

JMAP  
REGENTS BY STATE  
STANDARD: TOPIC

NY Algebra I Regents Exam Questions from Spring 2013  
to June 2021 Sorted by State Standard: Topic

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## Algebra I Regents Exam Questions by State Standard: Topic

### EXPRESSIONS AND EQUATIONS

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

- 1 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

- 2 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)  $3.00a + 1.50s$
- 3 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)  $280 - 30(w - 1)$

- 4 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)  $250 - 5b$
- 5 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)  $23(x + 250)$
- 6 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)  $7x^5 + 2x^2 + 6$

- 7 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.

- 8 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

- 9 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.

- 10 Which polynomial has a leading coefficient of 4 and a degree of 3?

1)  $3x^4 - 2x^2 + 4x - 7$

2)  $4 + x - 4x^2 + 5x^3$

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

4)  $2x + x^2 + 4x^3$

- 11 Students were asked to write an expression which had a leading coefficient of 3 and a constant term of  $-4$ . Which response is correct?

1)  $3 - 2x^3 - 4x$

2)  $7x^3 - 3x^5 - 4$

3)  $4 - 7x + 3x^3$

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

- 12 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.A.1: IDENTIFYING PROPERTIES

- 13 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

- 14 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

- 15 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

- 18 John was given the equation  $4(2a + 3) = -3(a - 1) + 31 - 11a$  to solve. Some of the steps and their reasons have already been completed. State a property of numbers for each missing reason.

$4(2a + 3) = -3(a - 1) + 31 - 11a$  Given

$8a + 12 = -3a + 3 + 31 - 11a$  \_\_\_\_\_

$8a + 12 = 34 - 14a$  Combining like terms

$22a + 12 = 34$  \_\_\_\_\_

- 16 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

- 17 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

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

$$\text{Original: } 3a + 6 = 2 - 5a + 7$$

$$\text{Step one: } 3a + 6 = 2 + 7 - 5a$$

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

- 23 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

A.REI.B.3: SOLVING LINEAR EQUATIONS

- 20 The solution to  $-2(1 - 4x) = 3x + 8$  is

- 1)  $\frac{6}{11}$
- 2) 2
- 3)  $-\frac{10}{7}$
- 4) -2

- 21 The solution to  $3(x - 8) + 4x = 8x + 4$  is

- 1) 12
- 2) 28
- 3) -12
- 4) -28

- 22 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

- 24 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

- 25 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

- 26 The value of  $x$  which makes

$$\frac{2}{3} \left( \frac{1}{4}x - 2 \right) = \frac{1}{5} \left( \frac{4}{3}x - 1 \right) \text{ true is}$$

- 1) -10
- 2) -2
- 3)  $-9.\overline{09}$
- 4)  $-11.\overline{3}$

- 27 What is the solution to the equation

$$\frac{3}{5} \left( x + \frac{4}{3} \right) = 1.04?$$

- 1)  $3.0\bar{6}$   
 2)  $0.4\bar{}$   
 3)  $-0.48\bar{}$   
 4)  $-0.709\bar{3}$

- 28 The value of
- $x$
- that satisfies the equation

$$\frac{4}{3} = \frac{x+10}{15} \text{ is}$$

- 1)  $-6$   
 2)  $5$   
 3)  $10$   
 4)  $30$

- 29 Which value of
- $x$
- makes
- $\frac{x-3}{4} + \frac{2}{3} = \frac{17}{12}$
- true?

- 1)  $8$   
 2)  $6$   
 3)  $0$   
 4)  $4$

- 30 Solve the equation below algebraically for the exact value of
- $x$
- .

$$6 - \frac{2}{3}(x+5) = 4x$$

- 31 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

- 32 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)  $2x + 9.00 = 14.50$



- 33 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)  $0.05(4x) + 0.10(x) = \$1.25$
- 34 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)  $24 - 12x = 60$
- 35 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)  $a = 2a - 7$
- 36 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.
- 37 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.]
- 38 Hannah went to the school store to buy supplies and spent \$16. She bought four more pencils than pens and two fewer erasers than pens. Pens cost \$1.25 each, pencils cost \$0.55 each, and erasers cost \$0.75 each. If  $x$  represents the number of pens Hannah bought, write an equation in terms of  $x$  that can be used to find how many of each item she bought. Use your equation to determine algebraically how many pens Hannah bought.
- 39 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.

A.CED.A.2: MODELING LINEAR EQUATIONS

- 40 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)  $c = 60 + 0.05d$
- 41 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)  $C = 62 + 30(g - 2)$
- 42 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

- 43 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)  $\frac{I - P}{t}$
  - 2)  $\frac{P - I}{t}$
  - 3)  $\frac{I}{Pt}$
  - 4)  $\frac{Pt}{I}$
- 44 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)  $\frac{V_2}{P_1V_1}$
  - 3)  $\frac{P_1V_1}{V_2}$
  - 4)  $\frac{P_1V_2}{V_1}$

- 45 The formula for blood flow rate is given by

$$F = \frac{p_1 - p_2}{r}, \text{ where } F \text{ is the flow rate, } p_1 \text{ the}$$

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)  $r = \frac{p_1 - p_2}{F}$

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

Which responses are correct?

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

- 47 The formula for the volume of a cone is

$$V = \frac{1}{3}\pi r^2 h. \text{ The radius, } r, \text{ of the cone may be}$$

expressed as

- 1)  $\sqrt{\frac{3V}{\pi h}}$
- 2)  $\sqrt{\frac{V}{3\pi h}}$
- 3)  $3\sqrt{\frac{V}{\pi h}}$
- 4)  $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

- 48 The equation for the volume of a cylinder is

$$V = \pi r^2 h. \text{ The positive value of } r, \text{ in terms of } h \text{ and } V, \text{ is}$$

- 1)  $r = \sqrt{\frac{V}{\pi h}}$
- 2)  $r = \sqrt{V\pi h}$
- 3)  $r = 2V\pi h$
- 4)  $r = \frac{V}{2\pi}$

- 49 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)  $t = \sqrt{\frac{da}{2}}$
- 2)  $t = \sqrt{\frac{2d}{a}}$
- 3)  $t = \left(\frac{da}{d}\right)^2$
- 4)  $t = \left(\frac{2d}{a}\right)^2$

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

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

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

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

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

51 Solve the equation below for  $x$  in terms of  $a$ .

$$4(ax + 3) - 3ax = 25 + 3a$$

52 A formula for determining the finite sum,  $S$ , of an arithmetic sequence of numbers is  $S = \frac{n}{2}(a + b)$ , where  $n$  is the number of terms,  $a$  is the first term, and  $b$  is the last term. Express  $b$  in terms of  $a$ ,  $S$ , and  $n$ .

53 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  $S$ .

54 The temperature inside a cooling unit is measured in degrees Celsius,  $C$ . Josh wants to find out how cold it is in degrees Fahrenheit,  $F$ . Solve the formula  $C = \frac{5}{9}(F - 32)$  for  $F$  so that Josh can convert Celsius to Fahrenheit.

55 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  $K$ .

56 The formula  $a = \frac{v_f - v_i}{t}$  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,  $t$ .

57 The formula  $F_g = \frac{GM_1M_2}{r^2}$  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  $M_2$ .

58 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.

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

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

**RATE****N.Q.A.1: CONVERSIONS**

- 62 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:

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

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

- 1)  $\frac{4 \text{ quarts}}{1 \text{ gallon}}$
- 2)  $\frac{2 \text{ pints}}{1 \text{ quart}}$
- 3)  $\frac{\frac{1}{4} \text{ cup}}{4 \text{ tablespoons}}$
- 4)  $\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}}$
- 63 Peyton is a sprinter who can run the 40-yard dash in 4.5 seconds. He converts his speed into miles per hour, as shown below.
- $$\frac{40 \text{ yd}}{4.5 \text{ sec}} \cdot \frac{3 \text{ ft}}{1 \text{ yd}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$$
- Which ratio is *incorrectly* written to convert his speed?
- 1)  $\frac{3 \text{ ft}}{1 \text{ yd}}$
- 2)  $\frac{5280 \text{ ft}}{1 \text{ mi}}$
- 3)  $\frac{60 \text{ sec}}{1 \text{ min}}$
- 4)  $\frac{60 \text{ min}}{1 \text{ hr}}$
- 64 A construction worker needs to move  $120 \text{ ft}^3$  of dirt by using a wheelbarrow. One wheelbarrow load holds  $8 \text{ ft}^3$  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)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{10 \text{ min}}{1 \text{ load}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{1 \text{ load}}{8 \text{ ft}^3}$
- 2)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{8 \text{ ft}^3}{10 \text{ min}} \cdot \frac{1}{1 \text{ load}}$
- 3)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{1 \text{ load}}{10 \text{ min}} \cdot \frac{8 \text{ ft}^3}{1 \text{ load}} \cdot \frac{1 \text{ hr}}{60 \text{ min}}$
- 4)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{1 \text{ load}}{8 \text{ ft}^3} \cdot \frac{10 \text{ min}}{1 \text{ load}} \cdot \frac{1 \text{ hr}}{60 \text{ min}}$

- 65 The following conversion was done correctly:

$$\frac{3 \text{ miles}}{1 \text{ hour}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{5280 \text{ feet}}{1 \text{ mile}} \cdot \frac{12 \text{ inches}}{1 \text{ foot}}$$

What were the final units for this conversion?

- 1) minutes per foot
- 2) minutes per inch
- 3) feet per minute
- 4) inches per minute

- 66 Faith wants to use the formula
- $C(f) = \frac{5}{9}(f - 32)$
- 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
- 67 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

- 68 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

- 69 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

- 70 Sarah travels on her bicycle at a speed of 22.7 miles per hour. What is Sarah's approximate speed, in kilometers per minute?

- 1) 0.2
- 2) 0.6
- 3) 36.5
- 4) 36.6

- 71 A news report suggested that an adult should drink a minimum of 4 pints of water per day. Based on this report, determine the minimum amount of water an adult should drink, in fluid ounces, per week.

- 72 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

- 73 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

- 74 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
- 75 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

- 76 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.
- 77 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.
- 78 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.

F.IF.B.6: RATE OF CHANGE

- 79 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.

|                             |    |      |      |      |      |
|-----------------------------|----|------|------|------|------|
| <b>Enlargement</b>          | 0  | 1    | 2    | 3    | 4    |
| <b>Area (square inches)</b> | 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                                  3) 5.4  
 2) 4.5                                  4) 6.0
- 80 The table below shows the average diameter of a pupil in a person’s eye as he or she grows older.

| <b>Age (years)</b> | <b>Average Pupil Diameter (mm)</b> |
|--------------------|------------------------------------|
| 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                                  3) -2.4  
 2) 0.04                              4) -0.04
- 81 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?

|                 |      |      |      |      |      |
|-----------------|------|------|------|------|------|
| <b>Year</b>     | 1898 | 1971 | 1985 | 2006 | 2012 |
| <b>Cost (¢)</b> | 1    | 6    | 14   | 24   | 35   |

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



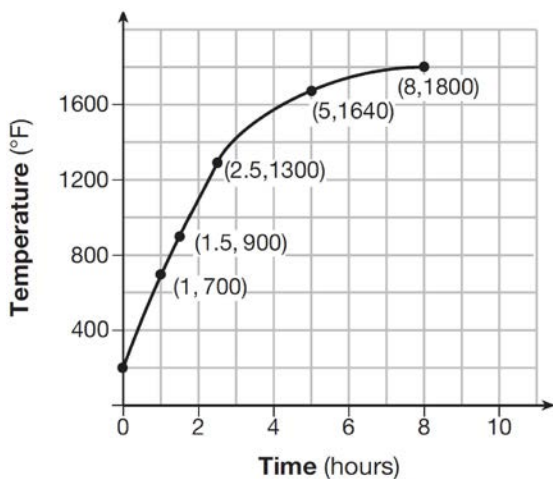
82 The table below shows the year and the number of households in a building that had high-speed broadband internet access.

|                             |      |      |      |      |      |      |
|-----------------------------|------|------|------|------|------|------|
| <b>Number of Households</b> | 11   | 16   | 23   | 33   | 42   | 47   |
| <b>Year</b>                 | 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

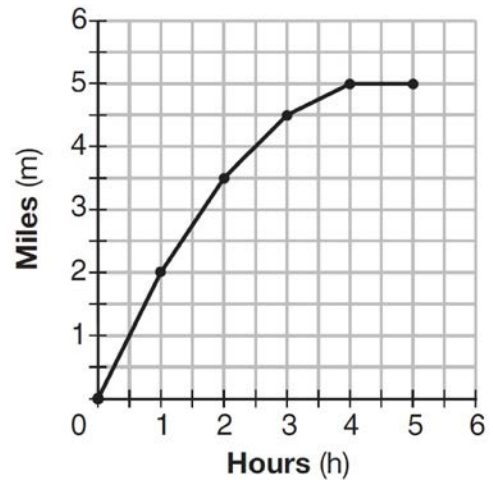
83 Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200°F.



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

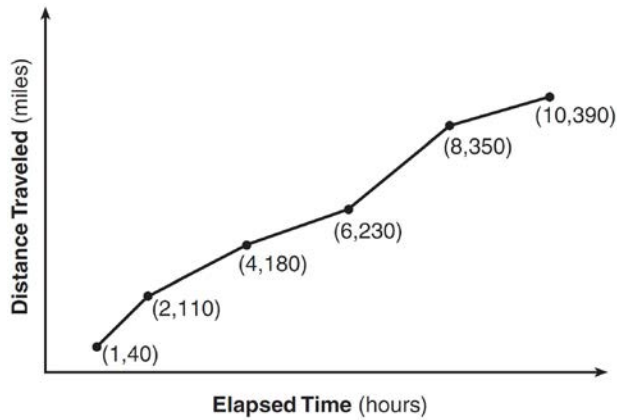
84 The graph below shows the distance in miles,  $m$ , hiked from a camp in  $h$  hours.



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

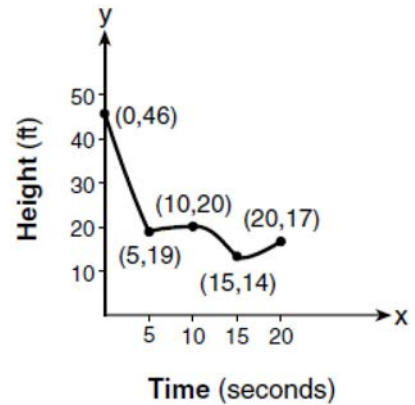
- 85 The Jamison family kept a log of the distance they traveled during a trip, as represented by the graph below.



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

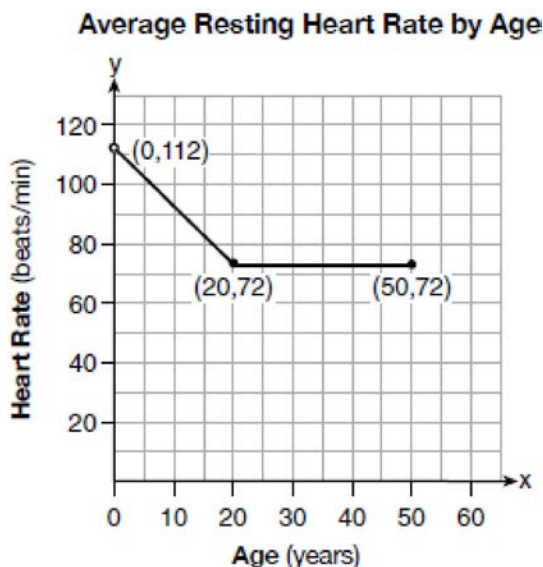
- 86 The graph below models the height of a remote-control helicopter over 20 seconds during flight.



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

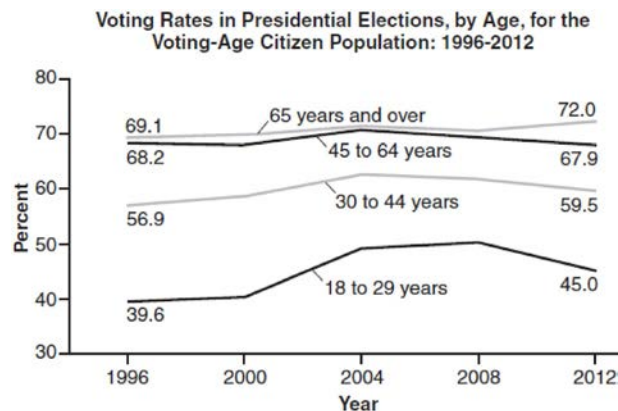
- 87 A graph of average resting heart rates is shown below. The average resting heart rate for adults is 72 beats per minute, but doctors consider resting rates from 60-100 beats per minute within normal range.



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.
- 88 The value of Tony's investment was \$1140 on January 1st. On this date three years later, his investment was worth \$1824. The average rate of change for this investment was \$19 per
- 1) day
  - 2) month
  - 3) quarter
  - 4) year

- 89 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.
- 90 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

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

- 91 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.

|                      |   |     |     |     |
|----------------------|---|-----|-----|-----|
| <b>Time (hrs)</b>    | 0 | 2   | 5   | 7   |
| <b>Distance (mi)</b> | 0 | 140 | 375 | 480 |

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

- 92 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.

| <b>t</b> | <b>P(t)</b> |
|----------|-------------|
| 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.

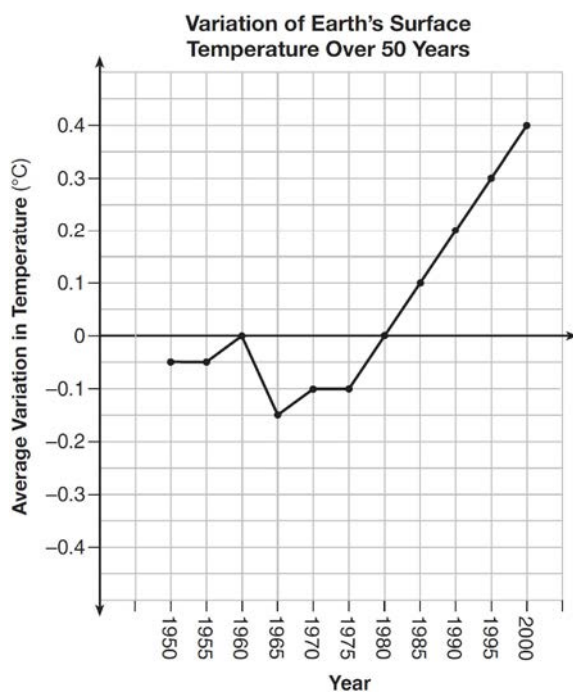
- 93 A blizzard occurred on the East Coast during January, 2016. Snowfall totals from the storm were recorded for Washington, D.C. and are shown in the table below.

| <b>Washington, D.C.</b> |                      |
|-------------------------|----------------------|
| <b>Time</b>             | <b>Snow (inches)</b> |
| 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.

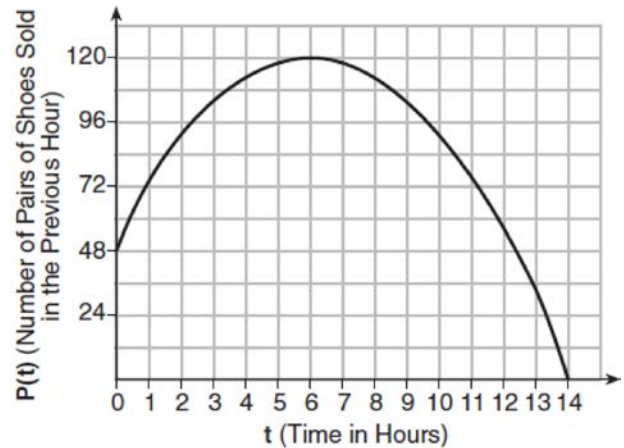
- 94 A population of rabbits in a lab,  $p(x)$ , can be modeled by the function  $p(x) = 20(1.014)^x$ , where  $x$  represents the number of days since the population was first counted. Explain what 20 and 1.014 represent in the context of the problem. Determine, to the *nearest tenth*, the average rate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

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



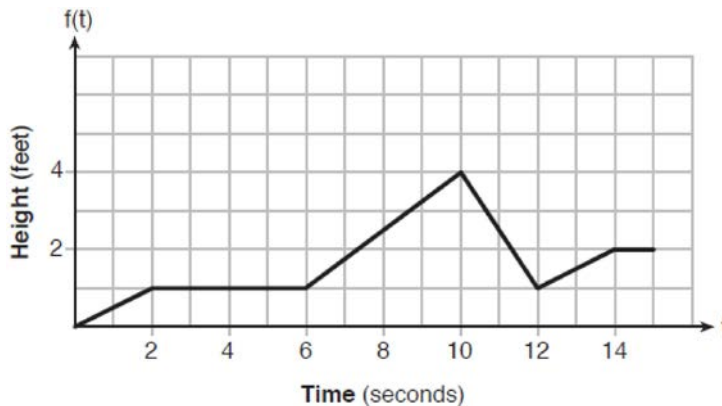
During which years did the temperature variation change the most per unit time? Explain how you determined your answer.

- 96 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.

- 97 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.

## LINEAR EQUATIONS

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

- 98 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)  $c(z) = 0.20(z - 1) + 0.46$
- 99 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)  $P(c) = .75c - 9.96$
- 100 A high school club is researching a tour package offered by the Island Kayak Company. The company charges \$35 per person and \$245 for the tour guide. Which function represents the total cost,  $C(x)$ , of this kayak tour package for  $x$  club members?
- 1)  $C(x) = 35x$
  - 2)  $C(x) = 35x + 245$
  - 3)  $C(x) = 35(x + 245)$
  - 4)  $C(x) = 35 + (x + 245)$

- 101 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.
- 102 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.
- 103 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.
- 104 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.

F.LE.A.2: MODELING LINEAR FUNCTIONS

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

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

1)

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

2)

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

3)

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

4)

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

|                    |     |     |     |     |     |
|--------------------|-----|-----|-----|-----|-----|
| <b>Day (n)</b>     | 1   | 2   | 3   | 4   | 5   |
| <b>Height (cm)</b> | 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  $n$ th day.

- 107 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,  $x$ .

|          |             |
|----------|-------------|
| <b>x</b> | <b>f(x)</b> |
| 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 EQUATIONS

- 108 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
- 109 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
- 110 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



- 111 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
- 112 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.
- 113 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.
- 114 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

115 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

116 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.

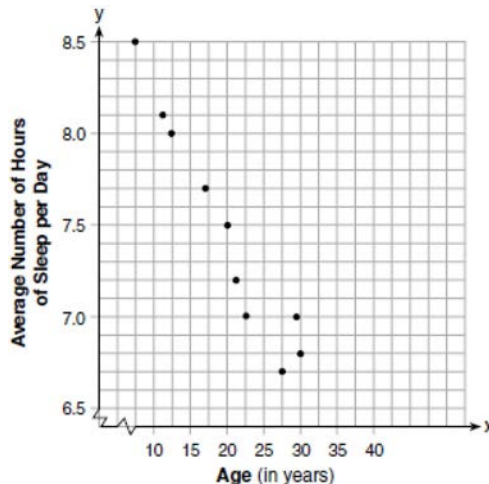
118 The table below shows the height in feet,  $h(t)$ , of a hot-air balloon and the number of minutes,  $t$ , the balloon is in the air.

|                    |    |     |     |     |     |
|--------------------|----|-----|-----|-----|-----|
| <b>Time (min)</b>  | 2  | 5   | 7   | 10  | 12  |
| <b>Height (ft)</b> | 64 | 168 | 222 | 318 | 369 |

The function  $h(t) = 30.5t + 8.7$  can be used to model this data table. Explain the meaning of the slope in the context of the problem. Explain the meaning of the y-intercept in the context of the problem.

S.ID.C.7: MODELING LINEAR FUNCTIONS

117 A student plotted the data from a sleep study as shown in the graph below.

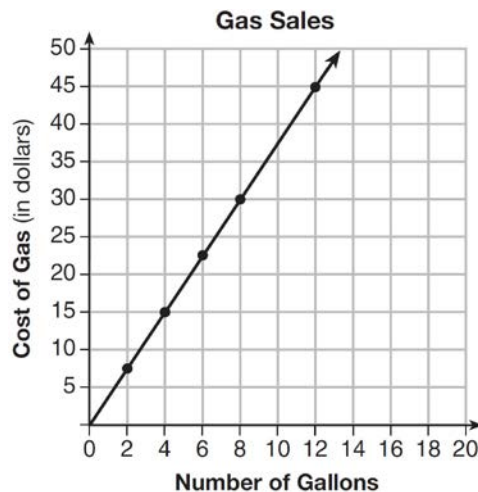


The student used the equation of the line  $y = -0.09x + 9.24$  to model the data. What does the rate of change represent in terms of these data?

- 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.

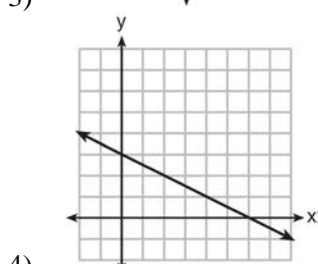
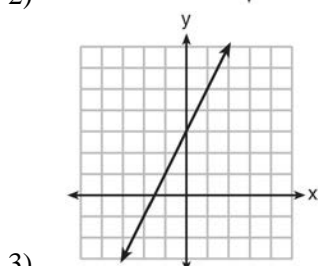
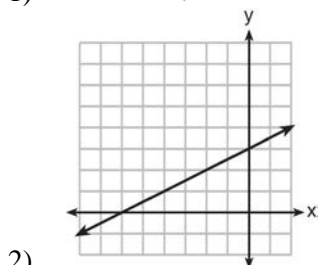
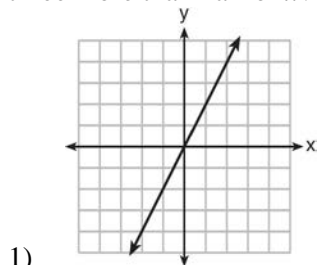
- 119 During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m. If she were to graph these data, what does the slope of the line connecting these two points represent in the context of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

- 121 The graph below was created by an employee at a gas station.



A.CED.A.2: GRAPHING LINEAR FUNCTIONS

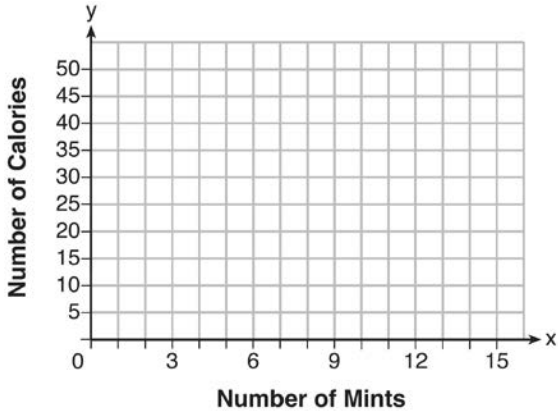
- 120 Which graph shows a line where each value of  $y$  is three more than half of  $x$ ?



Which statement can be justified by using the graph?

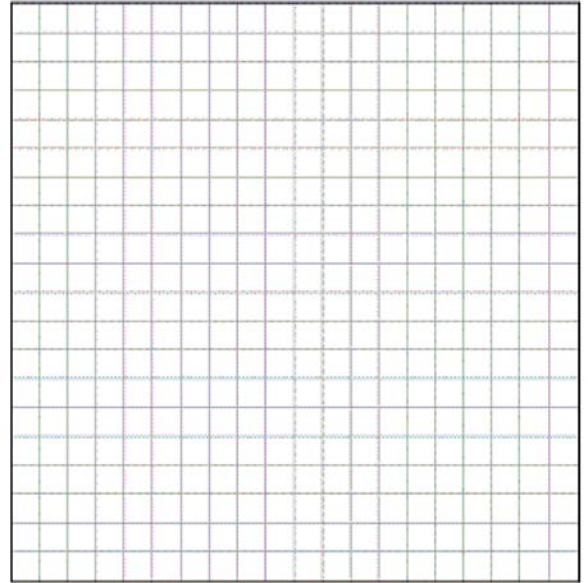
- 1) If 10 gallons of gas was purchased, \$35 was paid.
- 2) For every gallon of gas purchased, \$3.75 was paid.
- 3) For every 2 gallons of gas purchased, \$5.00 was paid.
- 4) If zero gallons of gas were purchased, zero miles were driven.

- 122 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.

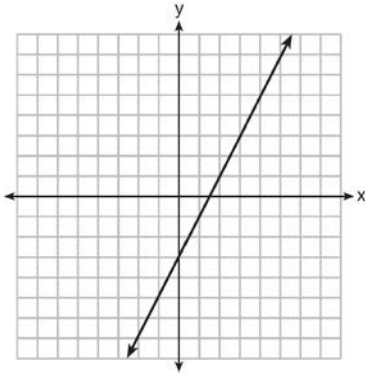
- 123 Zeke and six of his friends are going to a baseball game. Their combined money totals \$28.50. At the game, hot dogs cost \$1.25 each, hamburgers cost \$2.50 each, and sodas cost \$0.50 each. Each person buys one soda. They spend all \$28.50 on food and soda. Write an equation that can determine 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

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

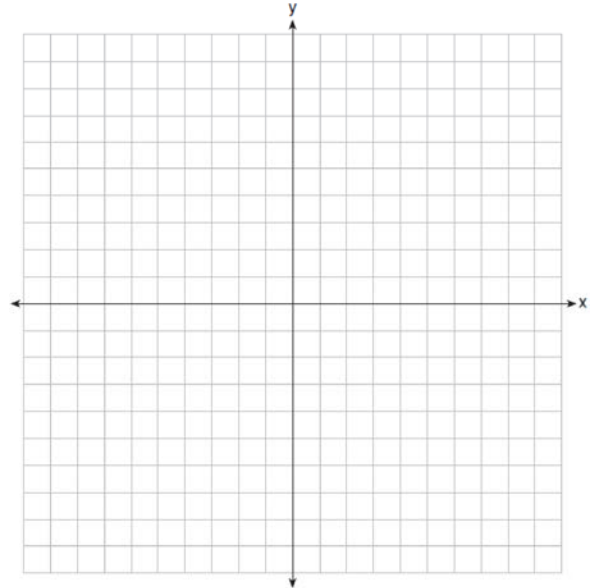


- 1)  $y = \frac{12 - 6x}{4}$
- 2)  $27 + 3y = 6x$
- 3)  $6y + x = 18$
- 4)  $y + 3 = 6x$

125 The value of the x-intercept for the graph of  $4x - 5y = 40$  is

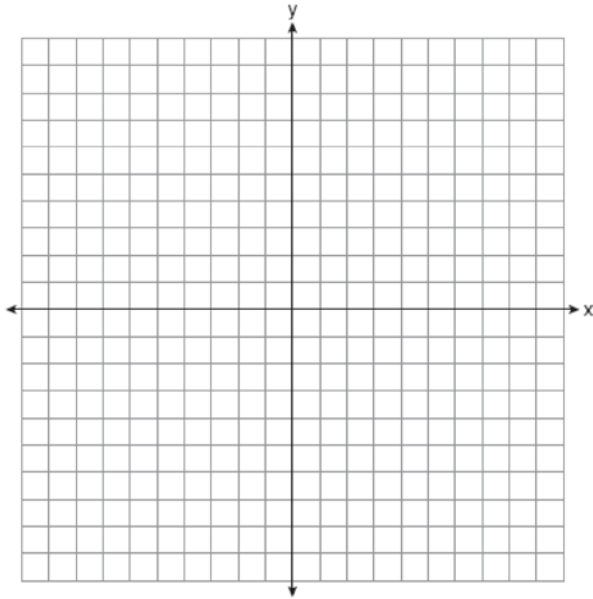
- 1) 10
- 2)  $\frac{4}{5}$
- 3)  $-\frac{4}{5}$
- 4) -8

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



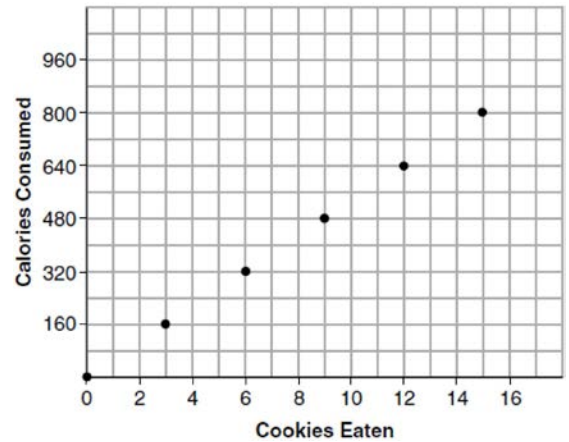
Is the point (3, 2) a solution to the equation?  
Explain your answer based on the graph drawn.

- 127 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  $k$ .

- 128 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.

A.REI.D.10: WRITING LINEAR EQUATIONS

- 129 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)  $(2, 9)$

- 130 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

- 131 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.

- 134 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)  $x \geq 11$

- 135 The solution to  $4p + 2 < 2(p + 5)$  is

- 1)  $p > -6$
- 2)  $p < -6$
- 3)  $p > 4$
- 4)  $p < 4$

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

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

## INEQUALITIES

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

- 132 When  $3a + 7b > 2a - 8b$  is solved for  $a$ , the result is

- 1)  $a > -b$
- 2)  $a < -b$
- 3)  $a < -15b$
- 4)  $a > -15b$

- 133 What is the solution to  $2h + 8 > 3h - 6$

- 1)  $h < 14$
- 2)  $h < \frac{14}{5}$
- 3)  $h > 14$
- 4)  $h > \frac{14}{5}$

- 137 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)  $x \geq \frac{54}{5}$

- 138 Solve algebraically for  $y$ :  $4(y - 3) \leq 4(2y + 1)$

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

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

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

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

142 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

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

144 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

145 Given  $7x + 2 \geq 58$ , which number is *not* in the solution set?  
1) 6  
2) 8  
3) 10  
4) 12

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

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

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

149 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

- 150 An ice cream shop sells ice cream cones,  $c$ , and milkshakes,  $m$ . Each ice cream cone costs \$1.50 and each milkshake costs \$2.00. Donna has \$19.00 to spend on ice cream cones and milkshakes. If she must buy 5 ice cream cones, which inequality could be used to determine the maximum number of milkshakes she can buy?
- 1)  $1.50(5) + 2.00m \geq 19.00$
  - 2)  $1.50(5) + 2.00m \leq 19.00$
  - 3)  $1.50c + 2.00(5) \geq 19.00$
  - 4)  $1.50c + 2.00(5) \leq 19.00$
- 151 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)  $0.75(7) + 1.25b \leq 22$
- 152 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
- 153 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  $x \geq 57$
- 154 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)  $750 < p < 1500$
- 155 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

156 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

157 Maria orders T-shirts for her volleyball camp. Adult-sized T-shirts cost \$6.25 each and youth-sized T-shirts cost \$4.50 each. Maria has \$550 to purchase both adult-sized and youth-sized T-shirts. If she purchases 45 youth-sized T-shirts, determine algebraically the maximum number of adult-sized T-shirts she can purchase.

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

A.CED.A.3: MODELING LINEAR  
INEQUALITIES

159 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?

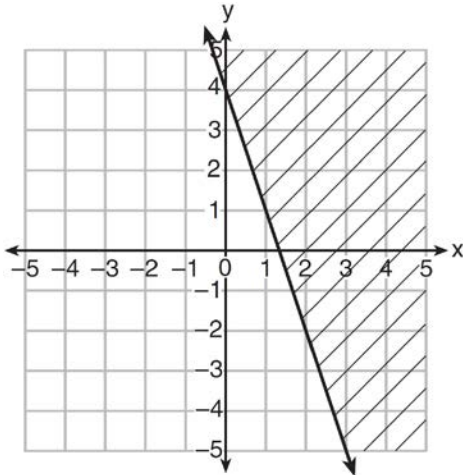
- 1)  $1.60x + 1.75y \leq 10$
- 2)  $1.60x + 1.75y \geq 10$
- 3)  $1.75x + 1.60y \leq 10$
- 4)  $1.75x + 1.60y \geq 10$

160 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.

161 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.

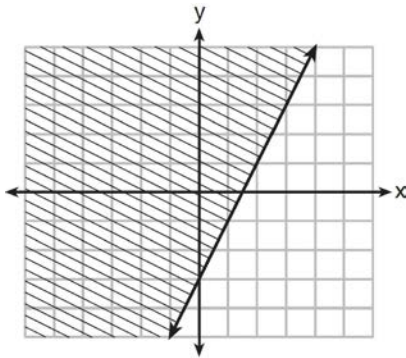
A.REI.D.12: GRAPHING LINEAR  
 INEQUALITIES

162 Which inequality is represented in the graph below?



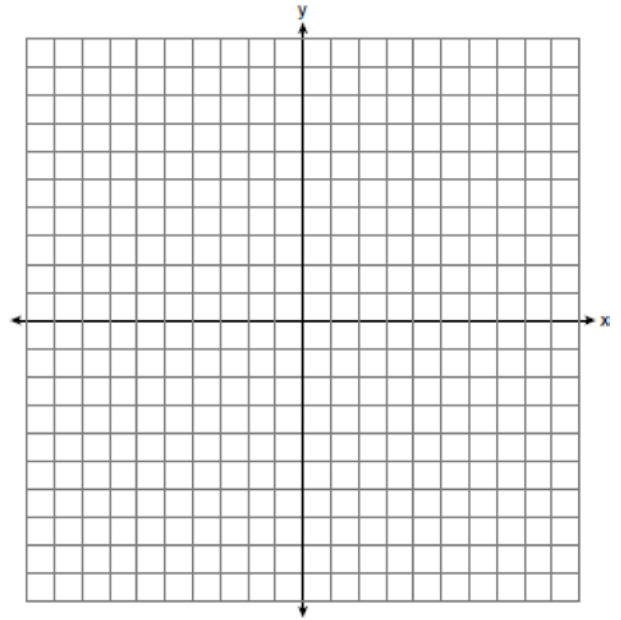
- 1)  $y \geq -3x + 4$
- 2)  $y \leq -3x + 4$
- 3)  $y \geq -4x - 3$
- 4)  $y \leq -4x - 3$

163 Which inequality is represented by the graph below?

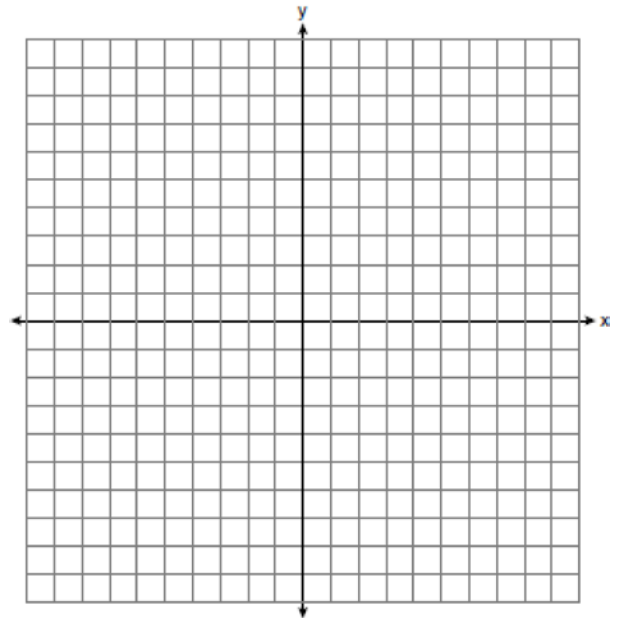


- 1)  $y \leq 2x - 3$
- 2)  $y \geq 2x - 3$
- 3)  $y \leq -3x + 2$
- 4)  $y \geq -3x + 2$

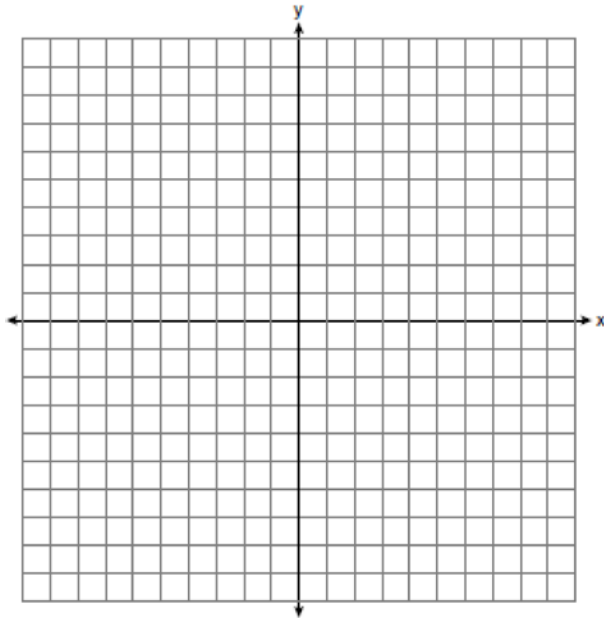
164 On the set of axes below, graph the inequality  $2x + y > 1$ .



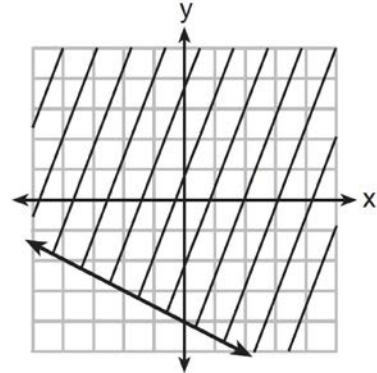
165 Graph the inequality  $y > 2x - 5$  on the set of axes below. State the coordinates of a point in its solution.



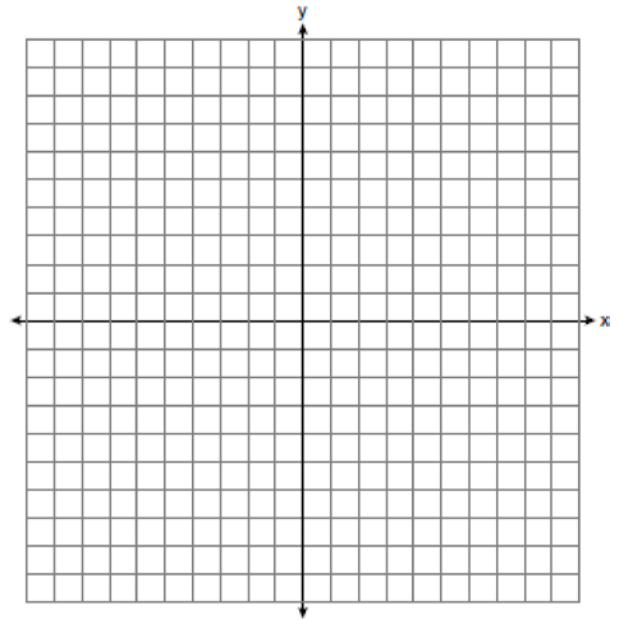
166 Graph the inequality  $y + 4 < -2(x - 4)$  on the set of axes below.



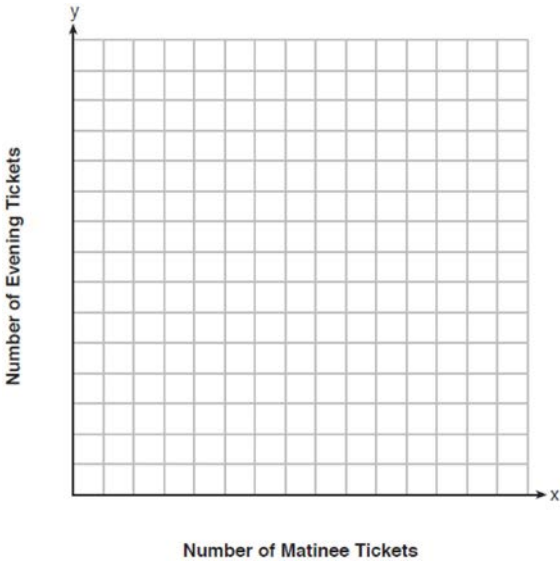
167 Shawn incorrectly graphed the inequality  $-x - 2y \geq 8$  as shown below.



