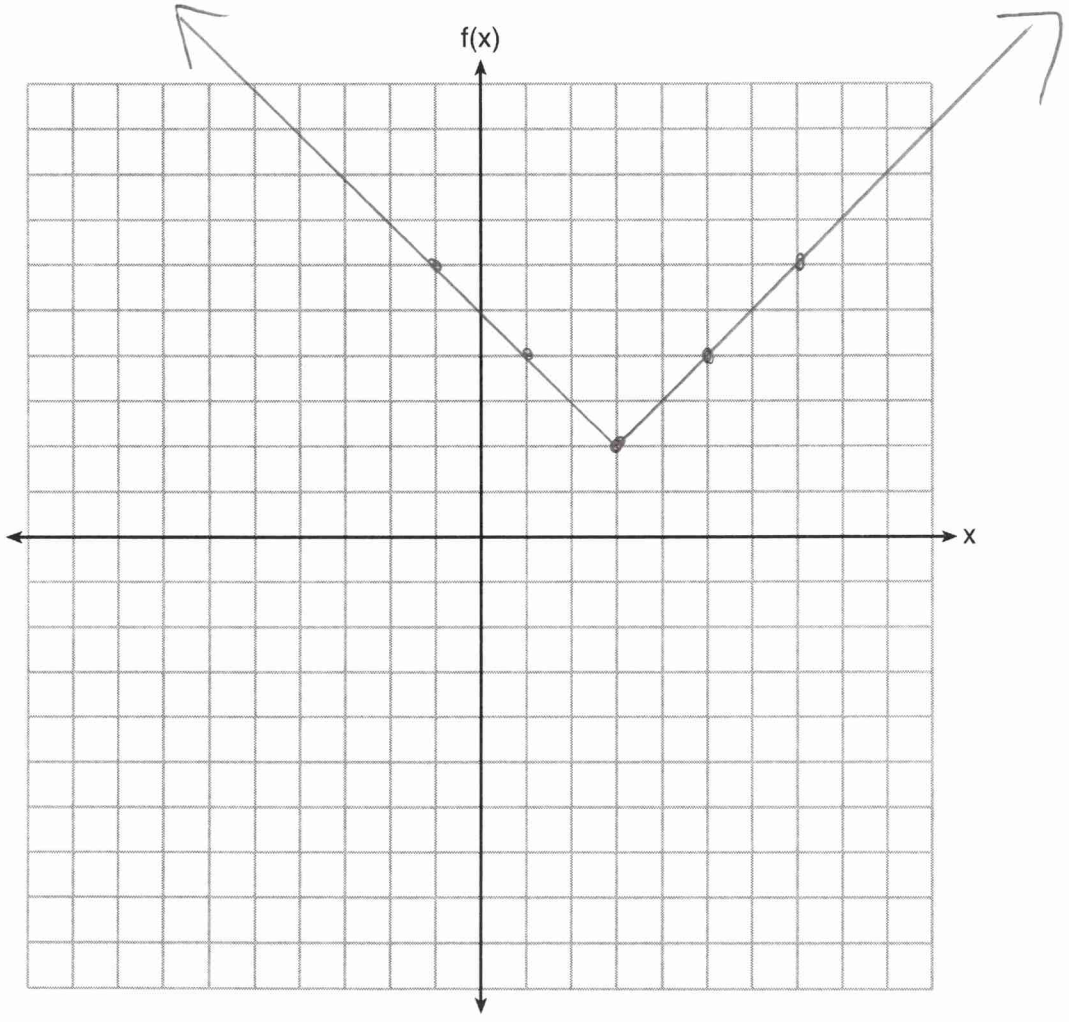
January 2018 Answer Key

(1) 4	(9) 3	(17) . . . . . 2 . . . . .
(2) 3	(10) 3	(18) . . . . . 3 . . . . .
(3) 1	(11) 2	(19) . . . . . 2 . . . . .
(4) 2	(12) 3	(20) . . . . . 3 . . . . .
(5) 1	(13) 3	(21) . . . . . 4 . . . . .
(6) 4	(14) 1	(22) . . . . . 4 . . . . .
(7) 4	(15) 2	(23) . . . . . 2 . . . . .
(8) 3	(16) 1	(24) . . . . . 2 . . . . .

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

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.

$S = -4$
$P = 3$
$-1 \quad -3$

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

$x-1=0 \quad x-3=0$

$x=1 \quad x=3$

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.

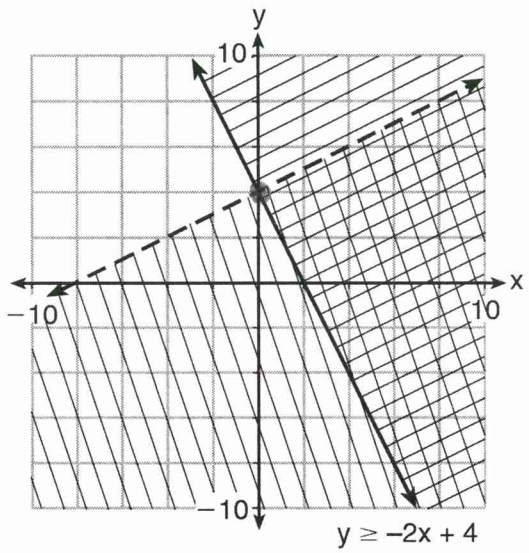
$D = rt$

$\frac{D \text{ feet}}{t \text{ minutes}} = \frac{r \cdot t \text{ minutes}}{t \text{ minutes}}$

$\frac{D \text{ feet}}{t \text{ minutes}} = r$

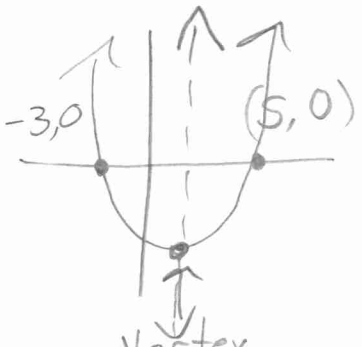
Feet per minute. I divided the distance by the time.

