419 ANS: 3   REF: 011820ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities

420 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.

REF: fall1301ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: solution set

421 ANS: 4

$2(2) < -12(-3) + 4$ $4 < -6(-3) + 4$

$4 < 40$ $4 < 22$

REF: 011716ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: solution set

422 ANS: 2   REF: 061404ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: bimodalgraph | graph

423 ANS: 3   REF: 081506ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: bimodalgraph | graph

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

425 ANS:

No, because the point $(0, 4)$ does not satisfy the inequality $y < \dfrac{1}{2}x + 4$. $4 < \dfrac{1}{2}(0) + 4$ is not a true statement.

REF: 011828ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: solution set

426 ANS:
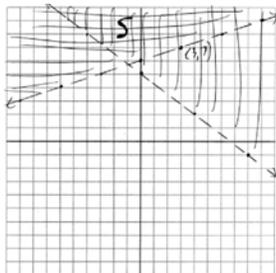
 No, (3,7) is on the boundary line, and not included in the solution set, because this is a strict inequality.

REF: 081735ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

427 ANS:
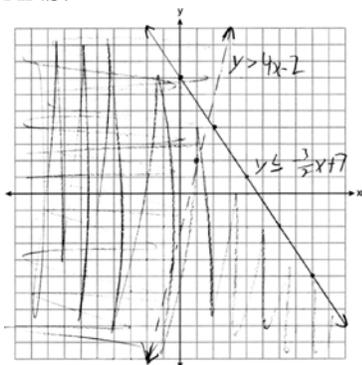
REF: 061835ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

428 ANS:
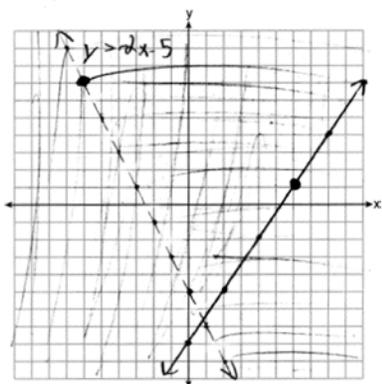
 $(6,1)$ is on a solid line. $(-6,7)$ is on a dashed line.

REF: 081835ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

429 ANS:
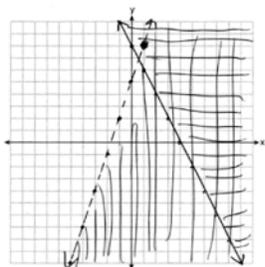
No, $(1, 8)$ falls on the boundary line of $y - 5 < 3x$, which is a strict inequality.

REF: 081933ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

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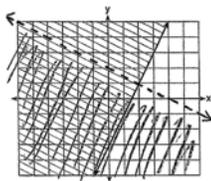
$y \geq 2x - 3$.   Oscar is wrong. $(2) + 2(1) < 4$ is not true.

REF: 011534ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

431 ANS:
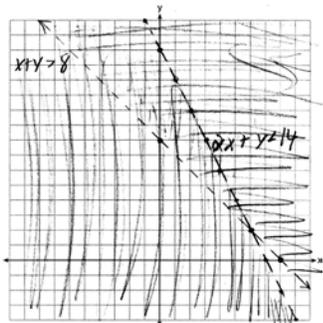
$(6, 2)$ is not a solution as its falls on the edge of each inequality.

REF: 061634ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

432 ANS:

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

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

$$875 < 1500$$
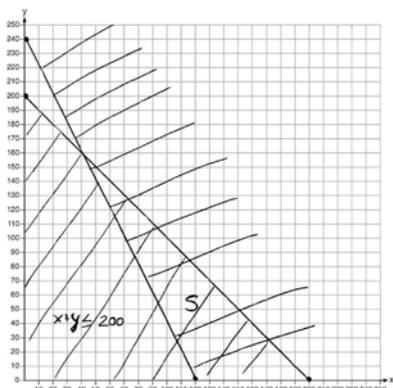
REF: 011637ai   NAT: A.REI.D.12   TOP: Graphing Systems of Linear Inequalities
KEY: graph

433 ANS: 3
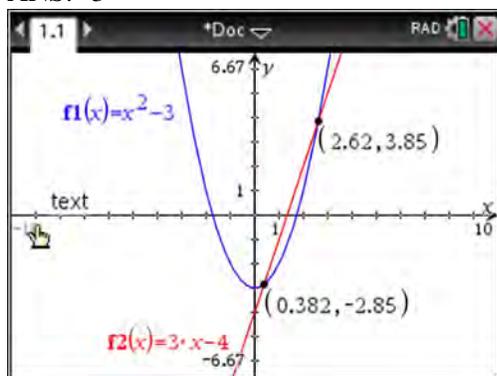
REF: 011810ai   NAT: A.REI.C.7   TOP: Quadratic-Linear Systems
KEY: algebraically

434 ANS: 2

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

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

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

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

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

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

435 ANS:

$x = -2, 1$
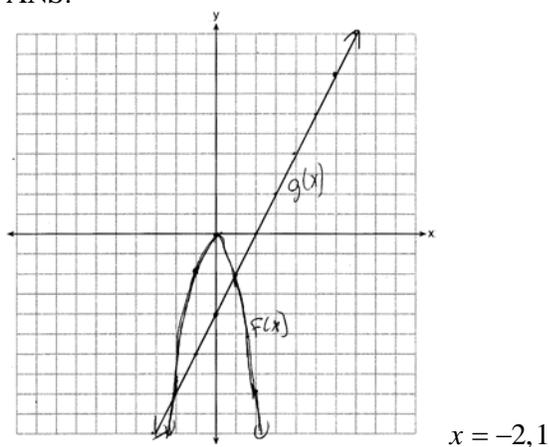
REF: 081435ai   NAT: A.REI.D.11   TOP: Quadratic-Linear Systems

436 ANS:

$x = 0, 3$
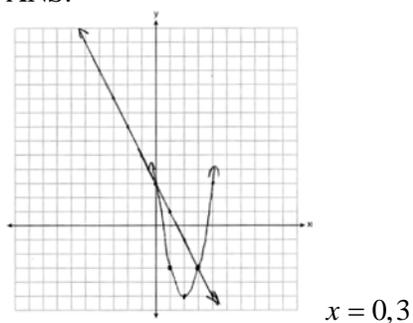
REF: 061934ai   NAT: A.REI.D.11   TOP: Quadratic-Linear Systems