Explain Shawn's mistake. Graph the inequality correctly on the set of axes below.



- 168 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.

## QUADRATICS

### A.REI.B.4: SOLVING QUADRATICS

- 169 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

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

- 171 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)  $-7 \pm \sqrt{3}$

- 172 The solutions to  $(x + 4)^2 - 2 = 7$  are
- 1)  $-4 \pm \sqrt{5}$
  - 2)  $4 \pm \sqrt{5}$
  - 3) -1 and -7
  - 4) 1 and 7

- 173 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)  $-4 \pm \sqrt{24}$

- 174 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  $-2$
- 175 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)  $9x^2 - 6x + 1 = 5$
- 176 Solve the quadratic equation below for the exact values of  $x$ .  
 $4x^2 - 5 = 75$
- 177 Solve  $5x^2 = 180$  algebraically.
- 178 Solve  $6x^2 - 42 = 0$  for the exact values of  $x$ .
- 179 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.
- 180 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)  $(2x + 3)(x - 1) = 0$
- 181 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  $2$
- 182 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  $-a$
- 183 Solve  $x^2 - 8x - 9 = 0$  algebraically. Explain the first step you used to solve the given equation.
- 184 Solve  $8m^2 + 20m = 12$  for  $m$  by factoring.
- 185 Solve the equation  $4x^2 - 12x = 7$  algebraically for  $x$ .

- 186 Solve the equation for  $y$ :  $(y - 3)^2 = 4y - 12$
- 187 In the equation  $x^2 + 10x + 24 = (x + a)(x + b)$ ,  $b$  is an integer. Find algebraically *all* possible values of  $b$ .
- 188 Write an equation that defines  $m(x)$  as a trinomial where  $m(x) = (3x - 1)(3 - x) + 4x^2 + 19$ . Solve for  $x$  when  $m(x) = 0$ .
- 189 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.
- 190 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.
- 191 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  $p$ ?
- 192 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)  $-2 \pm 4\sqrt{5}$
- 193 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)  $(x - 3)^2 = 3$
- 194 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)  $(x + 3)^2 = 16$
- 195 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)  $x = -4 \pm 2\sqrt{2}$

- 196 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)  $-4 \pm \sqrt{26}$
- 197 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)  $(x - 8)^2 = 23$
- 198 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)  $(x - 3)^2 = -3$
- 199 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)  $(x - 4)^2 = 17$
- 200 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)  $x^2 - 5x + 3 = 0$
- 201 Use the method of completing the square to determine the exact values of  $x$  for the equation  $x^2 - 8x + 6 = 0$ .
- 202 Solve the following equation by completing the square:  $x^2 + 4x = 2$
- 203 Solve the equation  $x^2 - 6x = 15$  by completing the square.
- 204 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.



205 The roots of  $x^2 - 5x - 4 = 0$  are

- 1) 1 and 4
- 2)  $\frac{5 \pm \sqrt{41}}{2}$
- 3) -1 and -4
- 4)  $\frac{-5 \pm \sqrt{41}}{2}$

206 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)  $-3 \pm 4\sqrt{14}$

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

208 Solve  $4w^2 + 12w - 44 = 0$  algebraically for  $w$ , to the *nearest hundredth*.

209 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*.

A.REI.B.4: USING THE DISCRIMINANT

210 How many real-number solutions does  $4x^2 + 2x + 5 = 0$  have?

- 1) one
- 2) two
- 3) zero
- 4) infinitely many

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

212 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

213 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?

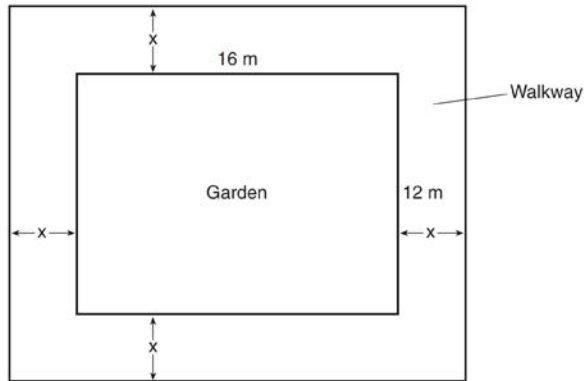
- 1)  $j^2 + 2 = 783$
- 2)  $j^2 - 2 = 783$
- 3)  $j^2 + 2j = 783$
- 4)  $j^2 - 2j = 783$

- 214 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)  $x^2 - 8(x - 1) = 17$
- 217 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)  $(15)(18) = 120 + x^2$

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

- 215 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)  $x^2 + 8^2 = (x + 2)^2$
- 216 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)  $A(w) = 4w^2 + 28w$
- 218 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.
- 219 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*.
- 220 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.
- 221 The length of a rectangular sign is 6 inches more than half its width. The area of this sign is 432 square inches. Write an equation in one variable that could be used to find the number of inches in the dimensions of this sign. Solve this equation algebraically to determine the dimensions of this sign, in inches.

- 222 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.

- 223 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.

- 224 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

- 225 In the function  $f(x) = (x - 2)^2 + 4$ , the minimum value occurs when  $x$  is
- 1)  $-2$
  - 2)  $2$
  - 3)  $-4$
  - 4)  $4$
- 226 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)  $-12$
- 227 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)  $y = (x - 12)^2 + 126$

228 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)  $j(x) = (x - 6)^2 - 29, (-6, -29)$

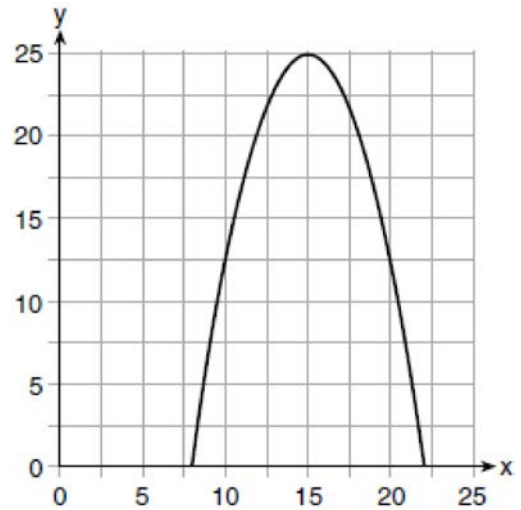
229 The function  $f(x) = 3x^2 + 12x + 11$  can be written in vertex form as

- 1)  $f(x) = (3x + 6)^2 - 25$
- 2)  $f(x) = 3(x + 6)^2 - 25$
- 3)  $f(x) = 3(x + 2)^2 - 1$
- 4)  $f(x) = 3(x + 2)^2 + 7$

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

231 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)  $q(x) = -\frac{1}{2}(x - 15)^2 + 25$

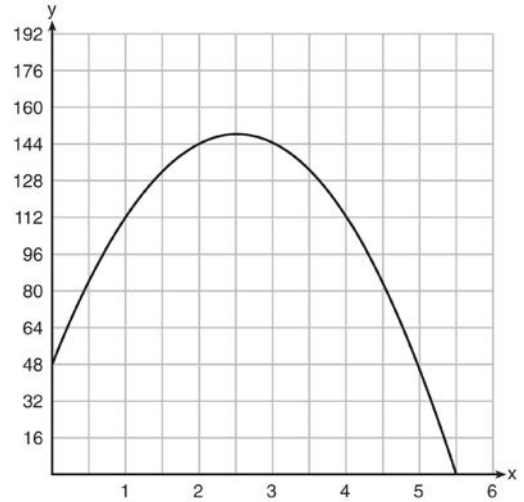
232 Determine and state the vertex of  $f(x) = x^2 - 2x - 8$  using the method of completing the square.

233 Use the method of completing the square to determine the vertex of  $f(x) = x^2 - 14x - 15$ . State the coordinates of the vertex.

- 234 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

- 235 A ball is thrown into the air from the edge of a 48-foot-high cliff so that it eventually lands on the ground. The graph below shows the height,  $y$ , of the ball from the ground after  $x$  seconds.



For which interval is the ball's height always *decreasing*?

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

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

|                    |     |     |     |     |     |     |     |    |
|--------------------|-----|-----|-----|-----|-----|-----|-----|----|
| <b>Time (sec)</b>  | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7  |
| <b>Height (ft)</b> | 180 | 260 | 308 | 324 | 308 | 260 | 180 | 68 |

Based on these data, which statement is *not* a valid conclusion?

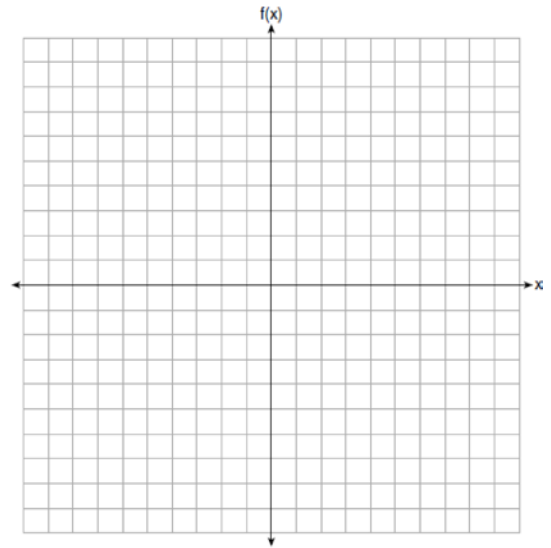
- 1) The rocket was launched from a height of 180 feet.
- 2) The maximum height of the rocket occurred 3 seconds after launch.
- 3) The rocket was in the air approximately 6 seconds before hitting the ground.
- 4) The rocket was above 300 feet for approximately 2 seconds.

- 237 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
- 238 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)  $0 \leq h(t) \leq 9$
- 239 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
- 240 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
- 241 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.
- 242 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.
- 243 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.
- 244 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.

245 A ball is projected up into the air from the surface of a platform to the ground below. The height of the ball above the ground, in feet, is modeled by the function  $f(t) = -16t^2 + 96t + 112$ , where  $t$  is the time, in seconds, after the ball is projected. State the height of the platform, in feet. State the coordinates of the vertex. Explain what it means in the context of the problem. State the entire interval over which the ball's height is *decreasing*.

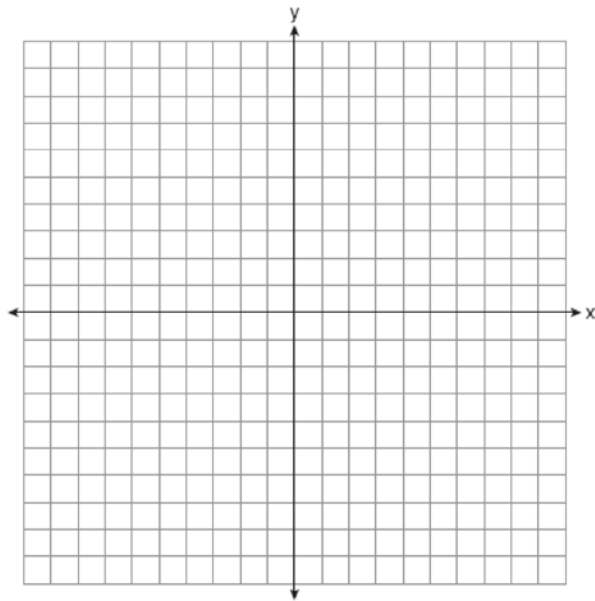
246 An Air Force pilot is flying at a cruising altitude of 9000 feet and is forced to eject from her aircraft. The function  $h(t) = -16t^2 + 128t + 9000$  models the height, in feet, of the pilot above the ground, where  $t$  is the time, in seconds, after she is ejected from the aircraft. Determine 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.

247 Graph the function  $f(x) = -x^2 - 6x$  on the set of axes below.



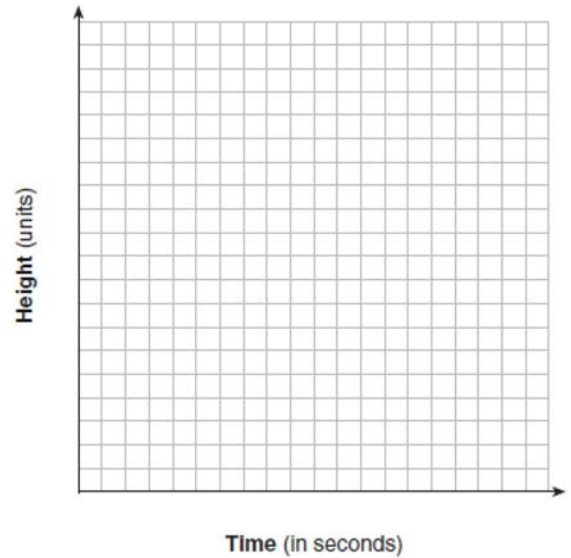
State the coordinates of the vertex of the graph.

- 248 On the set of axes below, draw the graph of  $y = x^2 - 4x - 1$ .



State the equation of the axis of symmetry.

- 249 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.

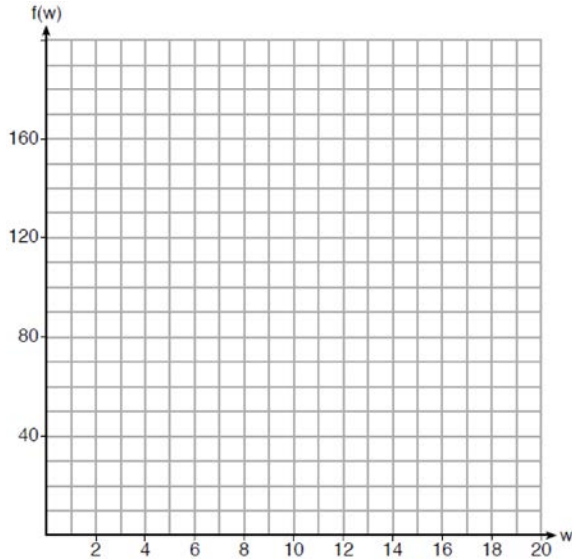


State the coordinates of the vertex and explain its meaning in the context of the problem.



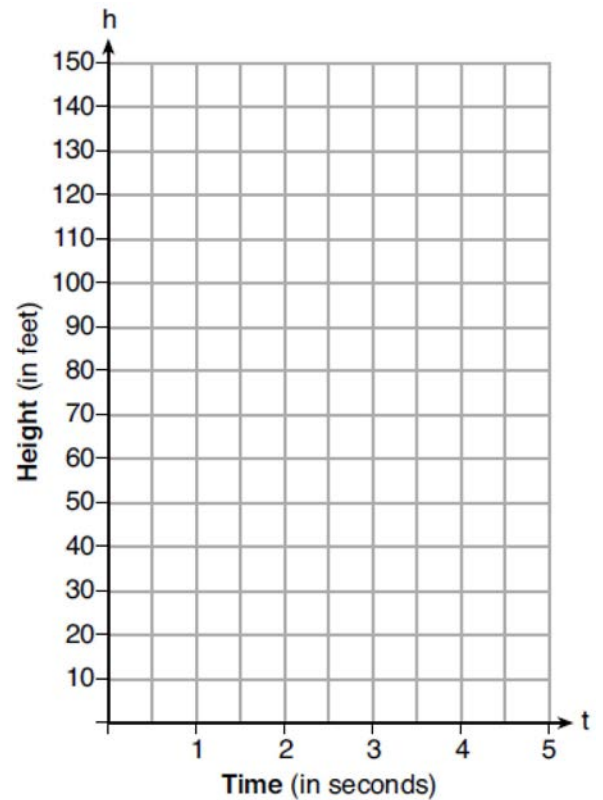
**Algebra I Regents Exam Questions by State Standard: Topic**

- 250 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  $f(w)$ .



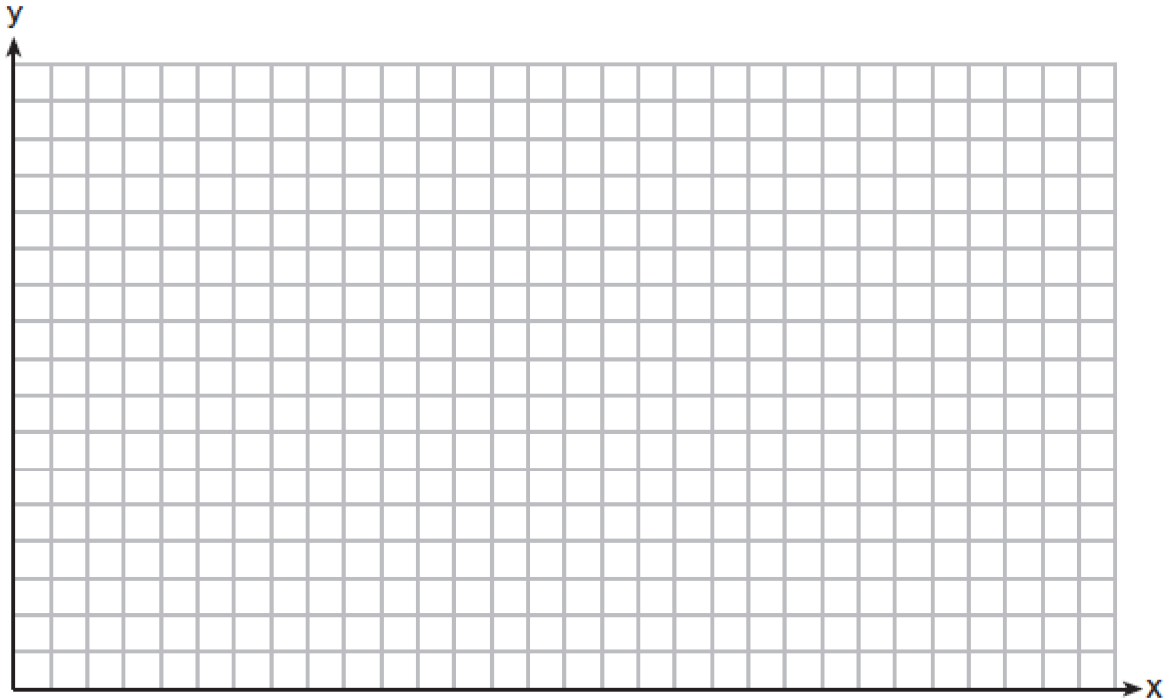
Explain the meaning of the vertex in the context of the problem.

- 251 Michael threw a ball into the air from the top of a building. The height of the ball, in feet, is modeled by the equation  $h = -16t^2 + 64t + 60$ , where  $t$  is the elapsed time, in seconds. Graph this equation on the set of axes below.



Determine the average rate of change, in feet per second, from when Michael released the ball to when the ball reached its maximum height.

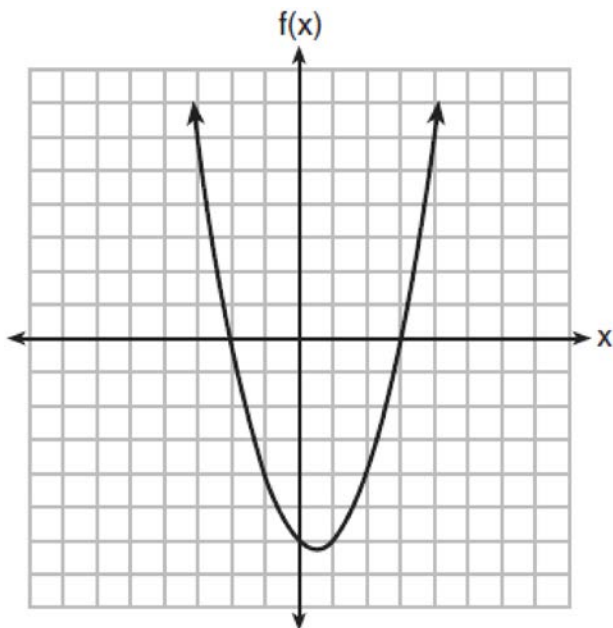
- 252 A football player attempts to kick a football over a goal post. The path of the football can be modeled by the function  $h(x) = -\frac{1}{225}x^2 + \frac{2}{3}x$ , where  $x$  is the horizontal distance from the kick, and  $h(x)$  is the height of the football above the ground, when both are measured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



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.

F.IF.C.7: GRAPHING QUADRATIC FUNCTIONS

- 253 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.APR.A.1: POWERS OF POWERS

- 254 Which expression is equivalent to  $(-4x^2)^3$ ?
- 1)  $-12x^6$
  - 2)  $-12x^5$
  - 3)  $-64x^6$
  - 4)  $-64x^5$

POWERS

A.SSE.B.3: MODELING EXPONENTIAL FUNCTIONS

- 255 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
- 256 A laboratory technician used the function  $t(m) = 2(3)^{2m+1}$  to model her research. Consider the following expressions:  
 I.  $6(3)^{2m}$  II.  $6(6)^{2m}$  III.  $6(9)^m$
- The function  $t(m)$  is equivalent to
- 1) I, only
  - 2) II, only
  - 3) I and III
  - 4) II and III

- 257 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)  $C(t) = 240(1.986)^{\frac{t}{24}}$

- 258 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)  $k(n) = 6(8)^{2n}$
- 259 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)  $V = 15,000(0.9)^{\frac{t}{2}}$
- 260 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)  $A(t) = 5000(1.013)^t (1.013)^{25}$
- 261 The number of bacteria grown in a lab can be modeled by  $P(t) = 300 \cdot 2^{4t}$ , where  $t$  is the number of hours. Which expression is equivalent to  $P(t)$ ?
- 1)  $300 \cdot 8^t$
  - 2)  $300 \cdot 16^t$
  - 3)  $300^t \cdot 2^4$
  - 4)  $300^{2t} \cdot 2^{2t}$
- 262 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)  $P(t) = 26,670(1.0035)^t$
- 263 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

264 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

265 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.

266 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.

267 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.

268 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.

269 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

270 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)  $3000(1 - 0.02)^{18}$

- 271 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)  $f(t) = (9.05 \times 10^6)(1 - 0.031)^7$
- 272 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)  $A = 1000(1 + 1.3)^2$
- 273 A high school sponsored a badminton tournament. After each round, one-half of the players were eliminated. If there were 64 players at the start of the tournament, which equation models the number of players left after 3 rounds?
- 1)  $y = 64(1 - .5)^3$
  - 2)  $y = 64(1 + .5)^3$
  - 3)  $y = 64(1 - .3)^{0.5}$
  - 4)  $y = 64(1 + .3)^{0.5}$
- 274 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)  $500 + 500(.04) + 520(.04) + 540.8(.04)$
- 275 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

- 276 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)  $150(1.15)^{m-1}$

- 277 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?

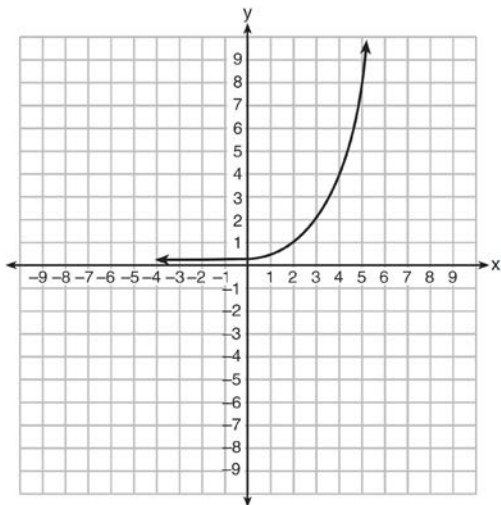
- 1)  $V(x) = 4(0.65)^x$  and it grows.                      3)  $V(x) = 4(1.35)^x$  and it grows.  
2)  $V(x) = 4(0.65)^x$  and it decays.                      4)  $V(x) = 4(1.35)^x$  and it decays.
- 278 Marc bought a new laptop for \$1250. He kept track of the value of the laptop over the next three 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)  $f(x) = 1000(1.2)^x$                                       3)  $f(x) = 1250(1.2)^x$   
2)  $f(x) = 1000(0.8)^x$                                       4)  $f(x) = 1250(0.8)^x$

- 279 Write an exponential equation for the graph shown below.



Explain how you determined the equation.

- 280 Mike knows that  $(3, 6.5)$  and  $(4, 17.55)$  are points on the graph of an exponential function,  $g(x)$ , and he wants to find another point on the graph of this function. First, he subtracts 6.5 from 17.55 to get 11.05. Next, he adds 11.05 and 17.55 to get 28.6. He states that  $(5, 28.6)$  is a point on  $g(x)$ . Is he correct? Explain your reasoning.

F.LE.B.5: MODELING EXPONENTIAL FUNCTIONS

- 281 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%

- 282 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

- 283 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.

- 284 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?

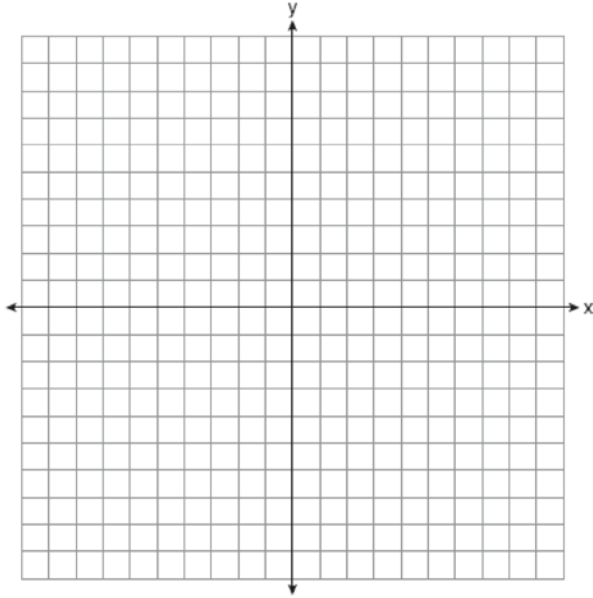
- 1) 98%
- 2) 2%
- 3) 0.98%
- 4) 0.02%



- 285 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
- 286 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.
- 287 The equation  $V(t) = 12,000(0.75)^t$  represents the value of a motorcycle  $t$  years after it was purchased. Which statement is true?
- 1) The motorcycle cost \$9000 when purchased.
  - 2) The motorcycle cost \$12,000 when purchased.
  - 3) The motorcycle's value is decreasing at a rate of 75% each year.
  - 4) The motorcycle's value is decreasing at a rate of 0.25% each year.
- 288 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.
- 289 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.
- 290 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

- 291 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

- 292 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
- 293 Which statement best describes the solutions of a two-variable equation?
- 1) The ordered pairs must lie on the graphed equation.
  - 2) The ordered pairs must lie near the graphed equation.
  - 3) The ordered pairs must have  $x = 0$  for one coordinate.
  - 4) The ordered pairs must have  $y = 0$  for one coordinate.
- 294 Which ordered pair does *not* fall on the line formed by the other three?
- 1)  $(16, 18)$
  - 2)  $(12, 12)$
  - 3)  $(9, 10)$
  - 4)  $(3, 6)$
- 295 Which point is *not* on the graph represented by  $y = x^2 + 3x - 6$ ?
- 1)  $(-6, 12)$
  - 2)  $(-4, -2)$
  - 3)  $(2, 4)$
  - 4)  $(3, -6)$
- 296 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)  $(-1, 6)$

- 297 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)  $(2.5, 23.25)$
- 298 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)  $(5, 5)$
- 299 Which ordered pair would *not* be a solution to  $y = x^3 - x$ ?
- 1)  $(-4, -60)$
  - 2)  $(-3, -24)$
  - 3)  $(-2, -6)$
  - 4)  $(-1, -2)$
- 301 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)  $-2x^2 + x - 5$
- 302 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)  $6x^3 + 2x^2 - 17$
- 303 The expression  $3(x + 4) - (2x + 7)$  is equivalent to
- 1)  $x + 5$
  - 2)  $x - 10$
  - 3)  $x - 3$
  - 4)  $x + 11$

A.APR.A.1: OPERATIONS WITH POLYNOMIALS

- 300 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)  $5x^2 - 12x - 2$
- 304 Which expression is equivalent to  $2(3g - 4) - (8g + 3)$ ?
- 1)  $-2g - 1$
  - 2)  $-2g - 5$
  - 3)  $-2g - 7$
  - 4)  $-2g - 11$
- 305 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)  $2x^2 + 7x - 11$

Algebra I Regents Exam Questions by State Standard: Topic

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- 306 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)  $19x^2 + 34x - 29$
- 307 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)  $5x^2 - x + 1$
- 308 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)  $2a^2 - a - 11$
- 309 Express in simplest form:  
 $(3x^2 + 4x - 8) - (-2x^2 + 4x + 2)$
- 310 Subtract  $5x^2 + 2x - 11$  from  $3x^2 + 8x - 7$ . Express the result as a trinomial.
- 311 If  $C = G - 3F$ , find the trinomial that represents  $C$  when  $F = 2x^2 + 6x - 5$  and  $G = 3x^2 + 4$ .
- 312 Which expression is *not* equivalent to  $-4x^3 + x^2 - 6x + 8$ ?
- 1)  $x^2(-4x + 1) - 2(3x - 4)$
  - 2)  $x(-4x^2 - x + 6) + 8$
  - 3)  $-4x^3 + (x - 2)(x - 4)$
  - 4)  $-4(x^3 - 2) + x(x - 6)$
- 313 When written in standard form, the product of  $(3 + x)$  and  $(2x - 5)$  is
- 1)  $3x - 2$
  - 2)  $2x^2 + x - 15$
  - 3)  $2x^2 - 11x - 15$
  - 4)  $6x - 15 + 2x^2 - 5x$
- 314 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)  $x^2 + 12x + 9$
- 315 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)  $3x^2 - 14x + 14$
- 316 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)  $8x^3 + 2x^2 + 3x + 18$

317 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)  $6x^2 - 6x - 11$

318 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)  $26$

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

320 Express  $(3x - 4)(x + 7) - \frac{1}{4}x^2$  as a trinomial in standard form.

321 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?

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

### A.SSE.A.2: FACTORING POLYNOMIALS

323 The expression  $x^2 - 10x + 24$  is equivalent to

- 1)  $(x + 12)(x - 2)$
- 2)  $(x - 12)(x + 2)$
- 3)  $(x + 6)(x + 4)$
- 4)  $(x - 6)(x - 4)$

324 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)  $(m + 16)(m - 4)$

325 The trinomial  $x^2 - 14x + 49$  can be expressed as

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

326 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)  $2(x + 3)(x + 2)$

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

328 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

329 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)  $(3x - 4)(x + 2)$

330 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)  $(4w - 1)(w + 3)$

331 Which product is equivalent to  $4x^2 - 3x - 27$ ?

- 1)  $(2x + 9)(2x - 3)$
- 2)  $(2x - 9)(2x + 3)$
- 3)  $(4x + 9)(x - 3)$
- 4)  $(4x - 9)(x + 3)$

332 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

333 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)  $2(9x + 25)(9x - 25)$

334 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)  $(4x + 6)(4x + 6)$

335 The expression  $49x^2 - 36$  is equivalent to

- 1)  $(7x - 6)^2$
- 2)  $(24.5x - 18)^2$
- 3)  $(7x - 6)(7x + 6)$
- 4)  $(24.5x - 18)(24.5x + 18)$

336 The expression  $4x^2 - 25$  is equivalent to

- 1)  $(4x - 5)(x + 5)$
- 2)  $(4x + 5)(x - 5)$
- 3)  $(2x + 5)(2x - 5)$
- 4)  $(2x - 5)(2x - 5)$

- 337 The expression  $16x^2 - 81$  is equivalent to
- 1)  $(8x - 9)(8x + 9)$
  - 2)  $(8x - 9)(8x - 9)$
  - 3)  $(4x - 9)(4x + 9)$
  - 4)  $(4x - 9)(4x - 9)$
- 338 Which expression is equivalent to  $18x^2 - 50$ ?
- 1)  $2(3x + 5)^2$
  - 2)  $2(3x - 5)^2$
  - 3)  $2(3x - 5)(3x + 5)$
  - 4)  $2(3x - 25)(3x + 25)$
- 339 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)  $(x^4 + y)(x - 9y)$
- 340 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)  $(x^2 - 4)(x^2 - 4)$
- 341 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)  $(w^2 + 6)(w^2 - 6)$
- 342 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)  $(p + 3)(p - 3)(p + 3)(p - 3)$
- 343 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)  $(y^2 + 50)(y^2 - 50)$
- 344 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)  $(8x^2 + 32)(8x^2 - 32)$
- 345 Factor the expression  $x^4 + 6x^2 - 7$  completely.
- 346 Factor  $x^4 - 16$  completely.

A.APR.B.3: ZEROS OF POLYNOMIALS

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

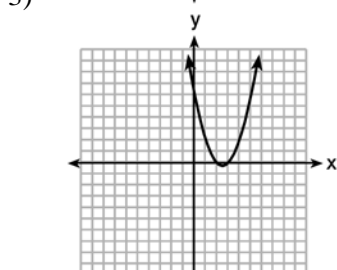
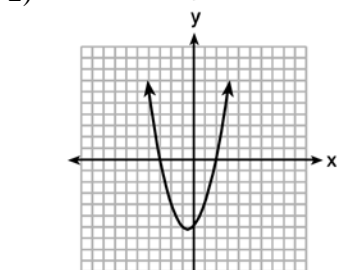
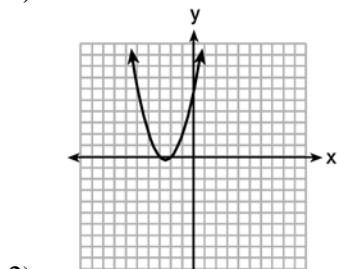
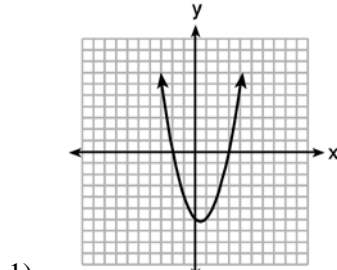
Algebra I Regents Exam Questions by State Standard: Topic

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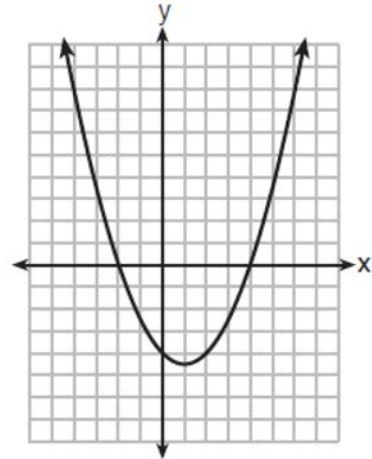
- 348 Which polynomial function has zeros at  $-3$ ,  $0$ , and  $4$ ?
- 1)  $f(x) = (x + 3)(x^2 + 4)$
  - 2)  $f(x) = (x^2 - 3)(x - 4)$
  - 3)  $f(x) = x(x + 3)(x - 4)$
  - 4)  $f(x) = x(x - 3)(x + 4)$
- 349 For which function defined by a polynomial are the zeros of the polynomial  $-4$  and  $-6$ ?
- 1)  $y = x^2 - 10x - 24$
  - 2)  $y = x^2 + 10x + 24$
  - 3)  $y = x^2 + 10x - 24$
  - 4)  $y = x^2 - 10x + 24$
- 350 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  $3$
- 351 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  $-2$
- 352 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  $3$
- 353 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  $8$
- 354 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  $-1$
- 355 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  $2$
- 356 The zeros of the function  $f(x) = 2x^3 + 12x - 10x^2$  are
- 1)  $\{2, 3\}$
  - 2)  $\{-1, 6\}$
  - 3)  $\{0, 2, 3\}$
  - 4)  $\{0, -1, 6\}$



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



358 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.

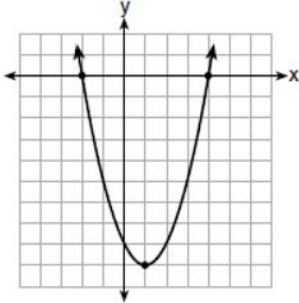


Which of these points can determine the zeros of the equation  $y = \frac{1}{2}x^2 - x - 4$ ?

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

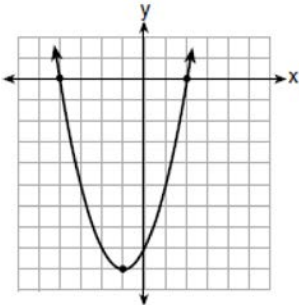
359 Which function has zeros of -4 and 2?

1)  $f(x) = x^2 + 7x - 8$



2)

3)  $g(x) = x^2 - 7x - 8$



4)

360 The zeros of the function  $f(x) = x^3 - 9x^2$  are

- 1) 9, only
- 2) 0 and 9
- 3) 0 and 3, only
- 4) -3, 0, and 3

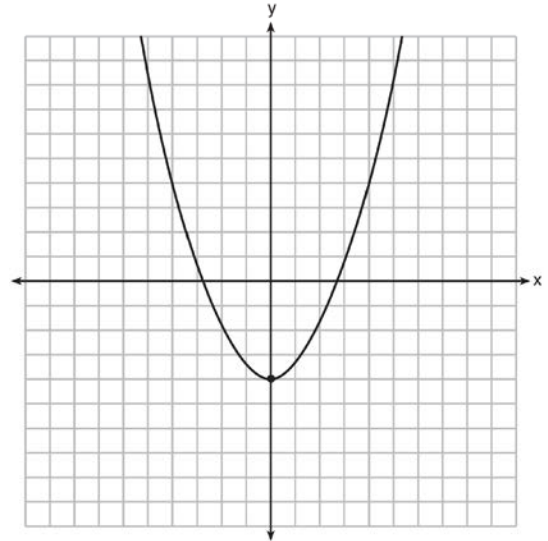
361 If  $f(x) = 2x^2 + x - 3$ , which equation can be used to determine the zeros of the function?

- 1)  $0 = (2x - 3)(x + 1)$
- 2)  $0 = (2x + 3)(x - 1)$
- 3)  $0 = 2x(x + 1) - 3$
- 4)  $0 = 2x(x - 1) - 3(x + 1)$

362 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.

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

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

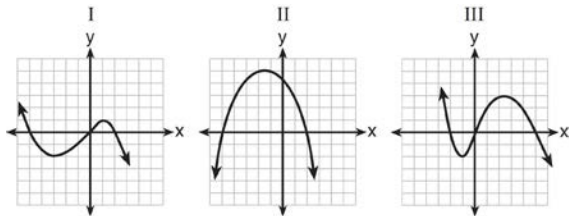
365 Determine all the zeros of  $m(x) = x^2 - 4x + 3$ , algebraically.

366 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  $r(x)$ .

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

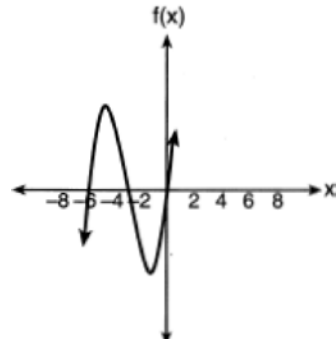
A.APR.B.3: GRAPHING POLYNOMIAL FUNCTIONS

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

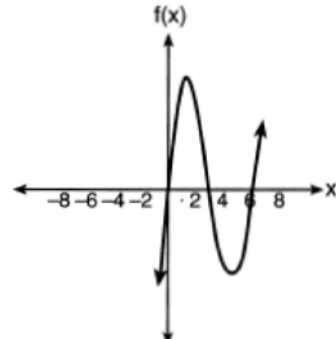


- 1) I, only
- 2) II, only
- 3) I and III
- 4) I, II, and III

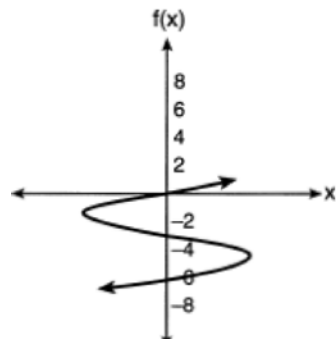
369 Which sketch represents the polynomial function  $f(x) = x(x + 6)(x + 3)$ ?



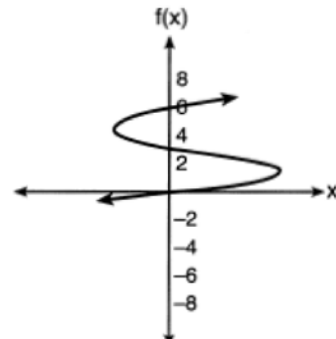
1)



2)

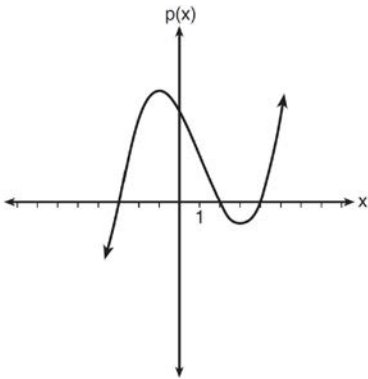


3)



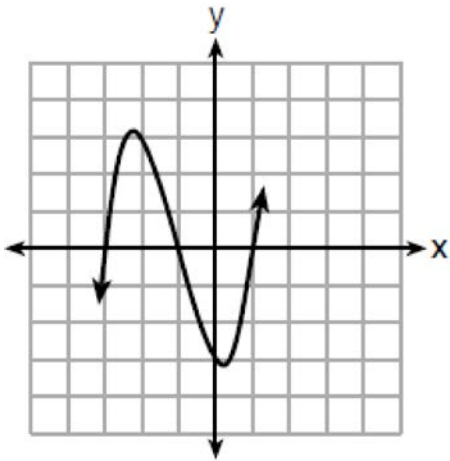
4)

370 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)  $(x - 3)(x + 5)(x + 2)(x + 4)$

371 A cubic function is graphed on the set of axes below.

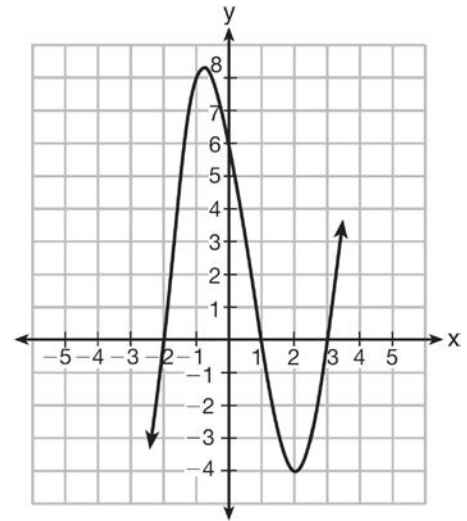


Which function could represent this graph?

- 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)  $k(x) = (x + 3)(x + 1)(x - 3)$

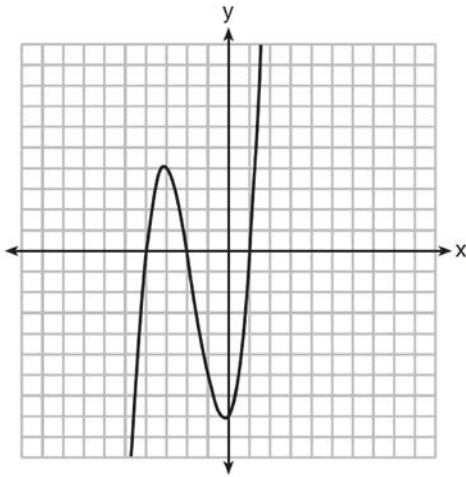
372 Which equation(s) represent the graph below?

- 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

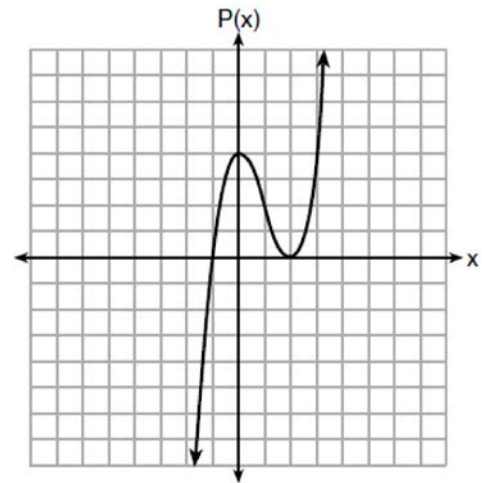
373 The graph of  $f(x)$  is shown below.



