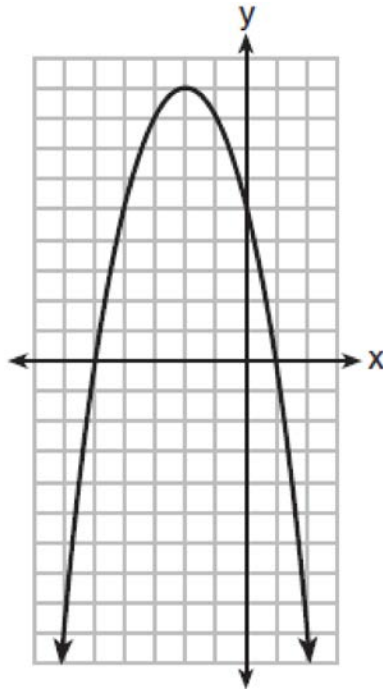


- 4 A relation is graphed on the set of axes below.



Based on this graph, the relation is

- | | |
|--|---|
| 1) a function because it passes the horizontal line test | 3) not a function because it fails the horizontal line test |
| 2) a function because it passes the vertical line test | 4) not a function because it fails the vertical line test |
- 5 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 | 3) quadratic |
| 2) exponential | 4) square root |
- 6 Which ordered pair would *not* be a solution to $y = x^3 - x$?
- | |
|----------------|
| 1) $(-4, -60)$ |
| 2) $(-3, -24)$ |
| 3) $(-2, -6)$ |
| 4) $(-1, -2)$ |
- 7 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) $P(c) = .25c - 9.96$ | 3) $P(c) = .50c - 10.21$ |
| 2) $P(c) = .50c - 9.71$ | 4) $P(c) = .75c - 9.96$ |

- 8 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
- 9 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) $(y^2 + 50)(y^2 - 50)$
- 10 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 $(3.85, 2.62)$
- 11 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
- 12 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) $\{0, 4, 92\}$
- 13 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) $-2x^2 + x - 5$
- 14 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) $-4 \pm \sqrt{24}$
- 15 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.

- 16 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

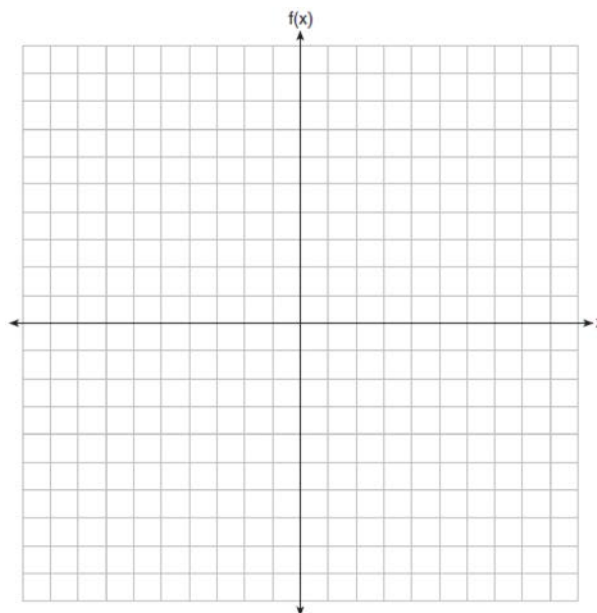
When referring to the data, which statement is *false*?

- 1) The mode is the best measure of central tendency for the data. 3) The median is 53.
 2) The data have two outliers. 4) The range is 120.
- 17 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 3) -2, -1, 0
 2) 1, 2 4) -2, -1
- 18 If the pattern below continues, which equation(s) is a recursive formula that represents the number of squares in this sequence?



- 1) $y = 2x + 1$ 3) $a_1 = 3$
 $a_n = a_{n-1} + 2$
 2) $y = 2x + 3$ 4) $a_1 = 1$
 $a_n = a_{n-1} + 2$
- 19 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) $2(x - 3)^2 - 1$ 3) $2x^2 + 2$
 2) $2(x + 3)^2 - 1$ 4) $2x^2 - 4$
- 20 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. 3) The system of inequalities has more solutions.
 2) The system of equations has more solutions. 4) Both systems have only one solution.