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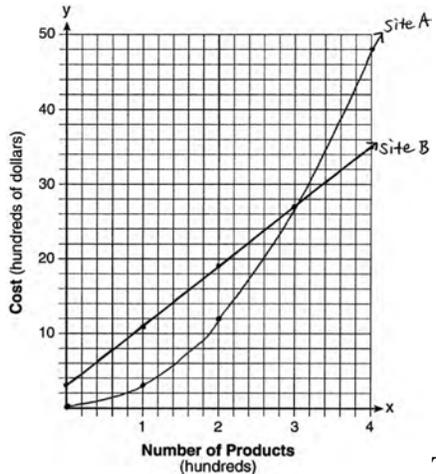
The graphs of the production costs intersect at $x = 3$. The company should use Site A, because the cost of Site A is lower at $x = 2$.

REF: 061437ai   NAT: A.REI.D.11   TOP: Quadratic-Linear Systems

438 ANS:

$$x^2 = x$$

$$x^2 - x = 0$$

$$x(x - 1) = 0$$

$$x = 0, 1$$

REF: 061731ai   NAT: A.REI.D.11   TOP: Quadratic-Linear Systems

439 ANS:

$$2x^2 + 3x + 10 = 4x + 32 \quad x = \frac{1 \pm \sqrt{(-1)^2 - 4(2)(-22)}}{2(2)} \approx -3.1, 3.6.$$ Quadratic formula, because the answer must be

$$2x^2 - x - 22 = 0$$

to the nearest tenth.

REF: 061735ai   NAT: A.REI.D.11   TOP: Quadratic-Linear Systems

440 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.

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

441 ANS: 1

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

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

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

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

$$6 = x$$

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

442 ANS: 2

$$|x + 2| = 3x - 2$$

$$x + 2 = 3x - 2$$

$$4 = 2x$$

$$x = 2$$

REF: 081702ai   NAT: A.REI.D.11   TOP: Other Systems

443 ANS: 3

$y = (-1)^2 - 3(-1) - 2 = 2$, $y = 4(-1) + 6 = 2$

REF: 011918ai   NAT: A.REI.D.11   TOP: Other Systems
444 ANS: 3   REF: 011518ai   NAT: A.REI.D.11   TOP: Other Systems
445 ANS: 2
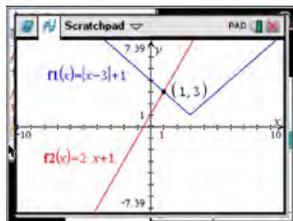
$|x - 3| + 1 = 2x + 1$ $x - 3 = 2x$ $x - 3 = -2x$

$|x - 3| = 2x$ $-3 = x$ $3x = 3$

                                       extraneous $x = 1$

REF: 061622ai   NAT: A.REI.D.11   TOP: Other Systems
446 ANS: 3   REF: 081819ai   NAT: A.REI.D.11   TOP: Other Systems
447 ANS: 3   REF: 081914ai   NAT: A.REI.D.11   TOP: Other Systems
448 ANS:
     $-3, 1$

REF: 081630ai   NAT: A.REI.D.11   TOP: Other Systems
449 ANS:
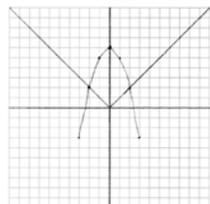
Yes, because the graph of $f(x)$ intersects the graph of $g(x)$ at $x = -2$.

REF: 011733ai   NAT: A.REI.D.11   TOP: Other Systems
450 ANS:
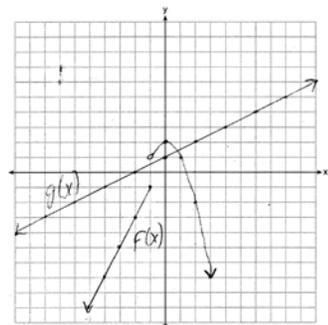
1, because the graphs only intersect once.

REF: 061636ai   NAT: A.REI.D.11   TOP: Other Systems
451 ANS: 4   REF: 061811ai   NAT: F.IF.A.1   TOP: Defining Functions
     KEY: ordered pairs

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

452 ANS: 2   REF: 011804ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: graphs
453 ANS: 4   REF: 081902ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: ordered pairs
454 ANS: 3   REF: 061504ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: ordered pairs
455 ANS: 3   REF: 061709ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: ordered pairs
456 ANS: 2   REF: 081511ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: mixed
457 ANS: 4   REF: 011907ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: mixed
458 ANS: 4   REF: 061903ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: mixed
459 ANS:
Yes, because every element of the domain is assigned one unique element in the range.

REF: 061430ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: ordered pairs
460 ANS:
Neither is correct. Nora's reason is wrong since a circle is not a function because it fails the vertical line test. Mia is wrong since a circle is not a function because multiple values of y map to the same x-value.

REF: 011732ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: graphs
461 ANS:
No, because the relation does not pass the vertical line test.

REF: 011626ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: graphs
462 ANS:
III and IV are functions. I, for $x = 6$, has two y-values. II, for $x = 1, 2$, has two y-values.

REF: 081826ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: graphs
463 ANS:
$(-4, 1)$, because then every element of the domain is not assigned one unique element in the range.