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

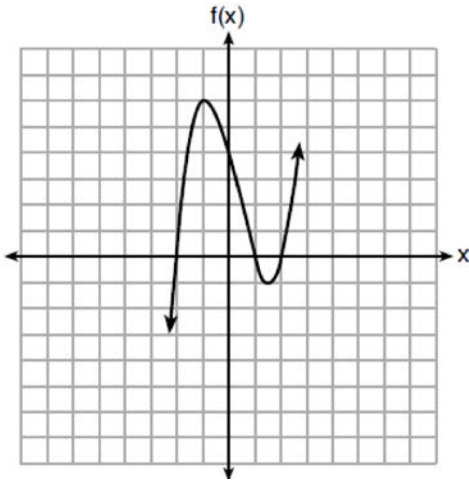
374 Wenona sketched the polynomial  $P(x)$  as shown on the axes below.



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)  $P(x) = (x - 1)(x + 2)$

375 A polynomial function is graphed below.



Which function could represent this graph?

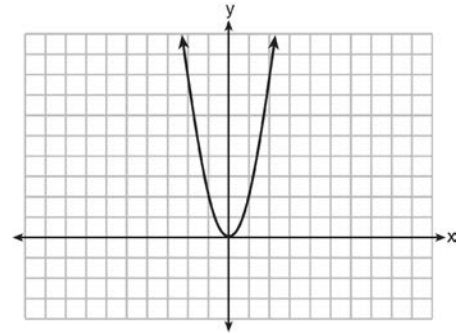
- 1)  $f(x) = (x + 1)(x^2 + 2)$
- 2)  $f(x) = (x - 1)(x^2 - 2)$
- 3)  $f(x) = (x - 1)(x^2 - 4)$
- 4)  $f(x) = (x + 1)(x^2 + 4)$

F.BF.B.3: GRAPHING POLYNOMIAL FUNCTIONS

376 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

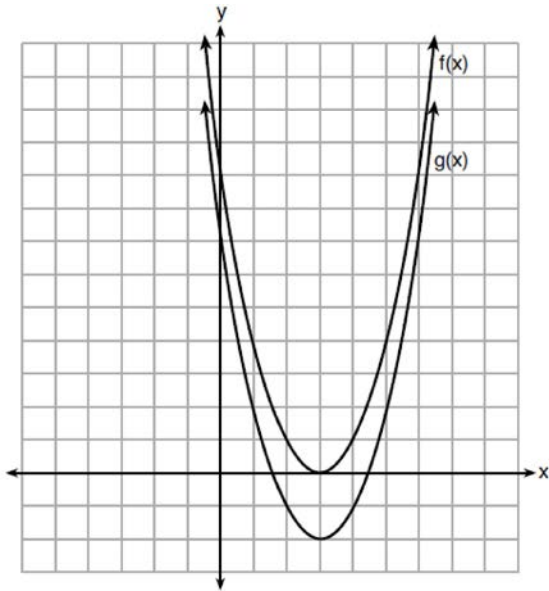
377 The graph of the equation  $y = ax^2$  is shown below.



If  $a$  is multiplied by  $-\frac{1}{2}$ , the graph of the new equation is

- 1) wider and opens downward
- 2) wider and opens upward
- 3) narrower and opens downward
- 4) narrower and opens upward

- 378 The functions  $f(x) = x^2 - 6x + 9$  and  $g(x) = f(x) + k$  are graphed below.



Which value of  $k$  would result in the graph of  $g(x)$ ?

- 1) 0
  - 2) 2
  - 3) -3
  - 4) -2
- 379 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
- 380 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
- 381 If the parent function of  $f(x)$  is  $p(x) = x^2$ , then the graph of the function  $f(x) = (x - k)^2 + 5$ , where  $k > 0$ , would be a shift of
- 1)  $k$  units to the left and a move of 5 units up
  - 2)  $k$  units to the left and a move of 5 units down
  - 3)  $k$  units to the right and a move of 5 units up
  - 4)  $k$  units to the right and a move of 5 units down
- 382 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.
- 383 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
- 384 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)  $2x^2 - 4$

385 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

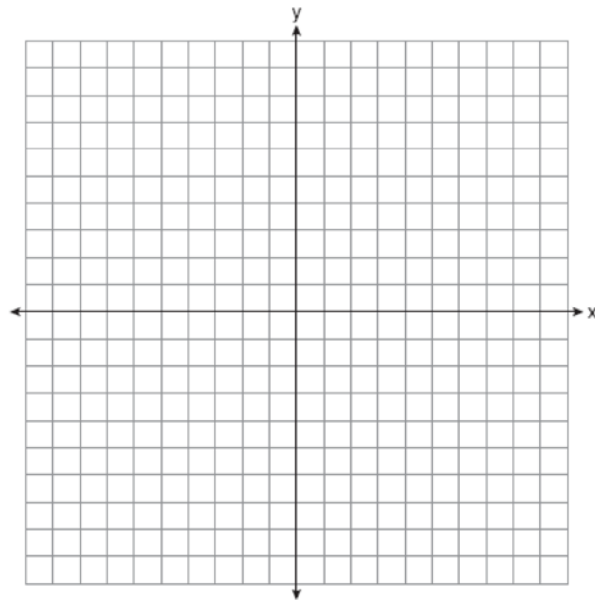
386 Josh graphed the function  $f(x) = -3(x - 1)^2 + 2$ . He then graphed the function  $g(x) = -3(x - 1)^2 - 5$  on the same coordinate plane. The vertex of  $g(x)$  is

- 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  $f(x)$

387 In the functions  $f(x) = kx^2$  and  $g(x) = |kx|$ ,  $k$  is a positive integer. If  $k$  is replaced by  $\frac{1}{2}$ , which statement about these new functions is true?

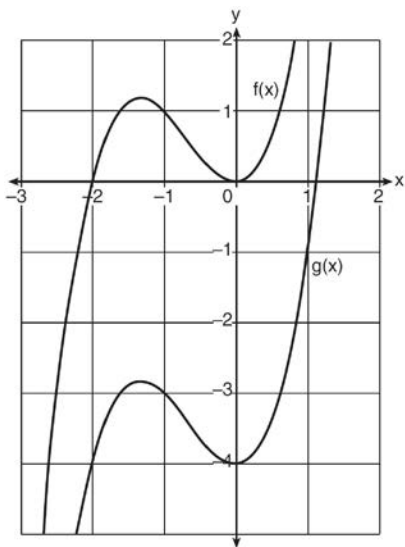
- 1) The graphs of both  $f(x)$  and  $g(x)$  become wider.
- 2) The graph of  $f(x)$  becomes narrower and the graph of  $g(x)$  shifts left.
- 3) The graphs of both  $f(x)$  and  $g(x)$  shift vertically.
- 4) The graph of  $f(x)$  shifts left and the graph of  $g(x)$  becomes wider.

388 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.]





- 389 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.

- 391 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.

- 392 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

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

## RADICALS

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

- 390 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.

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

- 395 If  $x = 2$ ,  $y = 3\sqrt{2}$ , and  $w = 2\sqrt{8}$ , which expression results in a rational number?
- 1)  $x + y$
  - 2)  $y - w$
  - 3)  $(w)(y)$
  - 4)  $y \div x$

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396 Given the following expressions:

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

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

Which expression(s) result in an irrational number?

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

397 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)  $P + L$

398 For which value of  $P$  and  $W$  is  $P + W$  a rational number?

1)  $P = \frac{1}{\sqrt{3}}$  and  $W = \frac{1}{\sqrt{6}}$

2)  $P = \frac{1}{\sqrt{4}}$  and  $W = \frac{1}{\sqrt{9}}$

3)  $P = \frac{1}{\sqrt{6}}$  and  $W = \frac{1}{\sqrt{10}}$

4)  $P = \frac{1}{\sqrt{25}}$  and  $W = \frac{1}{\sqrt{2}}$

399 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.

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

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

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

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

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

405 State whether the product of  $\sqrt{3}$  and  $\sqrt{9}$  is rational or irrational. Explain your answer.

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

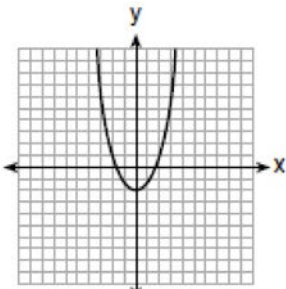
407 A teacher wrote the following set of numbers on the board:

$$a = \sqrt{20} \quad b = 2.5 \quad c = \sqrt{225}$$

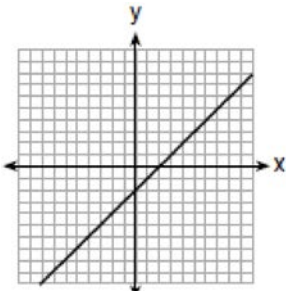
Explain why  $a + b$  is irrational, but  $b + c$  is rational.

F.IF.C.7: GRAPHING ROOT FUNCTIONS

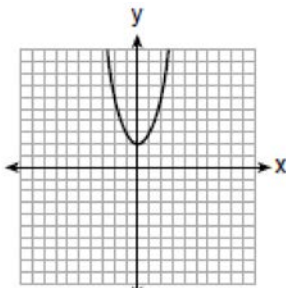
408 Which graph represents  $y = \sqrt{x-2}$ ?



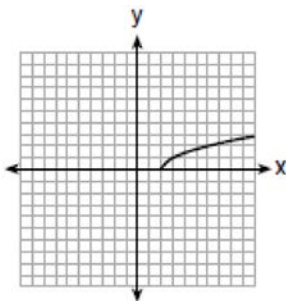
1)



2)

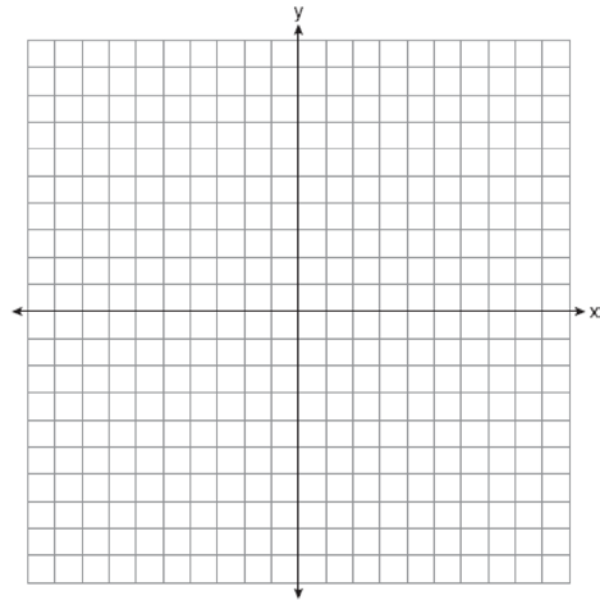


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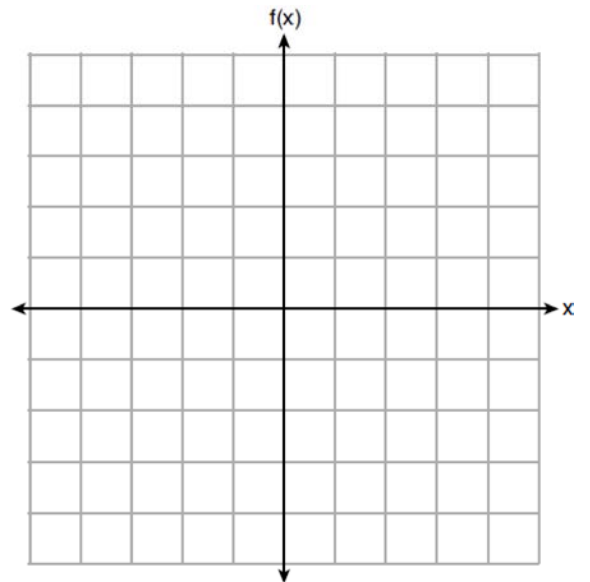


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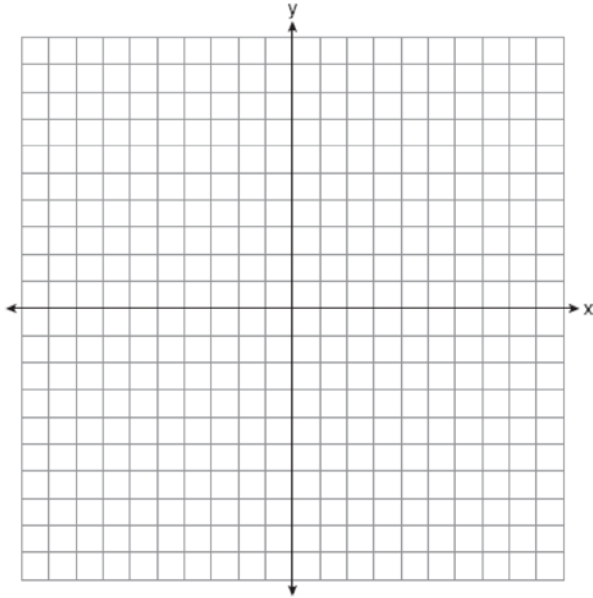
409 Draw the graph of  $y = \sqrt{x} - 1$  on the set of axes below.



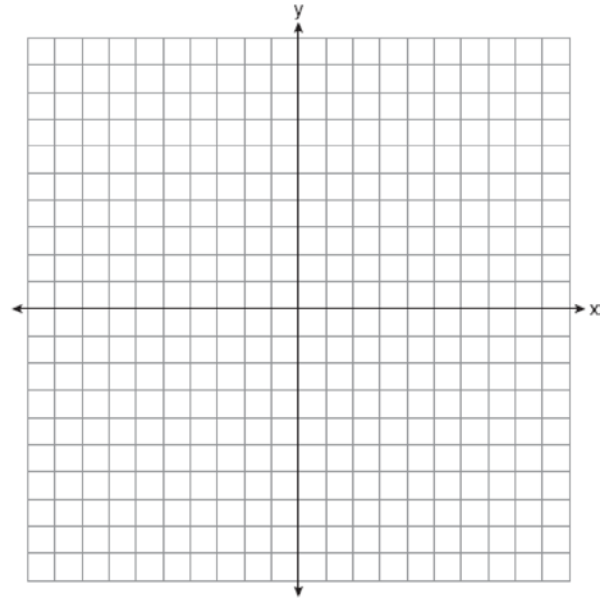
410 Graph  $f(x) = -\sqrt{x} + 1$  on the set of axes below.



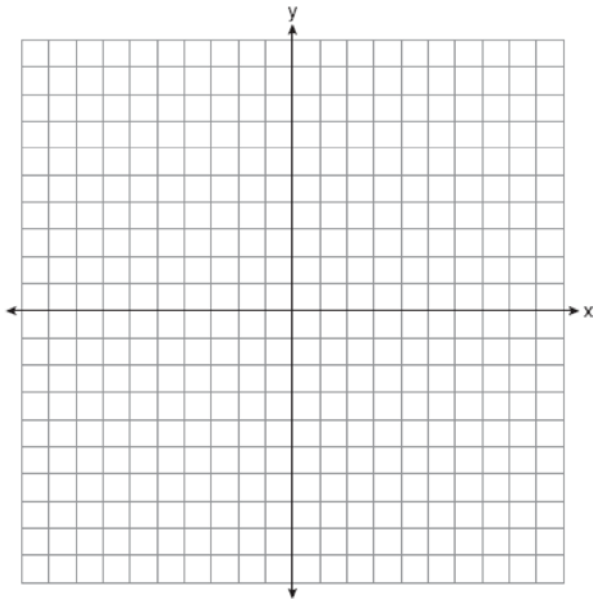
411 Graph  $f(x) = \sqrt{x+2}$  over the domain  $-2 \leq x \leq 7$ .



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



412 Graph the function  $y = -\sqrt{x+3}$  on the set of axes below.



## SYSTEMS

### A.REI.C.6: SOLVING LINEAR SYSTEMS

414 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)  $\left(\frac{1}{2}, 9\right)$

- 415 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.

- 416 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)  $2x - 3(3x - 4) = -21$
- 417 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)  $6x + 6y = 48$   
 $6x + 2y = 8$

- 418 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)  $8x + 4y = 44$   
 $-8x + 8y = -8$

- 419 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)  $x + 2y = 5$   
 $4x + 2y = 12$

- 420 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)  $40x + 30y = 100$

$$36x + 30y = -96$$

- 421 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)  $3x + 3y = 9$

$$2x - 3y = -1$$

- 422 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)  $-5y = -5$

$$x - 4y = -10$$

- 423 Which system of equations has the same solutions as the system below?

$$3x - y = 7$$

$$2x + 3y = 12$$

1)  $6x - 2y = 14$

$$-6x + 9y = 36$$

2)  $18x - 6y = 42$

$$4x + 6y = 24$$

3)  $-9x - 3y = -21$

$$2x + 3y = 12$$

4)  $3x - y = 7$

$$x + y = 2$$

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

424 Which system has the same solution as the system below?

$$\begin{aligned}x + 3y &= 10 \\ -2x - 2y &= 4\end{aligned}$$

- 1)  $-x + y = 6$   
 $2x + 6y = 20$
- 2)  $-x + y = 14$   
 $2x + 6y = 20$
- 3)  $x + y = 6$   
 $2x + 6y = 20$
- 4)  $x + y = 14$   
 $2x + 6y = 20$

425 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.

426 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.

427 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.

428 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)  $(6.0, 5.4)$

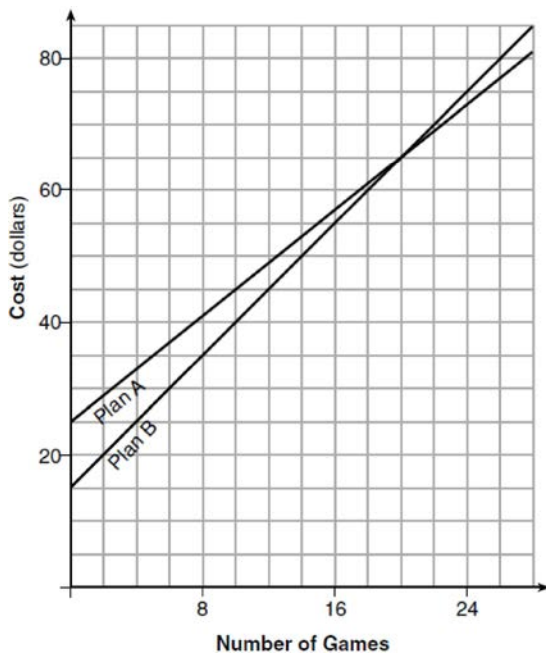
A.CED.A.3: MODELING LINEAR SYSTEMS

- 429 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)  $m + f = 3.95$   
 $f + 0.005 = m$
- 430 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)  $a + c = 1470$   
 $7.75a + 10.25c = 150$
- 431 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)  $3.50P + 2.50H = 14$   
 $P + H = 43$
- 432 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)  $D + Q = 4.80$   
 $.25D + .10Q = 30$
- 433 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



- 434 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

- 435 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.

- 436 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*.

- 437 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.]

- 438 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.

- 439 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.
- 440 At a local garden shop, the price of plants includes sales tax. The cost of 4 large plants and 8 medium plants is \$40. The cost of 5 large plants and 2 medium plants is \$28. If  $l$  is the cost of a large plant and  $m$  is the cost of a medium plant, write a system of equations that models this situation. Could the cost of one large plant be \$5.50 and the cost of one medium plant be \$2.25? Justify your answer. Determine algebraically both the cost of a large plant and the cost of a medium plant.
- 441 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.
- 442 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?
- 443 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.
- 444 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.

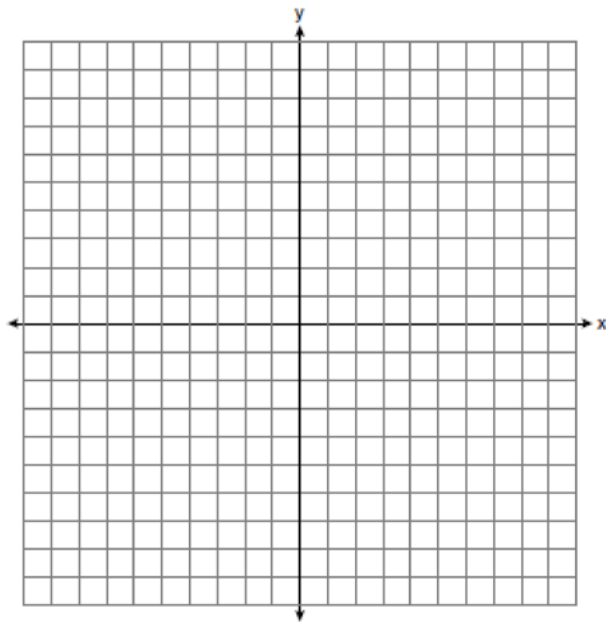
445 Allysa spent \$35 to purchase 12 chickens. She bought two different types of chickens. Americana chickens cost \$3.75 each and Delaware chickens cost \$2.50 each. Write a system of equations that can be used to determine the number of Americana chickens,  $A$ , and the number of Delaware chickens,  $D$ , 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.

446 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.

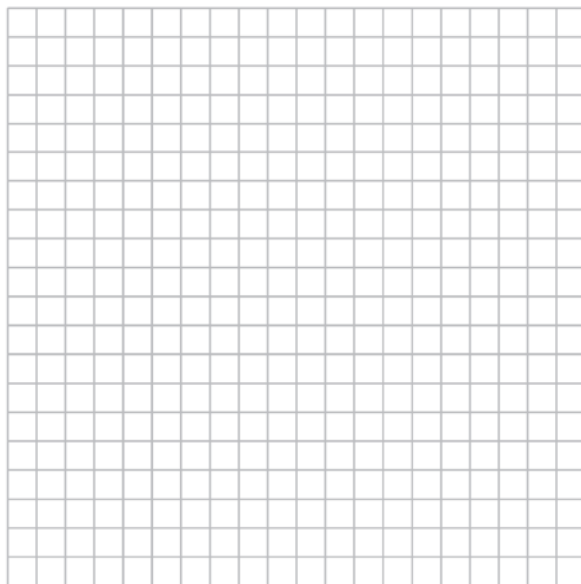
A.REI.C.6: GRAPHING LINEAR SYSTEMS

- 447 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.

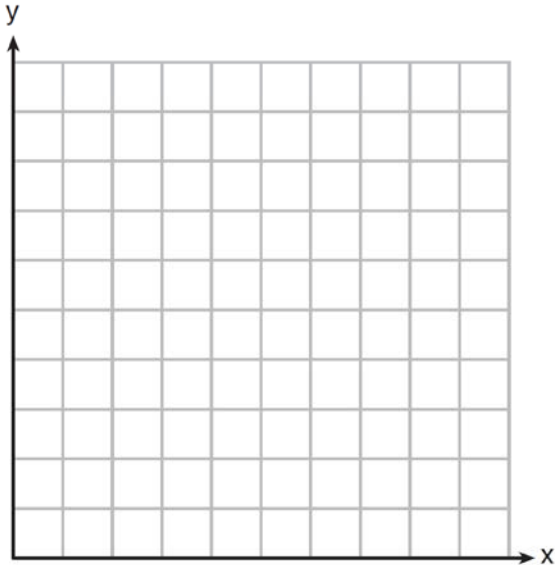
- 448 Next weekend Marnie wants to attend either carnival *A* or carnival *B*. Carnival *A* charges \$6 for admission and an additional \$1.50 per ride. Carnival *B* charges \$2.50 for admission and an additional \$2 per ride.
- In function notation, write  $A(x)$  to represent the total cost of attending 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.
  - 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.]
  - Marnie wants to go on five rides. Determine which carnival would have the lower total cost. Justify your answer.



- 449 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.

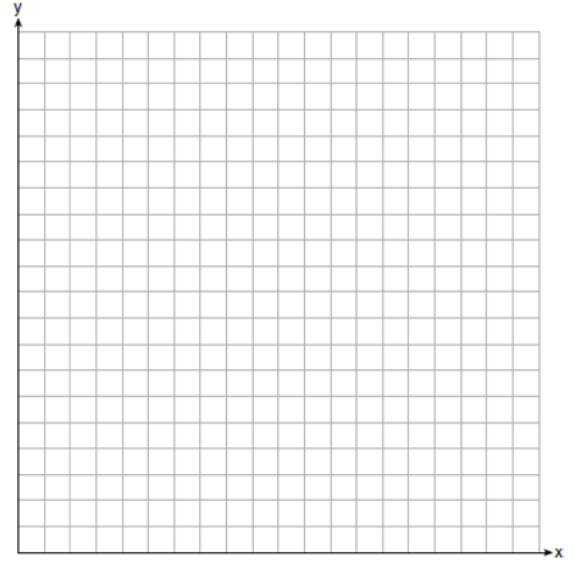


- 450 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for \$19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for \$24. Let  $x$  equal the price of one package of cupcakes and  $y$  equal the price of one package of brownies. Write a system of equations that describes the given situation. On the set of axes below, graph the system of equations.



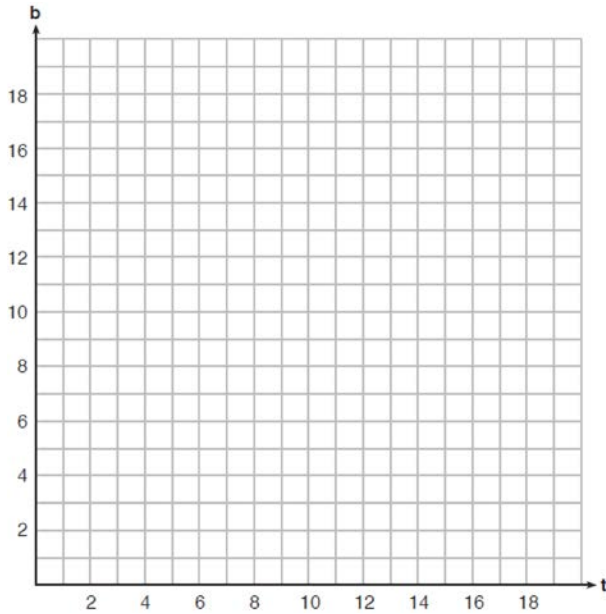
Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

- 451 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.



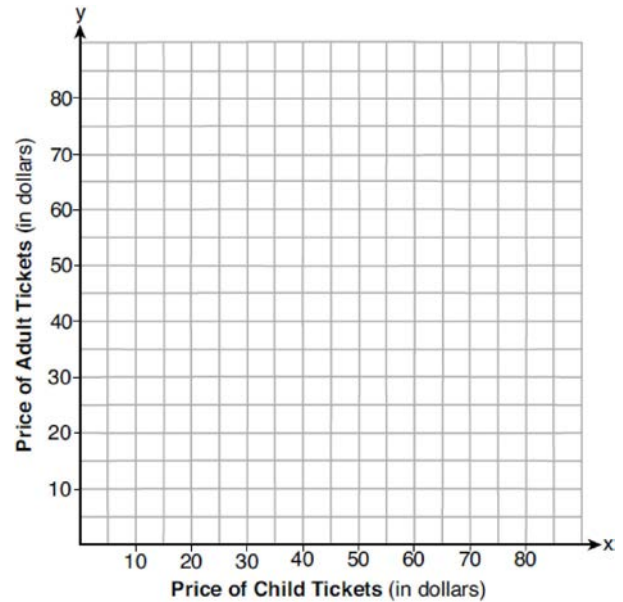
Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

452 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.

453 Two families went to Rollercoaster World. The Brown family paid \$170 for 3 children and 2 adults. The Peckham family paid \$360 for 4 children and 6 adults. If  $x$  is the price of a child's ticket in dollars and  $y$  is the price of an adult's ticket in dollars, write a system of equations that models this situation. Graph your system of equations on the set of axes below.



State the coordinates of the point of intersection. Explain what each coordinate of the point of intersection means in the context of the problem.

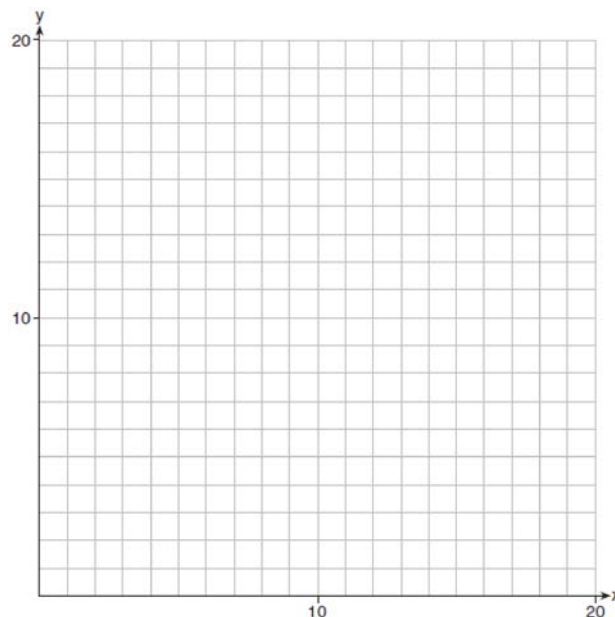
A.CED.A.3: MODELING SYSTEMS OF LINEAR  
INEQUALITIES

- 454 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)  $m + g \geq 40$   
 $12m + 14g \geq 250$
- 455 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)  $1.25r + 2g < 50$   
 $r \leq 10$   
 $g \geq 12$
- 456 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.

457 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.

458 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.

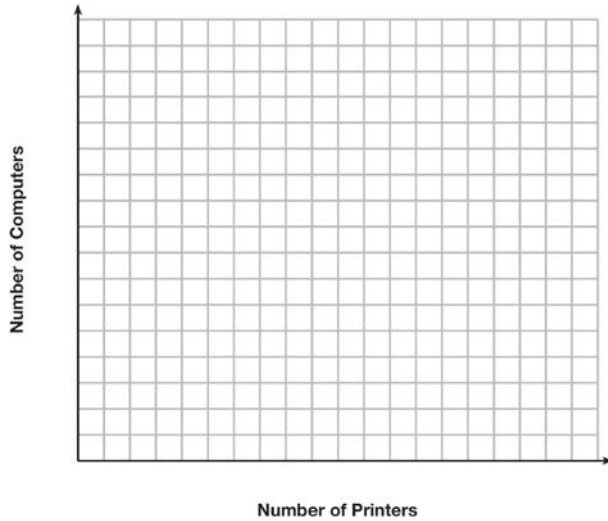
459 Edith babysits for  $x$  hours a week after school at a job that pays \$4 an hour. She has accepted a job that pays \$8 an hour as a library assistant working  $y$  hours a week. She will work both jobs. She is able to work *no more than* 15 hours a week, due to school commitments. Edith wants to 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.

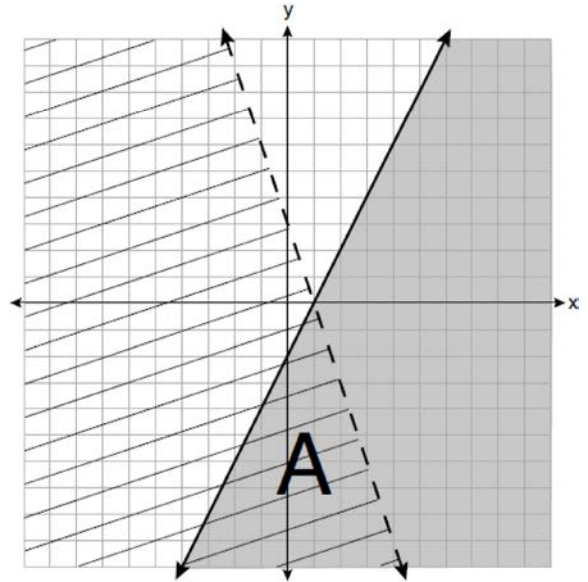


- 460 An on-line electronics store must sell at least \$2500 worth of printers and computers per day. Each printer costs \$50 and each computer costs \$500. The store can ship a maximum of 15 items per day. On the set of axes below, graph a system of inequalities that models these constraints.



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.

- 461 A system of inequalities is graphed on the set of axes below.



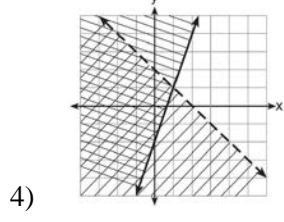
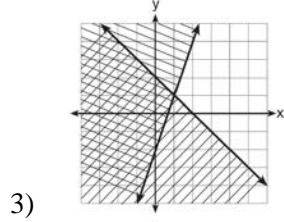
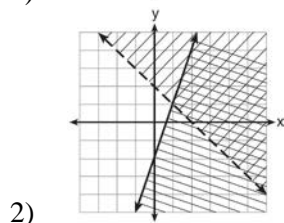
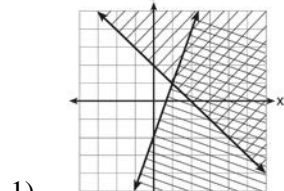
State the system of inequalities represented by the graph. State what region A represents. State what the entire gray region represents.

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

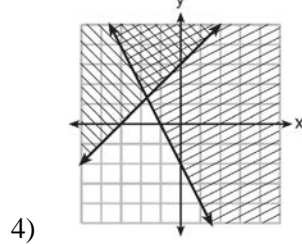
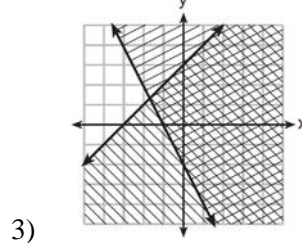
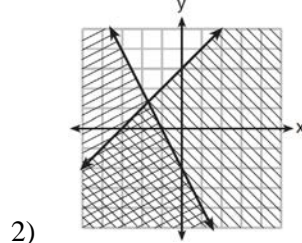
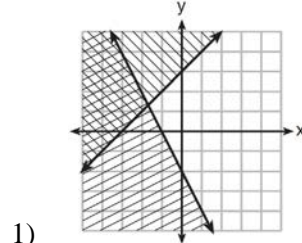
462 Given:  $y + x > 2$

$y \leq 3x - 2$

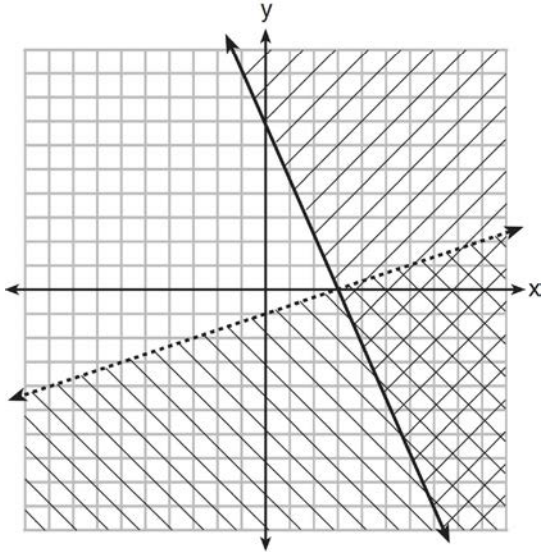
Which graph shows the solution of the given set of inequalities?



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



464 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)

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

$$y > -\frac{1}{2}x + 5 \text{ and } y \leq 3x - 2?$$

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

466 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)

467 First consider the system of equations  $y = -\frac{1}{2}x + 1$

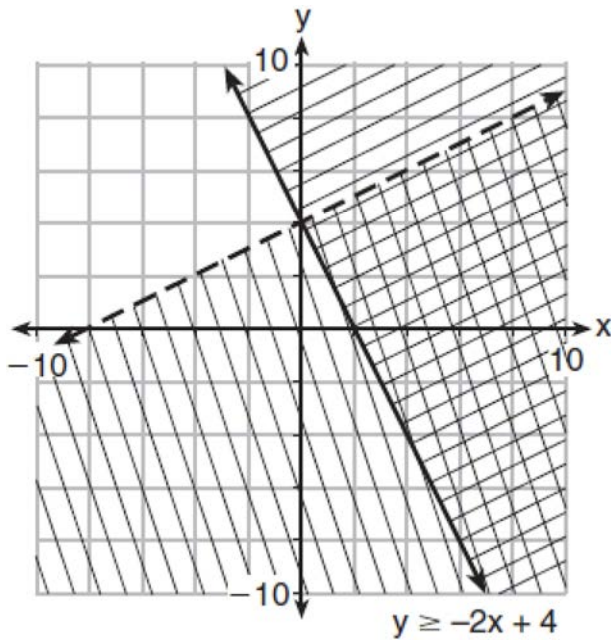
and  $y = x - 5$ . Then consider the system of

inequalities  $y > -\frac{1}{2}x + 1$  and  $y < x - 5$ . When

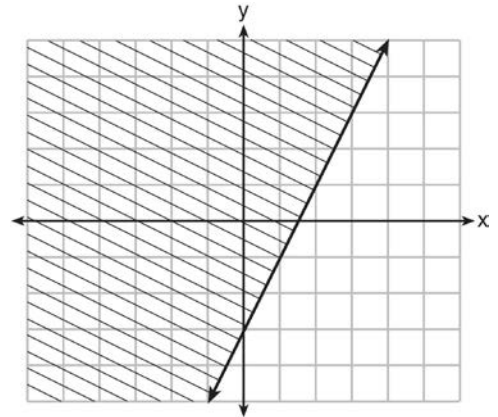
comparing the number of solutions in each of these systems, which statement is true?

- 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.

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

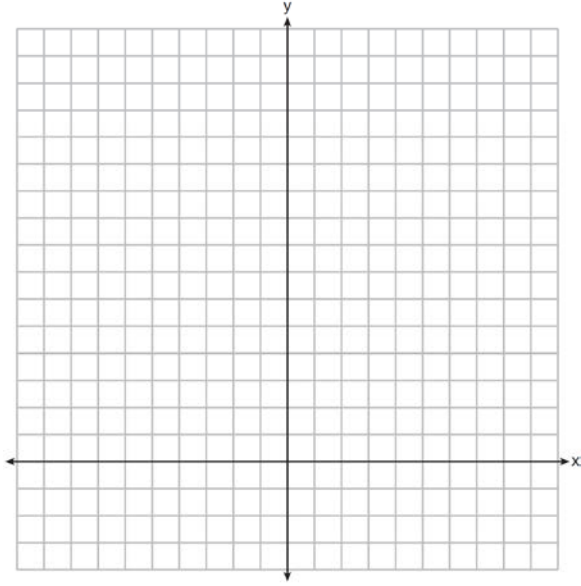


469 The graph of an inequality is shown below.



- Write the inequality represented by the graph.
- On the same set of axes, graph the inequality  $x + 2y < 4$ .
- 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.

- 470 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.

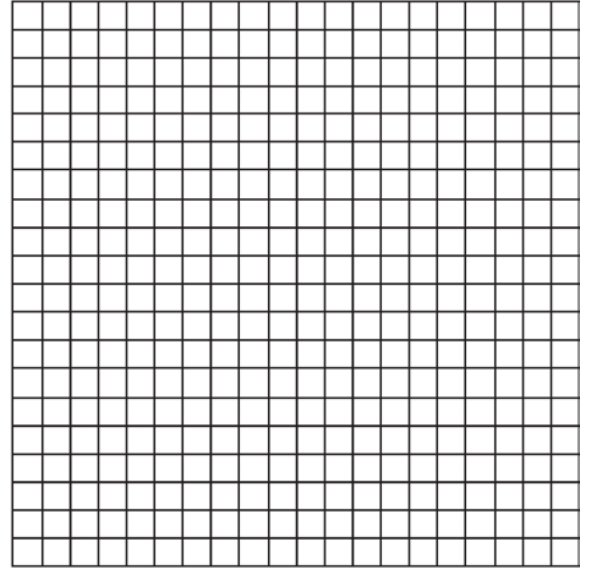


Kai says that the point  $(6, 2)$  is a solution to this system. Determine if he is correct and explain your reasoning.

- 471 Solve the following system of inequalities graphically on the grid below and label the solution  $S$ .

$$3x + 4y > 20$$

$$x < 3y - 18$$

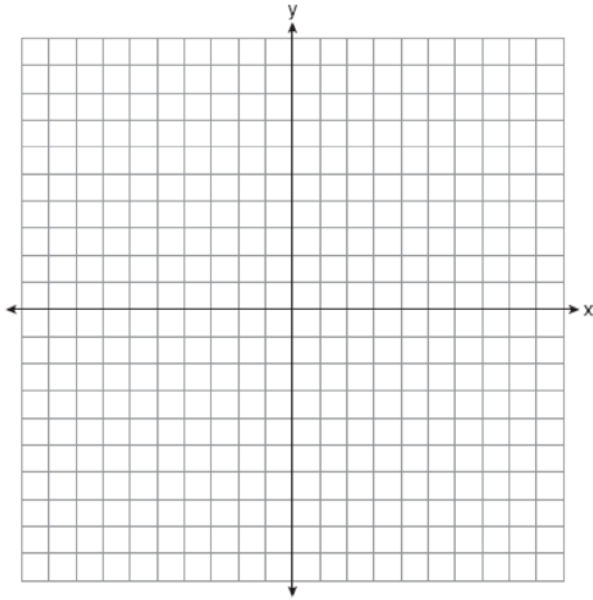


Is the point  $(3, 7)$  in the solution set? Explain your answer.

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

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

$$4x - y < 2$$

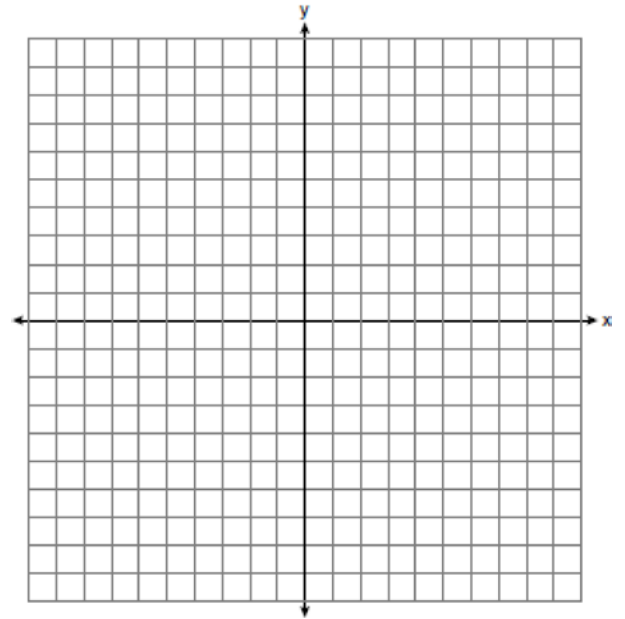


Determine if the point  $(1, 2)$  is in the solution set.  
Explain your answer.

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

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

$$y + 2x > -5$$

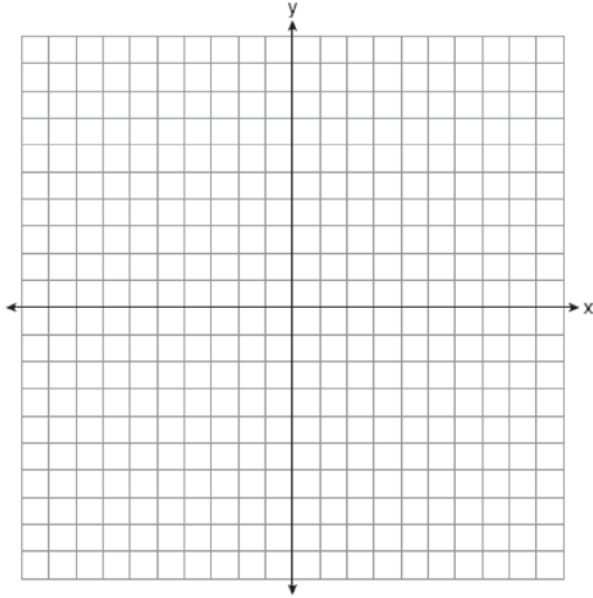


Based upon your graph, explain why  $(6, 1)$  is a solution to this system and why  $(-6, 7)$  is *not* a solution to this system.