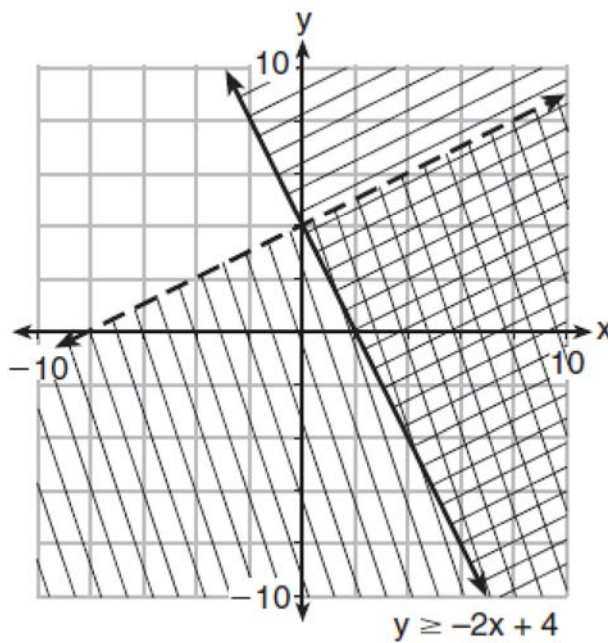
25 On the set of axes below, graph $f(x) = |x - 3| + 2$.



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

27 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.

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

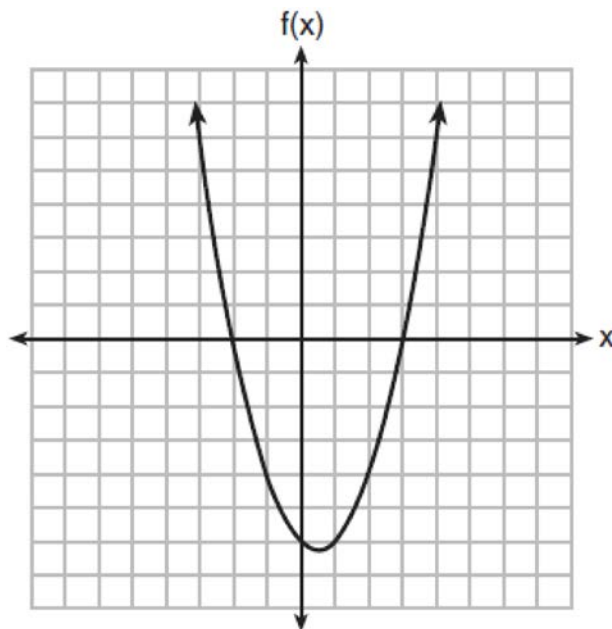


- 29 If the zeros of a quadratic function, F , are -3 and 5 , what is the equation of the axis of symmetry of F ? Justify your answer.
- 30 The formula $F_g = \frac{GM_1M_2}{r^2}$ calculates the gravitational force between two objects where G is the gravitational constant, M_1 is the mass of one object, 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 .
- 31 At Mountain Lakes High School, the mathematics and physics scores of nine students were compared as shown in the table below.

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

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

- 32 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*.

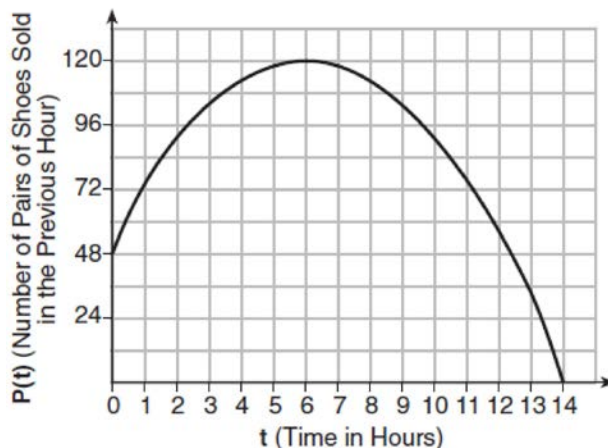
- 33 Jim is a furniture salesman. His weekly pay is \$300 plus 3.5% of his total sales for the week. Jim sells x dollars' worth of furniture during the week. Write a function, $p(x)$, which can be used to determine his pay for the week. Use this function to determine Jim's pay to the *nearest cent* for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

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

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

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

- 35 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.
- 36 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.

- 37 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.