REF: 011527ai   NAT: F.IF.A.1   TOP: Defining Functions
KEY: ordered pairs
464 ANS: 1   REF: 061420ai   NAT: F.IF.A.2   TOP: Functional Notation
465 ANS: 1   REF: 081805ai   NAT: F.IF.A.2   TOP: Functional Notation

466 ANS: 2
$f(-3) = -12 + 5 = -7$

REF: 061902ai   NAT: F.IF.A.2   TOP: Functional Notation

467 ANS: 1
$g(-3) = -2(-3)^2 + 3(-3) = -18 - 9 = -27$

REF: 011902ai   NAT: F.IF.A.2   TOP: Functional Notation

468 ANS: 2
$f(-2) = (-2 - 1)^2 + 3(-2) = 9 - 6 = 3$

REF: 081605ai   NAT: F.IF.A.2   TOP: Functional Notation

469 ANS: 3
$f(8) = \frac{1}{2}(8)^2 - \left(\frac{1}{4}(8) + 3\right) = 32 - 5 = 27$

REF: 081704ai   NAT: F.IF.A.2   TOP: Functional Notation

470 ANS: 4
$k(9) = 2(9)^2 - 3\sqrt{9} = 162 - 9 = 153$

REF: 061802ai   NAT: F.IF.A.2   TOP: Functional Notation

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

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

472 ANS: 1
$f(3) = -2(3)^2 + 32 = -18 + 32 = 14$

REF: 061705ai   NAT: F.IF.A.2   TOP: Functional Notation

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

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

474 ANS:
$g(-2) = -4(-2)^2 - 3(-2) + 2 = -16 + 6 + 2 = -8$

REF: 081925ai   NAT: F.IF.A.2   TOP: Functional Notation

475 ANS:

$w(52) - w(38)$ $\quad\quad$ $15(x - 40) + 400 = 445$ 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.

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

476 ANS: 3

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

REF: 011603ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Evaluating Functions

477 ANS: 4 $\quad\quad\quad\quad$ REF: 011917ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: graph

478 ANS: 4 $\quad\quad\quad\quad$ REF: 061509ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: graph

479 ANS: 1 $\quad\quad\quad\quad$ REF: 081710ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: limited domain

480 ANS: 1

$f(2) = 0$

$f(6) = 8$

REF: 081411ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: limited domain

481 ANS: 4 $\quad\quad\quad\quad$ REF: 061417ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: real domain, linear

482 ANS: 3 $\quad\quad\quad\quad$ REF: 061816ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: real domain, quadratic

483 ANS: 2

$f(x) = x^2 + 2x - 8 = x^2 + 2x + 1 - 9 = (x + 1)^2 - 9$

REF: 061611ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: real domain, quadratic

484 ANS: 4

$x = \dfrac{-(-2)}{2(2)} = \dfrac{1}{2}$ $\quad$ $h\left(\dfrac{1}{2}\right) = -\dfrac{9}{2}$

REF: 081923ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: real domain, quadratic

485 ANS: 3

$f(-2) = 0, f(3) = 10, f(5) = 42$

REF: 011812ai $\quad$ NAT: F.IF.A.2 $\quad$ TOP: Domain and Range
KEY: limited domain

486 ANS: 2 REF: 081806ai NAT: F.IF.A.2 TOP: Domain and Range
KEY: limited domain
487 ANS: 2
$f(-2) = f(-1) = -16, f(0) = -12, f(1) = -4$

REF: 011914ai NAT: F.IF.A.2 TOP: Domain and Range
KEY: limited domain
488 ANS: 2 REF: 011619ai NAT: F.IF.A.2 TOP: Domain and Range
KEY: real domain, exponential
489 ANS: 4
There are no negative or fractional cars.

REF: 061402ai NAT: F.IF.B.5 TOP: Domain and Range
490 ANS: 2
$$0 = -16t^2 + 144$$

$$16t^2 = 144$$

$$t^2 = 9$$

$$t = 3$$

REF: 081423ai NAT: F.IF.B.5 TOP: Domain and Range
491 ANS: 2 REF: 011506ai NAT: F.IF.B.5 TOP: Domain and Range
492 ANS: 1 REF: 011615ai NAT: F.IF.B.5 TOP: Domain and Range
493 ANS: 4 REF: 061623ai NAT: F.IF.B.5 TOP: Domain and Range
494 ANS: 2 REF: 081620ai NAT: F.IF.B.5 TOP: Domain and Range
495 ANS: 4 REF: 011719ai NAT: F.IF.B.5 TOP: Domain and Range
496 ANS: 2 REF: 061821ai NAT: F.IF.B.5 TOP: Domain and Range
497 ANS: 4 REF: 061920ai NAT: F.IF.B.5 TOP: Domain and Range
498 ANS: 4
Time is continuous and positive.

REF: 081921ai NAT: F.IF.B.5 TOP: Domain and Range
499 ANS: 2
$P(x) = -0.5x^2 + 800x - 100 - (300x + 250) = -0.5x^2 + 500x - 350$

REF: 081406ai NAT: F.BF.A.1 TOP: Operations with Functions
500 ANS:
$g(x) = 2(2x + 1)^2 - 1 = 2(4x^2 + 4x + 1) - 1 = 8x^2 + 8x + 2 - 1 = 8x^2 + 8x + 1$

REF: 061625ai NAT: F.BF.A.1 TOP: Operations with Functions
501 ANS: 3 REF: 081410ai NAT: F.LE.A.1 TOP: Families of Functions
KEY: bimodalgraph
502 ANS: 2 REF: 081907ai NAT: F.LE.A.1 TOP: Families of Functions
503 ANS: 3 REF: 011505ai NAT: F.LE.A.1 TOP: Families of Functions
504 ANS: 1 REF: 061606ai NAT: F.LE.A.1 TOP: Families of Functions

505 ANS: 1   REF: 061906ai   NAT: F.LE.A.1   TOP: Families of Functions
506 ANS: 4   REF: 061406ai   NAT: F.LE.A.1   TOP: Families of Functions
507 ANS: 1   REF: 011623ai   NAT: F.LE.A.1   TOP: Families of Functions
508 ANS: 2   REF: 061624ai   NAT: F.LE.A.1   TOP: Families of Functions
509 ANS: 1   REF: 081717ai   NAT: F.LE.A.1   TOP: Families of Functions
510 ANS: 1   REF: 011805ai   NAT: F.LE.A.1   TOP: Families of Functions
511 ANS: 4
II is linear.

REF: 081823ai   NAT: F.LE.A.1   TOP: Families of Functions
512 ANS: 3   REF: 081412ai   NAT: F.LE.A.1   TOP: Families of Functions
513 ANS: 3   REF: 011711ai   NAT: F.LE.A.1   TOP: Families of Functions
514 ANS: 3   REF: 061721ai   NAT: F.LE.A.1   TOP: Families of Functions
515 ANS: 4   REF: 061814ai   NAT: F.LE.A.1   TOP: Families of Functions
516 ANS: 3   REF: 061911ai   NAT: F.LE.A.1   TOP: Families of Functions
517 ANS:
Exponential, because the function does not grow at a constant rate.