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

$$2x + y \geq 8$$

$$y - 5 < 3x$$

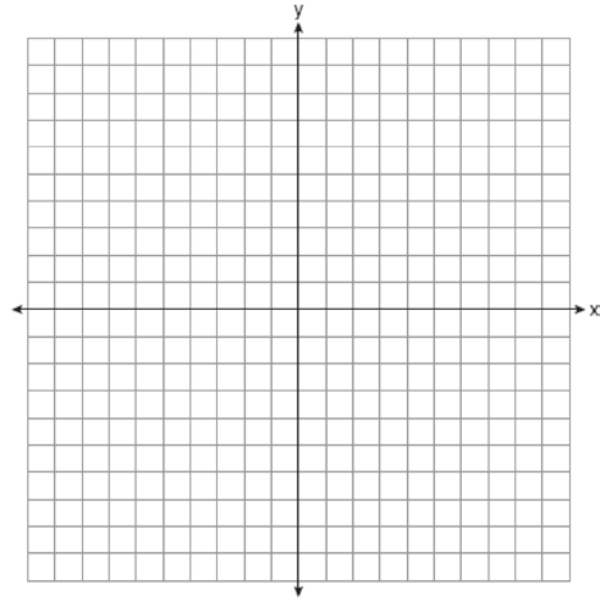


Determine if the point  $(1, 8)$  is in the solution set.  
Explain your answer.

475 Graph the system of inequalities:

$$-x + 2y - 4 < 0$$

$$3x + 4y + 4 \geq 0$$

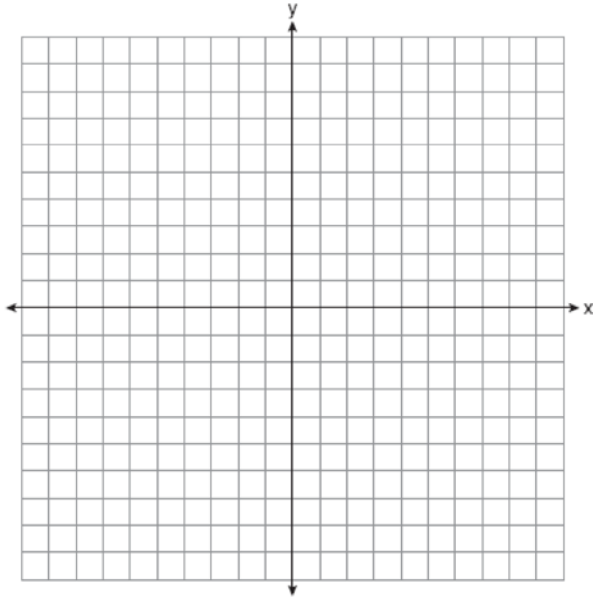


Stephen says the point  $(0, 0)$  is a solution to this system. Determine if he is correct, and explain your reasoning.

476 Graph the system of inequalities on the set of axes below:

$$y \leq -\frac{3}{4}x + 5$$

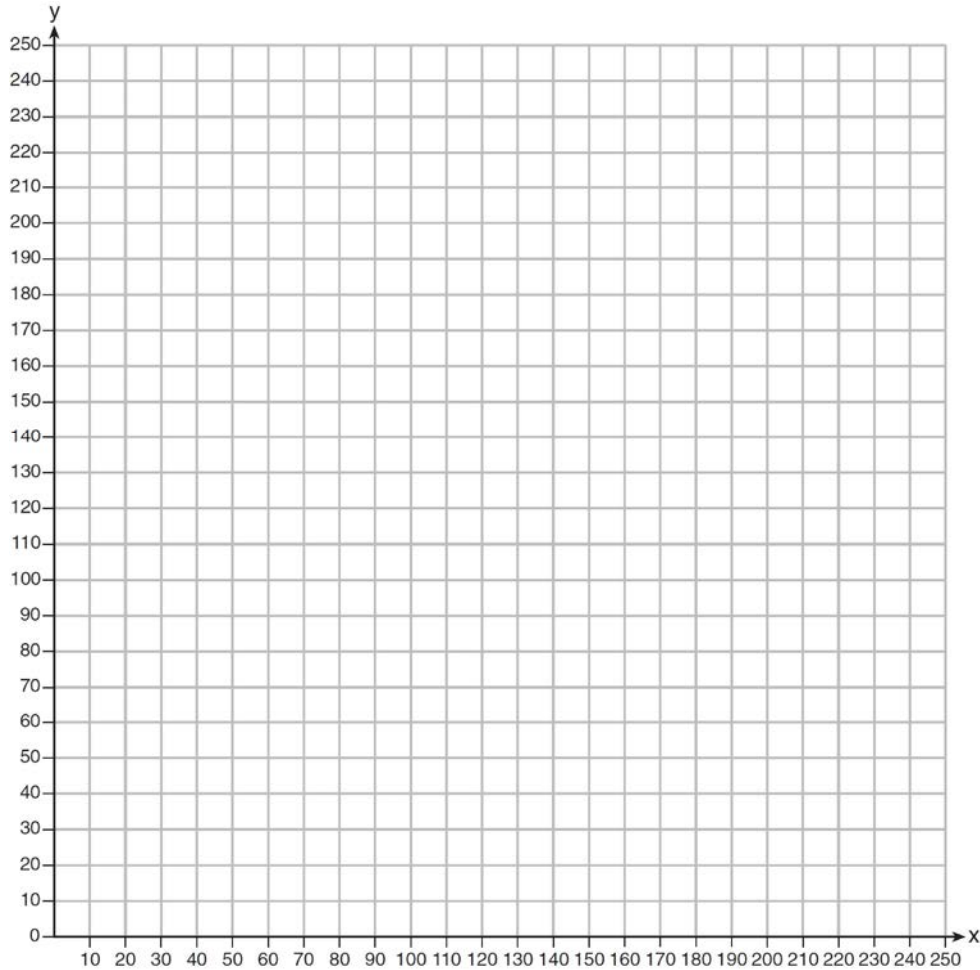
$$3x - 2y > 4$$



Is  $(6,3)$  a solution to the system of inequalities?  
Explain your answer.



- 477 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

- 478 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

- 479 If  $f(x) = x^2 - 2x - 8$  and  $g(x) = \frac{1}{4}x - 1$ , for which values 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  $0$

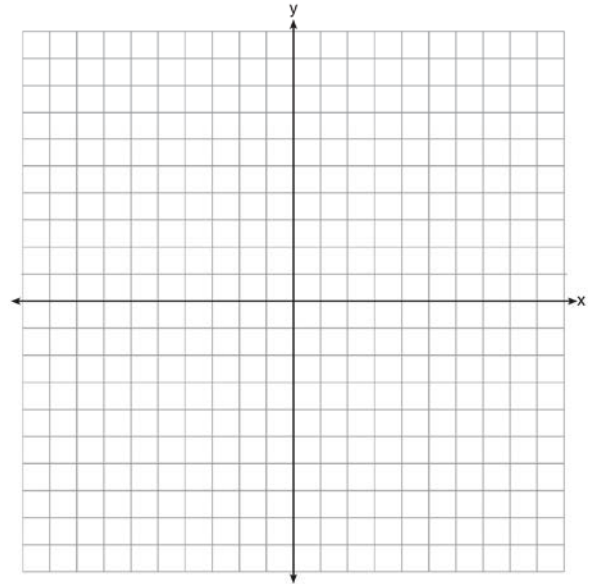
- 480 If  $f(x) = x^2$  and  $g(x) = x$ , determine the value(s) of  $x$  that satisfy the equation  $f(x) = g(x)$ .

- 481 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.

- 482 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.

- 483 Let  $f(x) = -2x^2$  and  $g(x) = 2x - 4$ . On the set of axes below, draw the graphs of  $y = f(x)$  and  $y = g(x)$ .

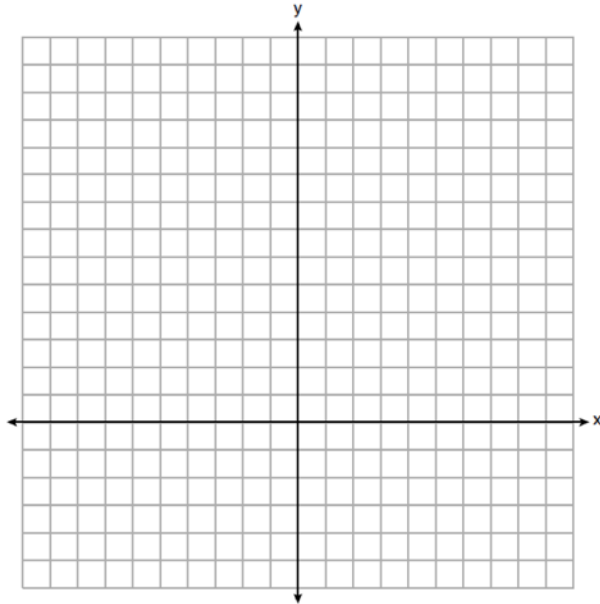


Using this graph, determine and state *all* values of  $x$  for which  $f(x) = g(x)$ .

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

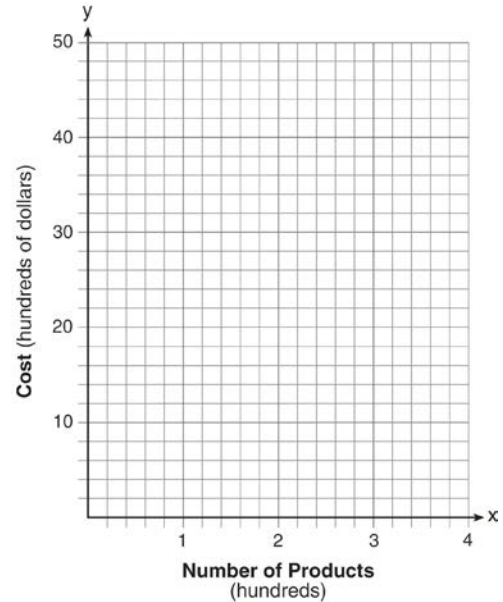
$$f(x) = 2x^2 - 8x + 3$$

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



Determine and state all values of  $x$  for which  $f(x) = g(x)$ .

- 485 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.

A.REI.D.11: OTHER SYSTEMS

486 Given:  $f(x) = \frac{2}{3}x - 4$  and  $g(x) = \frac{1}{4}x + 1$

Four statements about this system are written below.

- I.  $f(4) = g(4)$
- II. When  $x = 12$ ,  $f(x) = g(x)$ .
- III. The graphs of  $f(x)$  and  $g(x)$  intersect at  $(12, 4)$ .
- IV. The graphs of  $f(x)$  and  $g(x)$  intersect at  $(4, 12)$ .

Which statement(s) are true?

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

487 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.

488 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  $x = 3$ .

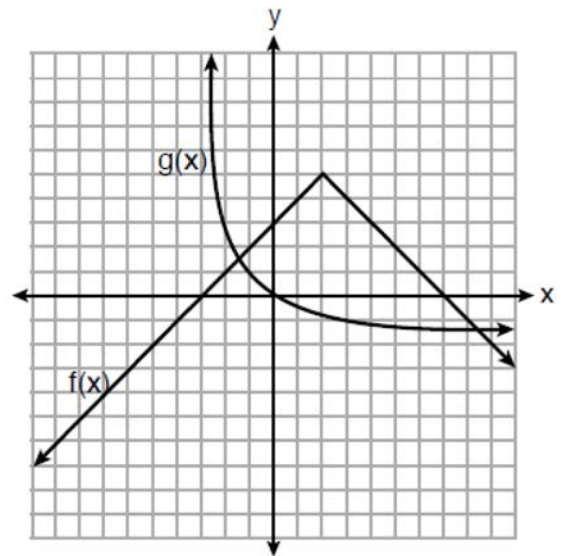
489 Given the functions  $h(x) = \frac{1}{2}x + 3$  and  $j(x) = |x|$ , which value of  $x$  makes  $h(x) = j(x)$ ?

- 1) -2
- 2) 2
- 3) 3
- 4) -6

490 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

491 The functions  $f(x)$  and  $g(x)$  are graphed below.



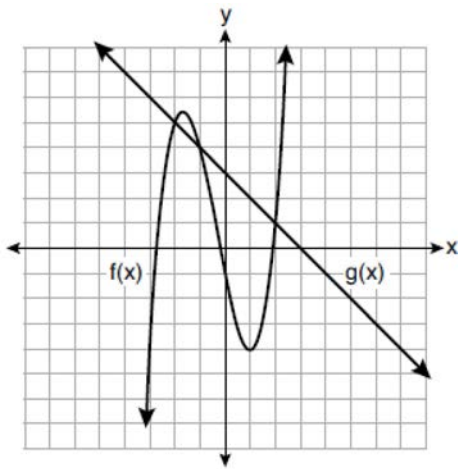
Based on the graph, the solutions to the equation  $f(x) = g(x)$  are

- 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

492 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  $y = -\frac{1}{2}x - \frac{3}{2}$

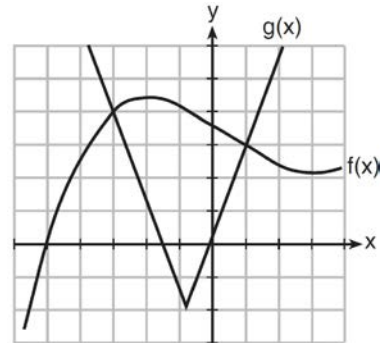
493 The functions  $f(x)$  and  $g(x)$  are graphed on the set of axes below.



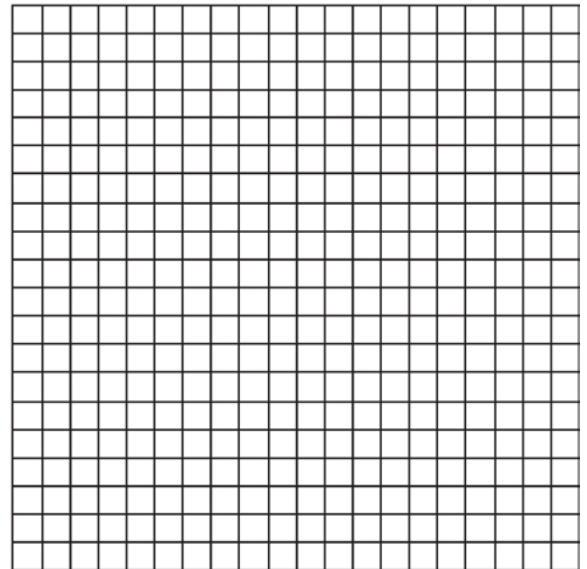
For which value of  $x$  is  $f(x) \neq g(x)$ ?

- 1)  $-1$
- 2)  $2$
- 3)  $3$
- 4)  $-2$

494 The graph below shows two functions,  $f(x)$  and  $g(x)$ . State all the values of  $x$  for which  $f(x) = g(x)$ .



495 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.

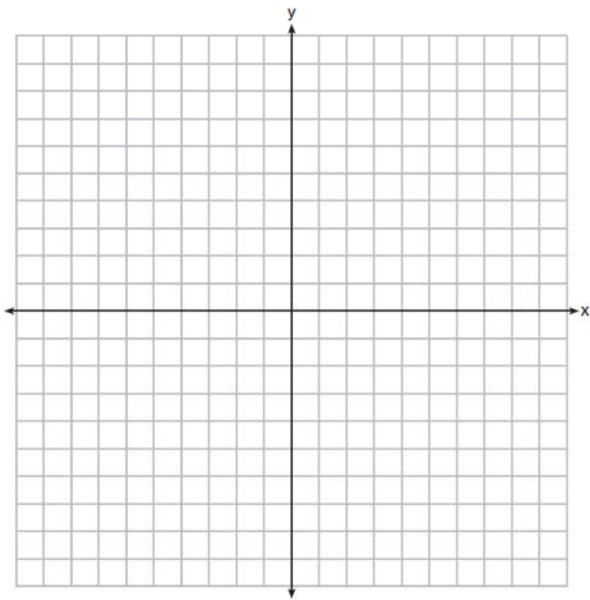


496 On the set of axes below, graph

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

and

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



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

- 497 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)  $(1, 3)$

498 Which table represents a function?

1) 

|             |   |   |   |   |
|-------------|---|---|---|---|
| <b>x</b>    | 2 | 4 | 2 | 4 |
| <b>f(x)</b> | 3 | 5 | 7 | 9 |

2) 

|             |   |    |    |   |
|-------------|---|----|----|---|
| <b>x</b>    | 0 | -1 | 0  | 1 |
| <b>f(x)</b> | 0 | 1  | -1 | 0 |

3) 

|             |   |   |   |   |
|-------------|---|---|---|---|
| <b>x</b>    | 3 | 5 | 7 | 9 |
| <b>f(x)</b> | 2 | 4 | 2 | 4 |

4) 

|             |   |    |    |   |
|-------------|---|----|----|---|
| <b>x</b>    | 0 | 1  | -1 | 0 |
| <b>f(x)</b> | 0 | -1 | 0  | 1 |

499 Which table could represent a function?

1) 

|          |             |
|----------|-------------|
| <b>x</b> | <b>f(x)</b> |
| 1        | 4           |
| 2        | 2           |
| 3        | 4           |
| 2        | 6           |

2) 

|          |             |
|----------|-------------|
| <b>x</b> | <b>g(x)</b> |
| 1        | 2           |
| 2        | 4           |
| 3        | 6           |
| 4        | 2           |

3) 

|          |             |
|----------|-------------|
| <b>x</b> | <b>h(x)</b> |
| 2        | 6           |
| 0        | 4           |
| 1        | 6           |
| 2        | 2           |

4) 

|          |             |
|----------|-------------|
| <b>x</b> | <b>k(x)</b> |
| 2        | 2           |
| 3        | 2           |
| 4        | 6           |
| 3        | 6           |

**Algebra I Regents Exam Questions by State Standard: Topic**

500 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 |

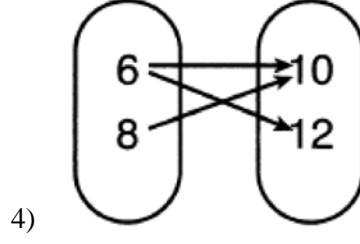
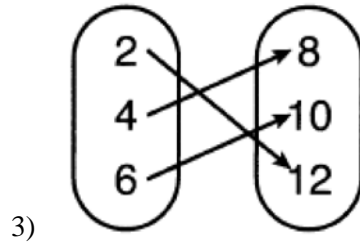
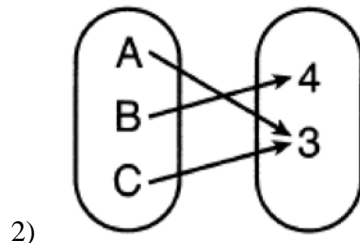
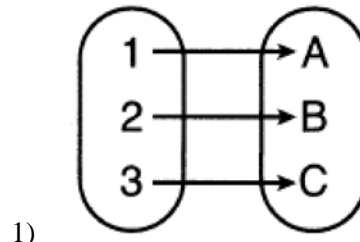
3) 

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

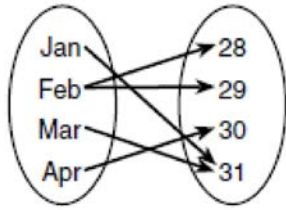
4) 

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

501 Which relation is *not* a function?



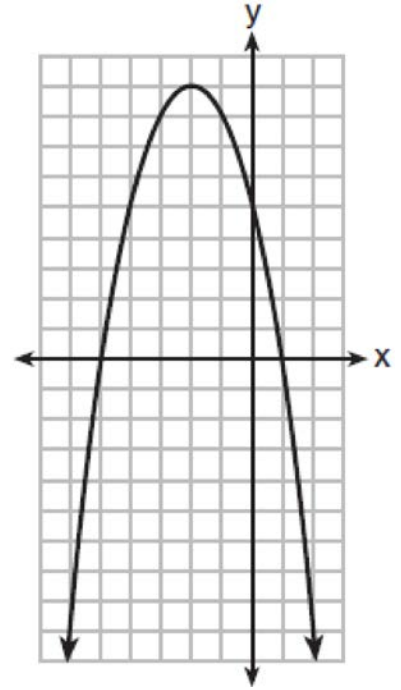
502 A mapping is shown in the diagram below.



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

503 A relation is graphed on the set of axes below.



Based on this graph, the relation is

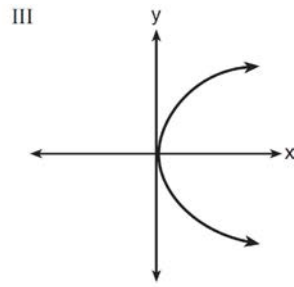
- 1) a function because it passes the horizontal line test
- 2) a function because it passes the vertical line test
- 3) not a function because it fails the horizontal line test
- 4) not a function because it fails the vertical line test



504 Which representations are functions?

I

| x | y   |
|---|-----|
| 2 | 6   |
| 3 | -12 |
| 4 | 7   |
| 5 | 5   |
| 2 | -6  |



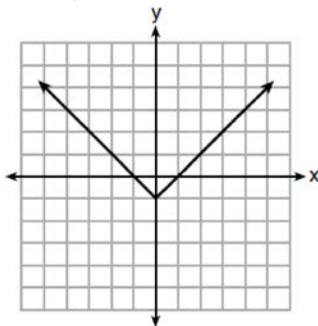
II  $\{(1,1), (2,1), (3,2), (4,3), (5,5), (6,8), (7,13)\}$       IV  $y = 2x + 1$

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

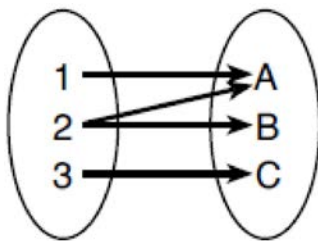
505 Which relation is *not* a function?

| x   | y  |
|-----|----|
| -10 | -2 |
| -6  | 2  |
| -2  | 6  |
| 1   | 9  |
| 5   | 13 |

- 1)
- 2)  $3x + 2y = 4$



3)

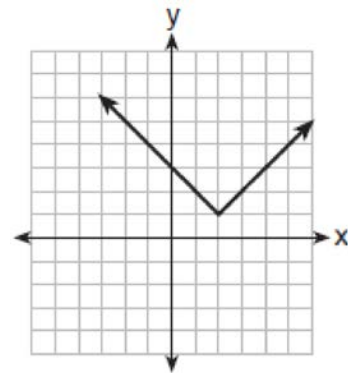


4)

506 Which relation does *not* represent a function?

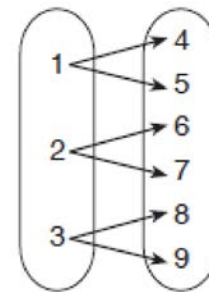
| x | 1   | 2 | 3   | 4 | 5   | 6   |
|---|-----|---|-----|---|-----|-----|
| y | 3.2 | 4 | 5.1 | 6 | 7.4 | 8.8 |

1)



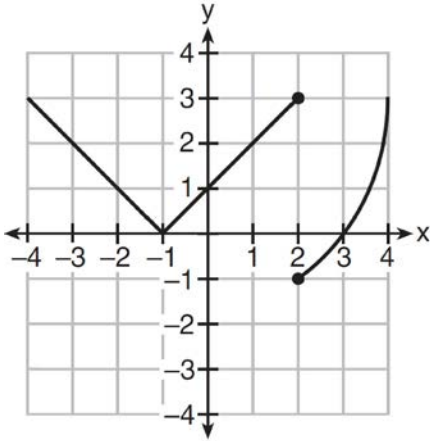
2)

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



4)

507 Marcel claims that the graph below represents a function.



State whether Marcel is correct. Justify your answer.

508 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.

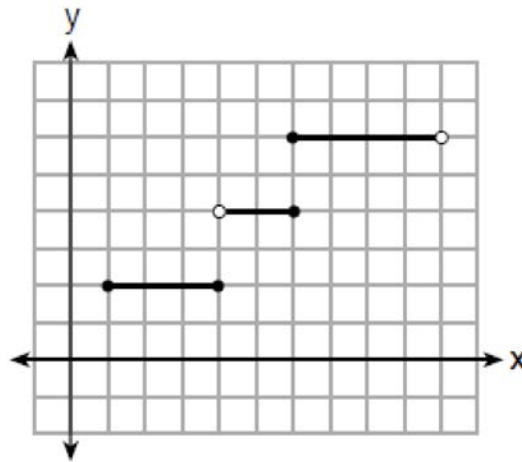
509 Nora says that the graph of a circle is a function because she can trace the whole graph without picking up her pencil. Mia says that a circle graph is *not* a function because multiple values of  $x$  map to the same  $y$ -value. Determine if either one is correct, and justify your answer completely.

510 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.

511 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**

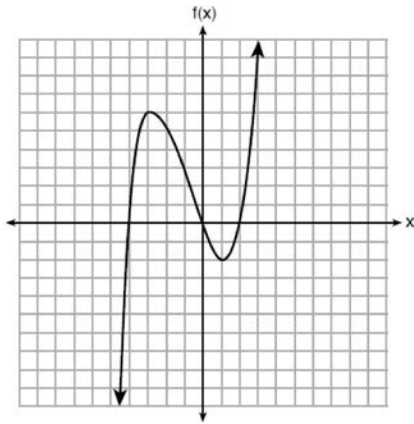
$$y = x^2$$

**IV**

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

F.IF.A.2: FUNCTIONAL NOTATION

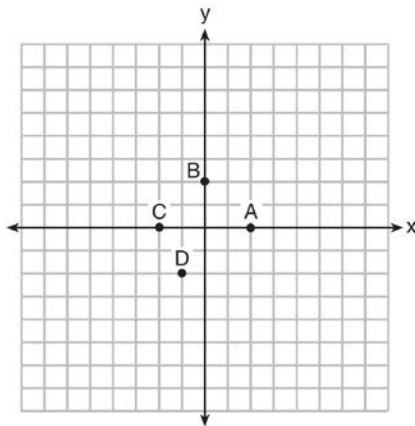
512 The graph of  $f(x)$  is shown below.



What is the value of  $f(-3)$ ?

- 1) 6
- 2) 2
- 3) -2
- 4) -4

513 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

514 If  $f(x) = 4x + 5$ , what is the value of  $f(-3)$ ?

- 1) -2
- 2) -7
- 3) 17
- 4) 4

515 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  $\pm 4$ . Who is correct?

- 1) Lynn, only
- 2) Jude, only
- 3) Anne, only
- 4) Both Lynn and Jude

516 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

517 A function is defined as  $K(x) = 2x^2 - 5x + 3$ . The value of  $K(-3)$  is

- 1) 54
- 2) 36
- 3) 0
- 4) -18

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

- 1)  $f(3) = -2$
- 2)  $f(-2) = 3$
- 3)  $f(-2) = -15$
- 4)  $f(-15) = -2$

519 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

520 If  $f(x) = 2(3^x) + 1$ , what is the value of  $f(2)$ ?

- 1) 13
- 2) 19
- 3) 37
- 4) 54

521 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

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

- 1) 1
- 2) -2
- 3) -1
- 4)  $-\frac{13}{3}$

523 If  $k(x) = 2x^2 - 3\sqrt{x}$ , then  $k(9)$  is

- 1) 315
- 2) 307
- 3) 159
- 4) 153

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

525 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.

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

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.

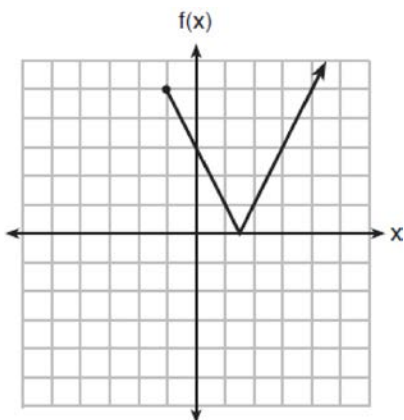
#### F.IF.A.2: EVALUATING FUNCTIONS

526 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

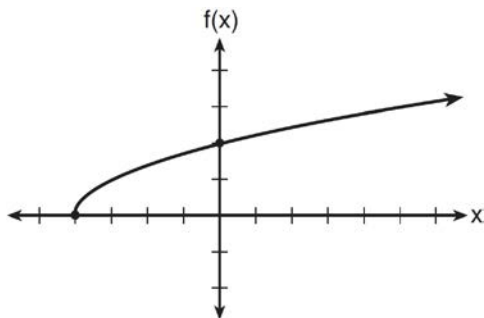
527 The function  $f(x)$  is graphed below.



The domain of this function is

- 1) all positive real numbers
- 2) all positive integers
- 3)  $x \geq 0$
- 4)  $x \geq -1$

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



The domain of the function is

- 1)  $\{x | x > 0\}$
- 2)  $\{x | x \geq 0\}$
- 3)  $\{x | x > -4\}$
- 4)  $\{x | x \geq -4\}$

529 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)  $\{-2, -1, 0, 0, 1, 1, 1, 2, 4, 4\}$

530 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)  $-\infty < y < \infty$

531 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  $f(x) > 0$ .

532 The range of the function  $f(x) = |x + 3| - 5$  is

- 1)  $[-5, \infty)$
- 2)  $(-5, \infty)$
- 3)  $[3, \infty)$
- 4)  $(3, \infty)$

533 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)  $\{0, -1, 1, -16, 16, -81, 81\}$

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

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

535 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)  $\{0, 4, 92\}$

536 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  $-1$

537 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)  $\{-16, -4\}$

538 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)  $[-4.5, \infty)$

539 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

540 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

541 Which domain would be the most appropriate to use for a function that compares the number of emails sent ( $x$ ) to the amount of data used for a cell phone plan ( $y$ )?

- 1) integers
- 2) whole numbers
- 3) rational numbers
- 4) irrational numbers

542 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

- 543 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
- 544 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
- 545 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
- 546 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
- 547 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  $\leq 0$
  - 2) an integer  $\geq 0$
  - 3) a rational number  $\leq 0$
  - 4) a rational number  $\geq 0$
- 548 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)  $\{\dots -2, -1, 0, 1, 2, 3, \dots\}$
  - 2)  $\{-2, -1, 0, 1, 2, 3\}$
  - 3)  $\{0, \frac{1}{2}, 1, 1\frac{1}{2}, 2, 2\frac{1}{2}\}$
  - 4)  $\{0, 1, 2, 3, \dots\}$
- 549 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
- 550 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)  $-3 \leq t \leq 3$
  - 2)  $0 \leq t \leq 3$
  - 3)  $0 \leq h(t) \leq 144$
  - 4) all real numbers



551 A population of paramecia,  $P$ , can be modeled using the exponential function  $P(t) = 3(2)^t$ , where  $t$  is the number of days since the population was first observed. Which domain is most appropriate to use to determine the population over the course of the first two weeks?

- 1)  $t \geq 0$
- 2)  $t \leq 2$
- 3)  $0 \leq t \leq 2$
- 4)  $0 \leq t \leq 14$

F.BF.A.1: OPERATIONS WITH FUNCTIONS

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

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

F.LE.A.1: FAMILIES OF FUNCTIONS

554 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)  $f(x)$
- 2)  $g(x)$
- 3)  $h(x)$
- 4)  $k(x)$

555 Which table of values represents a linear relationship?

1) 

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

2) 

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

3) 

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

4) 

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

556 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

1) 

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

Student 2

2) 

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

Student 3

3) 

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

Student 4

4) 

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

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

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

|  |     |     |     |     |     |     |     |      |      |      |
|--|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>Number of Hours, <math>x</math></b>       | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8    | 9    | 10   |
| <b>Number of Bacteria, <math>B(x)</math></b> | 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.

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

|                       |                          |
|-----------------------|--------------------------|
| <b><math>x</math></b> | <b><math>t(x)</math></b> |
| -3                    | 10                       |
| -1                    | 7.5                      |
| 1                     | 5                        |
| 3                     | 2.5                      |
| 5                     | 0                        |

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

559 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  $n$ th pattern? Explain your answer.

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

|                       |                          |
|-----------------------|--------------------------|
| <b><math>x</math></b> | <b><math>f(x)</math></b> |
| 0                     | 2                        |
| 1                     | 4                        |
| 2                     | 8                        |
| 3                     | 16                       |

State if Caleb is correct. Explain your reasoning.

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

- 561 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.

|                   |     |     |     |     |     |     |
|-------------------|-----|-----|-----|-----|-----|-----|
| <b>Game</b>       | 13  | 14  | 15  | 16  | 17  | 18  |
| <b>Attendance</b> | 348 | 435 | 522 | 609 | 696 | 783 |

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

- 562 The function  $f$  is shown in the table below.

|          |             |
|----------|-------------|
| <b>x</b> | <b>f(x)</b> |
| 0        | 1           |
| 1        | 3           |
| 2        | 9           |
| 3        | 27          |

Which type of function best models the given data?

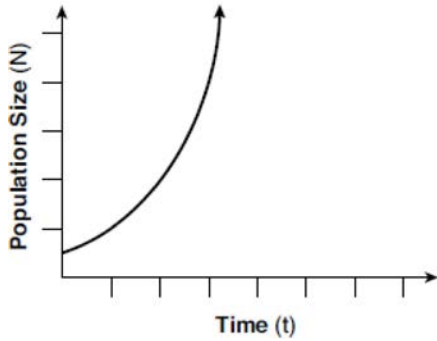
- 1) exponential growth function                      3) linear function with positive rate of change  
 2) exponential decay function                      4) linear function with negative rate of change
- 563 The table below shows the average yearly balance in a savings account where interest is compounded annually. No money is deposited or withdrawn after the initial amount is deposited.

|             |                            |
|-------------|----------------------------|
| <b>Year</b> | <b>Balance, in Dollars</b> |
| 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?

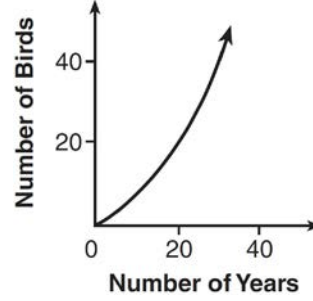
- 1) linear function with a negative rate of change                      3) exponential decay function  
 2) linear function with a positive rate of change                      4) exponential growth function

564 Which type of function is shown in the graph below?

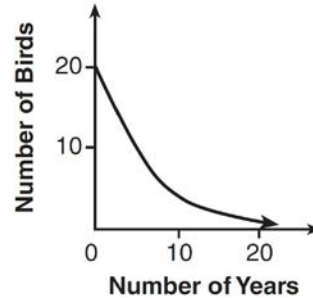


- 1) linear
- 2) exponential
- 3) square root
- 4) absolute value

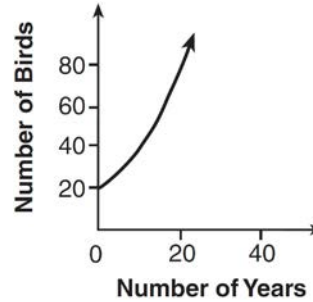
565 A population that initially has 20 birds approximately doubles every 10 years. Which graph represents this population growth?



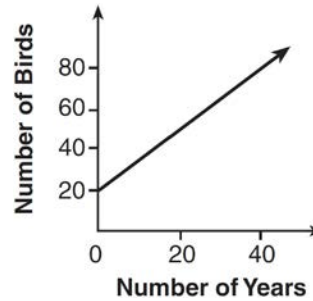
1)



2)



3)



4)

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

- 566 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
- 567 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
- 568 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
- 569 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
- 570 Eric deposits \$500 in a bank account that pays 3.5% interest, compounded yearly. Which type of function should he use to determine how much money he will have in the account at the end of 10 years?
- 1) linear
  - 2) quadratic
  - 3) absolute value
  - 4) exponential
- 571 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
- 572 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.
- 573 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.

- 574 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.
- 575 Which situation could be modeled as a linear equation?
- 1) The value of a car decreases by 10% every year.
  - 2) The number of fish in a lake doubles every 5 years.
  - 3) Two liters of water evaporate from a pool every day.
  - 4) The amount of caffeine in a person's body decreases by  $\frac{1}{3}$  every 2 hours.
- 576 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
- 577 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

F.LE.A.2: FAMILIES OF FUNCTIONS

- 578 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)  $F(x) = 2x + 3$

Algebra I Regents Exam Questions by State Standard: Topic

[www.jmap.org](http://www.jmap.org)

579 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.

|                          |    |        |           |
|--------------------------|----|--------|-----------|
| <b>t</b> (time, in days) | 0  | 2      | 4         |
| <b>f(t)</b> (bacteria)   | 25 | 15,625 | 9,765,625 |

Which function would accurately model the technician's data?

1)  $f(t) = 25^t$

3)  $f(t) = 25t$

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

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

580 Which function is shown in the table below?

| <b>x</b> | <b>f(x)</b>   |
|----------|---------------|
| -2       | $\frac{1}{9}$ |
| -1       | $\frac{1}{3}$ |
| 0        | 1             |
| 1        | 3             |
| 2        | 9             |
| 3        | 27            |

1)  $f(x) = 3x$

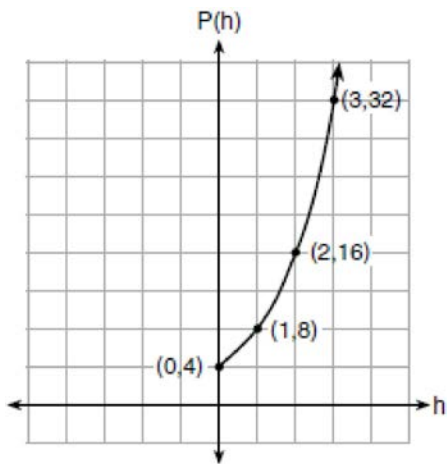
3)  $f(x) = -x^3$

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

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



- 581 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)  $P(h) = \frac{46}{5}h + \frac{6}{5}$
  - 3)  $P(h) = 3h^2 + 0.2h + 4.2$
  - 4)  $P(h) = \frac{2}{3}h^3 - h^2 + 3h + 4$
- 582 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

- 583 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
- 584 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
- 585 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)  $k(x) = 1.5x^3 + 1.5x^2$
- 586 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

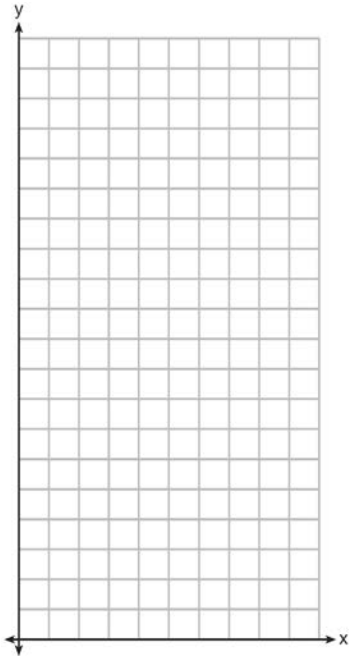
- 587 The table below shows the weights of Liam's pumpkin,  $l(w)$ , and Patricia's pumpkin,  $p(w)$ , over a four-week period where  $w$  represents the number of weeks. Liam's pumpkin grows at a constant rate. Patricia's pumpkin grows at a weekly rate of approximately 52%.

| 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.

588 Graph  $f(x) = x^2$  and  $g(x) = 2^x$  for  $x \geq 0$  on the set of axes below.

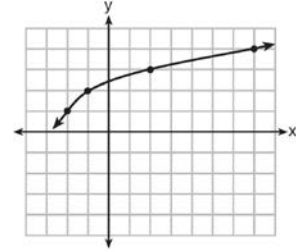


State which function,  $f(x)$  or  $g(x)$ , has a greater value when  $x = 20$ . Justify your reasoning.

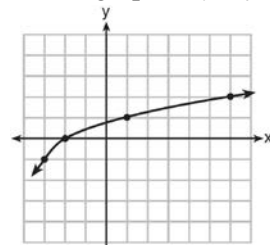
589 Michael has \$10 in his savings account. Option 1 will add \$100 to his account each week. Option 2 will double the amount in his account at the end of each week. Write a function in terms of  $x$  to model each option of saving. Michael wants to have at least \$700 in his account at the end of 7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

F.BF.B.3: TRANSFORMATIONS WITH FUNCTIONS

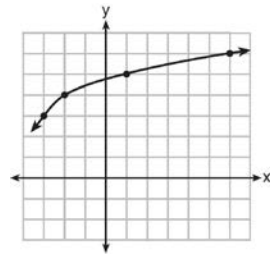
590 The graph of  $y = f(x)$  is shown below.



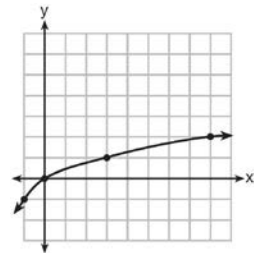
What is the graph of  $y = f(x + 1) - 2$ ?



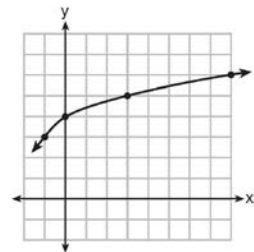
1)



2)

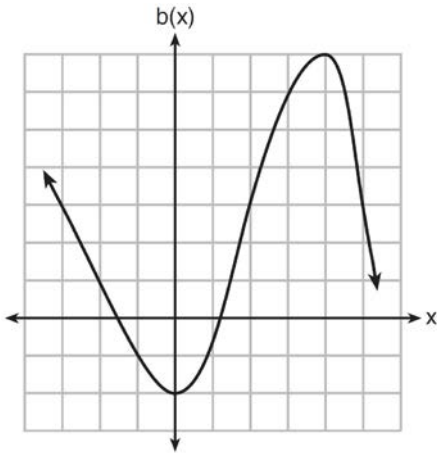


3)



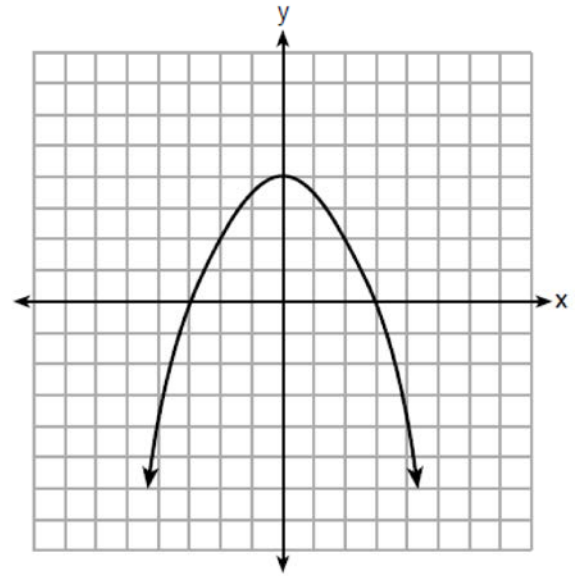
4)

- 591 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  $h(x)$ .

- 592 The graph of the function  $p(x)$  is represented below. On the same set of axes, sketch the function  $p(x + 2)$ .



**F.IF.C.9: COMPARING FUNCTIONS**

- 593 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  $-2$

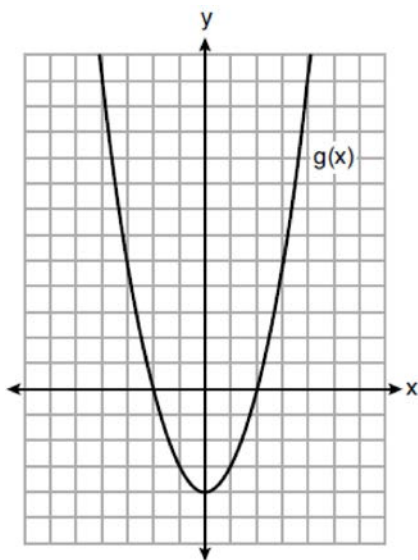


596 Which statement is true about the quadratic functions  $g(x)$ , shown in the table below, and  $f(x) = (x - 3)^2 + 2$ ?

| 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.

