

**ALGEBRA I****Tuesday, January 23, 2018 — 1:15 to 4:15 p.m., only**

Student Name \_\_\_\_\_

School Name \_\_\_\_\_

**The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.**

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III, and IV** directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. 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.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

**Notice ...**

**A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.**

**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**

## Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

- 1 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
- 2 Jill invests \$400 in a savings bond. The value of the bond,  $V(x)$ , in hundreds of dollars after  $x$  years is illustrated in the table below.

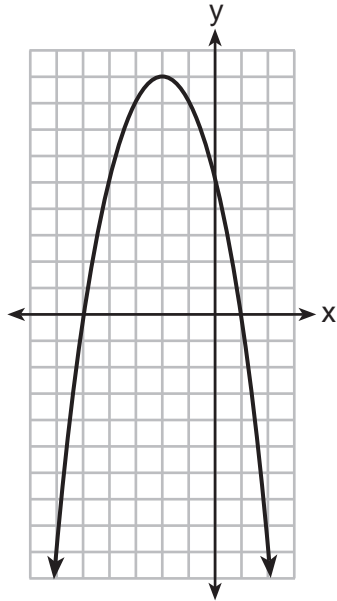
$x$	$V(x)$
0	4
1	5.4
2	7.29
3	9.84

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

- (1)  $V(x) = 4(0.65)^x$ , and it grows.
  - (2)  $V(x) = 4(0.65)^x$ , and it decays.
  - (3)  $V(x) = 4(1.35)^x$ , and it grows.
  - (4)  $V(x) = 4(1.35)^x$ , and it decays.
- 3 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)  $3.50P + 2.50H = 14$   
 $P + H = 43$

Use this space for  
computations.

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
  - (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
- 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
  - (2) exponential
  - (3) quadratic
  - (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)  $(y^2 - 10)^2$                                   (3)  $(y^2 + 10)(y^2 - 10)$   
(2)  $(y^2 - 50)^2$                                   (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                      (3)  $(0.38, -2.85)$  and  $(2.62, 3.85)$   
(2)  $(2.62, 3.85)$ , only                      (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    (3) 4.9  
(2) 2    (4) 50

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

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

Use this space for computations.

13 Which polynomial is twice the sum of  $4x^2 - x + 1$  and  $-6x^2 + x - 4$ ?

- (1)  $-2x^2 - 3$     (3)  $-4x^2 - 6$   
(2)  $-4x^2 - 3$     (4)  $-2x^2 + x - 5$

14 What are the solutions to the equation  $3(x - 4)^2 = 27$ ?

- (1) 1 and 7    (3)  $4 \pm \sqrt{24}$   
(2)  $-1$  and  $-7$     (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*?

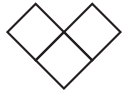
- (1) The mode is the best measure of central tendency for the data.  
(2) The data have two outliers.  
(3) The median is 53.  
(4) The range is 120.

Use this space for  
computations.

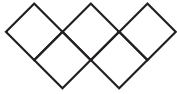
17 Given the set  $\{x \mid -2 \leq x \leq 2, \text{ where } x \text{ is an integer}\}$ , what is the solution of  $-2(x - 5) < 10$ ?

- (1) 0, 1, 2                                      (3) -2, -1, 0  
(2) 1, 2                                         (4) -2, -1

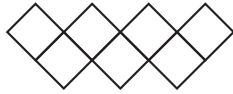
18 If the pattern below continues, which equation(s) is a recursive formula that represents the number of squares in this sequence?



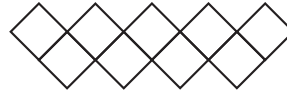
Design 1



Design 2



Design 3



Design 4

- (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.  
(2) The system of equations has more solutions.  
(3) The system of inequalities has more solutions.  
(4) Both systems have only one solution.

Use this space for  
computations.

21 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)  $A(t) = 5000(1.013)^t (1.013)^{25}$

22 The value of  $x$  which makes  $\frac{2}{3}\left(\frac{1}{4}x - 2\right) = \frac{1}{5}\left(\frac{4}{3}x - 1\right)$  true is

(1)  $-10$

(3)  $-9.\overline{09}$

(2)  $-2$

(4)  $-11.\overline{3}$

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

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

(1)

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

(3)

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

(2)

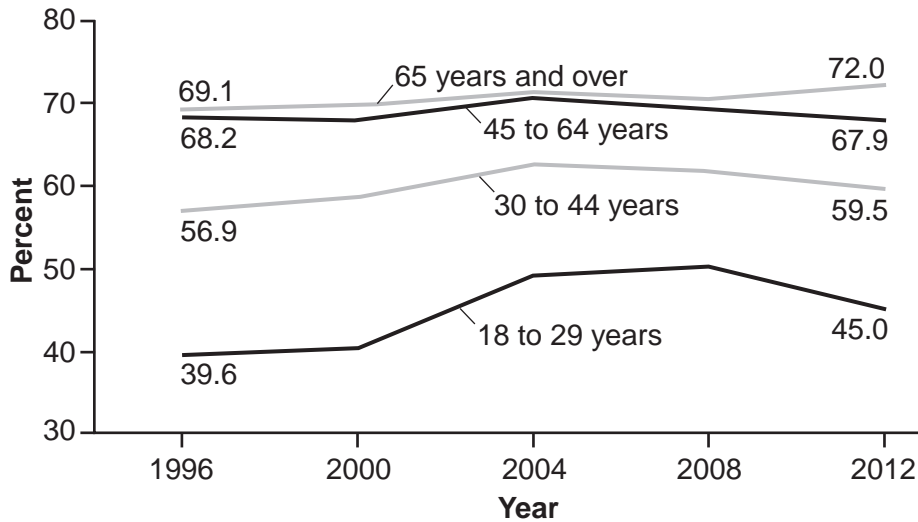
x	h(x)
-2	-9
-1	-3
0	1
1	3
2	3
3	1

(4)

Use this space for  
computations.