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



No because it is on the dashed line.

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.



x value is axis of symetry

x value is average of the x values of the zeros.

$-3 + 5 = -2$

$\frac{2}{2} = 1$

$x = 1$

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.

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

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

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

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

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.

r = .921544

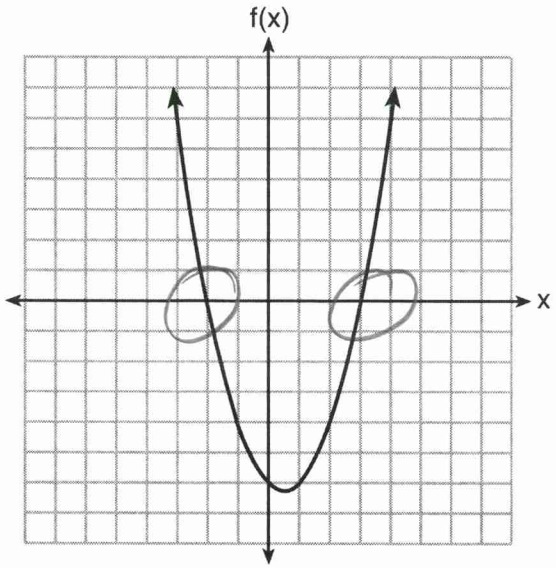
r = .92

Explain what the correlation coefficient means with regard to the context of this situation.

As math scores increase so do physics scores.

Strong positive correlation between Math and physics scores.

32 The graph of the function $f(x) = ax^2 + bx + c$ is given below.



Zeros
$x = -2$
$x = 3$

Could the factors of $f(x)$ be $(x + 2)$ and $(x - 3)$? Based on the graph, explain why or why *not*.

Yes. The graph shows the zeros of the function are -2 and 3. When the factors $(x+2)$ and $(x-3)$ are set to zero, they show $x = -2$ and $x = 3$.

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

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.

$P(x) = 300 + .035x$

Use this function to determine Jim's pay to the *nearest cent* for a week when his sales total is \$8250.

↑
2 Decimal Places

$P(8250) = 300 + .035(8250)$

$P(8250 = 588.75$

$\$588.75$

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.

$y = -8.5x + 99.2$

Explain what the y-intercept means in the context of the problem.

The rope is 99.2 cm before it has any knots tied.

The unknotted rope is 99.2 cm

Explain what the slope means in the context of the problem.

With each new knot the rope is shortened by 8.5 cm.

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.

$l + w \leq 360$

$2l + 1.5w \geq 500$

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.

$2(144) + 1.5w \geq 500$

$288 + 1.5w \geq 500$

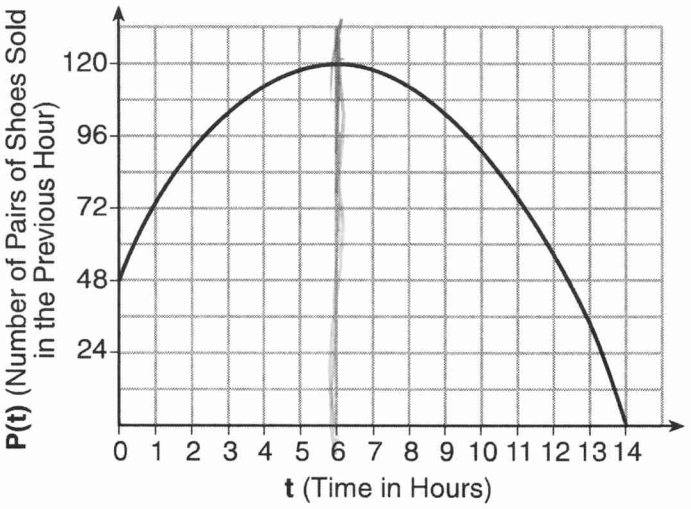
$-288 \quad -288$

$1.5w \geq 212$

$w \geq 141.\overline{3}$

142 water bottles

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*.

Domain represent Time in this case. Time is continuous so the domain should include all positive real numbers

State the entire interval for which the number of pairs of shoes sold is increasing.

0 to 6 OR 0 to 14

Determine the average rate of change between the sixth and fourteenth hours, and explain what it means in the context of the problem.

(6, 120) (14, 0) $\frac{120-0}{6-14} = \frac{120}{-8} = -15$

From 6 to 14 hours he is selling 15 less pairs of shoes per hour.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

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 $\frac{3}{4}$.

$d = 2c - 5$

c = cats

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.

$$\frac{3}{4} = \frac{c+3}{2c-5+3}$$

Could Bea's Pet Shop initially have 15 cats and 20 dogs? Explain your reasoning.

No

$d = 2c - 5$

$20 = 2(15) - 5$

$20 \neq 25$

Determine algebraically the number of cats and the number of dogs Bea initially had in her pet shop.

$$\frac{3}{4} = \frac{c+3}{2c-5+3}$$

$$\frac{3}{4} = \frac{c+3}{2c-2}$$

$4(c+3) = 3(2c-2)$

$4c + 12 = 6c - 6$

$18 = 2c$

$9 = c$

$d = 2(9) - 5$

$d = 18 - 5 = 13$

9 cats
13 dogs