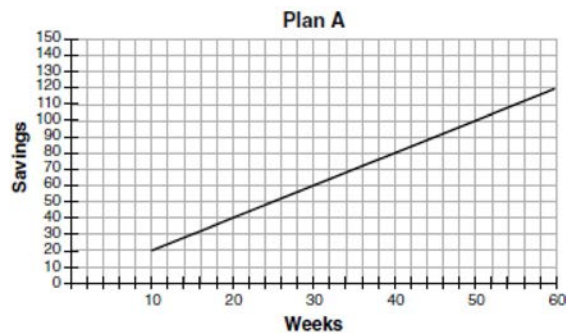
597 Which statement is true about the functions  $f(x)$  and  $g(x)$ , given below?



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

- 1) The minimum value of  $g(x)$  is greater than the maximum value of  $f(x)$ .
- 2)  $f(x)$  and  $g(x)$  have the same y-intercept.
- 3)  $f(x)$  and  $g(x)$  have the same roots.
- 4)  $f(x) = g(x)$  when  $x = -4$ .

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

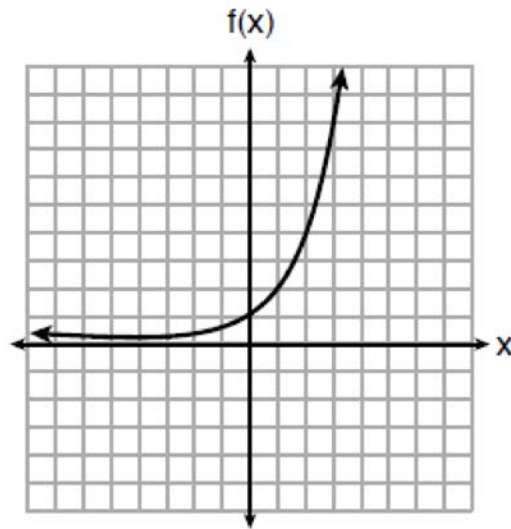


Plan B is represented by the function

$f(x) = 0.01 + 0.05x^2$ , 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

599 Three functions are shown below.



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

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

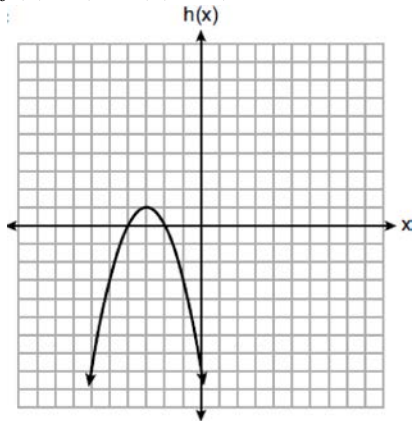
Which statement is true?

- 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  $h(x)$ .

600 Three functions are shown below.

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

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



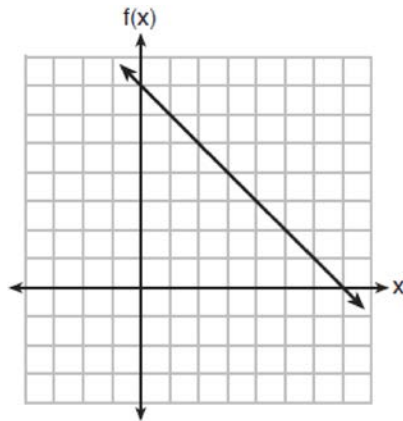
C:

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.



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



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

| <b>x</b> | <b>p(x)</b> |
|----------|-------------|
| 2        | 5           |
| 3        | 4           |
| 4        | 3           |
| 5        | 4           |
| 6        | 5           |

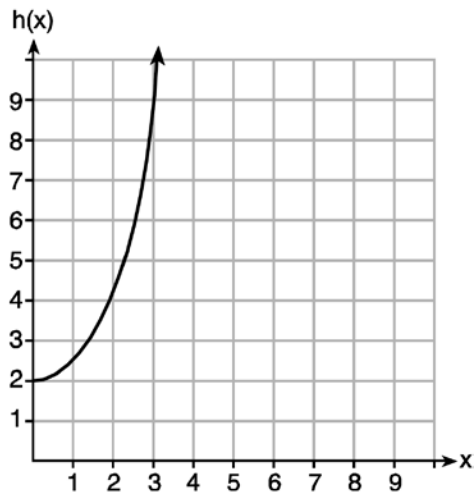
When the input is 4, which functions have the same output value?

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

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

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

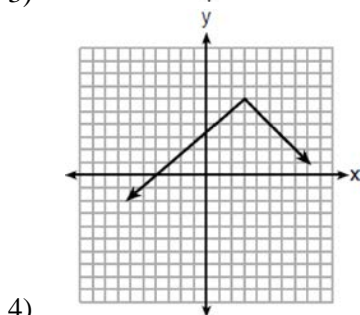
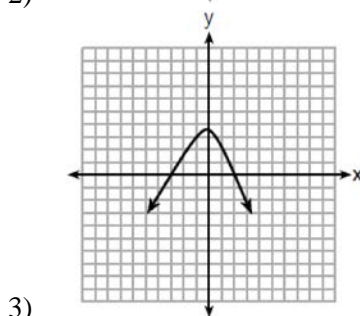
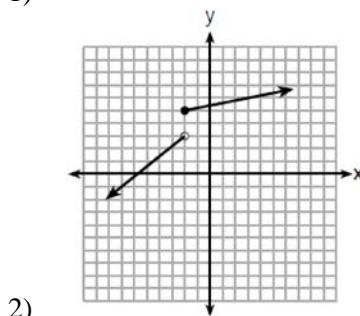
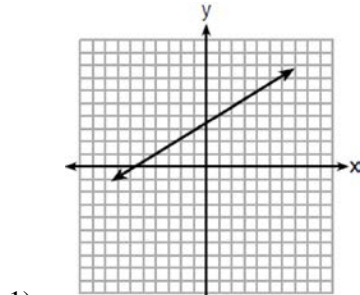
| $x$ | $f(x)$ |
|-----|--------|
| 0   | 1      |
| 1   | 2      |
| 2   | 5      |
| 3   | 7      |



The correct list of functions ordered from greatest to least by average rate of change over the interval  $0 \leq x \leq 3$  is

- 1)  $f(x)$ ,  $g(x)$ ,  $h(x)$
- 2)  $h(x)$ ,  $g(x)$ ,  $f(x)$
- 3)  $g(x)$ ,  $f(x)$ ,  $h(x)$
- 4)  $h(x)$ ,  $f(x)$ ,  $g(x)$

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



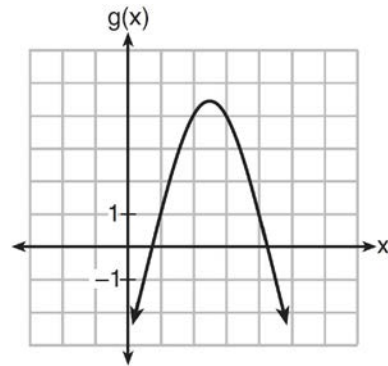
604 Which quadratic function has the largest maximum?

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

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

2)

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

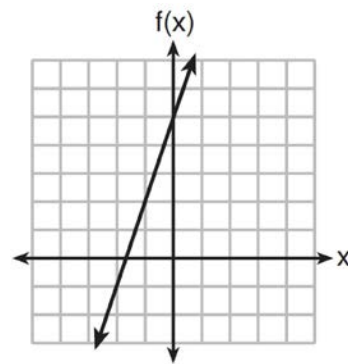


605 Which function has the greatest y-intercept?

1)  $f(x) = 3x$

2)  $2x + 3y = 12$

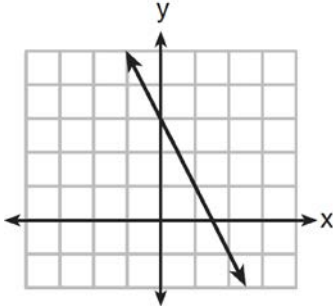
3) the line that has a slope of 2 and passes through  $(1, -4)$



606 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)  $2y = -6x + 10$

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

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

| x  | k(x) |
|----|------|
| -1 | -1   |
| 0  | 3    |
| 1  | 5    |
| 2  | 5    |
| 3  | 3    |
| 4  | -1   |

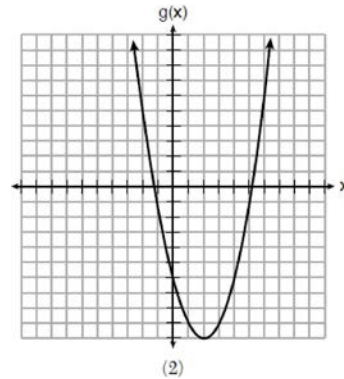
- 2)  
 3)  $g(x) = -(x-5)^2 + 5$

| x  | h(x) |
|----|------|
| -2 | -9   |
| -1 | -3   |
| 0  | 1    |
| 1  | 3    |
| 2  | 3    |
| 3  | 1    |

4)

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

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



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

| x  | f(x) |
|----|------|
| -1 | -2   |
| 0  | -5   |
| 1  | -6   |
| 2  | -5   |
| 3  | -2   |

4)

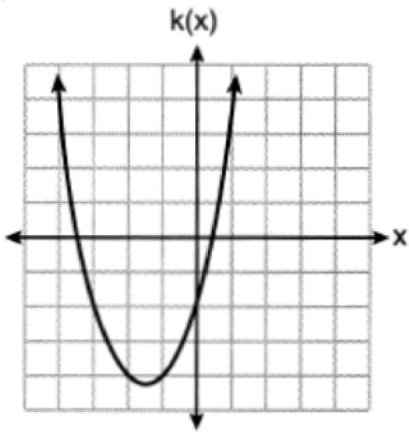
609 Which function has the *smallest* y-intercept?

1)  $g(x) = 2x - 6$

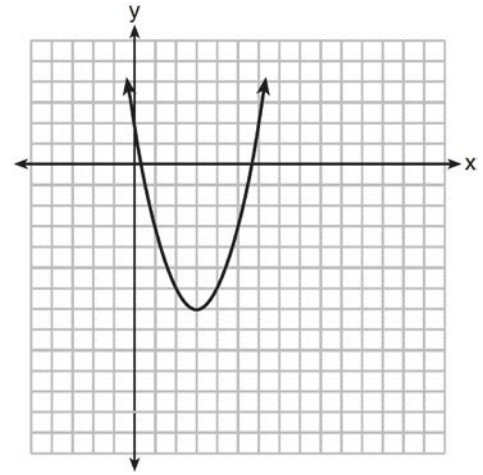
| x  | h(x)          |
|----|---------------|
| -2 | $\frac{1}{4}$ |
| -1 | $\frac{1}{2}$ |
| 0  | 1             |
| 1  | 2             |
| 2  | 4             |

2)

3)  $f(x) = \sqrt{x} - 2$



610 The graph representing a function is shown below.



Which function has a minimum that is *less* than the one shown in the graph?

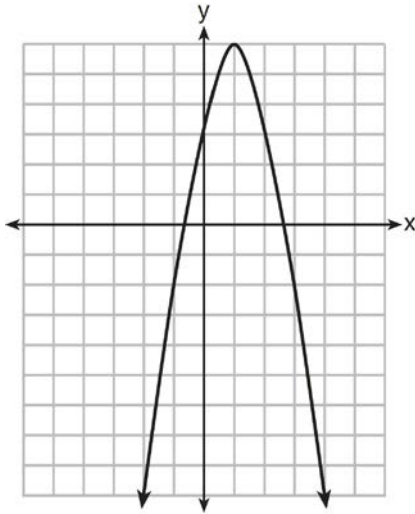
1)  $y = x^2 - 6x + 7$

2)  $y = |x + 3| - 6$

3)  $y = x^2 - 2x - 10$

4)  $y = |x - 8| + 2$

611 Let  $f$  be the function represented by the graph below.

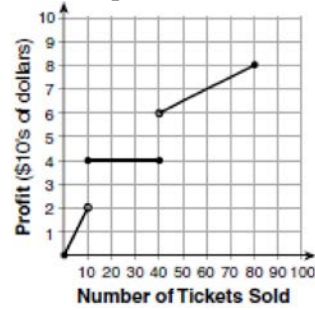


Let  $g$  be a function such that  $g(x) = -\frac{1}{2}x^2 + 4x + 3$ .

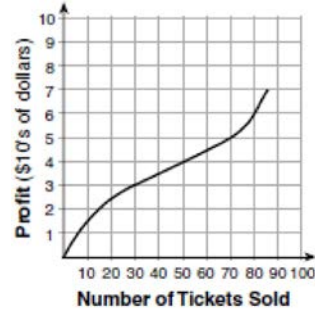
Determine which function has the larger maximum value. Justify your answer.

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

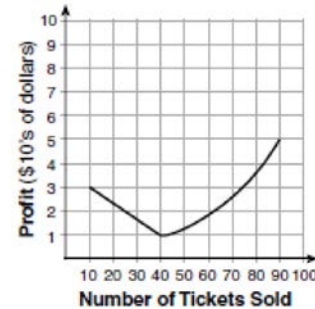
612 To keep track of his profits, the owner of a carnival booth decided to model his ticket sales on a graph. He found that his profits only declined when he sold between 10 and 40 tickets. Which graph could represent his profits?



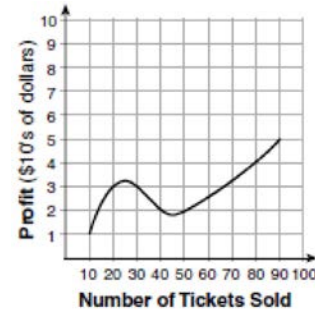
1)



2)

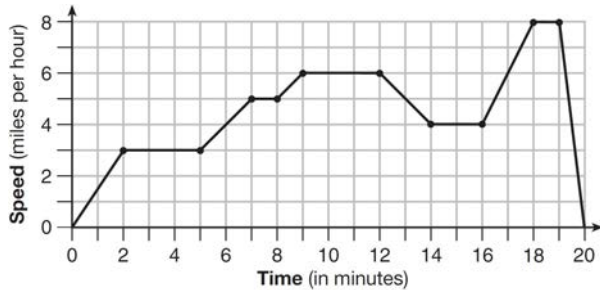


3)



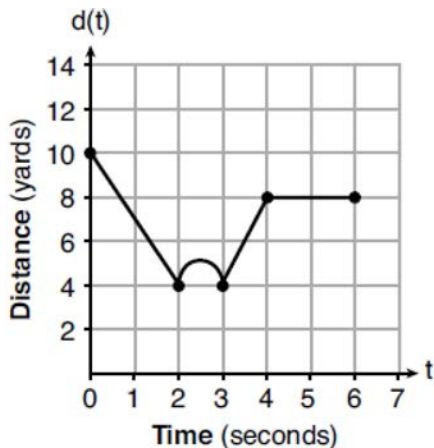
4)

- 613 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?

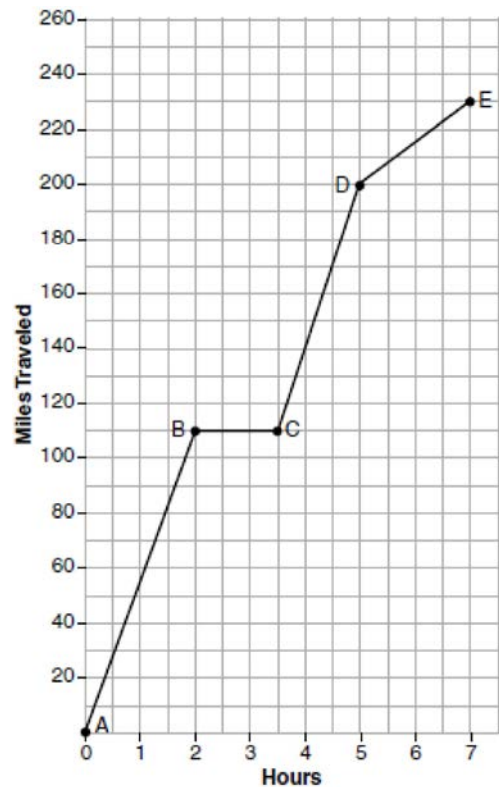
- 1) She was standing still.
  - 2) She was increasing her speed.
  - 3) She was decreasing her speed.
  - 4) She was jogging at a constant rate.
- 614 A child is playing outside. The graph below shows the child's distance,  $d(t)$ , in yards from home over a period of time,  $t$ , in seconds.



Which interval represents the child constantly moving closer to home?

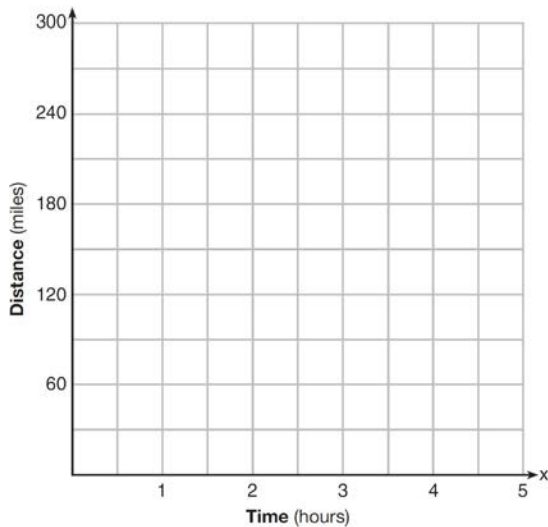
- 1)  $0 \leq t \leq 2$
- 2)  $2 \leq t \leq 3$
- 3)  $3 \leq t \leq 4$
- 4)  $4 \leq t \leq 6$

- 615 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.

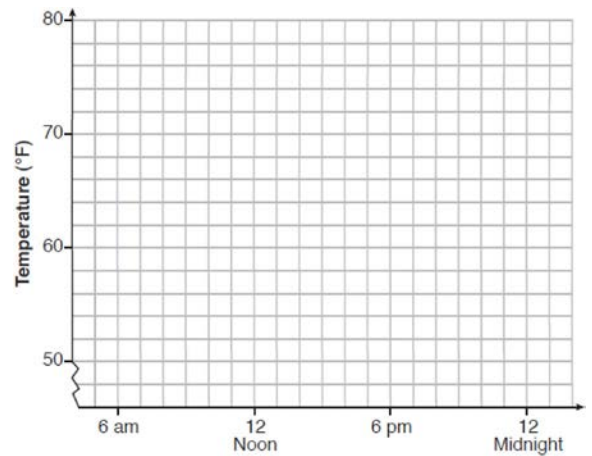
616 A driver leaves home for a business trip and drives at a constant speed of 60 miles per hour for 2 hours. Her car gets a flat tire, and she spends 30 minutes changing the tire. She resumes driving and drives at 30 miles per hour for the remaining one hour until she reaches her destination. On the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



617 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  $50^{\circ}\text{F}$ . For the next 4 hours, the temperature rose  $3^{\circ}$  per hour. The next 6 hours, it rose  $2^{\circ}$  per hour. The temperature then stayed steady until 6 p.m. For the next 2 hours, the temperature dropped  $1^{\circ}$  per hour. The temperature then dropped steadily until the temperature was  $56^{\circ}\text{F}$  at midnight.

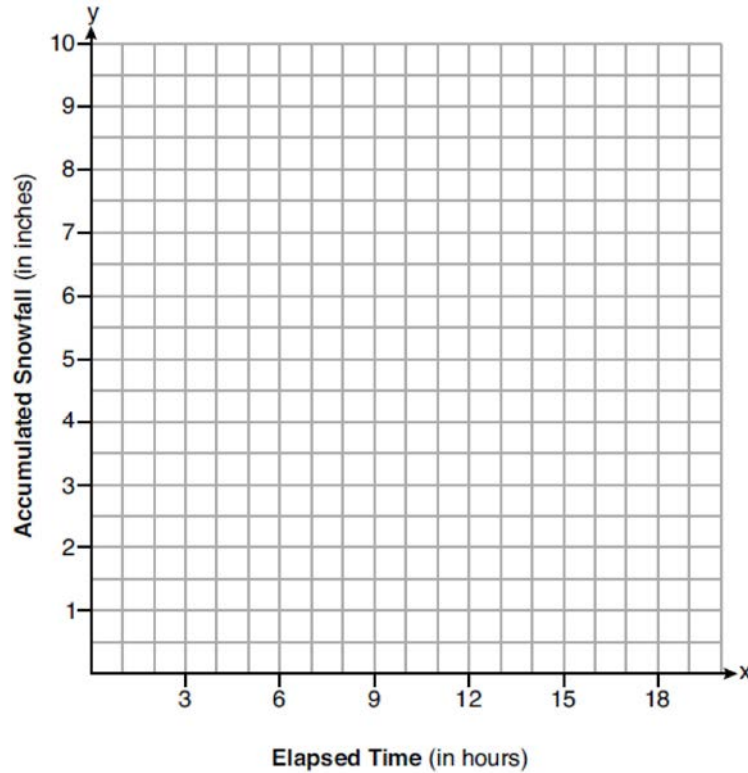
On the set of axes below, graph Elroy's data.



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.

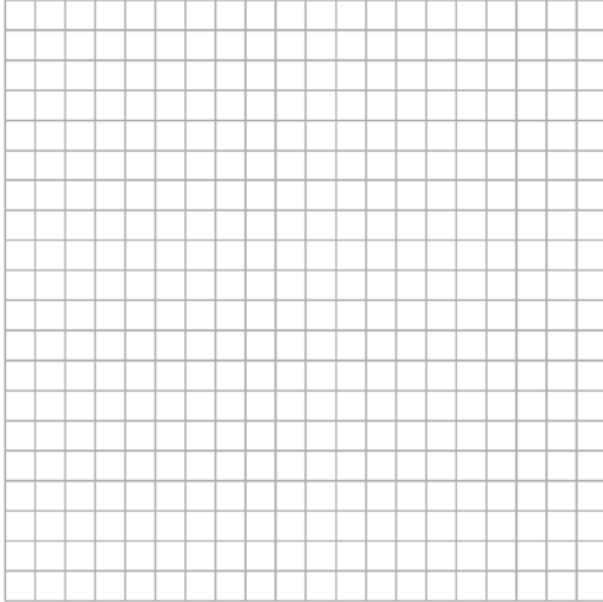


- 618 A snowstorm started at midnight. For the first 4 hours, it snowed at an average rate of one-half inch per hour. The snow then started to fall at an average rate of one inch per hour for the next 6 hours. Then it stopped snowing for 3 hours. Then it started snowing again at an average rate of one-half 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*.

- 619 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.

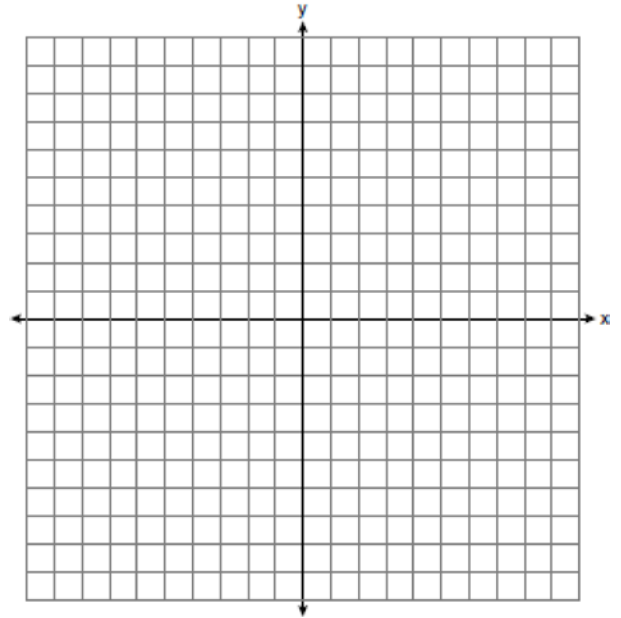


- b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

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

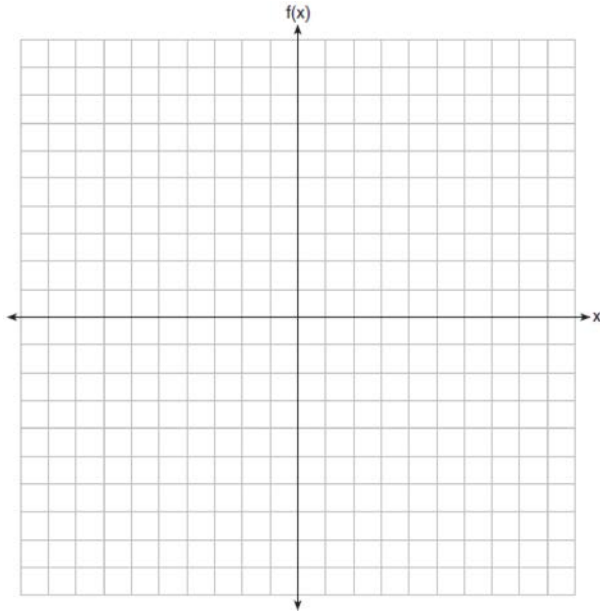
- 620 What is the *minimum* value of the function  $y = |x + 3| - 2$ ?
- 1) -2
  - 2) 2
  - 3) 3
  - 4) -3

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

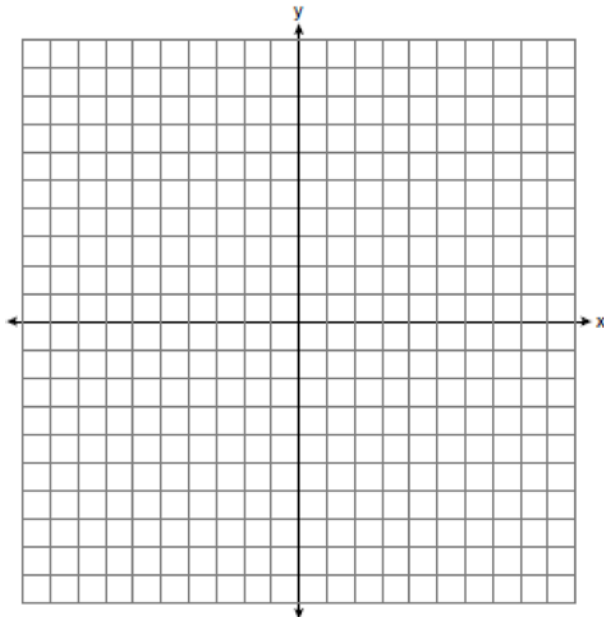


State the range of the function. State the domain over which the function is increasing.

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



623 Graph the function  $f(x) = \left| \frac{1}{2}x + 3 \right|$  over the interval  $-8 \leq x \leq 0$ .



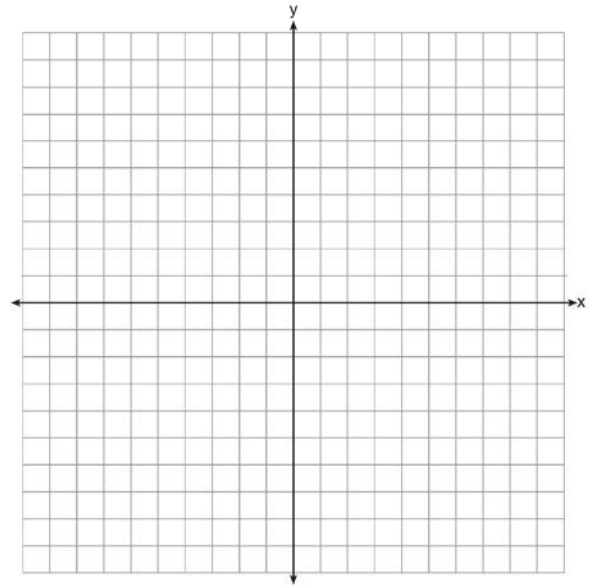
F.BF.B.3: GRAPHING ABSOLUTE VALUE FUNCTIONS

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

$$g(x) = |x - a|$$

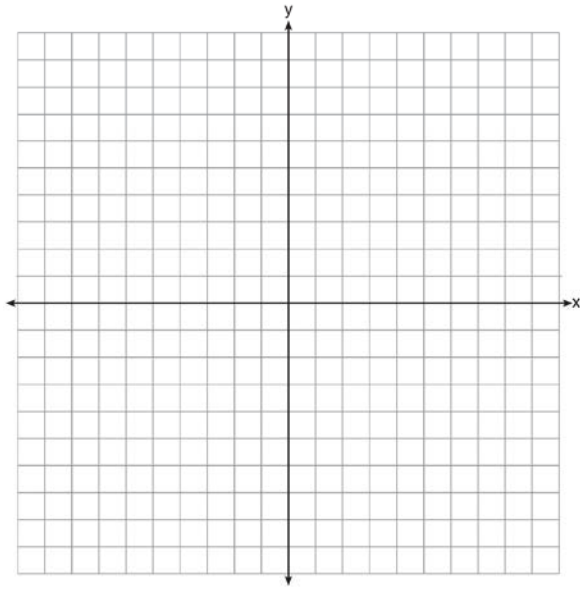
$$h(x) = |x| - a$$

625 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  $h(x)$ ?

626 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  $y = |x|$ .

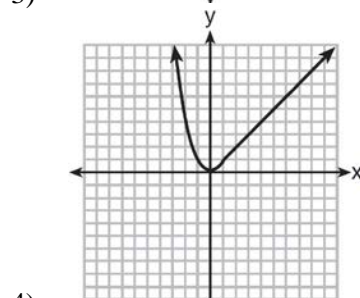
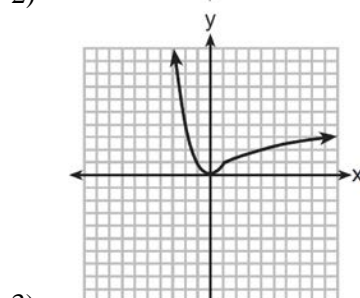
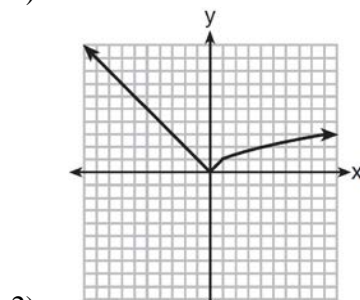
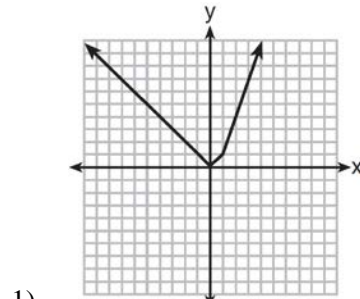
F.IF.C.7: GRAPHING PIECEWISE-DEFINED FUNCTIONS

627 When the function  $g(x) = \begin{cases} 5x, & x \leq 3 \\ x^2 + 4, & x > 3 \end{cases}$  is graphed

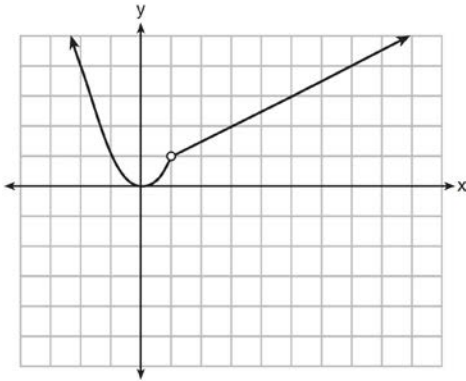
correctly, how should the points be drawn on the graph for an  $x$ -value of 3?

- 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  $(3, 13)$

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



629 A function is graphed on the set of axes below.

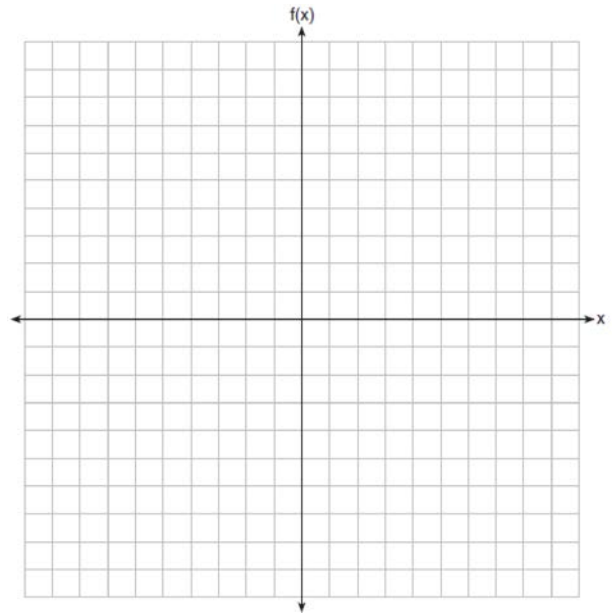


Which function is related to the graph?

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

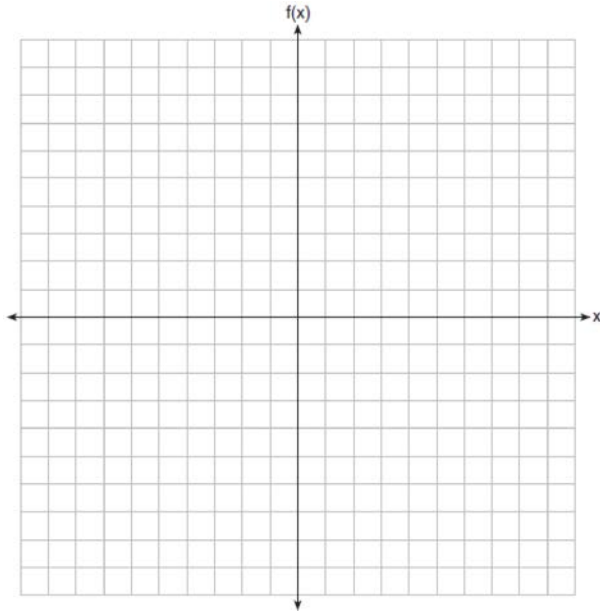
630 On the set of axes below, graph the piecewise function:

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



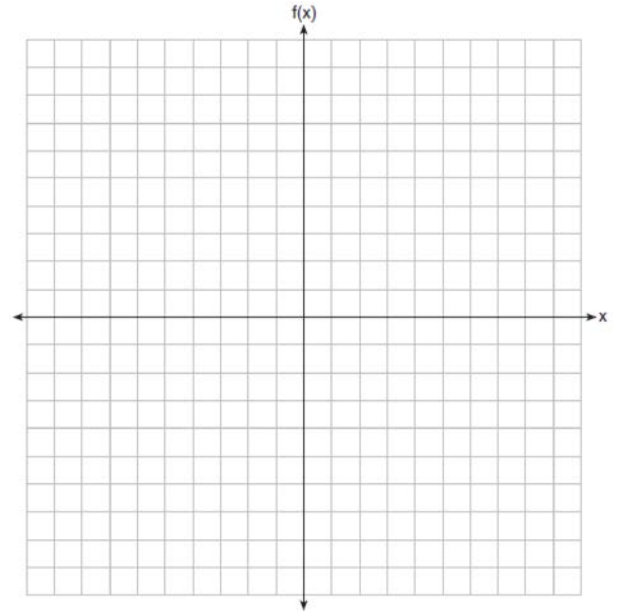
631 Graph the following function on the set of axes below.

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

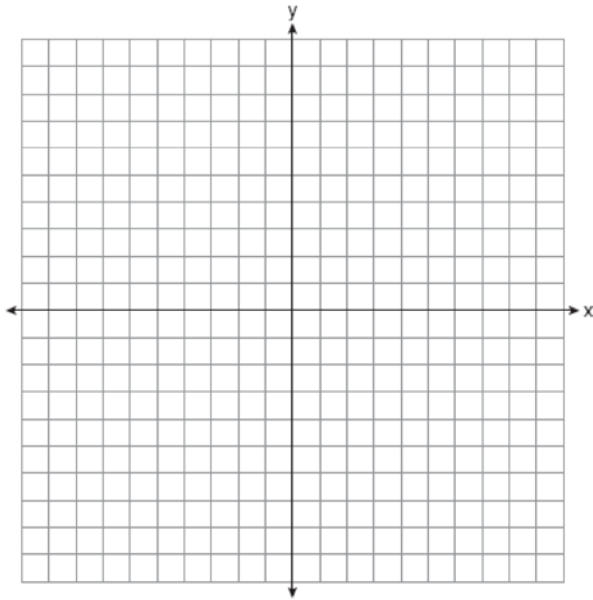


632 Graph the following piecewise function on the set of axes below.

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



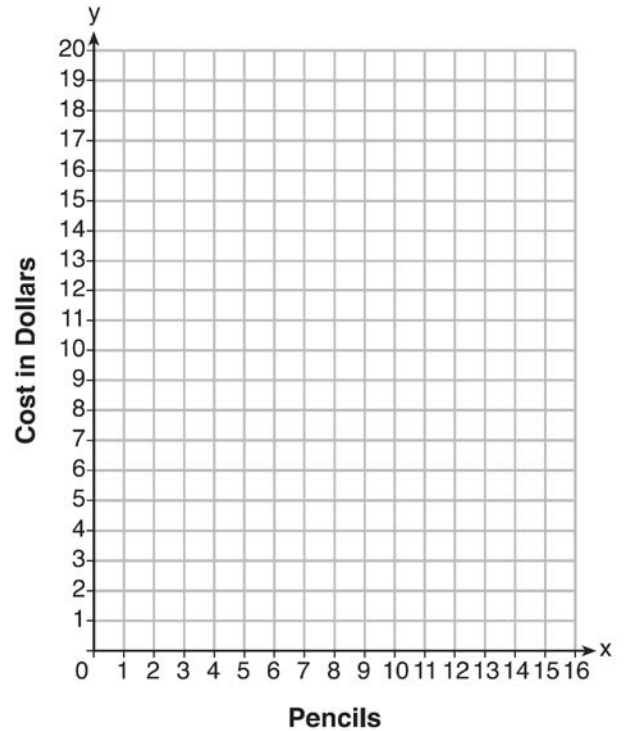
633 Graph the function: 
$$h(x) = \begin{cases} 2x - 3, & x < 0 \\ x^2 - 4x - 5, & 0 \leq x \leq 5 \end{cases}$$



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

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

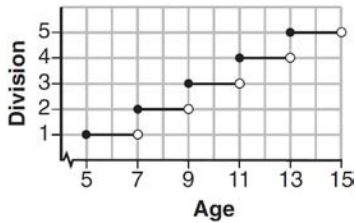
Create a graph of  $c$  on the axes below.



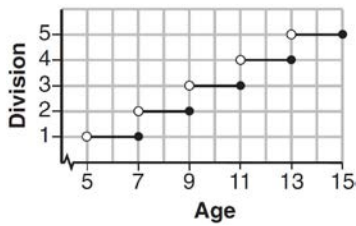
A customer brings 8 pencils to the cashier. The cashier suggests that the total cost to purchase 10 pencils would be less expensive. State whether the cashier is correct or incorrect. Justify your answer.

F.IF.C.7: GRAPHING STEP FUNCTIONS

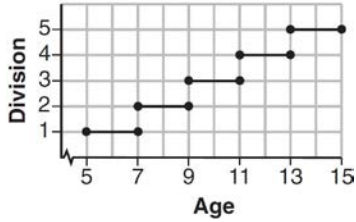
635 Morgan can start wrestling at age 5 in Division 1. He remains in that division until his next odd birthday when he is required to move up to the next division level. Which graph correctly represents this information?



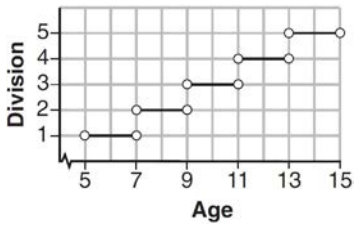
1)



2)



3)



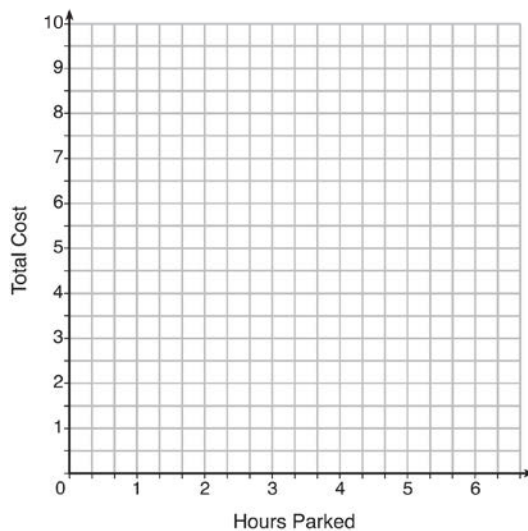
4)



- 636 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

637 Given the following three sequences:

I. 2, 4, 6, 8, 10...

II. 2, 4, 8, 16, 32...

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

638 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

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

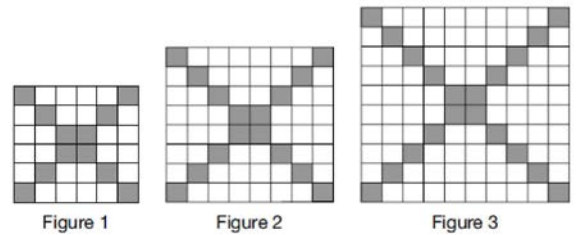
640 In a sequence, the first term is 4 and the common difference is 3. The fifth term of this sequence is

- 1) -11
- 2) -8
- 3) 16
- 4) 19

641 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

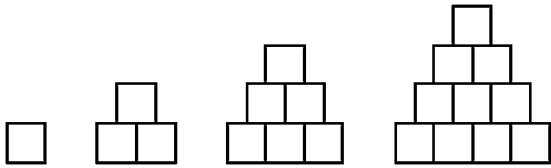
642 The shaded boxes in the figures below represent a sequence.



If figure 1 represents the first term and this pattern continues, how many shaded blocks will be in figure 35?

- 1) 55
- 2) 148
- 3) 420
- 4) 805

- 643 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
- 644 If  $f(1) = 3$  and  $f(n) = -2f(n-1) + 1$ , then  $f(5) =$
- 1) -5  
 2) 11  
 3) 21  
 4) 43
- 645 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

- 646 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)  $\{-10, 50, -250, 1250, \dots\}$
- 647 If  $a_n = n(a_{n-1})$  and  $a_1 = 1$ , what is the value of  $a_5$ ?
- 1) 5  
 2) 20  
 3) 120  
 4) 720

- 648 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

- 649 A recursively defined sequence is shown below.

$$a_1 = 5$$

$$a_{n+1} = 2a_n - 7$$

The value of  $a_4$  is

- 1) -9  
 2) -1  
 3) 8  
 4) 15

- 650 Write the first five terms of the recursive sequence defined below.

$$a_1 = 0$$

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

- 651 Given the recursive formula:

$$a_1 = 3$$

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

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

- 653 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  $n$ th term of this sequence?

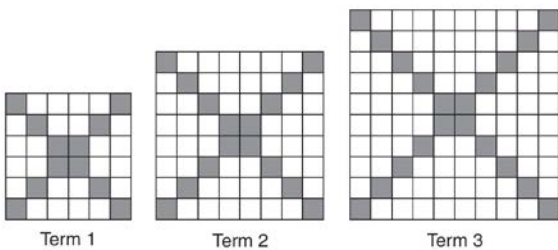
- 1)  $a_n = 8n + 10$
- 2)  $a_n = 8n - 14$
- 3)  $a_n = 16n + 10$
- 4)  $a_n = 16n - 38$

- 654 Which function defines the sequence  $-6, -10, -14, -18, \dots$ , where  $f(6) = -26$ ?

- 1)  $f(x) = -4x - 2$
- 2)  $f(x) = 4x - 2$
- 3)  $f(x) = -x + 32$
- 4)  $f(x) = x - 26$

F.LE.A.2: SEQUENCES

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



Assuming the pattern continues, which formula determines  $a_n$ , the number of shaded squares in the  $n$ th term?