REF: 081527ai   NAT: F.LE.A.1   TOP: Families of Functions
518 ANS:
Linear, because the function has a constant rate of change.

REF: 011625ai   NAT: F.LE.A.1   TOP: Families of Functions
519 ANS:
Exponential, because the function does not have a constant rate of change.

REF: 081627ai   NAT: F.LE.A.1   TOP: Families of Functions
520 ANS:
Yes, because $f(x)$ does not have a constant rate of change.

REF: 061826ai   NAT: F.LE.A.1   TOP: Families of Functions
521 ANS:
Linear, because the function grows at a constant rate.
$$\frac{435-348}{14-13} = \frac{522-435}{15-14} = \frac{609-522}{16-15} = \frac{696-609}{17-16} = \frac{783-696}{18-17} = \frac{87}{1}$$

REF: 011926ai   NAT: F.LE.A.1   TOP: Families of Functions
522 ANS: 3   REF: 061415ai   NAT: F.LE.A.2   TOP: Families of Functions
523 ANS: 2   REF: 061513ai   NAT: F.LE.A.2   TOP: Families of Functions
524 ANS: 4   REF: 011616ai   NAT: F.LE.A.2   TOP: Families of Functions
525 ANS: 1   REF: 061707ai   NAT: F.LE.A.2   TOP: Families of Functions
526 ANS: 2   REF: 081714ai   NAT: F.LE.A.2   TOP: Families of Functions

527 ANS: 1
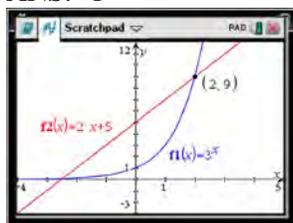
$$f(-1) < g(-1)$$

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

$$\frac{1}{3} < 3$$

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

528 ANS: 3
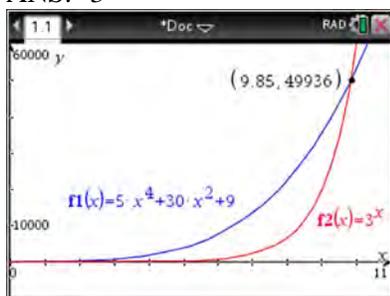
REF: 061621ai   NAT: F.LE.A.3   TOP: Families of Functions

529 ANS: 1   REF: 081618ai   NAT: F.LE.A.3   TOP: Families of Functions

530 ANS: 3
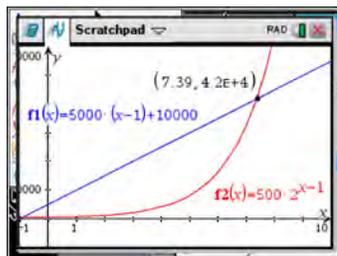
x	$A = 5000(x-1) + 10000$	$B = 500(2)^{x-1}$
6	35,000	16,000
7	40,000	32,000
8	45,000	64,000
9	50,000	128,000

REF: 081518ai   NAT: F.LE.A.3   TOP: Families of Functions

531 ANS: 3

$l(w) = 3.1w - 16.2$, $l(10) = 3.1(10) - 16.2 = 14.8$, $l(13) = 3.1(13) - 16.2 = 24.1$; $p(w) = 2.5(1.52)^{w-6}$, $p(10) = 2.5(1.52)^{10-6} \approx 13.3$, $p(13) = 2.5(1.52)^{13-6} \approx 46.9$

REF: 011916ai   NAT: F.LE.A.3   TOP: Families of Functions

532 ANS:

$f(x) = 10 + 100x$, $g(x) = 10(2)^x$; both, since $f(7) = 10 + 100(7) = 710$ and $g(7) = 10(2)^7 = 1280$

REF: 061736ai   NAT: F.LE.A.3   TOP: Families of Functions

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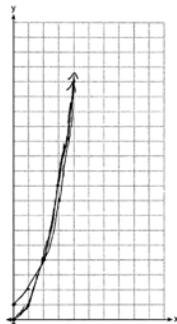
 $g(x)$ has a greater value: $2^{20} > 20^2$

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

534 ANS: 1   REF: 011620ai   NAT: F.BF.B.3   TOP: Transformations with Functions
KEY: bimodalgraph

535 ANS:
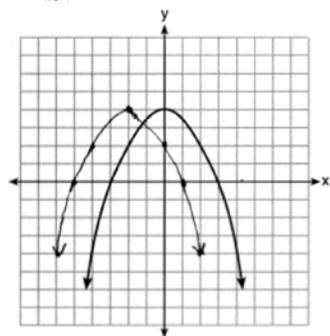
REF: 061828ai   NAT: F.BF.B.3   TOP: Transformations with Functions

536 ANS:
2 units right and 3 units down.

REF: 081626ai   NAT: F.BF.B.3   TOP: Transformations with Functions

537 ANS: 3

The minimum of $r(x)$ is -16. The minimum of $q(x)$ is -9 $\left(x = \dfrac{-2}{2(1)} = -1; q(-1) = -9 \right)$.