0118AI

Answer Section

1 ANS: 4 PTS: 2 REF: 011801ai NAT: A.REI.A.1
TOP: Identifying Properties

2 ANS: 3
 $\frac{5.4-4}{4} = 0.35$

PTS: 2 REF: 011802ai NAT: F.LE.A.2 TOP: Modeling Exponential Functions
3 ANS: 1 PTS: 2 REF: 011803ai NAT: A.CED.A.3
TOP: Modeling Linear Systems

4 ANS: 2 PTS: 2 REF: 011804ai NAT: F.IF.A.1
TOP: Defining Functions KEY: graphs

5 ANS: 1 PTS: 2 REF: 011805ai NAT: F.LE.A.1
TOP: Families of Functions

6 ANS: 4
 $-2 \neq (-1)^3 - (-1)$
 $-2 \neq 0$

PTS: 2 REF: 011806ai NAT: A.REI.D.10 TOP: Identifying Solutions

7 ANS: 4
 $P(c) = (.50 + .25)c - 9.96 = .75c - 9.96$

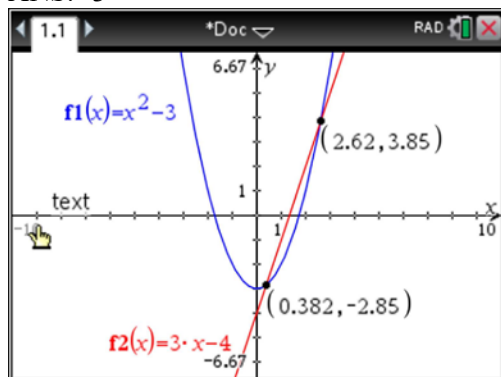
PTS: 2 REF: 011807ai NAT: F.BF.A.1 TOP: Modeling Linear Functions

8 ANS: 3
 $\sqrt{576} = 24 \quad \sqrt{684} = 6\sqrt{19}$

PTS: 2 REF: 011808ai NAT: N.RN.B.3 TOP: Operations with Radicals
KEY: classify

9 ANS: 3 PTS: 2 REF: 011809ai NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares KEY: higher power

10 ANS: 3



PTS: 2 REF: 011810ai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems
KEY: algebraically

- 11 ANS: 2
 $-4.9(0)^2 + 50(0) + 2$
- PTS: 2 REF: 011811ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions
 KEY: context
- 12 ANS: 3
 $f(-2) = 0, f(3) = 10, f(5) = 42$
- PTS: 2 REF: 011812ai NAT: F.IF.A.2 TOP: Domain and Range
 KEY: limited domain
- 13 ANS: 3 PTS: 2 REF: 011813ai NAT: A.APR.A.1
 TOP: Operations with Polynomials KEY: addition
- 14 ANS: 1
 $3(x - 4)^2 = 27$
 $(x - 4)^2 = 9$
 $x - 4 = \pm 3$
 $x = 1, 7$
- PTS: 2 REF: 011814ai NAT: A.REI.B.4 TOP: Solving Quadratics
 KEY: taking square roots
- 15 ANS: 2 PTS: 2 REF: 011815ai NAT: A.REI.C.6
 TOP: Solving Linear Systems
- 16 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.
- PTS: 2 REF: 011816ai NAT: S.ID.A.3 TOP: Central Tendency and Dispersion
- 17 ANS: 2
 $-2(x - 5) < 10$
 $x - 5 > -5$
 $x > 0$
- PTS: 2 REF: 011817ai NAT: A.REI.B.3 TOP: Interpreting Solutions
- 18 ANS: 3 PTS: 2 REF: 011818ai NAT: F.LE.A.2
 TOP: Sequences KEY: recursive
- 19 ANS: 2 PTS: 2 REF: 011819ai NAT: F.BF.B.3
 TOP: Graphing Polynomial Functions
- 20 ANS: 3 PTS: 2 REF: 011820ai NAT: A.REI.D.12
 TOP: Graphing Systems of Linear Inequalities KEY: solution set
- 21 ANS: 4 PTS: 2 REF: 011821ai NAT: A.SSE.B.3
 TOP: Modeling Exponential Functions