- 1)  $a_n = 4n + 12$
- 2)  $a_n = 4n + 8$
- 3)  $a_n = 4n + 4$
- 4)  $a_n = 4n + 2$

- 655 For the sequence  $-27, -12, 3, 18, \dots$ , the expression that defines the  $n$ th term where  $a_1 = -27$  is

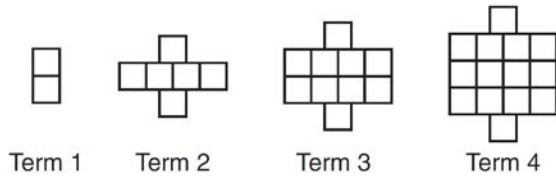
- 1)  $15 - 27n$
- 2)  $15 - 27(n - 1)$
- 3)  $-27 + 15n$
- 4)  $-27 + 15(n - 1)$

- 656 Given: the sequence  $4, 7, 10, 13, \dots$

When using the arithmetic sequence formula  $a_n = a_1 + (n - 1)d$  to determine the 10th term, which variable would be replaced with the number 3?

- 1)  $a_1$
- 2)  $n$
- 3)  $a_n$
- 4)  $d$

657 A pattern of blocks is shown below.



If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the  $n$ th term?

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

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

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



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

659 Given the pattern below, which recursive formula represents the number of triangles in this sequence?

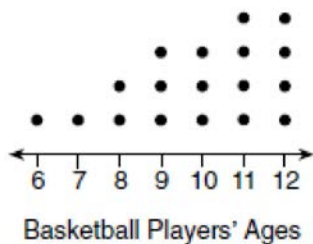
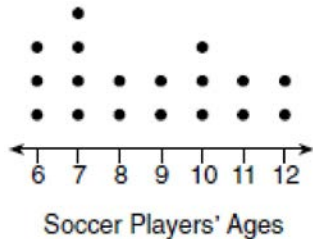


- 1)  $y = 2x + 3$
- 2)  $y = 3x + 2$
- 3)  $a_1 = 2$   
 $a_n = a_{n-1} + 3$
- 4)  $a_1 = 3$   
 $a_n = a_{n-1} + 2$

- 660 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)  $f(1) = 4$   
 $f(x) = 10f(x - 1)$
- 661 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)  $a_1 = 0$ ;  $a_n = 21a_{n-1} + 49$
- 662 Which function could be used to represent the sequence 8, 20, 50, 125, 312.5, . . . , 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)  $a_n = (a_1)(a_{n-1})$
- 663 Which recursively defined function represents the sequence 3, 7, 15, 31, . . . ?
- 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)  $f(1) = 3$ ,  $f(n + 1) = 3f(n) - 2$
- 664 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



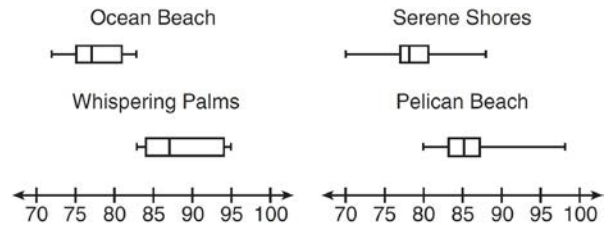
- 667 Noah conducted a survey on sports participation. He created the following two dot plots to represent the number of students participating, by age, in soccer and basketball.



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.

- 668 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

- 669 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.



- 670 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  $B$
- 671 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:

|                   | $\bar{x}$ | $\sigma_x$ | $n$ | min | $Q_1$ | med  | $Q_3$ | max |
|-------------------|-----------|------------|-----|-----|-------|------|-------|-----|
| <b>4th Period</b> | 77.75     | 10.79      | 20  | 58  | 69    | 76.5 | 87.5  | 96  |
| <b>6th Period</b> | 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.

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

|              |    |    |    |    |    |    |    |
|--------------|----|----|----|----|----|----|----|
| <b>Miami</b> | 76 | 75 | 83 | 73 | 60 | 66 | 76 |
|              | 81 | 83 | 85 | 83 | 87 | 80 | 80 |

|                    |    |    |    |    |    |    |    |
|--------------------|----|----|----|----|----|----|----|
| <b>Los Angeles</b> | 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.

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

- 673 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.
- 674 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.
- 675 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.

S.ID.B.5: FREQUENCY TABLES

676 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.

| <b>Age</b> | <b>For</b> | <b>Against</b> | <b>No Opinion</b> |
|------------|------------|----------------|-------------------|
| 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

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

|               | <b>Pizza</b> | <b>Burgers</b> |
|---------------|--------------|----------------|
| <b>Male</b>   | 23           | 42             |
| <b>Female</b> | 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

678 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.

|                      | <b>Hip-Hop</b> | <b>Alternative</b> | <b>Classic Rock</b> |
|----------------------|----------------|--------------------|---------------------|
| <b>Middle School</b> | 28             | 18                 | 4                   |
| <b>High School</b>   | 22             | 22                 | 6                   |
| <b>College</b>       | 16             | 20                 | 14                  |

What percentage of college students prefer classic rock?

- 1) 14%
- 2) 28%
- 3) 33%
- 4) 58%



- 683 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.

|                  | <b>1 Club</b> | <b>2 Clubs</b> | <b>3 or More Clubs</b> |
|------------------|---------------|----------------|------------------------|
| 9 <sup>th</sup>  | 90            | 33             | 12                     |
| 10 <sup>th</sup> | 125           | 12             | 15                     |
| 11 <sup>th</sup> | 87            | 22             | 18                     |
| 12 <sup>th</sup> | 75            | 27             | 23                     |

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

- 684 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.

| <b>Programming Preferences</b> |               |              |
|--------------------------------|---------------|--------------|
|                                | <b>Comedy</b> | <b>Drama</b> |
| <b>Male</b>                    | 70            | 35           |
| <b>Female</b>                  | 48            | 42           |

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

- 685 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.

|                       | <b>Watch Sports</b> | <b>Don't Watch Sports</b> | <b>Total</b> |
|-----------------------|---------------------|---------------------------|--------------|
| <b>Like Pop</b>       |                     |                           |              |
| <b>Don't Like Pop</b> |                     |                           |              |
| <b>Total</b>          |                     |                           |              |

S.ID.A.1: FREQUENCY HISTOGRAMS

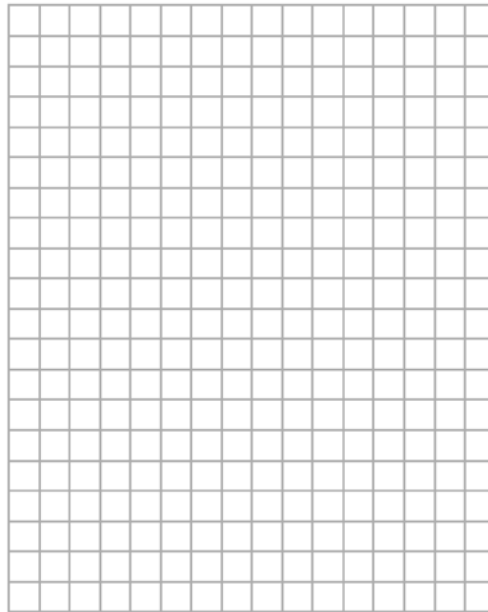
686 The heights, in feet, of former New York Knicks basketball players are listed below.

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.



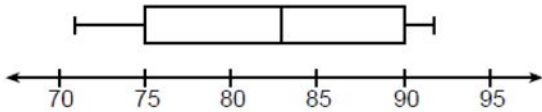
Determine and state which interval contains the upper quartile. Justify your response.

S.ID.A.1: BOX PLOTS

687 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

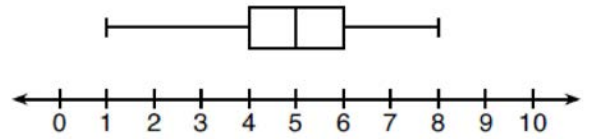
688 The box plot below summarizes the data for the average monthly high temperatures in degrees Fahrenheit for Orlando, Florida.



The third quartile is

- 1) 92
- 2) 90
- 3) 83
- 4) 71

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



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

690 Below are two representations of data.

A: 2,5,5,6,6,6,7,8,9



B:

Which statement about *A* and *B* is true?

- 1) median of *A* > median of *B*
- 2) range of *A* < range of *B*
- 3) upper quartile of *A* < upper quartile of *B*
- 4) lower quartile of *A* > lower quartile of *B*

691 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.

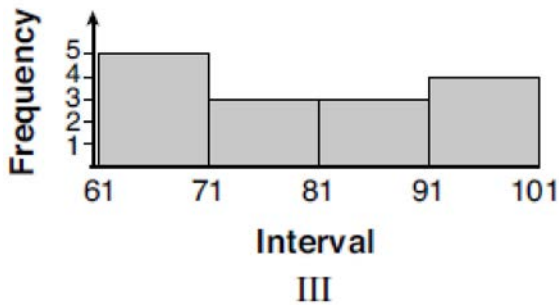
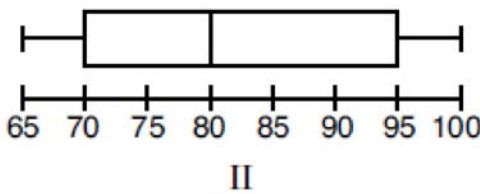
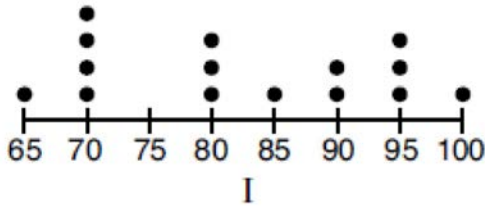


S.ID.A.1: DOT PLOTS

692 Given the following data set:

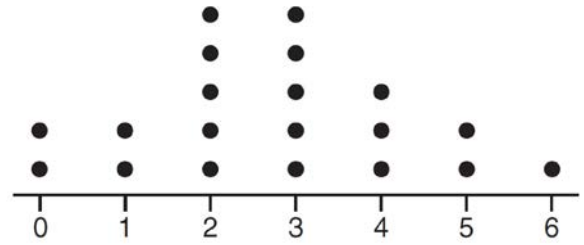
65, 70, 70, 70, 70, 80, 80, 80, 85, 90, 90, 95, 95, 95, 100

Which representations are correct for this data set?



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

693 The dot plot shown below represents the number of pets owned by students in a class.

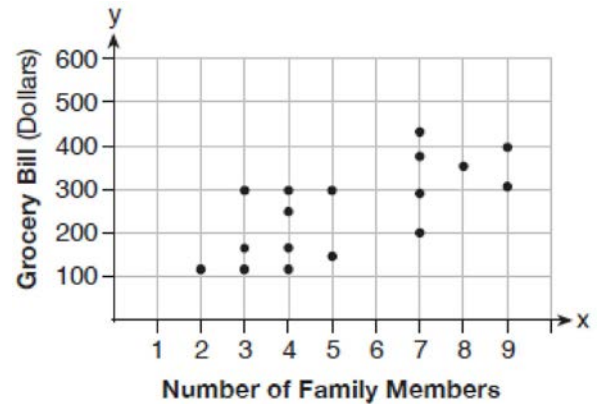


Which statement about the data is *not* true?

- 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

694 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.



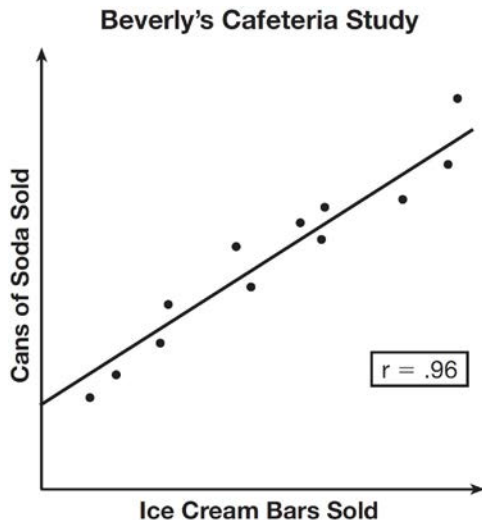
The most appropriate prediction of the grocery bill for a family that consists of six members is

- 1) \$100
- 2) \$300
- 3) \$400
- 4) \$500



S.ID.C.9: ANALYSIS OF DATA

- 695 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

- 696 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

- 697 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.

- 698 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.



- 701 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*.)

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

|   |      |      |      |       |       |     |      |      |      |
|---|------|------|------|-------|-------|-----|------|------|------|
| <b>Median Diameter of Grains of Sand, in Millimeters (<math>x</math>)</b> | 0.17 | 0.19 | 0.22 | 0.235 | 0.235 | 0.3 | 0.35 | 0.42 | 0.85 |
| <b>Slope of Beach, in Degrees (<math>y</math>)</b>                        | 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.

- 703 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.

|                            |    |    |    |    |    |
|----------------------------|----|----|----|----|----|
| <b>Number of Knots</b>     | 4  | 5  | 6  | 7  | 8  |
| <b>Length of Rope (cm)</b> | 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.

- 704 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.

- 705 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.

- 706 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.

- 707 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.

|                    |     |    |    |     |     |    |    |    |    |    |     |     |
|--------------------|-----|----|----|-----|-----|----|----|----|----|----|-----|-----|
| <b>Mass (kg)</b>   | 4.5 | 5  | 4  | 3.5 | 5.5 | 5  | 5  | 4  | 4  | 6  | 3.5 | 5.5 |
| <b>Height (cm)</b> | 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.

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

|  |    |    |    |    |    |    |    |    |    |    |
|--|----|----|----|----|----|----|----|----|----|----|
| <b>Hours Spent Studying (<math>x</math>)</b> | 0  | 1  | 2  | 4  | 4  | 4  | 6  | 6  | 7  | 8  |
| <b>Test Scores (<math>y</math>)</b>          | 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.

- 709 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.

|  |     |     |     |     |     |     |     |     |     |     |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>Distance From Times Square (city blocks) (<math>x</math>)</b> | 0   | 0   | 1   | 1   | 3   | 4   | 7   | 11  | 14  | 19  |
| <b>Cost of a Room (dollars) (<math>y</math>)</b>                 | 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.

- 710 The following table represents a sample of sale prices, in thousands of dollars, and number of new homes available at that price in 2017.

| <b>Sale Price, <math>p</math></b><br>(in thousands of dollars) | 160 | 180 | 200 | 220 | 240 | 260 | 280 |
|--|-----|-----|-----|-----|-----|-----|-----|
| <b>Number of New Homes Available</b><br>$f(p)$                 | 126 | 103 | 82  | 75  | 82  | 40  | 20  |

State the linear regression function,  $f(p)$ , that estimates the number of new homes available at a specific sale price,  $p$ . Round all values to the *nearest hundredth*. State the correlation coefficient of the data to the *nearest hundredth*. Explain what this means in the context of the problem.

- 711 Joey recorded his heart rate, in beats per minute (bpm), after doing different numbers of jumping jacks. His results are shown in the table below.

| <b>Number of Jumping Jacks</b><br><b><math>x</math></b> | <b>Heart Rate</b><br>(bpm)<br><b><math>y</math></b> |
|---|---|
| 0   | 68  |
| 10  | 84  |
| 15  | 104   |
| 20  | 100   |
| 30  | 120   |

State the linear regression equation that estimates the heart rate per number of jumping jacks. State the correlation coefficient of the linear regression equation, rounded to the *nearest hundredth*. Explain what the correlation coefficient suggests in the context of this problem.

- 712 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.

| <b>Number of Weeks</b>     | 1   | 2   | 3   | 4   |
|----------------------------|-----|-----|-----|-----|
| <b>Number of Downloads</b> | 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.

- 713 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

- 714 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.

- 715 The results of a linear regression are shown below.

$$y = ax + b$$

$$a = -1.15785$$

$$b = 139.3171772$$

$$r = -0.896557832$$

$$r^2 = 0.8038159461$$

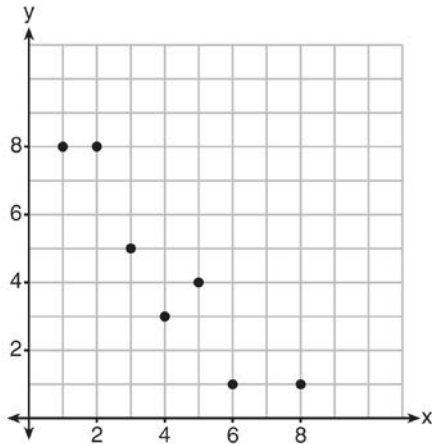
Which phrase best describes the relationship between  $x$  and  $y$ ?

- 1) strong negative correlation
- 2) strong positive correlation
- 3) weak negative correlation
- 4) weak positive correlation

716 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?

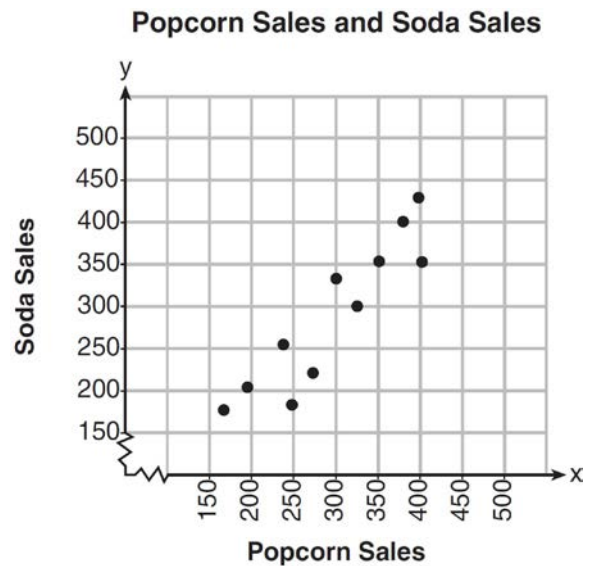
- 1) 0.9
- 2) 0.5
- 3) -0.3
- 4) -0.8

717 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

718 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.



Which conclusion can be drawn from the scatterplot?

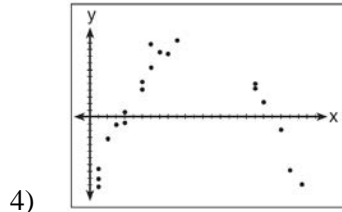
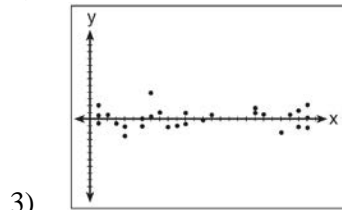
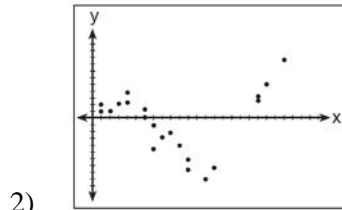
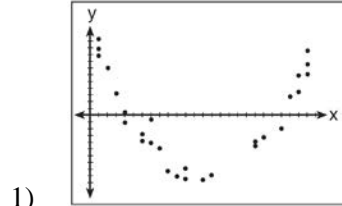
- 1) There is a negative correlation between popcorn sales and soda sales.
- 2) There is a positive correlation between popcorn sales and soda sales.
- 3) There is no correlation between popcorn sales and soda sales.
- 4) Buying popcorn causes people to buy soda.





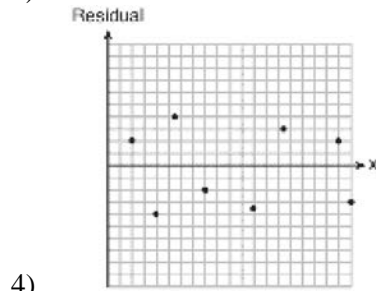
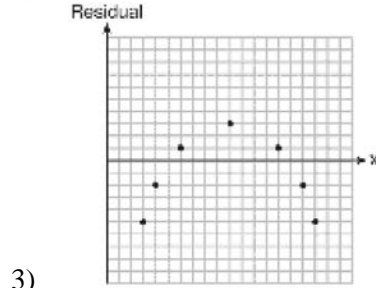
S.ID.B.6: RESIDUALS

722 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?

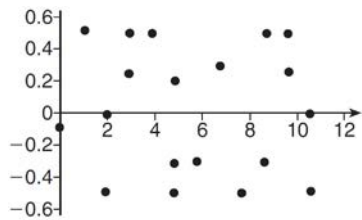


723 Which statistic would indicate that a linear function would *not* be a good fit to model a data set?

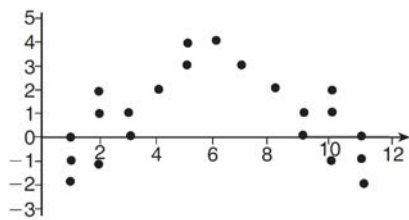
- 1)  $r = -0.93$
- 2)  $r = 1$



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



Graph A



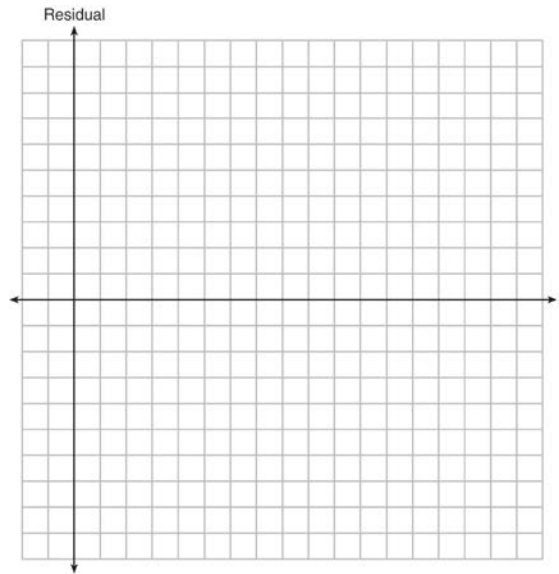
Graph B

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

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

|                 |   |   |    |    |    |    |    |   |   |    |
|-----------------|---|---|----|----|----|----|----|---|---|----|
| $x$             | 2 | 3 | 3  | 4  | 6  | 7  | 8  | 9 | 9 | 10 |
| <b>Residual</b> | 2 | 1 | -1 | -2 | -3 | -2 | -1 | 2 | 0 | 3  |

Plot these residuals on the set of axes below.



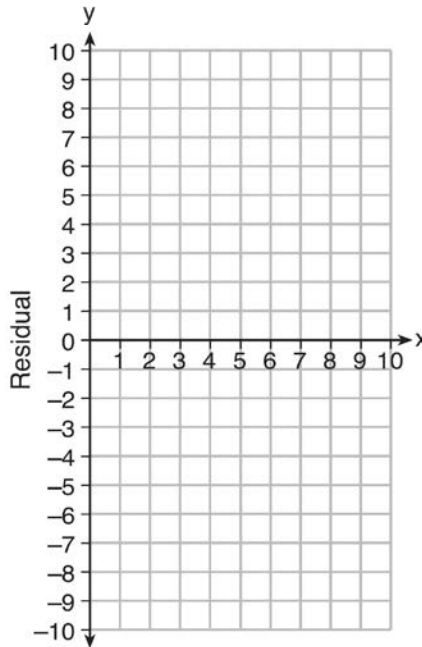
Using the plot, assess the fit of the line for these residuals and justify your answer.

726 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*.

| <b>Tutor Hours, <math>x</math></b> | <b>Raw Test Score</b> | <b>Residual (Actual-Predicted)</b> |
|------------------------------------|-----------------------|------------------------------------|
| 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: 2 REF: 061702ai NAT: A.SSE.A.1 TOP: Dependent and Independent Variables
- 2 ANS: 4 REF: 081503ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 3 ANS: 4 REF: 011718ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 4 ANS: 2 REF: 081712ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 5 ANS: 3 REF: 081901ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 6 ANS: 4 REF: 061602ia NAT: A.SSE.A.1 TOP: Modeling Expressions
- 7 ANS: 3 REF: 061819ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 8 ANS: 1 REF: 061905ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 9 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
- 10 ANS: 4  
 $4x^3 + x^2 + 2x$
- REF: 012024ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 11 ANS: 4  
 $3x^4 - 4x^2 - 4$
- REF: 062122ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 12 ANS:  
 No,  $-2$  is the coefficient of the term with the highest power.
- REF: 081628ai NAT: A.SSE.A.1 TOP: Modeling Expressions
- 13 ANS: 1 REF: 061401ai NAT: A.REI.A.1 TOP: Identifying Properties
- 14 ANS: 4 REF: 081701ai NAT: A.REI.A.1 TOP: Identifying Properties
- 15 ANS: 4 REF: 011801ai NAT: A.REI.A.1 TOP: Identifying Properties
- 16 ANS: 4 REF: 011908ai NAT: A.REI.A.1 TOP: Identifying Properties
- 17 ANS: 4 REF: 061909ai NAT: A.REI.A.1 TOP: Identifying Properties
- 18 ANS:  
 Distributive and Addition Property of Equality
- REF: 012029ai NAT: A.REI.A.1 TOP: Identifying Properties
- 19 ANS:  
 Commutative. This property is correct because  $x + y = y + x$ .
- REF: 081926ai NAT: A.REI.A.1 TOP: Identifying Properties

20 ANS: 2  
 $-2 + 8x = 3x + 8$   
 $5x = 10$   
 $x = 2$

REF: 081804ai NAT: A.REI.B.3 TOP: Solving Linear Equations  
 KEY: integral expressions

21 ANS: 4  
 $3x - 24 + 4x = 8x + 4$   
 $7x - 24 = 8x + 4$   
 $-28 = x$

REF: 062106ai NAT: A.REI.B.3 TOP: Solving Linear Equations  
 KEY: integral expressions

22 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

23 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

24 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

25 ANS: 2

$$6\left(\frac{5}{6}\left(\frac{3}{8} - x\right)\right) = 16$$

$$8\left(5\left(\frac{3}{8} - x\right)\right) = 96$$

$$15 - 40x = 768$$

$$-40x = 753$$

$$x = -18.825$$

REF: 081713ai NAT: A.REI.B.3 TOP: Solving Linear Equations

KEY: fractional expressions

26 ANS: 4

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

$$10(3x - 24) = 3(16x - 12)$$

$$30x - 240 = 48x - 36$$

$$-204 = 18x$$

$$x = -11.\bar{3}$$

REF: 011822ai NAT: A.REI.B.3 TOP: Solving Linear Equations

KEY: fractional expressions



27 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

28 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

29 ANS: 2

$$\frac{x-3}{4} + \frac{8}{12} = \frac{17}{12}$$

$$\frac{x-3}{4} = \frac{9}{12}$$

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

$$x - 3 = 3$$

$$x = 6$$

REF: 012005ai NAT: A.REI.B.3 TOP: Solving Linear Equations

KEY: fractional expressions

30 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

31 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

32 ANS: 3 REF: 081614ai NAT: A.CED.A.1 TOP: Modeling Linear Equations

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

34 ANS: 3 REF: 081616ai NAT: A.CED.A.1 TOP: Modeling Linear Equations

35 ANS: 2 REF: 061915ai NAT: A.CED.A.1 TOP: Modeling Linear Equations

36 ANS:

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

$$5x = 12$$

$$x = 2.4$$

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

37 ANS:

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

$$45x = 15$$

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

REF: spr1305ai NAT: A.CED.A.1 TOP: Modeling Linear Equations

38 ANS:

$$1.25x + 0.55(x+4) + 0.75(x-2) = 16 \quad 1.25x + 0.55x + 2.2 + 0.75x - 1.5 = 16$$

$$2.55x + 0.7 = 16$$

$$2.55x = 15.3$$

$$x = 6$$

REF: 062134ai NAT: A.CED.A.1 TOP: Modeling Linear Equations

39 ANS:

$$1000 - 60x = 600 - 20x. \quad 1000 - 60(10) = 400. \quad \text{Ian is incorrect because } I = 1000 - 6(16) = 40 \neq 0$$

$$40x = 400$$

$$x = 10$$

REF: 011737ai NAT: A.CED.A.1 TOP: Modeling Linear Equations

40 ANS: 4 REF: 061422ai NAT: A.CED.A.2 TOP: Modeling Linear Equations

41 ANS: 4 REF: 081508ai NAT: A.CED.A.2 TOP: Modeling Linear Equations

42 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

43 ANS: 3 REF: 011606ai NAT: A.CED.A.4 TOP: Transforming Formulas

44 ANS: 3 REF: 011704ai NAT: A.CED.A.4 TOP: Transforming Formulas

45 ANS: 3 REF: 061723ai NAT: A.CED.A.4 TOP: Transforming Formulas

46 ANS: 4 REF: 061823ai NAT: A.CED.A.4 TOP: Transforming Formulas

47 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

48 ANS: 1 REF: 011516ai NAT: A.CED.A.4 TOP: Transforming Formulas

49 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

50 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

51 ANS:

$$4ax + 12 - 3ax = 25 + 3a$$

$$ax = 13 + 3a$$

$$x = \frac{13 + 3a}{a}$$

REF: 081632ai NAT: A.CED.A.4 TOP: Transforming Formulas

52 ANS:

$$2S = n(a + b)$$

$$\frac{2S}{n} = a + b$$

$$\frac{2S}{n} - a = b$$

REF: 012032ai NAT: A.CED.A.4 TOP: Transforming Formulas

53 ANS:

$$\frac{S}{180} = n - 2$$

$$\frac{S}{180} + 2 = n$$

REF: 061631ai NAT: A.CED.A.4 TOP: Transforming Formulas

54 ANS:

$$9C = 5F - 160$$

$$F = \frac{9C + 160}{5}$$

REF: 062131ai NAT: A.CED.A.4 TOP: Transforming Formulas

55 ANS:

$$9K = 5F + 2298.35$$

$$F = \frac{9K - 2298.35}{5}$$

REF: 081829ai NAT: A.CED.A.4 TOP: Transforming Formulas

56 ANS:

$$at = v_f - v_i$$

$$at + v_i = v_f$$

REF: 081928ai NAT: A.CED.A.4 TOP: Transforming Formulas

57 ANS:

$$F_g = \frac{GM_1M_2}{r^2}$$

$$r^2 = \frac{GM_1M_2}{F_g}$$

$$r = \sqrt{\frac{GM_1M_2}{F_g}}$$

REF: 011830ai NAT: A.CED.A.4 TOP: Transforming Formulas

58 ANS:

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

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

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

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

59 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

60 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

61 ANS:

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

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

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

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

62 ANS: 3 REF: 081812ai NAT: N.Q.A.1 TOP: Conversions

KEY: dimensional analysis

63 ANS: 2 REF: 011502ai NAT: N.Q.A.1 TOP: Conversions

KEY: dimensional analysis

64 ANS: 4 REF: 061720ai NAT: N.Q.A.1 TOP: Conversions

KEY: dimensional analysis

65 ANS: 4 REF: 011924ai NAT: N.Q.A.1 TOP: Conversions

KEY: dimensional analysis

66 ANS: 1

$$C(68) = \frac{5}{9}(68 - 32) = 20$$

REF: 011710ai NAT: N.Q.A.1 TOP: Conversions KEY: formula

67 ANS: 1

$$12.5 \text{ sec} \times \frac{1 \text{ min}}{60 \text{ sec}} = 0.208\bar{3} \text{ min}$$

REF: 061608ai NAT: N.Q.A.1 TOP: Conversions KEY: dimensional analysis

68 ANS: 1

$$\text{I. } 10 \text{ mi} \left( \frac{1.609 \text{ km}}{1 \text{ mi}} \right) = 16.09 \text{ km}; \quad \text{II. } 44880 \text{ ft} \left( \frac{1 \text{ mi}}{5280 \text{ ft}} \right) \left( \frac{1.609 \text{ km}}{1 \text{ mi}} \right) \approx 13.6765 \text{ km}; \quad \text{III.}$$

$$15560 \text{ yd} \left( \frac{3 \text{ ft}}{1 \text{ yd}} \right) \left( \frac{1 \text{ mi}}{5280 \text{ ft}} \right) \left( \frac{1.609 \text{ km}}{1 \text{ mi}} \right) \approx 14.225 \text{ km}$$

REF: 061815ai NAT: N.Q.A.1 TOP: Conversions KEY: dimensional analysis

69 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

70 ANS: 2

$$\frac{22.7 \text{ m}}{\text{hr}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1.609 \text{ km}}{1 \text{ m}} = \frac{0.6 \text{ km}}{\text{min}}$$

REF: 062123ai NAT: N.Q.A.1 TOP: Conversions KEY: dimensional analysis

71 ANS:

$$\frac{4 \text{ pints}}{\text{day}} \times \frac{2 \text{ cups}}{1 \text{ pint}} \times \frac{8 \text{ ounces}}{1 \text{ cup}} \times \frac{7 \text{ days}}{\text{week}} = \frac{448 \text{ ounces}}{\text{week}}$$

REF: 012027ai NAT: N.Q.A.1 TOP: Conversions KEY: dimensional analysis

72 ANS:

$$12 \text{ km} \left( \frac{0.62 \text{ m}}{1 \text{ km}} \right) = 7.44 \text{ m} \quad \frac{26.2 \text{ m}}{7.44 \text{ mph}} \approx 3.5 \text{ hours}$$

REF: 011726ai NAT: N.Q.A.1 TOP: Conversions KEY: dimensional analysis

73 ANS: 3

REF: 081609ai

NAT: N.Q.A.2

TOP: Using Rate

74 ANS: 4

REF: 081909ai

NAT: N.Q.A.2

TOP: Using Rate

75 ANS:

$$\frac{2}{40} = \frac{5.75}{x} \quad \frac{5280}{115} \approx 46$$

$$x = 115$$

REF: 081730ai NAT: N.Q.A.2 TOP: Using Rate

76 ANS:

The rate of speed is expressed in  $\frac{\text{feet}}{\text{minute}}$  because speed =  $\frac{\text{distance}}{\text{time}}$ .

REF: 011827ai NAT: A.CED.A.2 TOP: Speed

77 ANS:

$$\frac{762 - 192}{92 - 32} = \frac{570}{60} = 9.5 \quad y = 9.5x \quad T = 192 + 9.5(120 - 32) = 1028$$

REF: 061635ai NAT: A.CED.A.2 TOP: Speed

78 ANS:

$$610 - 55(4) = 390 \quad \frac{390}{65} = 6 \quad 4 + 6 = 10 \quad 610 - 55(2) = 500 \quad \frac{500}{65} \approx 7.7 \quad 10 - (2 + 7.7) \approx 0.3$$

REF: 081733ai NAT: A.CED.A.2 TOP: Speed

79 ANS: 3

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

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

80 ANS: 4

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

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

81 ANS: 4

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

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

82 ANS: 1 REF: 061603ai NAT: F.IF.B.6 TOP: Rate of Change

83 ANS: 1 REF: 081515ai NAT: F.IF.B.6 TOP: Rate of Change

84 ANS: 1

The graph is steepest between hour 0 and hour 1.

REF: 081601ai NAT: F.IF.B.6 TOP: Rate of Change

85 ANS: 1

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

$$70 > 60$$

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

86 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

87 ANS: 1 REF: 011721ai NAT: F.IF.B.6 TOP: Rate of Change

88 ANS: 2

$$\left( \frac{\$1824 - 1140}{3 - 0 \text{ yr}} \right) \left( \frac{1 \text{ yr}}{12 \text{ m}} \right) = \frac{\$19}{\text{m}}$$

REF: 062105ai NAT: F.IF.B.6 TOP: Rate of Change

89 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

90 ANS: 1

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

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

91 ANS:

$$\frac{480 - 140}{7 - 2} = 68 \text{ mph}$$

REF: 011731ai NAT: F.IF.B.6 TOP: Rate of Change

92 ANS:

$$\frac{3.41 - 6.26}{9 - 3} = -0.475$$

REF: 081827ai NAT: F.IF.B.6 TOP: Rate of Change



93 ANS:

$\frac{33-1}{12-1} \approx 2.9$   $\frac{36-11}{15-6} \approx 2.8$  The interval 1 a.m. to 12 noon has the greater rate.

REF: 061929ai NAT: F.IF.B.6 TOP: Rate of Change

94 ANS:

There are 20 rabbits at  $x = 0$  and they are growing 1.4% per day.  $\frac{p(100) - p(50)}{100 - 50} \approx 0.8$

REF: 061833ai NAT: F.IF.B.6 TOP: Rate of Change

95 ANS:

During 1960-1965 the graph has the steepest slope.

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

96 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;  $\frac{120-0}{6-14} = -15$ , 15 fewer shoes were sold each hour between the sixth and fourteenth hours.

REF: 011836ai NAT: F.IF.B.6 TOP: Rate of Change

97 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

98 ANS: 4 REF: 011523ai NAT: F.BF.A.1 TOP: Modeling Linear Functions

99 ANS: 4

$P(c) = (.50 + .25)c - 9.96 = .75c - 9.96$

REF: 011807ai NAT: F.BF.A.1 TOP: Modeling Linear Functions

100 ANS: 2 REF: 062101ai NAT: F.BF.A.1 TOP: Modeling Linear Functions

101 ANS:

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

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

102 ANS:

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

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

103 ANS:

$p(x) = 0.035x + 300$   $p(8250) = 0.035(8250) + 300 = 588.75$

REF: 011833ai NAT: F.BF.A.1 TOP: Modeling Linear Functions

104 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

105 ANS: 4 REF: 081604ai NAT: F.LE.A.2 TOP: Modeling Linear Functions

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

REF: 081525ai NAT: F.LE.A.2 TOP: Modeling Linear Functions

107 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

108 ANS: 3 REF: 061407ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

109 ANS: 2 REF: 011709ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

110 ANS: 2 REF: 011501ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

111 ANS: 3 REF: 061817ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

112 ANS: 2 REF: 081402ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

113 ANS: 3 REF: 061501ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

114 ANS: 4 REF: 081709ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

115 ANS: 2 REF: 081817ai NAT: F.LE.B.5 TOP: Modeling Linear Functions

116 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

117 ANS: 2 REF: 061704ai NAT: S.ID.C.7 TOP: Modeling Linear Functions

118 ANS:  
 The height of the balloon increases 30.5 ft per min. The balloon starts at a height of 8.7 ft.

REF: 062127ai NAT: S.ID.C.7 TOP: Modeling Linear Functions

119 ANS:  
 There is 2 inches of snow every 4 hours.

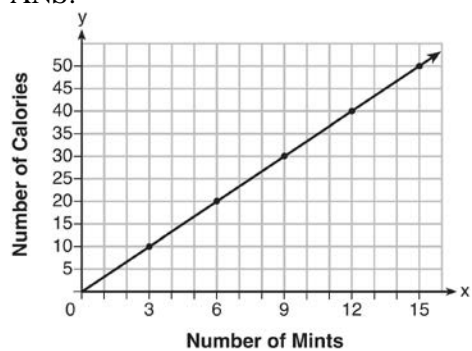
REF: 061630ai NAT: S.ID.C.7 TOP: Modeling Linear Functions

120 ANS: 2 REF: 081413ai NAT: A.CED.A.2 TOP: Graphing Linear Functions

KEY: bimodalgraph

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

122 ANS:



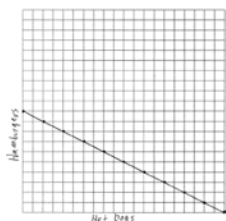
$$C(x) = \frac{10}{3}x \quad 180 = \frac{10}{3}x$$

$$540 = 10x$$

$$54 = x$$

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

123 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

124 ANS: 4

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

$$y = -3$$

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

125 ANS: 1

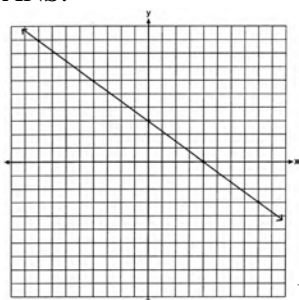
$$4x - 5(0) = 40$$

$$4x = 40$$

$$x = 10$$

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

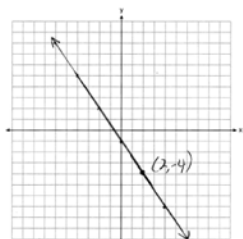
126 ANS:



No, because (3,2) is not on the graph.

REF: 061429ai NAT: F.IF.B.4 TOP: Graphing Linear Functions

127 ANS:



REF: 081927ai NAT: F.IF.B.4 TOP: Graphing Linear Functions

128 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

129 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

130 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

131 ANS:

$$m = \frac{4-1}{-3-6} = \frac{3}{-9} = -\frac{1}{3} \quad y - y_1 = m(x - x_1)$$

$$4 = -\frac{1}{3}(-3) + b \quad y - 4 = -\frac{1}{3}(x + 3)$$

$$4 = 1 + b$$

$$3 = b$$

$$y = -\frac{1}{3}x + 3$$

REF: 061629ai NAT: A.REI.D.10 TOP: Writing Linear Equations

KEY: other forms

132 ANS: 4

$$a + 7b > -8b$$

$$a > -15b$$

REF: 061913ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

133 ANS: 1

$$2h + 8 > 3h - 6$$

$$14 > h$$

$$h < 14$$

REF: 081607ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

134 ANS: 4

$$3x + 2 \leq 5x - 20$$

$$22 \leq 2x$$

$$11 \leq x$$

REF: 061609ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

135 ANS: 4

$$4p + 2 < 2p + 10$$

$$2p < 8$$

$$p < 4$$

REF: 061801ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

136 ANS: 1

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

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

$$9 < x$$

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

137 ANS: 1

$$2 + \frac{4}{9}x \geq 4 + x$$

$$-2 \geq \frac{5}{9}x$$

$$x \leq -\frac{18}{5}$$

REF: 081711ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

138 ANS:

$$4y - 12 \leq 8y + 4$$

$$-16 \leq 4y$$

$$-4 \leq y$$

REF: 062125ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

139 ANS:

$$1.8 - 0.4y \geq 2.2 - 2y$$

$$1.6y \geq 0.4$$

$$y \geq 0.25$$

REF: 011727ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

140 ANS:

$$3600 + 1.02x < 2000 + 1.04x$$

$$1600 < 0.02x$$

$$80000 < x$$

REF: 011925ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

141 ANS:

$$\frac{2}{3} < \frac{x}{5}$$

$$\frac{10}{3} < x$$

REF: 081929ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

142 ANS:

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

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

$$bx-ax \geq 10b$$

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

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

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

143 ANS: 4

$$47-4x < 7$$

$$-4x < -40$$

$$x > 10$$

REF: 061713ai NAT: A.REI.B.3 TOP: Interpreting Solutions

144 ANS: 2

$$-2(x-5) < 10$$

$$x-5 > -5$$

$$x > 0$$

REF: 011817ai NAT: A.REI.B.3 TOP: Interpreting Solutions

145 ANS: 1

$$7x+2 \geq 58$$

$$7x \geq 56$$

$$x \geq 8$$

REF: 012003ai NAT: A.REI.B.3 TOP: Interpreting Solutions

146 ANS:

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

$$-a-9 > -12$$

$$-a > -3$$

$$a < 3$$

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

147 ANS:

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

$$12 \leq 2x$$

$$6 \leq x$$

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

148 ANS:

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

$$-8x < 8$$

$$x > -1$$

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

149 ANS:

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

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

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

$$12 \leq 2x$$

$$6 \leq x$$

REF: 081534ai NAT: A.REI.B.3 TOP: Interpreting Solutions

150 ANS: 2 REF: 062107ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

151 ANS: 4 REF: 081505ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

152 ANS: 3 REF: 011513ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

153 ANS: 1 REF: 061910ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

154 ANS: 4

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

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

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

$$1500 > p$$

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

155 ANS: 2

$$7 < \frac{7.2 + 7.6 + p_L}{3} \quad \text{and} \quad \frac{7.2 + 7.6 + p_H}{3} < 7.8$$

$$6.2 < p_L \quad p_H < 8.6$$

REF: 061607ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

156 ANS: 1

$$116(30) + 439L \leq 6500$$

$$439L \leq 3020$$

$$L \leq 6.879$$

REF: 011904ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities



157 ANS:

$$6.25a + 4.5(45) \leq 550 \quad 55 \text{ shirts}$$

$$6.25a + 202.5 \leq 550$$

$$6.25a \leq 347.50$$

$$a \leq 55.6$$

REF: 012026ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

158 ANS:

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

$$8x + 165 \geq 200$$

$$8x \geq 35$$

$$x \geq 4.375$$

5 hours

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

159 ANS: 1

REF: 061806ai NAT: A.CED.A.3 TOP: Modeling Linear Inequalities

160 ANS:

$$135 + 72x \geq 580 \quad 7$$

$$72x \geq 445$$

$$x \geq 6.2$$

REF: 081833ai NAT: A.CED.A.1 TOP: Modeling Linear Inequalities

161 ANS:

$$A(x) = 5x + 50 \quad 5x + 50 < 6x + 25 \quad 26 \text{ shirts}$$

$$B(x) = 6x + 25 \quad 25 < x$$

REF: 061933ai NAT: A.CED.A.3 TOP: Modeling Linear Inequalities

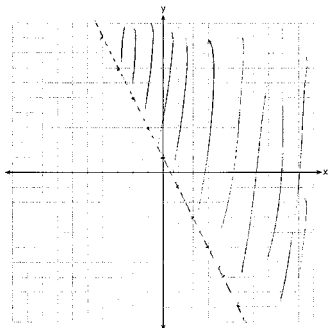
162 ANS: 1

REF: 061505ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

163 ANS: 2

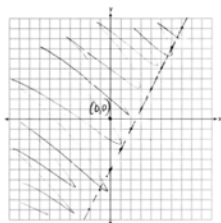
REF: 011605ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

164 ANS:



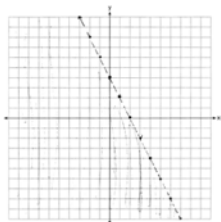
REF: 081526ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

165 ANS:



REF: 011729ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

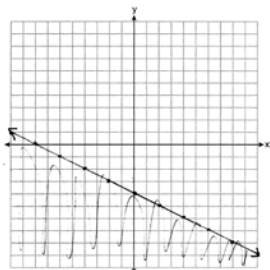
166 ANS:



$$y < -2x + 4$$

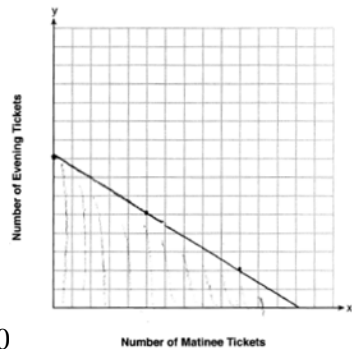
REF: 061730ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

167 ANS:



REF: 081634ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

168 ANS:



$$7.5x + 12.5y \leq 100$$

13, because  $7.5(13) \leq 100$  and  $7.5(14) > 100$ .