REF: 081917ai   NAT: F.IF.C.9   TOP: Comparing Functions

538 ANS: 4

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

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

4) $g\colon S=\dfrac{-(-1)}{-1}=-1$

$n\colon S=-2+4=2$

REF: 081521ai   NAT: F.IF.C.9   TOP: Comparing Functions

539 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

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

REF: spr1301ai   NAT: F.IF.C.9   TOP: Comparing Functions

540 ANS: 2
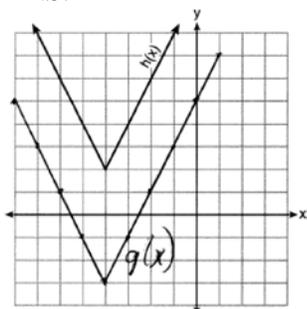
REF: 081718ai   NAT: F.IF.C.9   TOP: Comparing Functions

541 ANS: 3

$x=3$

REF: 061717ai   NAT: F.IF.C.9   TOP: Comparing Functions

542 ANS: 4

$f(4)=q(4)=p(4)=3$

REF: 011921ai   NAT: F.IF.C.9   TOP: Comparing Functions

543 ANS: 3   REF: 061820ai   NAT: F.IF.C.9   TOP: Comparing Functions

544 ANS: 4

1) $y=3x+2$; 2) $\dfrac{-5-2}{3-2}=-7$; 3) $y=-2x+3$; 4) $y=-3x+5$

REF: 081615ai   NAT: F.IF.C.9   TOP: Comparing Functions

545 ANS: 3

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

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

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

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

$\quad = 6\dfrac{1}{4}$ $\quad = \dfrac{56}{5}$

$\quad = 11\dfrac{1}{5}$

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

546 ANS: 3   REF: 011622ai   NAT: F.IF.C.9   TOP: Comparing Functions

547 ANS: 4

1) $b = 0$; 2) $b = 4$; 3) $b = -6$; 4) $b = 5$

REF: 081611ai   NAT: F.IF.C.9   TOP: Comparing Functions

548 ANS: 2   REF: 011723ai   NAT: F.IF.C.9   TOP: Comparing Functions

549 ANS: 2

1) $x = \dfrac{-2}{2(-1)} = 1$; 2) $h = \dfrac{3}{2}$ Using $(0,3)$, $3 = a\left(0 - \dfrac{3}{2}\right)^2 + k$; Using $(1,5)$, $5 = a\left(1 - \dfrac{3}{2}\right)^2 + k$

$\quad y = -1^2 + 2(1) + 4 = 5$ $3 = \dfrac{9}{4}a + k$ $5 = \dfrac{1}{4}a + k$

$\quad$ vertex $(1,5)$

$\qquad\qquad\qquad\qquad\qquad\qquad k = 3 - \dfrac{9}{4}a$ $k = 5 - \dfrac{1}{4}a$

$5 - \dfrac{1}{4}a = 3 - \dfrac{9}{4}a$ $k = 5 - \dfrac{1}{4}(-1) = \dfrac{21}{4}$; 3) vertex $(5,5)$; 4) Using $c = 1$ $-9 = (-2)^2 a + (-2)b + 1$

$20 - a = 12 - 9a$ $-10 = 4a - 2b$

$\quad 8a = -8$ vertex $\left(\dfrac{3}{2}, \dfrac{21}{4}\right)$ $b = 2a + 5$

$\quad\; a = -1$

$-3 = (-1)^2 a + (-1)b + 1$ $2a + 5 = a + 4$ $x = \dfrac{-3}{2(-1)} = \dfrac{3}{2}$ vertex $\left(\dfrac{3}{2}, \dfrac{13}{4}\right)$

$-3 = a - b + 1$ $a = -1$

$b = a + 4$ $b = -1 + 4 = 3$ $y = -\left(\dfrac{3}{2}\right)^2 + 3\left(\dfrac{3}{2}\right) + 1 = -\dfrac{9}{4} + \dfrac{18}{4} + \dfrac{4}{4} = \dfrac{13}{4}$

REF: 011823ai   NAT: F.IF.C.9   TOP: Comparing Functions

550 ANS: 2

1) $x = \dfrac{-2}{2(1)} = -1$, $h(-1) = (-1)^2 + 2(-1) - 6 = -7$; 2) $y = -10$; 3) $k\left(\dfrac{-5 + -2}{2}\right) = (-3.5 + 5)(-3.5 + 2) = -2.25$; 4) $y = -6$

REF: 061813ai   NAT: F.IF.C.9   TOP: Comparing Functions

551 ANS: 4

The y-intercept for $f(x)$ is $(0,1)$. The y-intercept for $g(x)$ is $(0,3)$. The y-intercept for $h(x)$ is $(0,-1)$.

REF: 081811ai   NAT: F.IF.C.9   TOP: Comparing Functions

552 ANS:

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

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

REF: 081429ai   NAT: F.IF.C.9   TOP: Comparing Functions

553 ANS: 3

1) B's zeros are -2 and -6 and C's zeros are -4 and -2; 2) A's y-intercept is 4 and B's y-intercept is 12; 3) B in standard form, $a > 0$ and C in standard form, $a < 0$; d) A has no minimum

REF: 061914ai   NAT: F.IF.C.9   TOP: Comparing Functions

554 ANS: 3   REF: 061701ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

555 ANS: 1   REF: 081918ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

556 ANS: 4   REF: 061502ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

557 ANS:
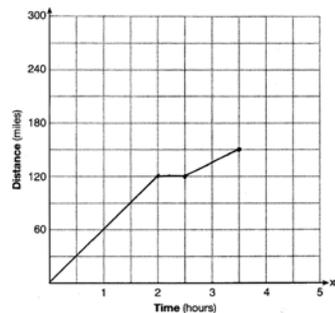
REF: 081528ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

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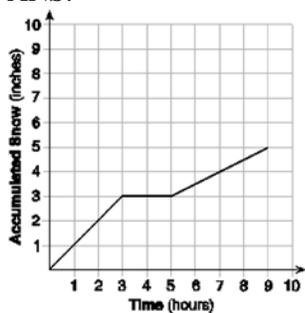
At 6 hours, $3\frac{1}{2}$ inches of snow have fallen.