22 ANS: 4

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

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

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

$$-204 = 18x$$

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

PTS: 2 REF: 011822ai NAT: A.REI.B.3 TOP: Solving Linear Equations

KEY: fractional expressions

23 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)

$$k = 3 - \frac{9}{4}a$$

$$k = 5 - \frac{1}{4}a$$

$$5 - \frac{1}{4}a = 3 - \frac{9}{4}a \quad k = 5 - \frac{1}{4}(-1) = \frac{21}{4}; \quad 3) \text{ vertex } (5,5); \quad 4) \text{ Using } c = 1 \quad -9 = (-2)^2a + (-2)b + 1$$

$$20 - a = 12 - 9a \quad \text{vertex} \left(\frac{3}{2}, \frac{21}{4} \right)$$

$$-10 = 4a - 2b$$

$$8a = -8$$

$$b = 2a + 5$$

$$a = -1$$

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

$$\text{vertex} \left(\frac{3}{2}, \frac{13}{4} \right)$$

$$-3 = a - b + 1$$

$$a = -1$$

$$b = a + 4$$

$$b = -1 + 4 = 3 \quad y = -\left(\frac{3}{2} \right)^2 + 3\left(\frac{3}{2} \right) + 1 = -\frac{9}{4} + \frac{18}{4} + \frac{4}{4} = \frac{13}{4}$$

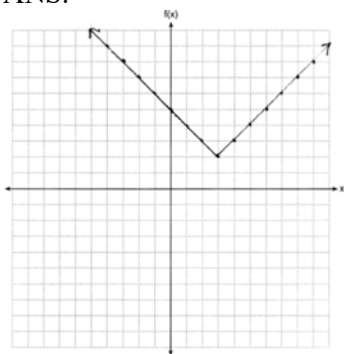
PTS: 2 REF: 011823ai NAT: F.IF.C.9 TOP: Comparing Functions

24 ANS: 2

From 1996-2012, the average rate of change was positive for three age groups.

PTS: 2 REF: 011824ai NAT: F.IF.B.6 TOP: Rate of Change

25 ANS:



PTS: 2 REF: 011825ai NAT: F.IF.C.7 TOP: Graphing Absolute Value Functions

26 ANS:

$$x^2 - 4x + 3 = 0$$

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

$$x = 1, 3$$

PTS: 2 REF: 011826ai NAT: A.APR.B.3 TOP: Zeros of Polynomials

27 ANS:

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

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

28 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.

PTS: 2 REF: 011828ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

KEY: solution set

29 ANS:

$$x = 1 \quad \frac{-3 + 5}{2} = 1$$

PTS: 2 REF: 011829ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: no context

30 ANS:

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

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

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

PTS: 2 REF: 011830ai NAT: A.CED.A.4 TOP: Transforming Formulas

31 ANS:

$r \approx 0.92$. The correlation coefficient suggests a strong positive correlation between a student's mathematics and physics scores.

PTS: 2 REF: 011831ai NAT: S.ID.C.8 TOP: Correlation Coefficient

32 ANS:

Yes, because from the graph the zeroes of $f(x)$ are -2 and 3 .

PTS: 2 REF: 011832ai NAT: F.IF.C.7 TOP: Graphing Quadratic Functions

33 ANS:

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

PTS: 4 REF: 011833ai NAT: F.BF.A.1 TOP: Modeling Linear Functions

34 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.

PTS: 4 REF: 011834ai NAT: S.ID.B.6 TOP: Regression

KEY: linear

35 ANS:

$$2L + 1.5W \geq 500 \quad 2(144) + 1.5W = 500 \quad 142 \text{ bottles of water must be sold to cover the cost of renting costumes.}$$

$$L + W \leq 360 \quad 1.5W = 212$$

$$W = 141.\bar{3}$$

PTS: 4 REF: 011835ai NAT: A.CED.A.3 TOP: Modeling Systems of Linear Inequalities

36 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.

PTS: 4 REF: 011836ai NAT: F.IF.B.6 TOP: Rate of Change

37 ANS:

$$d = 2c - 5; 20 \neq 2(15) - 5 \quad 20 \text{ dogs is not five less than twice } 15 \text{ cats} \quad \frac{c+3}{2c-5+3} = \frac{3}{4} \quad d = 2(9) - 5 = 13$$

$$\frac{c+3}{d+3} = \frac{3}{4} \quad 20 \neq 25$$

$$4c + 12 = 6c - 6$$

$$18 = 2c$$

$$c = 9$$

PTS: 6

REF: 011837ai

NAT: A.CED.A.3

TOP: Modeling Linear Systems