REF: 011935ai NAT: A.REI.D.12 TOP: Graphing Linear Inequalities

169 ANS: 3

REF: 081403ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

170 ANS: 4

$$36x^2 = 25$$

$$x^2 = \frac{25}{36}$$

$$x = \pm \frac{5}{6}$$

REF: 011715ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

171 ANS: 3 REF: 081523ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

172 ANS: 3

$$(x+4)^2 = 9$$

$$x+4 = \pm 3$$

$$x = -1, -7$$

REF: 012015ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

173 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

174 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

175 ANS: 1 REF: 061521ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

176 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

177 ANS:

$$5x^2 = 180$$

$$x^2 = 36$$

$$x = \pm 6$$

REF: 061928ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

178 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

179 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

180 ANS: 4 REF: 011503ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: factoring

181 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

182 ANS: 3 REF: 011702ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: factoring

183 ANS:

$$x^2 - 8x - 9 = 0 \quad \text{I factored the quadratic.}$$

$$(x - 9)(x + 1) = 0$$

$$x = 9, -1$$

REF: 011927ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: factoring

184 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

185 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

186 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

187 ANS:

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

REF: 081425ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: factoring

188 ANS:

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

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

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

REF: 061433ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: factoring

189 ANS:

$$2x^2 + 5x - 42 = 0 \quad \text{Agree, as shown by solving the equation by factoring.}$$

$$(x + 6)(2x - 7) = 0$$

$$x = -6, \frac{7}{2}$$

REF: 061628ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: factoring

190 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

191 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

192 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

193 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

194 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

195 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

196 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

197 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

198 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

199 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

200 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

201 ANS:

$$x^2 - 8x = -6$$

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

$$(x - 4)^2 = 10$$

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

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

REF: 012031ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: completing the square



202 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

203 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

204 ANS:

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

REF: 081432ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: completing the square

205 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

206 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

207 ANS:

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(-5)}}{2(1)} = \frac{-1 \pm \sqrt{21}}{2} \approx -2.8, 1.8$$

REF: 061827ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: quadratic formula

208 ANS:

$$w^2 + 3w - 11 = 0 \quad \frac{-3 \pm \sqrt{3^2 - 4(1)(-11)}}{2(1)} = \frac{-3 \pm \sqrt{53}}{2} \approx -5.14, 2.14$$

REF: 062132ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: quadratic formula

209 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

210 ANS: 3

$$b^2 - 4ac = 2^2 - 4(4)(5) = -76$$

REF: 061822ai NAT: A.REI.B.4 TOP: Using the Discriminant

211 ANS:

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

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

212 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

213 ANS: 3 REF: 081409ai NAT: A.CED.A.1 TOP: Modeling Quadratics

214 ANS: 4 REF: 081723ai NAT: A.CED.A.1 TOP: Modeling Quadratics

215 ANS: 4 REF: spr1304ai NAT: A.CED.A.1 TOP: Geometric Applications of Quadratics

216 ANS: 2

$$w(w + 7) = w^2 + 7w$$

REF: 081920ai NAT: A.CED.A.1 TOP: Geometric Applications of Quadratics

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

218 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

219 ANS:

$$(2w)(w) = 34$$

$$w^2 = 17$$

$$w \approx 4.1$$

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

220 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

221 ANS:

$$w \left( \frac{1}{2}w + 6 \right) = 432 \quad \frac{1}{2}w^2 + 6w = 432 \quad l = \frac{1}{2}(24) + 6 = 18$$

$$w^2 + 12w - 864 = 0$$

$$(w - 24)(w + 36) = 0$$

$$w = 24$$

REF: 012036ai NAT: A.CED.A.1 TOP: Geometric Applications of Quadratics

222 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

223 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

224 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.  $x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-13)}}{2(1)} = \frac{-7 + \sqrt{101}}{2} \approx 1.5$

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

225 ANS: 2

REF: 011601ai NAT: F.IF.C.8 TOP: Vertex Form of a Quadratic

226 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

227 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

228 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

229 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

230 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

231 ANS: 4

$$\text{Vertex } (15, 25), \text{ point } (10, 12.5) \quad 12.5 = a(10 - 15)^2 + 25$$

$$-12.5 = 25a$$

$$-\frac{1}{2} = a$$

REF: 061716ai NAT: F.IF.C.8 TOP: Vertex Form of a Quadratic

232 ANS:

$$f(x) = (x^2 - 2x + 1) - 8 - 1 = (x - 1)^2 - 9 \quad (1, -9)$$

REF: 061932ai NAT: F.IF.C.8 TOP: Vertex Form of a Quadratic

233 ANS:

$$f(x) = x^2 - 14x + 49 - 15 - 49 = (x - 7)^2 - 64 \quad (7, -64)$$

REF: 062130ai NAT: F.IF.C.8 TOP: Vertex Form of a Quadratic

234 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

235 ANS: 3 REF: 061409ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions  
KEY: context

236 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

237 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

238 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

239 ANS: 2

$$-4.9(0)^2 + 50(0) + 2$$

REF: 011811ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: context

240 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

241 ANS:

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

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

$$t = 0, 4$$

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

KEY: context

242 ANS:

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

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

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

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

$$t = 5$$

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

KEY: context

243 ANS:

$$x = 1 \quad \frac{-3 + 5}{2} = 1$$

REF: 011829ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: no context

244 ANS:

$$-16t^2 + 256 = 0$$

$$16t^2 = 256$$

$$t^2 = 16$$

$$t = 4$$

REF: 061829ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: context

245 ANS:

112; (3,256); At  $t = 3$ , the ball is 256 ft high; 3-7 seconds

REF: 062136ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: context

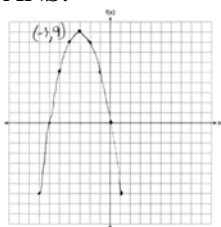
246 ANS:

 $x = \frac{-128}{2(-16)} = 4 \quad h(4) = -16(4)^2 + 128(4) + 9000 = -256 + 512 + 9000 = 9256$  (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

247 ANS:



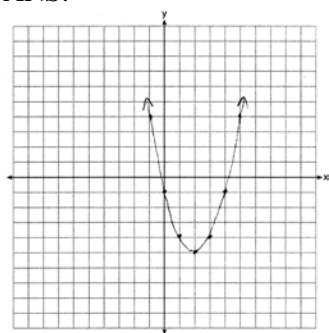
REF: 061726ai

NAT: F.IF.B.4

TOP: Graphing Quadratic Functions

KEY: no context

248 ANS:



$$x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$$

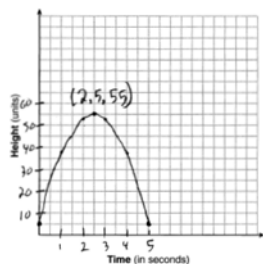
REF: 061627ai

NAT: F.IF.B.4

TOP: Graphing Quadratic Functions

KEY: no context

249 ANS:



The ball reaches a maximum height of 55 units at 2.5 seconds.

REF: 011736ai

NAT: F.IF.B.4

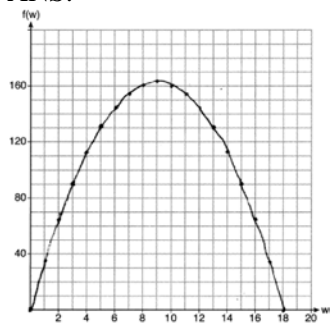
TOP: Graphing Quadratic Functions

KEY: context



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

250 ANS:

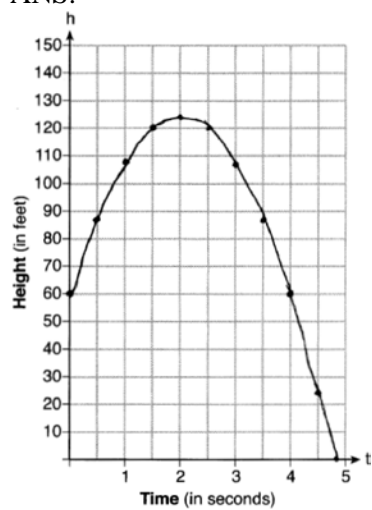


If the garden's width is 9 ft, its area is 162 ft<sup>2</sup>.

REF: 081836ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: context

251 ANS:

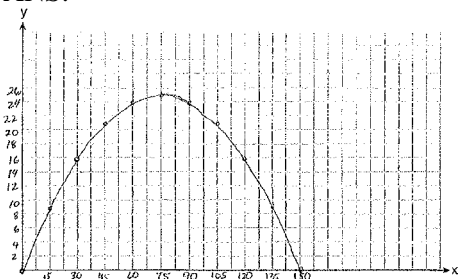


$$\frac{h(2) - h(0)}{2 - 0} = 32$$

REF: 012033ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: context

252 ANS:



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

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

REF: 061537ai    NAT: F.IF.B.4    TOP: Graphing Quadratic Functions  
KEY: context

253 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

254 ANS: 3    REF: 062114ai    NAT: A.APR.A.1    TOP: Powers of Powers

255 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

256 ANS: 3

$$t(m) = 2(3)^{2m+1} = 2(3)^{2m}(3)^1 = 6(3)^{2m} = 6(3^2)^m = 6(9)^m$$

REF: 012019ai    NAT: A.SSE.B.3    TOP: Modeling Exponential Functions

257 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

258 ANS: 2    REF: 011714ai    NAT: A.SSE.B.3    TOP: Modeling Exponential Functions

259 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

260 ANS: 4    REF: 011821ai    NAT: A.SSE.B.3    TOP: Modeling Exponential Functions

261 ANS: 2    REF: 081801ai    NAT: A.SSE.B.3    TOP: Modeling Exponential Functions

262 ANS: 2

$$(1.0005)^7 \approx 1.0035$$

REF: 081913ai    NAT: A.SSE.B.3    TOP: Modeling Exponential Functions

263 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

264 ANS:

$$f(5) = (8) \cdot 2^5 = 256 \quad f(t) = g(t)$$

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

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

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

REF: 011632ai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

265 ANS: 3

$$E(10) = 1(1.11)^{10} \approx 3 \quad S(10) = 30(1.04)^{10} \approx 44$$

$$E(53) = 1(1.11)^{53} \approx 252 \quad S(53) = 30(1.04)^{53} \approx 239$$

REF: 081721ai NAT: A.CED.A.1 TOP: Modeling Exponential Functions

266 ANS:

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

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

267 ANS:

$$V(t) = 25000(0.815)^t \quad V(3) - V(4) \approx 2503.71$$

REF: 081834ai NAT: A.CED.A.1 TOP: Modeling Exponential Functions

268 ANS:

$$V = 450(1.025)^t; \text{ No, } 450(1.025)^{20} < 2 \cdot 450$$

REF: 011933ai NAT: A.CED.A.1 TOP: Modeling Exponential Functions

269 ANS:

$$A(t) = 5000(1.012)^t \quad A(32) - A(17) \approx 1200$$

REF: 081934ai NAT: A.CED.A.1 TOP: Modeling Exponential Functions

270 ANS: 1 REF: 011504ai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

271 ANS: 3 REF: 081507ai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

272 ANS: 2 REF: 061712ai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

273 ANS: 1 REF: 012002ai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

KEY: AI

274 ANS: 2 REF: 061617ai NAT: F.BF.A.1 TOP: Modeling Exponential Functions

275 ANS:

$$B = 3000(1.042)^t$$

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

276 ANS: 1 REF: 081617ai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

277 ANS: 3

$$\frac{5.4 - 4}{4} = 0.35$$

REF: 011802ai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

278 ANS: 4 REF: 011912ai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

279 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

280 ANS:

No. He found another point if  $g(x)$  were a linear function.

REF: 062129ai NAT: F.LE.A.2 TOP: Modeling Exponential Functions

281 ANS: 2 REF: 061517ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

282 ANS: 4 REF: 011608ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

283 ANS: 2 REF: 081624ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

284 ANS: 2 REF: 061923ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

285 ANS: 3 REF: 011515ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

286 ANS: 3 REF: 011724ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

287 ANS: 2 REF: 012014ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

288 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

289 ANS:

$1 - 0.95 = 0.05 = 5\%$  To find the rate of decay of an equation in the form  $y = ab^x$ , subtract  $b$  from 1.

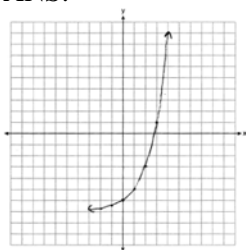
REF: 081530ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

290 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

291 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

292 ANS: 3 REF: 081602ai NAT: A.REI.D.10 TOP: Identifying Solutions

293 ANS: 1 REF: 012011ai NAT: A.REI.D.10 TOP: Identifying Solutions

294 ANS: 1

$$\frac{12-10}{12-9} = \frac{2}{3} \quad y-6 = \frac{2}{3}(x-3) \quad 18-6 \neq \frac{2}{3}(16-3)$$

REF: 062124ai NAT: A.REI.D.10 TOP: Identifying Solutions

295 ANS: 4 REF: 081405ai NAT: A.REI.D.10 TOP: Identifying Solutions

296 ANS: 4

$$f(-1) = (-1)^2 - 3(-1) + 4 = 8$$

REF: 061808ai NAT: A.REI.D.10 TOP: Identifying Solutions

297 ANS: 3

$$10.25 \neq 3(1.25)^2 - 1.25 + 7$$

REF: 061918ai NAT: A.REI.D.10 TOP: Identifying Solutions

298 ANS: 1

$$3(10) + 2 \neq (-2)^2 - 5(-2) + 17$$

$$32 \neq 31$$

REF: 081818ai NAT: A.REI.D.10 TOP: Identifying Solutions

299 ANS: 4

$$-2 \neq (-1)^3 - (-1)$$

$$-2 \neq 0$$

REF: 011806ai NAT: A.REI.D.10 TOP: Identifying Solutions

300 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

301 ANS: 3 REF: 011813ai NAT: A.APR.A.1 TOP: Operations with Polynomials

KEY: addition

302 ANS: 1

$$2(3x^3 + 2x^2 - 17)$$

REF: 081813ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: addition

303 ANS: 1

$$3(x + 4) - (2x + 7) = 3x + 12 - 2x - 7 = x + 5$$

REF: 062102ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: subtraction

304 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

305 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

306 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

307 ANS: 2

REF: 061403ai NAT: A.APR.A.1 TOP: Operations with Polynomials

KEY: subtraction

308 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

309 ANS:

$$5x^2 - 10$$

REF: 061725ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: subtraction

310 ANS:

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

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

311 ANS:

$$C = 3x^2 + 4 - 3(2x^2 + 6x - 5) = 3x^2 + 4 - 6x^2 - 18x + 15 = -3x^2 - 18x + 19$$

REF: 061926ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: subtraction

312 ANS: 2

$$x(-4x^2 - x + 6) + 8 = -4x^3 - x^2 + 6x + 8$$

REF: 012016ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: multiplication

313 ANS: 2

(d) is the product, but not written in standard form.

REF: 062108ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: multiplication

314 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

315 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

316 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

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

318 ANS: 3

$$(6x^2 + 2x)(5x - 6) = 30x^3 - 36x^2 + 10x^2 - 12x = 30x^3 - 26x^2 - 12x$$

REF: 081824ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: multiplication

319 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

320 ANS:

$$3x^2 + 21x - 4x - 28 - \frac{1}{4}x^2 = 2.75x^2 + 17x - 28$$

REF: 012028ai NAT: A.APR.A.1 TOP: Operations with Polynomials

KEY: multiplication

321 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

322 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

323 ANS: 4 REF: 012012ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

324 ANS: 3 REF: 081803ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

325 ANS: 1 REF: 061810ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

326 ANS: 3

$$(2x + 3)(x + 4) = 2x^2 + 11x + 12$$

REF: 081916ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

327 ANS: 3 REF: 011612ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power

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

KEY: quadratic

329 ANS: 1 REF: 011906ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

330 ANS: 3 REF: 061917ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

331 ANS: 3 REF: 062110ai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: quadratic

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

KEY: higher power



333 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

334 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

335 ANS: 3

REF: 081703ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: quadratic

336 ANS: 3

REF: 081807ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: quadratic

337 ANS: 3

REF: 081908ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: quadratic

338 ANS: 3

$$18x^2 - 50 = 2(9x^2 - 25) = 2(3x - 5)(3x + 5)$$

REF: 012006ai NAT: A.SSE.A.2 TOP: Factoring the Difference of Perfect Squares  
KEY: quadratic

339 ANS: 2

REF: 061503ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: multivariable

340 ANS: 3

REF: 061601ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: higher power

341 ANS: 4

REF: 061901ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: higher power AI

342 ANS: 3

REF: 011522ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: higher power

343 ANS: 3

REF: 011809ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: higher power

344 ANS: 3

REF: 061706ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: higher power

345 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

346 ANS:

$$(x^2 + 4)(x + 2)(x - 2)$$

REF: 062128ai NAT: A.SSE.A.2 TOP: Factoring the Difference of Perfect Squares  
KEY: higher power AI

347 ANS: 3 REF: 061412ai NAT: A.APR.B.3 TOP: Zeros of Polynomials

348 ANS: 3 REF: 061710ai NAT: A.APR.B.3 TOP: Zeros of Polynomials

349 ANS: 2  
 $(x + 4)(x + 6) = 0$

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

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

350 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

351 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

352 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

353 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

354 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

355 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

356 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

357 ANS: 3

REF: spr1302ai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

358 ANS: 3

REF: 011909ai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

359 ANS: 4

REF: 011706ai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

360 ANS: 2

$$f(x) = x^3 - 9x^2 = x^2(x - 9) = 0$$

$$x = 0, 9$$

REF: 012009ai NAT: A.APR.B.3 TOP: Zeros of Polynomials

361 ANS: 2

REF: 081816ai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

362 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

363 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

- 364 ANS:  
Graph  $f(x)$  and find  $x$ -intercepts,  $-3, 1, 8$ .
- REF: 081825ai NAT: A.APR.B.3 TOP: Zeros of Polynomials
- 365 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
- 366 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
- 367 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
- 368 ANS: 1 REF: 011524ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
- 369 ANS: 1  
The zeros of  $f$  are  $-6, -3$  and  $0$ .
- REF: 062112ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions  
KEY: bimodalgraph
- 370 ANS: 1 REF: 081623ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
- 371 ANS: 2 REF: 061818ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
- 372 ANS: 2  
 $y = (x - 3)(x + 2)(x - 1)$
- REF: 061512ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
- 373 ANS: 1  
 $f(x) = (x + 2)(x + 4)(x - 1)$
- REF: 081504ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
- 374 ANS: 1 REF: 081707ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions

375 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

376 ANS: 2 REF: 081501ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

377 ANS: 1 REF: 081417ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

378 ANS: 4 REF: 012007ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

379 ANS: 2 REF: 011717ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

380 ANS: 3 REF: 081808ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

381 ANS: 3 REF: 062113ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

382 ANS: 2 REF: 011512ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

383 ANS: 3 REF: 011910ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

384 ANS: 2 REF: 011819ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

385 ANS: 2 REF: 061904ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

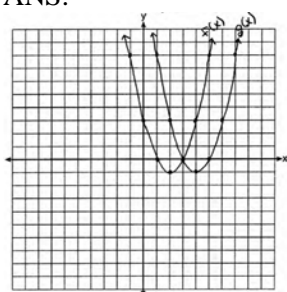
386 ANS: 1

$$-5 - 2 = -7$$

REF: 081905ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

387 ANS: 1 REF: 081706ai NAT: F.BF.B.3 TOP: Graphing Polynomial Functions

388 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

389 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

390 ANS: 1 REF: 081401ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

391 ANS: 2 REF: 061508ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

392 ANS: 3

$$\sqrt{576} = 24 \quad \sqrt{684} = 6\sqrt{19}$$

REF: 011808ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

393 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

394 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

395 ANS: 3

$(2\sqrt{8})(3\sqrt{2}) = 6\sqrt{16} = 24$

REF: 062109ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

396 ANS: 1

I.  $-\frac{5}{8} + \frac{3}{5} = \frac{-1}{40}$ ; III.  $(\sqrt{5}) \cdot (\sqrt{5}) = \frac{5}{1}$ ; IV.  $3 \cdot (\sqrt{49}) = \frac{21}{1}$

REF: 011604ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

397 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

398 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

399 ANS:

Correct. The sum of a rational and irrational is irrational.

REF: 011525ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

400 ANS:

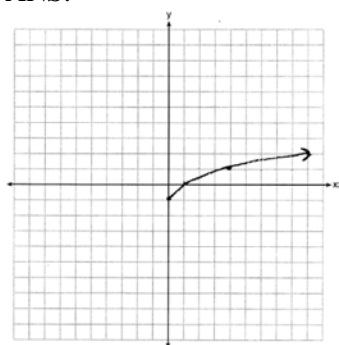
$3\sqrt{2} \cdot 8\sqrt{18} = 24\sqrt{36} = 144$  is rational, as it can be written as the ratio of two integers.

REF: 061626ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

- 401 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
- 402 ANS:  
 No. The sum of a rational and irrational is irrational.
- REF: 011728ai    NAT: N.RN.B.3    TOP: Operations with Radicals  
 KEY: classify
- 403 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
- 404 ANS:  
 Rational, as  $\sqrt{16} \cdot \frac{4}{7} = \frac{16}{7}$ , which is the ratio of two integers.
- REF: 061831ai    NAT: N.RN.B.3    TOP: Operations with Radicals  
 KEY: classify
- 405 ANS:  
 The product is irrational because  $\sqrt{27}$  can not be written as the ratio of two integers.
- REF: 012030ai    NAT: N.RN.B.3    TOP: Operations with Radicals  
 KEY: classify
- 406 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
- 407 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,  $\frac{35}{2}$ .
- REF: 081725ai    NAT: N.RN.B.3    TOP: Operations with Radicals  
 KEY: classify
- 408 ANS: 4    REF: 061703ai    NAT: F.IF.C.7    TOP: Graphing Root Functions  
 KEY: bimodalgraph

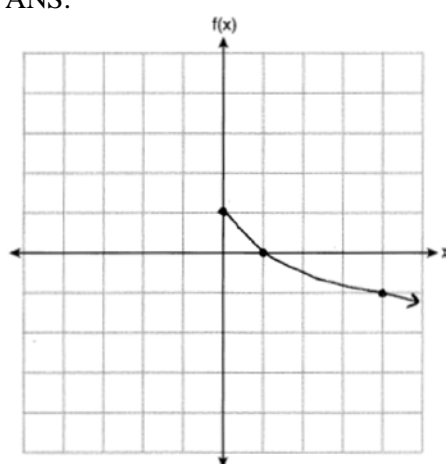
409 ANS:



REF: 061425ai NAT: F.IF.C.7

TOP: Graphing Root Functions

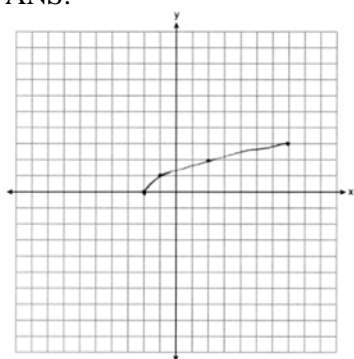
410 ANS:



REF: 012025ai NAT: F.IF.C.7

TOP: Graphing Root Functions

411 ANS:

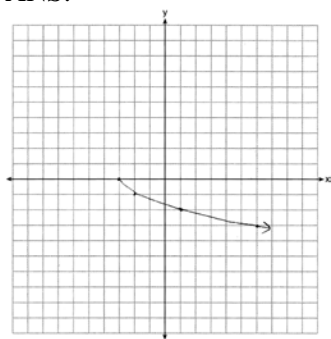


REF: 061825ai NAT: F.IF.C.7

TOP: Graphing Root Functions



412 ANS:

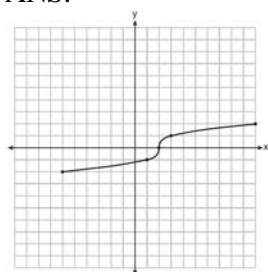


REF: 081625ai

NAT: F.IF.C.7

TOP: Graphing Root Functions

413 ANS:



REF: fall1304ai

NAT: F.IF.C.7

TOP: Graphing Root Functions

414 ANS: 1

$$3(-2x + 2x + 8) = 12$$

$$24 \neq 12$$

REF: 061708ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

KEY: substitution

415 ANS: 2

REF: 011815ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

416 ANS: 3

$$y = -3x - 4$$

$$2x - 3(-3x - 4) = -21$$

REF: 011922ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

KEY: substitution

417 ANS: 2

$$2(3x - y = 4)$$

$$6x - 2y = 8$$

REF: 061414ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

418 ANS: 4

REF: 011621ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

419 ANS: 4

REF: 081622ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

420 ANS: 4

$$36x + 30y = 96$$

REF: 081724ai

NAT: A.REI.C.6

TOP: Solving Linear Systems

421 ANS: 3

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

$$2x - 2y = 6$$

REF: 081822ai NAT: A.REI.C.6 TOP: Solving Linear Systems

422 ANS: 1

$$x - 4y = -10 \quad x + 3 = 5 \quad 5x = 10 \quad 2 + y = 5$$

$$\underline{x + y = 5} \quad x = 2 \quad x = 2 \quad y = 3$$

$$-5y = -15$$

$$y = 3$$

REF: 081922ai NAT: A.REI.C.6 TOP: Solving Linear Systems

423 ANS: 2

$$6(3x - y = 7)$$

$$2(2x + 3y = 12)$$

REF: 012020ai NAT: A.REI.C.6 TOP: Solving Linear Systems

424 ANS: 2

$$2x + 6y = 20 \quad x + 3(6) = 10 \quad -2x + 2y = 28 \quad -x + 6 = 14$$

$$\underline{-2x - 2y = 4} \quad x = -8 \quad \underline{2x + 6y = 20} \quad -x = 8$$

$$4y = 24 \quad 8y = 48 \quad x = -8$$

$$y = 6 \quad y = 6$$

REF: 062120ai NAT: A.REI.C.6 TOP: Solving Linear Systems

425 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

426 ANS:

No. There are infinite solutions.

REF: 011725ai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: substitution

427 ANS:

$$24x + 27y = 144 \quad -8.5y = -51 \quad \text{Agree, as both systems have the same solution.}$$

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

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

$$y = 6 \quad 8x = -6$$

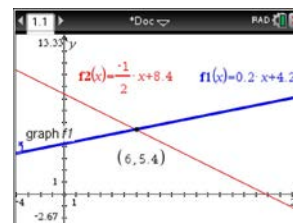
$$8x + 9(6) = 48 \quad x = -\frac{3}{4}$$

$$8x = -6$$

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

REF: 061533ai NAT: A.REI.C.6 TOP: Solving Linear Systems

428 ANS: 4



$$m = \frac{5 - 4.6}{4 - 2} = \frac{.4}{2} = 0.2 \quad 4(0.2x + 4.2) + 2x = 33.6 \quad y = 0.2(6) + 4.2 = 5.4$$

$$5 = .2(4) + b \quad 0.8x + 16.8 + 2x = 33.6$$

$$4.2 = b \quad 2.8x = 16.8$$

$$y = 0.2x + 4.2 \quad x = 6$$

REF: 061618ai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: substitution

429 ANS: 4 REF: 081419ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

430 ANS: 1 REF: 061605ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

431 ANS: 1 REF: 011803ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

432 ANS: 2 REF: 081809ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

433 ANS: 3

$$a + p = 165 \quad 1.75(165 - p) + 2.5p = 337.5$$

$$1.75a + 2.5p = 337.5 \quad 288.75 - 1.75p + 2.5p = 337.5$$

$$0.75p = 48.75$$

$$p = 65$$

REF: 061506ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

434 ANS: 2

$$L + S = 20 \quad 27.98L + 10.98(20 - L) = 355.60$$

$$27.98L + 10.98S = 355.60 \quad 27.98L + 219.60 - 10.98L = 355.60$$

$$17L = 136$$

$$L = 8$$

REF: 081510ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

435 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

$$35 = 2.5G \quad 25 = 2G$$

$$G = 14 \quad G = 12.5$$

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

436 ANS:

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

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

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

$$d = 2.25$$

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

437 ANS:

$$p + 2s = 15.95 \quad 5p + 10s = 79.75$$

$$3p + 5s = 45.90 \quad 6p + 10s = 91.80$$

$$p = 12.05$$

REF: 011734ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

438 ANS:

$$d = 2c - 5; \quad 20 \neq 2(15) - 5 \quad 20 \text{ dogs is not five less than twice } 15 \text{ cats} \quad \frac{c+3}{2c-5+3} = \frac{3}{4} \quad d = 2(9) - 5 = 13$$

$$\frac{c+3}{d+3} = \frac{3}{4} \quad 20 \neq 25$$

$$4c + 12 = 6c - 6$$

$$18 = 2c$$

$$c = 9$$

REF: 011837ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

439 ANS:

$$A(x) = 7 + 3(x - 2) \quad 7 + 3(x - 2) = 6.50 + 3.25(x - 2)$$

$$B(x) = 3.25x \quad 7 + 3x - 6 = 3.25x$$

$$1 = 0.25x$$

$$4 = x$$

REF: 061834ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

440 ANS:

$$4l + 8m = 40 \quad \text{No, since } 5(5.5) + 2(2.25) \neq 28 \quad 4l + 8m = 40 \quad 4(4.5) + 8m = 40$$

$$5l + 2m = 28$$

$$\underline{20l + 8m = 112}$$

$$8m = 22$$

$$16l = 72$$

$$m = 2.75$$

$$l = 4.5$$

REF: 062137ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

441 ANS:

$$b = 4s + 6 \quad 4s + 6 - 3 = 7s - 21 \quad b = 4(8) + 6 = 38 \quad 38 + x = 3(8 + x)$$

$$b - 3 = 7(s - 3)$$

$$3s = 24$$

$$x + 38 = 24 + 3x$$

$$s = 8$$

$$2x = 14$$

$$x = 7$$

REF: 081837ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

442 ANS:

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

$$c + d = 22$$

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

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

$$-3.15c = -31.50$$

$$c = 10$$

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

443 ANS:

$$18j + 32w = 19.92 \quad 14(.52) + 26(.33) = 15.86 \neq 15.76 \quad 7(18j + 32w = 19.92) \quad 18j + 32(.24) = 19.92$$

$$14j + 26w = 15.76$$

$$9(14j + 26w = 15.76)$$

$$18j + 7.68 = 19.92$$

$$126j + 224w = 139.44$$

$$18j = 12.24$$

$$126j + 234w = 141.84$$

$$j = .68$$

$$10w = 2.4$$

$$w = .24$$

REF: 081637ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

444 ANS:

$$4c + 3f = 16.53 \quad \text{No, because } 5(2.49) + 4(2.87) \neq 21.11. \quad 16c + 12f = 66.12 \quad 4(2.79) + 3f = 16.53$$

$$5c + 4f = 21.11$$

$$\underline{15c + 12f = 63.33}$$

$$3f = 5.37$$

$$c = 2.79$$

$$f = 1.79$$

REF: 061937ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

445 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

446 ANS:

$$10d + 25q = 1755, \quad 10(90 - q) + 25q = 1755, \quad \text{no, because } 20.98 \cdot 1.08 > 90 \cdot 0.25$$

$$d + q = 90 \quad 900 - 10q + 25q = 1755$$

$$15q = 855$$

$$q = 57$$

REF: 061837ai NAT: A.CED.A.3 TOP: Modeling Linear Systems

447 ANS: 3

$$15 > 5$$

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

448 ANS:

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

$$B(x) = 2x + 2.50$$

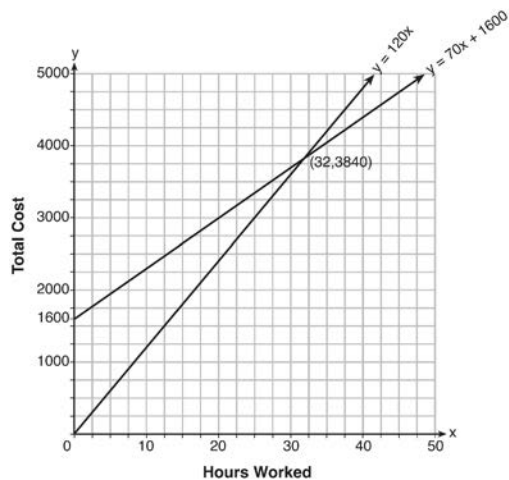
$$.50x = 3.50$$

$$B(x) = 2(5) + 2.50 = 12.50$$

$$x = 7$$

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

449 ANS:



$y = 120x$  and  $y = 70x + 1600$

$120x = 70x + 1600$

$50x = 1600$

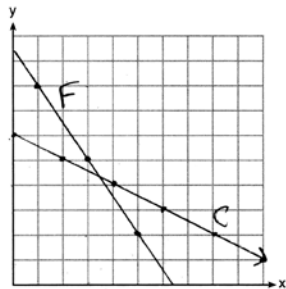
$x = 32$

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

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

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

450 ANS:



$3x + 2y = 19$        $6x + 4y = 38$        $2(3.50) + 4y = 24$

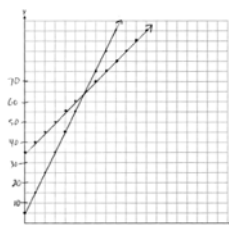
$2x + 4y = 24$        $2x + 4y = 24$        $7 + 4y = 24$

$4x = 14$        $4y = 17$

$x = 3.50$        $y = 4.25$

REF: 061637ai NAT: A.REI.C.6 TOP: Graphing Linear Systems

451 ANS:

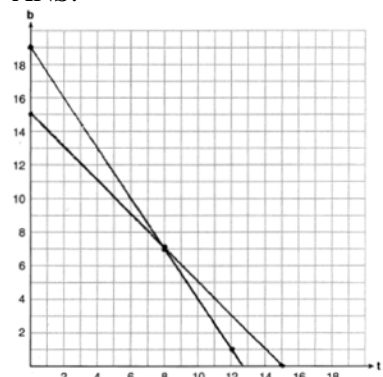


$y = 10x + 5$  In 2016, the swim team and chorus will each have 65 members.

$y = 5x + 35$

REF: 061737ai NAT: A.REI.C.6 TOP: Graphing Linear Systems

452 ANS:

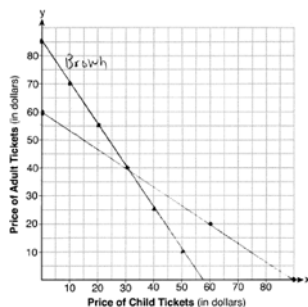


$t + b = 15$  No, because according to the graph, 8 tricycles were ordered.

$3t + 2b = 38$

REF: 011937ai NAT: A.REI.C.6 TOP: Graphing Linear Systems

453 ANS:



$3x + 2y = 170$

(30,40) The price of a child's ticket is \$30 and the price of an adult's

$4x + 6y = 360$

ticket is \$40.

REF: 012037ai NAT: A.REI.C.6 TOP: Graphing Linear Systems

454 ANS: 1

REF: 061711ai

NAT: A.CED.A.3

TOP: Modeling Systems of Linear Inequalities

455 ANS: 2

REF: 081810ai

NAT: A.CED.A.3

TOP: Modeling Systems of Linear Inequalities



456 ANS:

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

$$6p + 9d \geq 5000 \quad 2640 + 9d \geq 5000$$

$$9d \geq 2360$$

$$d \geq 262.\bar{2}$$

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

457 ANS:

$$x + y \leq 200 \quad 12x + 8.50(50) \geq 1000$$

$$12x + 8.50y \geq 1000 \quad 12x + 425 \geq 1000$$

$$12x \geq 575$$

$$x \geq \frac{575}{12}$$

$$48$$

REF: 081635ai NAT: A.CED.A.3 TOP: Modeling Systems of Linear Inequalities

458 ANS:

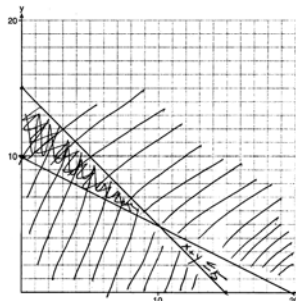
 $2L + 1.5W \geq 500$   $2(144) + 1.5W = 500$  142 bottles of water must be sold to cover the cost of renting costumes.

$$L + W \leq 360 \quad 1.5W = 212$$

$$W = 141.\bar{3}$$

REF: 011835ai NAT: A.CED.A.3 TOP: Modeling Systems of Linear Inequalities

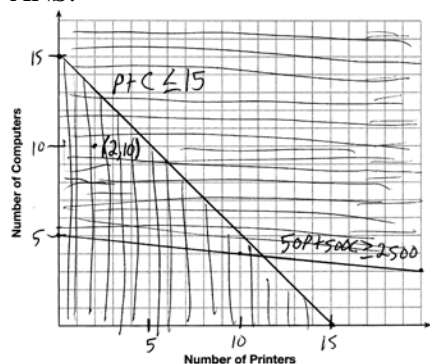
459 ANS:


 $x + y \leq 15$  One hour at school and eleven hours at the library.

$$4x + 8y \geq 80$$

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

460 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

461 ANS:

$y < -3x + 3$  Region A represents the solution set of the system. The gray region represents the solution set of

$$y \leq 2x - 2$$

$$y \leq 2x - 2.$$

REF: 061936ai NAT: A.CED.A.3 TOP: Modeling Systems of Linear Inequalities

462 ANS: 2 REF: 061404ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: bimodalgraph | graph

463 ANS: 3 REF: 081506ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: bimodalgraph | graph

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

465 ANS: 2

(4, 3) is on the boundary of  $y > -\frac{1}{2}x + 5$ , 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

466 ANS: 4

$$2(2) < -12(-3) + 4 \quad 4 < -6(-3) + 4$$

$$4 < 40$$

$$4 < 22$$

REF: 011716ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: solution set

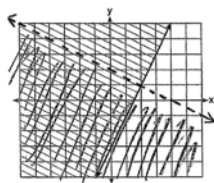
467 ANS: 3 REF: 011820ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: solution set

468 ANS:

No, because the point (0, 4) does not satisfy the inequality  $y < \frac{1}{2}x + 4$ .  $4 < \frac{1}{2}(0) + 4$  is not a true statement.

REF: 011828ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: solution set

469 ANS:



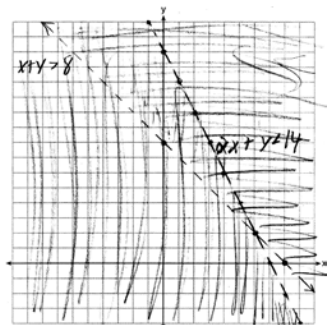
$$y \geq 2x - 3.$$

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

470 ANS:

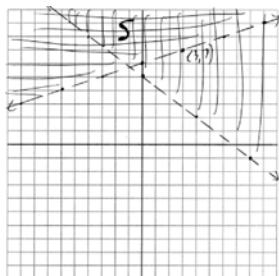


$(6, 2)$  is not a solution as its falls on the edge of each inequality.

REF: 061634ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

KEY: graph

471 ANS:

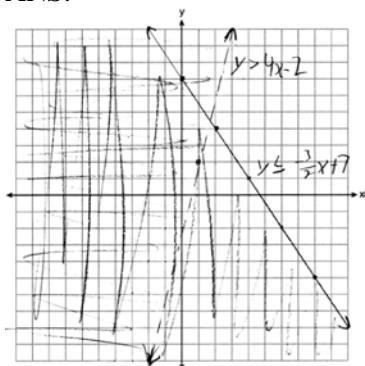


No,  $(3, 7)$  is on the boundary line, and not included in the solution set, because this is a strict inequality.

REF: 081735ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

KEY: graph

472 ANS:

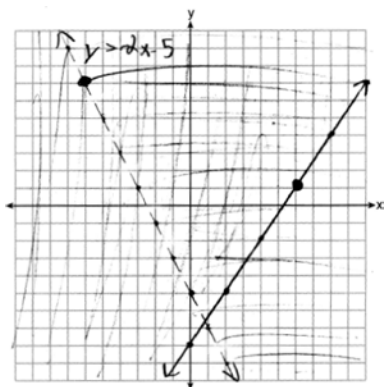


(1,2) is not in the solution set since it does not fall in an area where the shadings overlap.

REF: 061835ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

KEY: graph

473 ANS:

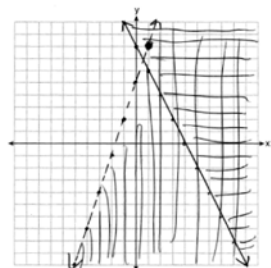


(6,1) is on a solid line. (-6,7) is on a dashed line.

REF: 081835ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

KEY: graph

474 ANS:

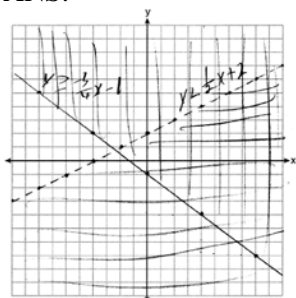


No, (1,8) falls on the boundary line of  $y - 5 < 3x$ , which is a strict inequality.

REF: 081933ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

KEY: graph

475 ANS:

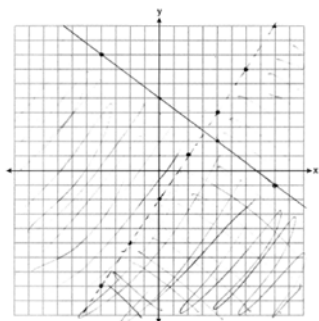


Correct, as  $0 + 2(0) - 4 < 0$

$$3(0) + 4(0) + 4 \geq 0$$

REF: 012034ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: graph

476 ANS:



No, as  $(6, 3)$  does not lie in the solution set.