REF: spr1307ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

559 ANS:

D-E, because his speed was slower. Craig may have stayed at a rest stop during *B-C*. $\frac{230-0}{7-0} \approx 32.9$

REF: 061734ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

560 ANS:
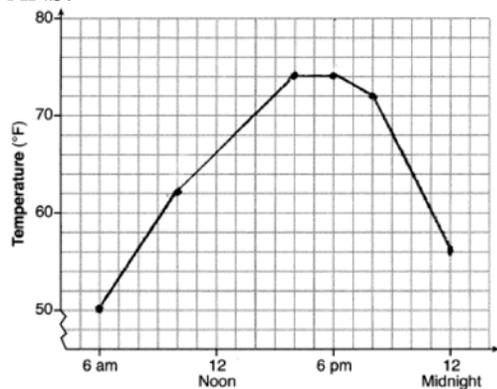
, 6am-4pm, $\frac{74-56}{6-12} = -3$

REF: 011936ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

561 ANS:
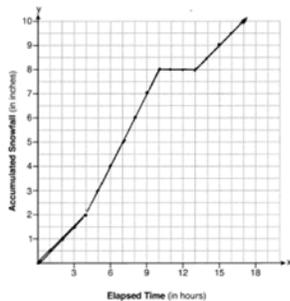
$\frac{10.0-0}{17.0-0} \approx 0.59$

REF: 081936ai   NAT: F.IF.B.4   TOP: Relating Graphs to Events

562 ANS: 4   REF: 081815ai   NAT: F.IF.C.7   TOP: Graphing Piecewise-Defined Functions

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

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

565 ANS:
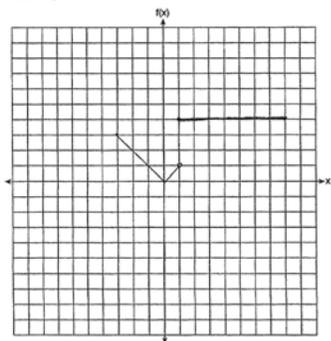
REF: 011530ai   NAT: F.IF.C.7   TOP: Graphing Piecewise-Defined Functions

566 ANS:
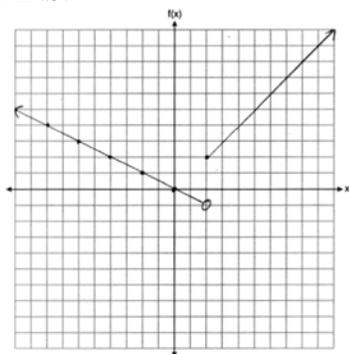
REF: 061832ai   NAT: F.IF.C.7   TOP: Graphing Piecewise-Defined Functions

567 ANS:
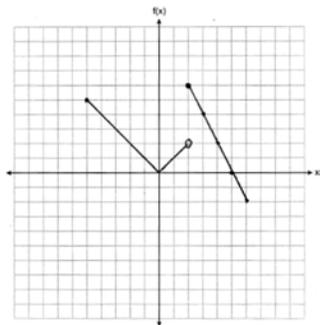
REF: 061927ai   NAT: F.IF.C.7   TOP: Graphing Piecewise-Defined Functions

568 ANS:
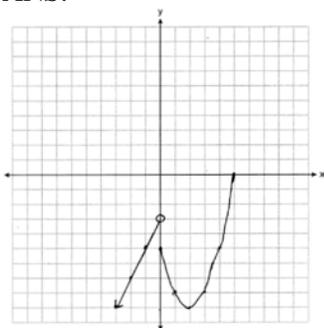
REF: 081932ai   NAT: F.IF.C.7   TOP: Graphing Piecewise-Defined Functions

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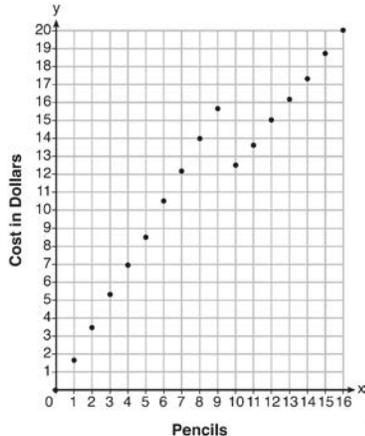
Since according to the graph, 8 pencils cost $14 and 10 pencils cost $12.50, the cashier is correct.

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

570 ANS: 1   REF: 061507ai   NAT: F.IF.C.7   TOP: Graphing Step Functions
KEY: bimodalgraph

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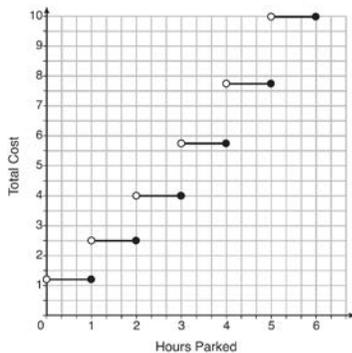
The cost for each additional hour increases after the first 2 hours.

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

572 ANS: 4
$f(1) = 3; f(2) = -5; f(3) = 11; f(4) = -21; f(5) = 43$

REF: 081424ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

573 ANS: 3
$f(0+1) = -2f(0) + 3 = -2(2) + 3 = -1$

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

REF: 011520ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

574 ANS: 3
$a_n = 3n + 1$

$a_5 = 3(5) + 1 = 16$

REF: 061613ai   NAT: F.IF.A.3   TOP: Sequences   KEY: explicit

575 ANS: 2
$f(1) = 2; \ f(2) = -5(2) + 2 = -8; \ f(3) = -5(-8) + 2 = 42; \ f(4) = -5(42) + 2 = -208$

REF: 061718ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

576 ANS: 3
$a_2 = n\left(a_{2-1}\right) = 2 \cdot 1 = 2, \ a_3 = n\left(a_{3-1}\right) = 3 \cdot 2 = 6, \ a_4 = n\left(a_{4-1}\right) = 4 \cdot 6 = 24, \ a_5 = n\left(a_{2-1}\right) = 5 \cdot 24 = 120$

REF: 061824ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

577 ANS: 2   REF: 061919ai   NAT: F.IF.A.3   TOP: Sequences
KEY: difference or ratio

578 ANS: 1
$a_2 = 3 + 2(6)^2 = 75$

REF: 081919ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

579 ANS: 1

$5r = a_2 \quad a_2 r = 245 \quad 5r = \dfrac{245}{r}$

$a_2 = \dfrac{245}{r} \quad 5r^2 = 245$

$r^2 = 49$

$r = \pm 7$

REF: 081924ai   NAT: F.IF.A.3   TOP: Sequences   KEY: difference or ratio

580 ANS: 3
1, 3, 6, 10, 15, 21, 28, ...

REF: 081715ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

581 ANS: 1
$d = \dfrac{37-31}{6-3} = 2 \quad a_n = 2n + 25$

$a_{20} = 2(20) + 25 = 65$

REF: 061807ai   NAT: F.IF.A.3   TOP: Sequences   KEY: explicit

582 ANS:
Yes, because the sequence has a common ratio, 3.

REF: 081726ai   NAT: F.IF.A.3   TOP: Sequences   KEY: difference or ratio

583 ANS:
$0, -1, 1, 1, 1$

REF: 081832ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

584 ANS:
$a_2 = 2(3 + 1) = 8$ $a_3 = 2(8 + 1) = 18$ $a_4 = 2(18 + 1) = 38$

REF: 061931ai   NAT: F.IF.A.3   TOP: Sequences   KEY: recursive

585 ANS: 3   REF: 061522ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

586 ANS: 2   REF: 061424ai   NAT: F.LE.A.2   TOP: Sequences
KEY: explicit

587 ANS: 4   REF: 061421ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

588 ANS: 2   REF: 081416ai   NAT: F.LE.A.2   TOP: Sequences
KEY: explicit

589 ANS: 1   REF: 081514ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

590 ANS: 3   REF: 011618ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

591 ANS: 1   REF: 081610ai   NAT: F.LE.A.2   TOP: Sequences
KEY: explicit

592 ANS: 1   REF: 011708ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

593 ANS: 3   REF: 011818ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

594 ANS: 4   REF: 081820ai   NAT: F.LE.A.2   TOP: Sequences
KEY: explicit

595 ANS: 2   REF: 011919ai   NAT: F.LE.A.2   TOP: Sequences
KEY: recursive

596 ANS: 1   REF: 061922ai   NAT: S.ID.A.2   TOP: Dispersion
KEY: basic

597 ANS:
Los Angeles because range, IQR and σ_x are less.

	σ_x	Min	Q1	Q3	Max	Range	IQR
Miami	7.2	60	75	83	87	27	8
Los Angeles	3.6	61	63	67	74	13	4

REF: 011931ai   NAT: S.ID.A.2   TOP: Central Tendency and Dispersion

15

598 ANS:
4th because IQR and σ_x are greater for 4th Period.

REF: 081831ai   NAT: S.ID.A.2   TOP: Central Tendency and Dispersion

599 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

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

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

601 ANS: 3

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

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

602 ANS: 4   REF: 011720ai   NAT: S.ID.A.2   TOP: Central Tendency and Dispersion

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

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

604 ANS: 3
Median remains at 1.4.

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

605 ANS: 4
(1) The box plot indicates the data is not evenly spread. (2) The median is 62.5. (3) The data is skewed because the mean does not equal the median. (4) an outlier is greater than $Q3 + 1.5 \cdot IRQ = 66 + 1.5(66 - 60.5) = 74.25$.
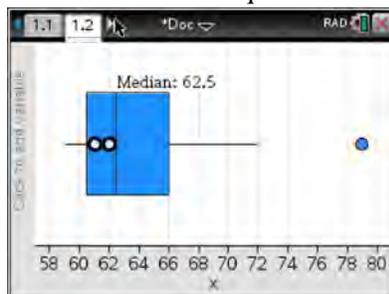
REF: 061715ai   NAT: S.ID.A.3   TOP: Central Tendency and Dispersion

606 ANS: 1
(1) the mode is a bit high (2) $Q_1 = 41, Q_3 = 68,$ 1.5 times the IQR of 27 is 40.5, $Q_1 - 1.5IQR = 41 - 40.5 = 0.5$, $Q_3 + 1.5IQR = 68 + 40.5 = 108.5$, so the data have two outliers.

REF: 011816ai   NAT: S.ID.A.3   TOP: Central Tendency and Dispersion

607 ANS: 4

$$\frac{30}{30+12+8} = 0.6$$

REF: 061615ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

608 ANS: 2

$$\frac{14}{16+20+14} = 28\%$$

REF: 011705ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

609 ANS: 1

$$\frac{58+41}{42+58+20+84+41+5} = \frac{99}{250} = 0.396$$

REF: 061809ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

610 ANS: 2

$$\frac{26}{42+26} = 0.382$$

REF: 061912ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

611 ANS: 2

$$\frac{56}{56+74+103} \approx 0.24$$

REF: 081906ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

612 ANS: 2

$$\frac{60-45}{60} = \frac{15}{60} = \frac{1}{4}$$

REF: 081814ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

613 ANS:

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

REF: 011526ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

614 ANS:

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

$$105m = 24570$$

$$m = 234$$

REF: 011630ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

615 ANS:

	Watch Sports	Don't Watch Sports	Total
Like Pop	26	28	54
Don't Like Pop	34	12	46
Total	60	40	100

REF: 061729ai   NAT: S.ID.B.5   TOP: Frequency Tables
KEY: two-way

616 ANS:

Interval	Frequency
6.0 – 6.1	3
6.2 – 6.3	10
6.4 – 6.5	11
6.6 – 6.7	0
6.8 – 6.9	2
7.0 – 7.1	3

6.4-6.5
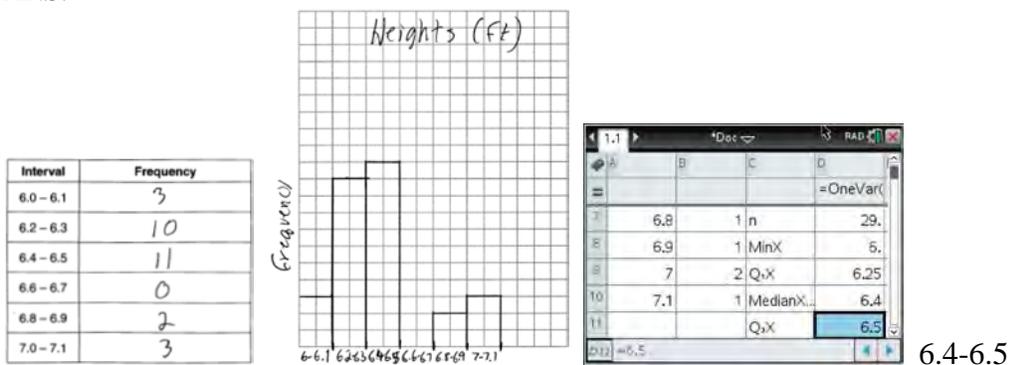
REF: 081734ai   NAT: S.ID.A.1   TOP: Frequency Histograms
KEY: frequency histograms