REF: 062135ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: graph

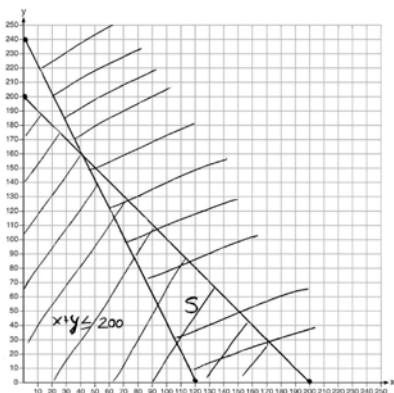
477 ANS:

$$x + y \leq 200 \quad \text{Marta is incorrect because } 12.5(30) + 6.25(80) < 1500$$

$$12.5x + 6.25y \geq 1500$$

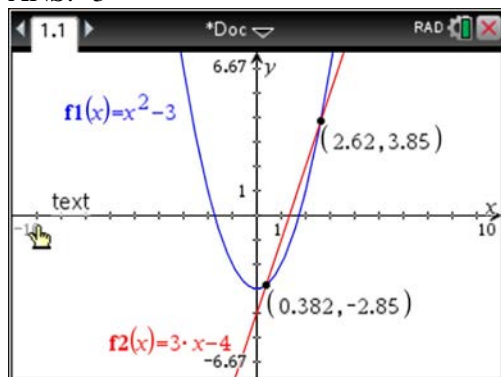
$$375 + 500 < 1500$$

$$875 < 1500$$



REF: 011637ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities  
KEY: graph

478 ANS: 3



REF: 011810ai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

KEY: algebraically

479 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

480 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

481 ANS:

$$2x^2 + 3x + 10 = 4x + 32 \quad x = \frac{1 \pm \sqrt{(-1)^2 - 4(2)(-22)}}{2(2)} \approx -3.1, 3.6. \text{ Quadratic formula, because the answer must be}$$

$$2x^2 - x - 22 = 0$$

to the nearest tenth.

REF: 061735ai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

482 ANS:

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

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

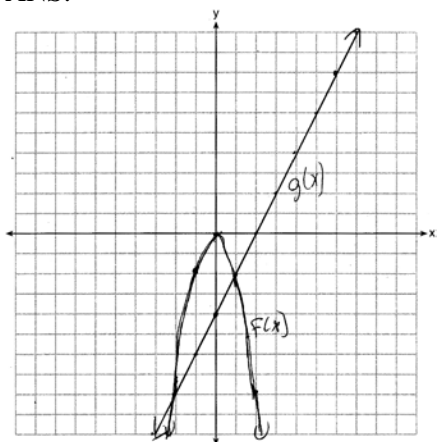
$$(x - 7)(x + 2) = 0$$

$$x = 7$$

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

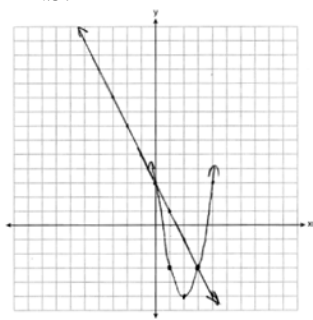
483 ANS:



$$x = -2, 1$$

REF: 081435ai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

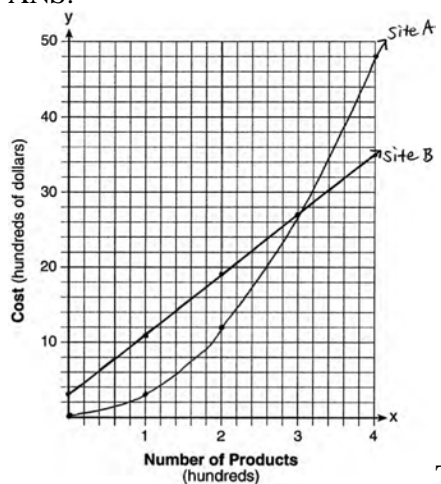
484 ANS:



$$x = 0, 3$$

REF: 061934ai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

485 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

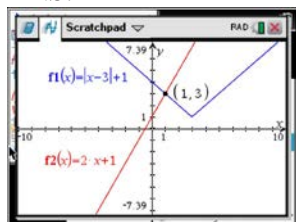
486 ANS: 4

I.  $f(4) = -\frac{4}{3}$  and  $g(4) = 2$ ; II.  $f(12) = 4$  and  $g(12) = 4$ 

REF: 062111ai NAT: A.REI.D.11 TOP: Other Systems

487 ANS: 3 REF: 011518ai NAT: A.REI.D.11 TOP: Other Systems

488 ANS: 2



$$\begin{aligned} |x-3| + 1 &= 2x + 1 & x-3 &= 2x & x-3 &= -2x \\ |x-3| &= 2x & -3 &= x & 3x &= 3 \\ & & \text{extraneous} & & x &= 1 \end{aligned}$$

REF: 061622ai NAT: A.REI.D.11 TOP: Other Systems

489 ANS: 1

$$\begin{aligned} \frac{1}{2}x + 3 &= |x| & -\frac{1}{2}x - 3 &= x \\ \frac{1}{2}x + 3 &= x & -x - 6 &= 2x \\ x + 6 &= 2x & -6 &= 3x \\ 6 &= x & -2 &= x \end{aligned}$$

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



490 ANS: 2  
 $|x + 2| = 3x - 2$   
 $x + 2 = 3x - 2$   
 $4 = 2x$   
 $x = 2$

REF: 081702ai NAT: A.REI.D.11 TOP: Other Systems

491 ANS: 3 REF: 081819ai NAT: A.REI.D.11 TOP: Other Systems

492 ANS: 3  
 $y = (-1)^2 - 3(-1) - 2 = 2, y = 4(-1) + 6 = 2$

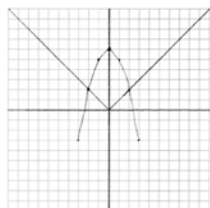
REF: 011918ai NAT: A.REI.D.11 TOP: Other Systems

493 ANS: 3 REF: 081914ai NAT: A.REI.D.11 TOP: Other Systems

494 ANS:  
 $-3, 1$

REF: 081630ai NAT: A.REI.D.11 TOP: Other Systems

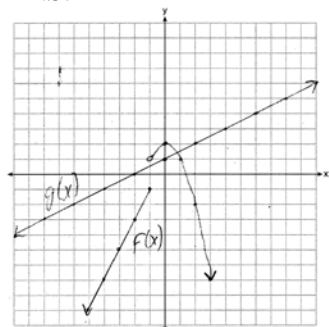
495 ANS:



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

496 ANS:



1, because the graphs only intersect once.

REF: 061636ai NAT: A.REI.D.11 TOP: Other Systems

497 ANS: 4 REF: 061811ai NAT: F.IF.A.1 TOP: Defining Functions  
 KEY: ordered pairs

498 ANS: 3 REF: 061504ai NAT: F.IF.A.1 TOP: Defining Functions  
 KEY: ordered pairs

499 ANS: 2 REF: 012004ai NAT: F.IF.A.1 TOP: Defining Functions  
 KEY: ordered pairs

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

- 500 ANS: 4 REF: 081902ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: ordered pairs
- 501 ANS: 4 REF: 062104ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: ordered pairs
- 502 ANS: 3 REF: 061709ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: ordered pairs
- 503 ANS: 2 REF: 011804ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: graphs
- 504 ANS: 2 REF: 081511ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: mixed
- 505 ANS: 4 REF: 061903ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: mixed
- 506 ANS: 4 REF: 011907ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: mixed
- 507 ANS:  
No, because the relation does not pass the vertical line test.
- REF: 011626ai NAT: F.IF.A.1 TOP: Defining Functions  
KEY: graphs
- 508 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
- 509 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
- 510 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
- 511 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
- 512 ANS: 1 REF: 081805ai NAT: F.IF.A.2 TOP: Functional Notation
- 513 ANS: 1 REF: 061420ai NAT: F.IF.A.2 TOP: Functional Notation

514 ANS: 2

$$f(-3) = -12 + 5 = -7$$

REF: 061902ai NAT: F.IF.A.2 TOP: Functional Notation

515 ANS: 1

$$f(3) = -2(3)^2 + 32 = -18 + 32 = 14$$

REF: 061705ai NAT: F.IF.A.2 TOP: Functional Notation

516 ANS: 1

$$g(-3) = -2(-3)^2 + 3(-3) = -18 - 9 = -27$$

REF: 011902ai NAT: F.IF.A.2 TOP: Functional Notation

517 ANS: 2

$$K(-3) = 2(-3)^2 - 5(-3) + 3 = 18 + 15 + 3 = 36$$

REF: 062103ai NAT: F.IF.A.2 TOP: Functional Notation

518 ANS: 2

$$f(-2) = (-2 - 1)^2 + 3(-2) = 9 - 6 = 3$$

REF: 081605ai NAT: F.IF.A.2 TOP: Functional Notation

519 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

520 ANS: 2

$$f(2) = 2(3^2) + 1 = 19$$

REF: 012001ai NAT: F.IF.A.2 TOP: Functional Notation

521 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

522 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

523 ANS: 4

$$k(9) = 2(9)^2 - 3\sqrt{9} = 162 - 9 = 153$$

REF: 061802ai NAT: F.IF.A.2 TOP: Functional Notation

524 ANS:

$$g(-2) = -4(-2)^2 - 3(-2) + 2 = -16 + 6 + 2 = -8$$

REF: 081925ai NAT: F.IF.A.2 TOP: Functional Notation

525 ANS:

$$\begin{aligned} w(52) - w(38) &= 15(x - 40) + 400 = 445 \text{ Since } w(x) > 400, x > 40. \text{ I substituted } 445 \text{ for } w(x) \text{ and solved} \\ 15(52 - 40) + 400 - 10(38) &= 15(x - 40) = 45 \\ 180 + 400 - 380 &= x - 40 = 3 \\ 200 &= x = 43 \end{aligned}$$

for  $x$ .

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

526 ANS: 3

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

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

527 ANS: 4 REF: 011917ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: graph528 ANS: 4 REF: 061509ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: graph529 ANS: 1 REF: 081710ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: limited domain530 ANS: 1  
 $f(2) = 0$   
 $f(6) = 8$ REF: 081411ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: limited domain531 ANS: 4  
 $\frac{1}{3}$  of a positive number +9 is a positive number.REF: 061417ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: real domain, linear532 ANS: 1 REF: 012018ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: real domain, absolute value533 ANS: 2 REF: 081806ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: limited domain534 ANS: 3 REF: 061816ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: real domain, quadratic535 ANS: 3  
 $f(-2) = 0, f(3) = 10, f(5) = 42$ REF: 011812ai NAT: F.IF.A.2 TOP: Domain and Range  
KEY: limited domain

536 ANS: 2

$$f(x) = x^2 + 2x - 8 = x^2 + 2x + 1 - 9 = (x + 1)^2 - 9$$

REF: 061611ai NAT: F.IF.A.2 TOP: Domain and Range

KEY: real domain, quadratic

537 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

538 ANS: 4

$$x = \frac{-(-2)}{2(2)} = \frac{1}{2} \quad h\left(\frac{1}{2}\right) = -\frac{9}{2}$$

REF: 081923ai NAT: F.IF.A.2 TOP: Domain and Range

KEY: real domain, quadratic

539 ANS: 2 REF: 011619ai NAT: F.IF.A.2 TOP: Domain and Range

KEY: real domain, exponential

540 ANS: 2 REF: 011506ai NAT: F.IF.B.5 TOP: Domain and Range

541 ANS: 2 REF: 062116ai NAT: F.IF.B.5 TOP: Domain and Range

542 ANS: 1 REF: 011615ai NAT: F.IF.B.5 TOP: Domain and Range

543 ANS: 4 REF: 061623ai NAT: F.IF.B.5 TOP: Domain and Range

544 ANS: 4 REF: 011719ai NAT: F.IF.B.5 TOP: Domain and Range

545 ANS: 4 REF: 061920ai NAT: F.IF.B.5 TOP: Domain and Range

546 ANS: 4

Time is continuous and positive.

REF: 081921ai NAT: F.IF.B.5 TOP: Domain and Range

547 ANS: 2 REF: 061821ai NAT: F.IF.B.5 TOP: Domain and Range

548 ANS: 4

There are no negative or fractional cars.

REF: 061402ai NAT: F.IF.B.5 TOP: Domain and Range

549 ANS: 2 REF: 081620ai NAT: F.IF.B.5 TOP: Domain and Range

550 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

551 ANS: 4 REF: 012021ai NAT: F.IF.B.5 TOP: Domain and Range

552 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

553 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

554 ANS: 1 REF: 061606ai NAT: F.LE.A.1 TOP: Families of Functions

555 ANS: 3 REF: 011505ai NAT: F.LE.A.1 TOP: Families of Functions

556 ANS: 1 REF: 081802ai NAT: F.LE.A.1 TOP: Families of Functions

557 ANS:

Exponential, because the function does not grow at a constant rate.

REF: 081527ai NAT: F.LE.A.1 TOP: Families of Functions

558 ANS:

Linear, because the function has a constant rate of change.

REF: 011625ai NAT: F.LE.A.1 TOP: Families of Functions

559 ANS:

Exponential, because the function does not have a constant rate of change.

REF: 081627ai NAT: F.LE.A.1 TOP: Families of Functions

560 ANS:

Yes, because  $f(x)$  does not have a constant rate of change.

REF: 061826ai NAT: F.LE.A.1 TOP: Families of Functions

561 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

562 ANS: 1 REF: 061906ai NAT: F.LE.A.1 TOP: Families of Functions

563 ANS: 4 REF: 061406ai NAT: F.LE.A.1 TOP: Families of Functions

564 ANS: 2 REF: 081907ai NAT: F.LE.A.1 TOP: Families of Functions

565 ANS: 3 REF: 081410ai NAT: F.LE.A.1 TOP: Families of Functions

KEY: bimodalgraph

566 ANS: 3 REF: 061721ai NAT: F.LE.A.1 TOP: Families of Functions

567 ANS: 2 REF: 061624ai NAT: F.LE.A.1 TOP: Families of Functions

568 ANS: 1 REF: 081717ai NAT: F.LE.A.1 TOP: Families of Functions

569 ANS: 1 REF: 011805ai NAT: F.LE.A.1 TOP: Families of Functions

570 ANS: 4 REF: 062117ai NAT: F.LE.A.1 TOP: Families of Functions

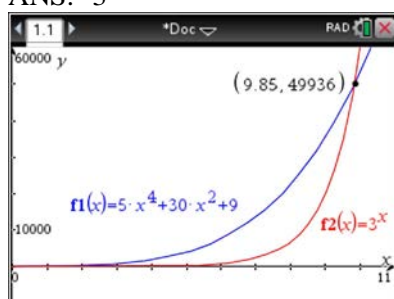
571 ANS: 3 REF: 081412ai NAT: F.LE.A.1 TOP: Families of Functions

572 ANS: 3 REF: 011711ai NAT: F.LE.A.1 TOP: Families of Functions

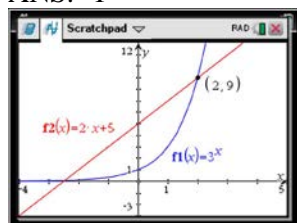
573 ANS: 4 REF: 061814ai NAT: F.LE.A.1 TOP: Families of Functions

- 574 ANS: 3                    REF: 061911ai            NAT: F.LE.A.1            TOP: Families of Functions  
 575 ANS: 3                    REF: 012017ai            NAT: F.LE.A.1            TOP: Families of Functions  
 576 ANS: 1                    REF: 011623ai            NAT: F.LE.A.1            TOP: Families of Functions  
 577 ANS: 4  
 II is linear.

- REF: 081823ai            NAT: F.LE.A.1            TOP: Families of Functions  
 578 ANS: 3                    REF: 061415ai            NAT: F.LE.A.2            TOP: Families of Functions  
 579 ANS: 2                    REF: 061513ai            NAT: F.LE.A.2            TOP: Families of Functions  
 580 ANS: 4                    REF: 011616ai            NAT: F.LE.A.2            TOP: Families of Functions  
 581 ANS: 1                    REF: 061707ai            NAT: F.LE.A.2            TOP: Families of Functions  
 582 ANS: 2                    REF: 081714ai            NAT: F.LE.A.2            TOP: Families of Functions  
 583 ANS: 3



- REF: 061621ai            NAT: F.LE.A.3            TOP: Families of Functions  
 584 ANS: 1



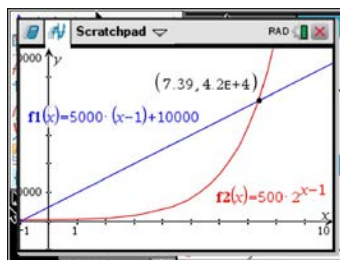
$$f(-1) < g(-1)$$

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

$$\frac{1}{3} < 3$$

- REF: 061515ai            NAT: F.LE.A.3            TOP: Families of Functions  
 585 ANS: 1                    REF: 081618ai            NAT: F.LE.A.3            TOP: Families of Functions

586 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            |

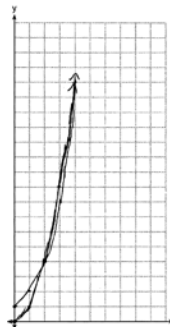
REF: 081518ai NAT: F.LE.A.3 TOP: Families of Functions

587 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

588 ANS:



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

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

589 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

590 ANS: 1 REF: 011620ai NAT: F.BF.B.3 TOP: Transformations with Functions

KEY: bimodalgraph

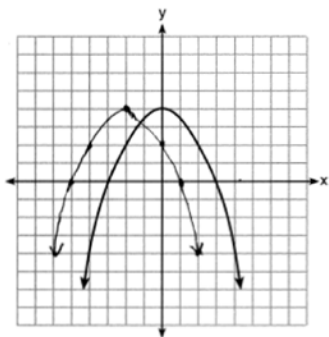
591 ANS:

2 units right and 3 units down.

REF: 081626ai NAT: F.BF.B.3 TOP: Transformations with Functions



592 ANS:



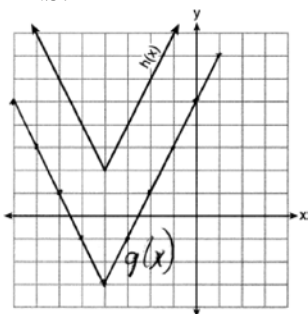
REF: 061828ai NAT: F.BF.B.3 TOP: Transformations with Functions

593 ANS: 3

The minimum of  $r(x)$  is  $-16$ . The minimum of  $q(x)$  is  $-9$   $\left(x = \frac{-2}{2(1)} = -1, q(-1) = -9\right)$ .

REF: 081917ai NAT: F.IF.C.9 TOP: Comparing Functions

594 ANS: 2



REF: 081718ai NAT: F.IF.C.9 TOP: Comparing Functions

595 ANS: 4

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

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

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

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

REF: 081521ai NAT: F.IF.C.9 TOP: Comparing Functions

596 ANS: 3

$$x = 3$$

REF: 061717ai NAT: F.IF.C.9 TOP: Comparing Functions

597 ANS: 2

The y-intercept of both  $f(x)$  and  $g(x)$  is  $-4$ .

REF: 012013ai NAT: F.IF.C.9 TOP: Comparing Functions

598 ANS: 2

REF: 011723ai NAT: F.IF.C.9 TOP: Comparing Functions

599 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

600 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

601 ANS: 4

$$f(4) = q(4) = p(4) = 3$$

REF: 011921ai NAT: F.IF.C.9 TOP: Comparing Functions

602 ANS: 4

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

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

REF: spr1301ai NAT: F.IF.C.9 TOP: Comparing Functions

603 ANS: 3

REF: 061820ai NAT: F.IF.C.9 TOP: Comparing Functions

604 ANS: 3

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

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

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

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

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

$$= -\frac{1}{4} + \frac{2}{4} + 6$$

$$= -\frac{36}{5} + \frac{72}{5} + \frac{20}{5}$$

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

$$= \frac{56}{5}$$

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

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

605 ANS: 4

1)  $b = 0$ ; 2)  $b = 4$ ; 3)  $b = -6$ ; 4)  $b = 5$ 

REF: 081611ai NAT: F.IF.C.9 TOP: Comparing Functions

606 ANS: 4

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

REF: 081615ai NAT: F.IF.C.9 TOP: Comparing Functions

607 ANS: 2

$$1) x = \frac{-2}{2(-1)} = 1 \quad ; \quad 2) h = \frac{3}{2} \text{ Using } (0,3), 3 = a\left(0 - \frac{3}{2}\right)^2 + k; \text{ Using } (1,5), 5 = a\left(1 - \frac{3}{2}\right)^2 + k$$

$$y = -1^2 + 2(1) + 4 = 5$$

$$3 = \frac{9}{4}a + k$$

$$5 = \frac{1}{4}a + k$$

vertex (1,5)

$$k = 3 - \frac{9}{4}a$$

$$k = 5 - \frac{1}{4}a$$

$$5 - \frac{1}{4}a = 3 - \frac{9}{4}a \quad k = 5 - \frac{1}{4}(-1) = \frac{21}{4}; 3) \text{ vertex } (5,5); 4) \text{ Using } c = 1 \quad -9 = (-2)^2a + (-2)b + 1$$

$$20 - a = 12 - 9a \quad \text{vertex} \left( \frac{3}{2}, \frac{21}{4} \right)$$

$$-10 = 4a - 2b$$

$$8a = -8$$

$$b = 2a + 5$$

$$a = -1$$

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

$$\text{vertex} \left( \frac{3}{2}, \frac{13}{4} \right)$$

$$-3 = a - b + 1$$

$$a = -1$$

$$b = a + 4 \quad b = -1 + 4 = 3 \quad y = -\left(\frac{3}{2}\right)^2 + 3\left(\frac{3}{2}\right) + 1 = -\frac{9}{4} + \frac{18}{4} + \frac{4}{4} = \frac{13}{4}$$

REF: 011823ai NAT: F.IF.C.9 TOP: Comparing Functions

608 ANS: 2

$$1) x = \frac{-2}{2(1)} = -1, h(-1) = (-1)^2 + 2(-1) - 6 = -7; 2) y = -10; 3) k \left( \frac{-5 + -2}{2} \right) = (-3.5 + 5)(-3.5 + 2) = -2.25; 4)$$

$$y = -6$$

REF: 061813ai NAT: F.IF.C.9 TOP: Comparing Functions

609 ANS: 1

$$1) -6; 2) 1; 3) -2; 4) -2$$

REF: 062115ai NAT: F.IF.C.9 TOP: Comparing Functions

610 ANS: 3

REF: 011622ai

NAT: F.IF.C.9

TOP: Comparing Functions

611 ANS:

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

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

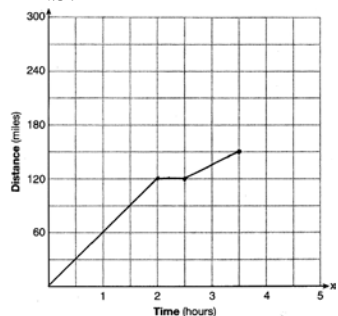
REF: 081429ai NAT: F.IF.C.9 TOP: Comparing Functions

- 612 ANS: 3                      REF: 061701ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events  
 613 ANS: 4                      REF: 061502ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events  
 614 ANS: 1                      REF: 081918ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events  
 615 ANS:

*D-E*, because his speed was slower. Craig may have stayed at a rest stop during *B-C*.  $\frac{230-0}{7-0} \approx 32.9$

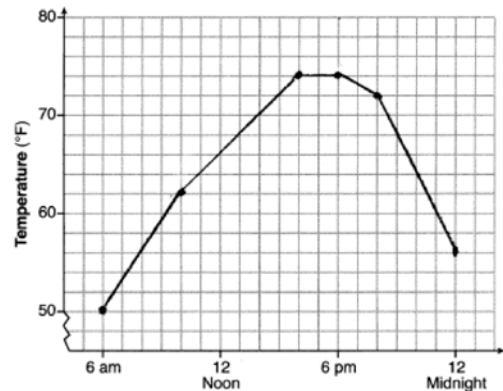
REF: 061734ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events

616 ANS:



REF: 081528ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events

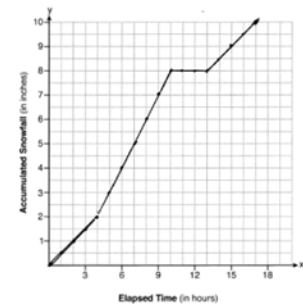
617 ANS:



, 6am-4pm,  $\frac{74-56}{6-12} = -3$

REF: 011936ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events

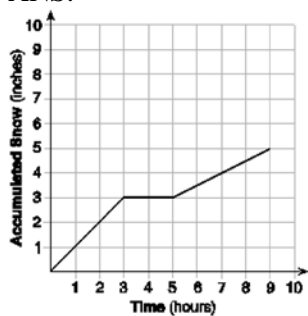
618 ANS:



$\frac{10.0-0}{17.0-0} \approx 0.59$

REF: 081936ai                      NAT: F.IF.B.4                      TOP: Relating Graphs to Events

619 ANS:

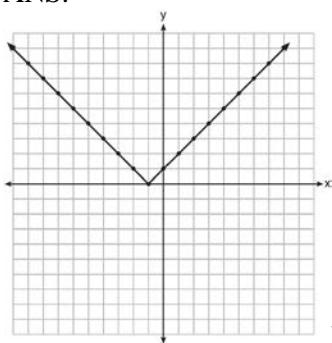


At 6 hours,  $3\frac{1}{2}$  inches of snow have fallen.

REF: spr1307ai NAT: F.IF.B.4 TOP: Relating Graphs to Events

620 ANS: 1 REF: 011712ai NAT: F.IF.C.7 TOP: Graphing Absolute Value Functions

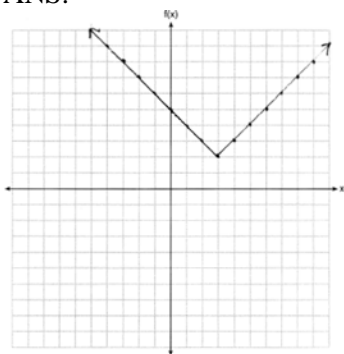
621 ANS:



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

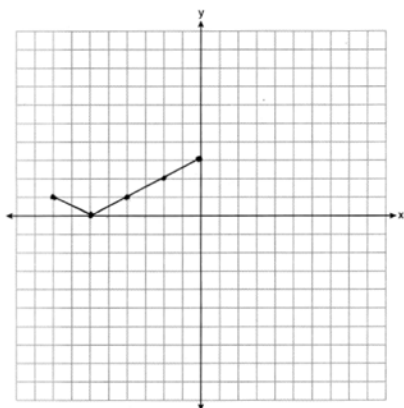
REF: fall1310ai NAT: F.IF.C.7 TOP: Graphing Absolute Value Functions

622 ANS:



REF: 011825ai NAT: F.IF.C.7 TOP: Graphing Absolute Value Functions

623 ANS:



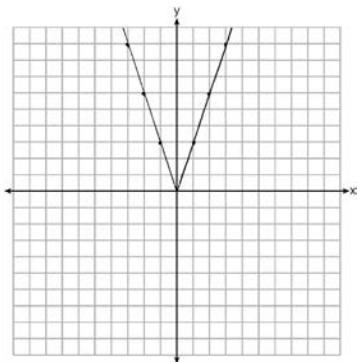
REF: 062126ai NAT: F.IF.C.7 TOP: Graphing Absolute Value Functions

624 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

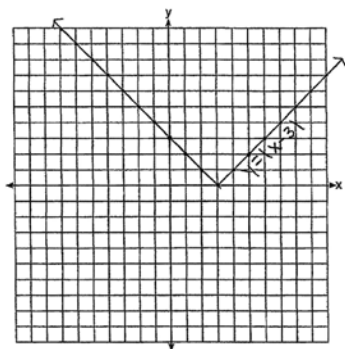
625 ANS:



2 down. 4 right.

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

626 ANS:



The graph has shifted three units to the right.

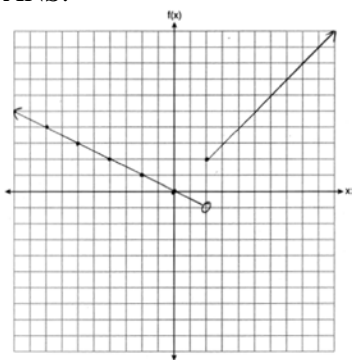
REF: 061525ai NAT: F.BF.B.3 TOP: Graphing Absolute Value Functions

627 ANS: 4 REF: 081815ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions

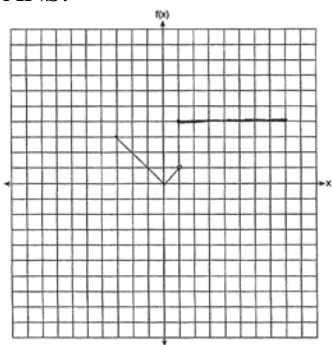
628 ANS: 2 REF: 081516ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions

KEY: bimodalgraph

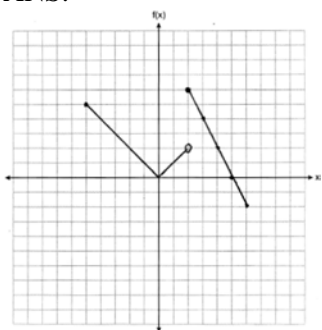
629 ANS: 2 REF: 081422ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions  
 630 ANS:



REF: 061832ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions  
 631 ANS:

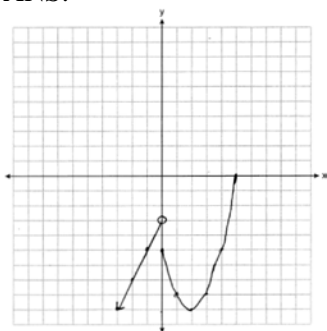


REF: 011530ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions  
 632 ANS:



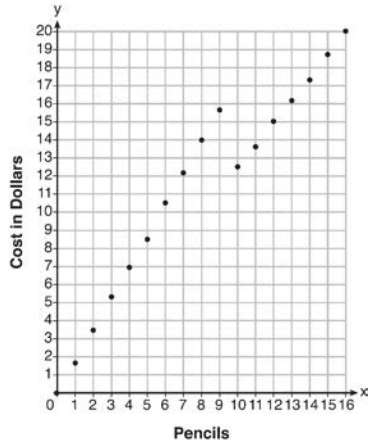
REF: 061927ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions

633 ANS:



REF: 081932ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions

634 ANS:



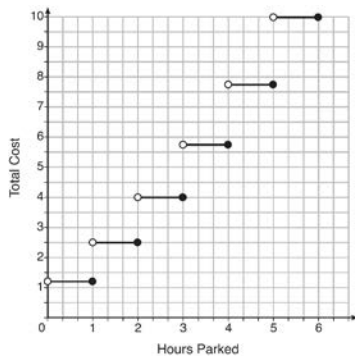
Since according to the graph, 8 pencils cost \$14 and 10 pencils cost \$12.50, the cashier is correct.

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

635 ANS: 1 REF: 061507ai NAT: F.IF.C.7 TOP: Graphing Step Functions

KEY: bimodalgraph

636 ANS:



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

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

637 ANS: 2 REF: 061919ai NAT: F.IF.A.3 TOP: Sequences

KEY: difference or ratio



638 ANS: 1

$$5r = a_2 \quad a_2 r = 245 \quad 5r = \frac{245}{r}$$

$$a_2 = \frac{245}{r} \quad 5r^2 = 245$$

$$r^2 = 49$$

$$r = \pm 7$$

REF: 081924ai NAT: F.IF.A.3 TOP: Sequences KEY: difference or ratio

639 ANS:

Yes, because the sequence has a common ratio, 3.

REF: 081726ai NAT: F.IF.A.3 TOP: Sequences KEY: difference or ratio

640 ANS: 3

$$a_n = 3n + 1$$

$$a_5 = 3(5) + 1 = 16$$

REF: 061613ai NAT: F.IF.A.3 TOP: Sequences KEY: explicit

641 ANS: 1

$$d = \frac{37 - 31}{6 - 3} = 2 \quad a_n = 2n + 25$$

$$a_{20} = 2(20) + 25 = 65$$

REF: 061807ai NAT: F.IF.A.3 TOP: Sequences KEY: explicit

642 ANS: 2

$$a_n = 4n + 8$$

$$a_{35} = 4(35) + 8 = 148$$

REF: 012008ai NAT: F.IF.A.3 TOP: Sequences KEY: explicit

643 ANS: 3

1, 3, 6, 10, 15, 21, 28, ...

REF: 081715ai NAT: F.IF.A.3 TOP: Sequences KEY: recursive

644 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

645 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

- 646 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
- 647 ANS: 3  
 $a_2 = n(a_{2-1}) = 2 \cdot 1 = 2, a_3 = n(a_{3-1}) = 3 \cdot 2 = 6, a_4 = n(a_{4-1}) = 4 \cdot 6 = 24, a_5 = n(a_{5-1}) = 5 \cdot 24 = 120$
- REF: 061824ai NAT: F.IF.A.3 TOP: Sequences KEY: recursive
- 648 ANS: 1  
 $a_2 = 3 + 2(6)^2 = 75$
- REF: 081919ai NAT: F.IF.A.3 TOP: Sequences KEY: recursive
- 649 ANS: 1  
 $a_2 = 2(5) - 7 = 3, a_3 = 2(3) - 7 = -1, a_4 = 2(-1) - 7 = -9$
- REF: 012023ai NAT: F.IF.A.3 TOP: Sequences KEY: recursive
- 650 ANS:  
 0, -1, 1, 1, 1
- REF: 081832ai NAT: F.IF.A.3 TOP: Sequences KEY: recursive
- 651 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
- 652 ANS: 2 REF: 061424ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: explicit
- 653 ANS: 2 REF: 081416ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: explicit
- 654 ANS: 1 REF: 081610ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: explicit
- 655 ANS: 4 REF: 081820ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: explicit
- 656 ANS: 4  
 $31 = 4 + (10 - 1)3$
- REF: 062118ai NAT: F.LE.A.2 TOP: Sequences KEY: explicit
- 657 ANS: 3 REF: 061522ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: recursive
- 658 ANS: 3 REF: 011818ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: recursive
- 659 ANS: 4 REF: 062121ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: recursive
- 660 ANS: 1 REF: 081514ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: recursive
- 661 ANS: 1 REF: 011708ai NAT: F.LE.A.2 TOP: Sequences  
 KEY: recursive

- 662 ANS: 2                    REF: 011919ai        NAT: F.LE.A.2        TOP: Sequences  
KEY: recursive
- 663 ANS: 3                    REF: 011618ai        NAT: F.LE.A.2        TOP: Sequences  
KEY: recursive
- 664 ANS: 4                    REF: 061421ai        NAT: F.LE.A.2        TOP: Sequences  
KEY: recursive
- 665 ANS: 1                    REF: 061922ai        NAT: S.ID.A.2        TOP: Dispersion  
KEY: basic
- 666 ANS: 3

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

- REF: 081404ai        NAT: S.ID.A.2        TOP: Central Tendency and Dispersion
- 667 ANS: 4                    REF: 011720ai        NAT: S.ID.A.2        TOP: Central Tendency and Dispersion
- 668 ANS: 4                    REF: 011514ai        NAT: S.ID.A.2        TOP: Central Tendency and Dispersion
- 669 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
- 670 ANS: 1  
A:  $\bar{x} = 6$ ;  $\sigma_x = 3.16$     B:  $\bar{x} = 6.875$ ;  $\sigma_x = 3.06$

- REF: 081519ai        NAT: S.ID.A.2        TOP: Central Tendency and Dispersion
- 671 ANS:  
4th because IQR and  $\sigma_x$  are greater for 4th Period.

- REF: 081831ai        NAT: S.ID.A.2        TOP: Central Tendency and Dispersion
- 672 ANS:  
Los Angeles because range, IQR and  $\sigma_x$  are less.

|                    | $\sigma_x$ | Min | Q1 | Q3 | Max | Range | IQR |
|--------------------|------------|-----|----|----|-----|-------|-----|
| <b>Miami</b>       | 7.2        | 60  | 75 | 83 | 87  | 27    | 8   |
| <b>Los Angeles</b> | 3.6        | 61  | 63 | 67 | 74  | 13    | 4   |

- REF: 011931ai        NAT: S.ID.A.2        TOP: Central Tendency and Dispersion
- 673 ANS: 3  
Median remains at 1.4.

- REF: 061520ai        NAT: S.ID.A.3        TOP: Central Tendency and Dispersion

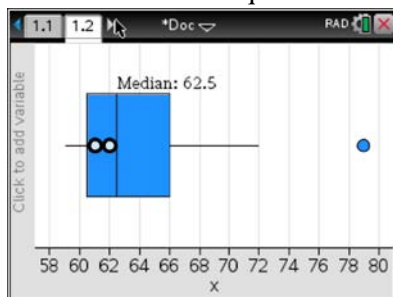
674 ANS: 1

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

675 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  $Q_3 + 1.5 \cdot IRQ = 66 + 1.5(66 - 60.5) = 74.25$ .

REF: 061715ai NAT: S.ID.A.3 TOP: Central Tendency and Dispersion

676 ANS: 4

$$\frac{30}{30 + 12 + 8} = 0.6$$

REF: 061615ai NAT: S.ID.B.5 TOP: Frequency Tables

KEY: two-way

677 ANS: 2

$$\frac{26}{42 + 26} = 0.382$$

REF: 061912ai NAT: S.ID.B.5 TOP: Frequency Tables

KEY: two-way

678 ANS: 2

$$\frac{14}{16 + 20 + 14} = 28\%$$

REF: 011705ai NAT: S.ID.B.5 TOP: Frequency Tables

KEY: two-way

679 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

680 ANS: 2

$$\frac{56}{56 + 74 + 103} \approx 0.24$$

REF: 081906ai NAT: S.ID.B.5 TOP: Frequency Tables

KEY: two-way

681 ANS: 3

$$\frac{138}{192} \approx 72\%$$

REF: 012010ai NAT: S.ID.B.5 TOP: Frequency Tables

KEY: two-way

682 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

683 ANS:

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

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

KEY: two-way

684 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

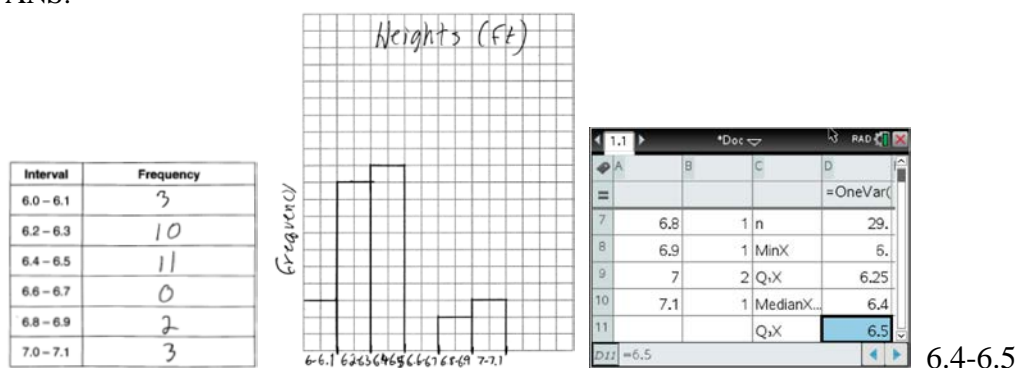
685 ANS:

|                | 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

686 ANS:



REF: 081734ai NAT: S.ID.A.1 TOP: Frequency Histograms

KEY: frequency histograms

687 ANS: 4 REF: 081603ai NAT: S.ID.A.1 TOP: Box Plots

KEY: interpret

688 ANS: 2 REF: 061805ai NAT: S.ID.A.1 TOP: Box Plots

KEY: interpret

689 ANS: 1

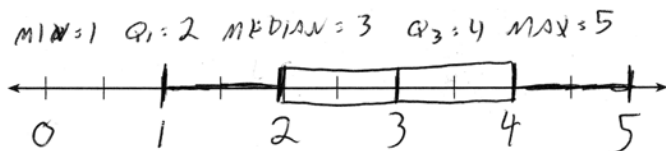
 $8 - 1 = 7$ 

REF: 081915ai NAT: S.ID.A.1 TOP: Box Plots KEY: interpret

690 ANS: 3 REF: 062119ai NAT: S.ID.A.1 TOP: Box Plots

KEY: interpret

691 ANS:



REF: 061432ai NAT: S.ID.A.1 TOP: Box Plots KEY: represent

692 ANS: 4 REF: 012022ai NAT: S.ID.A.1 TOP: Dot Plots

693 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

694 ANS: 2 REF: 011901ai NAT: S.ID.B.6 TOP: Scatter Plots

KEY: line of best fit

695 ANS: 2 REF: 061516ai NAT: S.ID.C.9 TOP: Analysis of Data

696 ANS: 2 REF: 011713ai NAT: S.ID.C.9 TOP: Analysis of Data

697 ANS: 2 REF: 081708ai NAT: S.ID.C.9 TOP: Analysis of Data

698 ANS: 3 REF: 081821ai NAT: S.ID.C.9 TOP: Analysis of Data

699 ANS: 4 REF: 081421ai NAT: S.ID.B.6 TOP: Regression

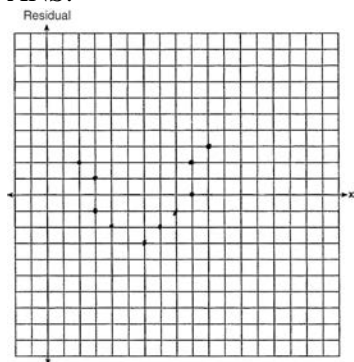
KEY: linear

- 700 ANS: 2 REF: 061916ai NAT: S.ID.B.6 TOP: Regression  
KEY: exponential
- 701 ANS:  
 $y = 0.05x - 0.92$
- REF: fall1307ai NAT: S.ID.B.6 TOP: Regression KEY: linear
- 702 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
- 703 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
- 704 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
- 705 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
- 706 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
- 707 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
- 708 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
- 709 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
- 710 ANS:  
 $f(p) = -.79p + 249.86$   $r = -.95$  There is a strong negative correlation as the higher the sales price, the fewer number of new homes available.
- REF: 012035ai NAT: S.ID.B.6 TOP: Regression KEY: linear with correlation coefficient

- 711 ANS:  
 $y = 1.72x + 69.4$ , 0.97, high, positive correlation between the number of jumping jacks and heart rate  
 REF: 062133ai NAT: S.ID.B.6 TOP: Regression KEY: linear with correlation coefficient
- 712 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
- 713 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
- 714 ANS: 4 REF: 011703ai NAT: S.ID.C.8 TOP: Correlation Coefficient
- 715 ANS: 1 REF: 081722ai NAT: S.ID.C.8 TOP: Correlation Coefficient
- 716 ANS: 1 REF: 061714ai NAT: S.ID.C.8 TOP: Correlation Coefficient
- 717 ANS: 3 REF: 061411ai NAT: S.ID.C.8 TOP: Correlation Coefficient
- 718 ANS: 2 REF: 061604ai NAT: S.ID.C.8 TOP: Correlation Coefficient
- 719 ANS: 2  
 $r = 0.92$   
 REF: 081606ai NAT: S.ID.C.8 TOP: Correlation Coefficient
- 720 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
- 721 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
- 722 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
- 723 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
- 724 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



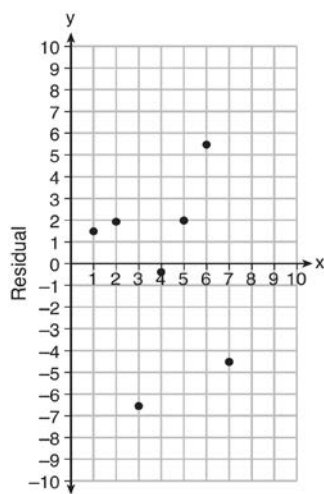
725 ANS:



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

REF: 081431ai NAT: S.ID.B.6 TOP: Residuals

726 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