617 ANS: 4   REF: 081603ai   NAT: S.ID.A.1   TOP: Box Plots
KEY: interpret

618 ANS: 2   REF: 061805ai   NAT: S.ID.A.1   TOP: Box Plots
KEY: interpret

619 ANS: 1
$8 - 1 = 7$

REF: 081915ai   NAT: S.ID.A.1   TOP: Box Plots   KEY: interpret

620 ANS:
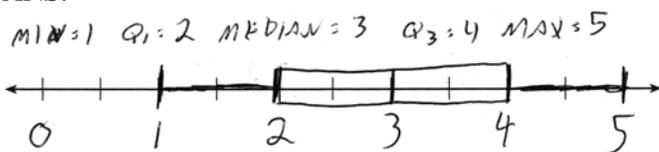
REF: 061432ai   NAT: S.ID.A.1   TOP: Box Plots   KEY: represent

621 ANS: 3
median = 3, IQR = $4 - 2 = 2$, $\bar{x} = 2.75$. An outlier is outside the interval $[Q_1 - 1.5(IQR), Q_3 + 1.5(IQR)]$.

$[2 - 1.5(2), 4 + 1.5(2)]$

$[-1, 7]$

REF: 061620ai   NAT: S.ID.A.1   TOP: Dot Plots

622 ANS: 2   REF: 011901ai   NAT: S.ID.B.6   TOP: Scatter Plots
KEY: line of best fit

623 ANS: 2   REF: 061516ai   NAT: S.ID.C.9   TOP: Analysis of Data

624 ANS: 2   REF: 011713ai   NAT: S.ID.C.9   TOP: Analysis of Data

625 ANS: 2   REF: 081708ai   NAT: S.ID.C.9   TOP: Analysis of Data

626 ANS: 3   REF: 081821ai   NAT: S.ID.C.9   TOP: Analysis of Data

627 ANS: 2   REF: 061916ai   NAT: S.ID.B.6   TOP: Regression
KEY: exponential

628 ANS: 4   REF: 081421ai   NAT: S.ID.B.6   TOP: Regression
KEY: linear

629 ANS:
$y = 0.05x - 0.92$

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

630 ANS:
$y = 17.159x - 2.476$. $y = 17.159(.65) - 2.476 \approx 8.7$

REF: 081633ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear

631 ANS:
$y = -8.5x + 99.2$ The y-intercept represents the length of the rope without knots. The slope represents the decrease in the length of the rope for each knot.

REF: 011834ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear

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

REF: 081536ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear with correlation coefficient

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

REF: 011635ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear with correlation coefficient

634 ANS:
$y = 0.96x + 23.95$, 0.92, high, positive correlation between scores 85 or better on the math and English exams.

REF: 061836ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear with correlation coefficient

635 ANS:
$y = 1.9x + 29.8$ $r = 0.3$ This indicates a weak relationship between a dog's height and mass.

REF: 011934ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear with correlation coefficient

636 ANS:
$y = 7.79x + 34.27$ $r = 0.98$ high, positive correlation between hours spent studying and test scores

REF: 061935ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear with correlation coefficient
637 ANS:
$y = -7.76x + 246.34$, -0.88 As the distance from Times Square increases, the cost of a room decreases.

REF: 081935ai   NAT: S.ID.B.6   TOP: Regression   KEY: linear with correlation coefficient
638 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.

REF: 061536ai   NAT: S.ID.B.6   TOP: Regression   KEY: exponential
639 ANS:
$y = 836.47(2.05)^x$ The data appear to grow at an exponential rate. $y = 836.47(2.05)^2 \approx 3515.$

REF: fall1313ai   NAT: S.ID.B.6   TOP: Regression   KEY: choose model
640 ANS: 2
$r = 0.92$

REF: 081606ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
641 ANS: 2   REF: 061604ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
642 ANS: 3   REF: 061411ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
643 ANS: 1   REF: 061714ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
644 ANS: 4   REF: 011703ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
645 ANS: 1   REF: 081722ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
646 ANS:
$r \approx 0.94.$ The correlation coefficient suggests that as calories increase, so does sodium.

REF: 011535ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
647 ANS:
$r \approx 0.92.$ The correlation coefficient suggests a strong positive correlation between a student's mathematics and physics scores.

REF: 011831ai   NAT: S.ID.C.8   TOP: Correlation Coefficient
648 ANS: 3
For a residual plot, there should be no observable pattern and a similar distribution of residuals above and below the x-axis.

REF: 011624ai   NAT: S.ID.B.6   TOP: Residuals
649 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.

REF: fall1303ai   NAT: S.ID.B.6   TOP: Residuals

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

REF: 061531ai   NAT: S.ID.B.6   TOP: Residuals

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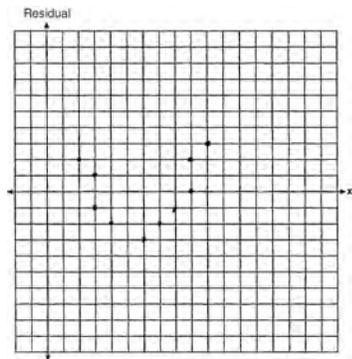
The line is a poor fit because the residuals form a pattern.

REF: 081431ai   NAT: S.ID.B.6   TOP: Residuals

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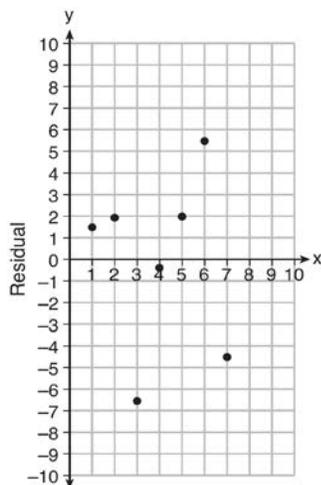
$y = 6.32x + 22.43$ Based on the residual plot, the equation is a good fit for the data because the residual values are scattered without a pattern and are fairly evenly distributed above and below the x-axis.

REF: fall1314ai   NAT: S.ID.B.6   TOP: Residuals