24 Voting rates in presidential elections from 1996-2012 are modeled below.

**Voting Rates in Presidential Elections, by Age, for the Voting-Age Citizen Population: 1996-2012**



Which statement does *not* correctly interpret voting rates by age based on the given graph?

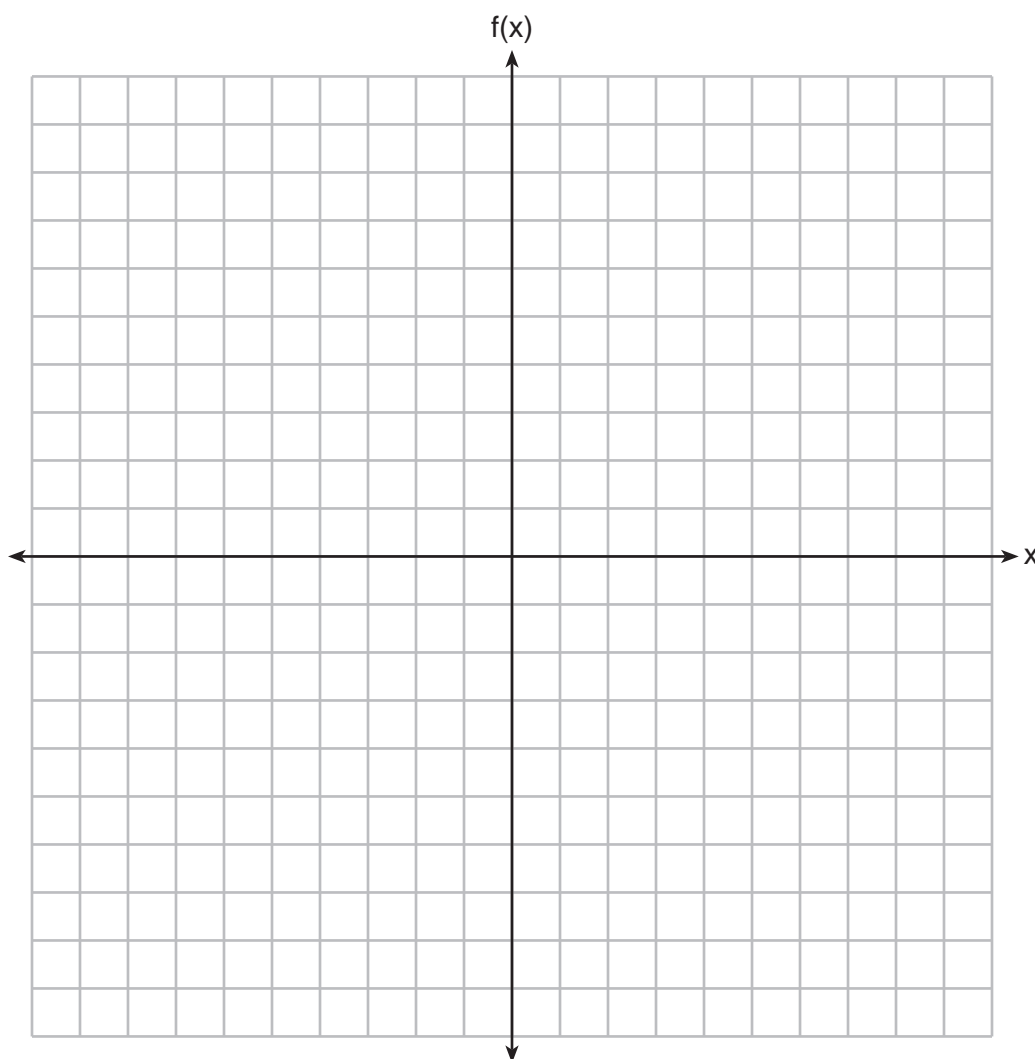
- (1) For citizens 18-29 years of age, the rate of change in voting rate was greatest between years 2000-2004.
  - (2) From 1996-2012, the average rate of change was positive for only two age groups.
  - (3) About 70% of people 45 and older voted in the 2004 election.
  - (4) The voting rates of eligible age groups lies between 35 and 75 percent during presidential elections every 4 years from 1996-2012.
-



## 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]

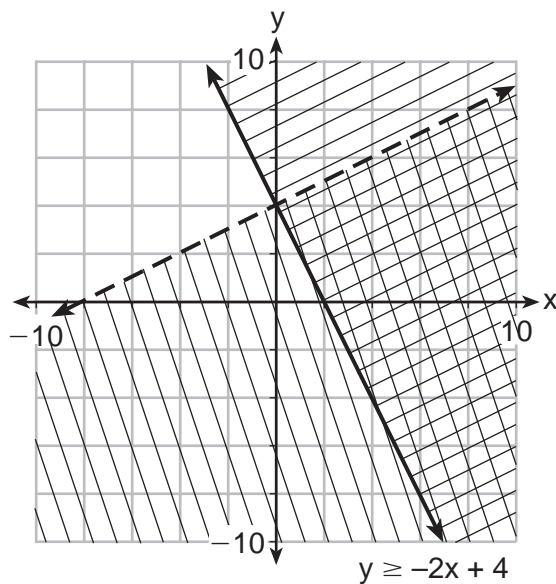
25 On the set of axes below, graph  $f(x) = |x - 3| + 2$ .



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

**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  $M_2$ .

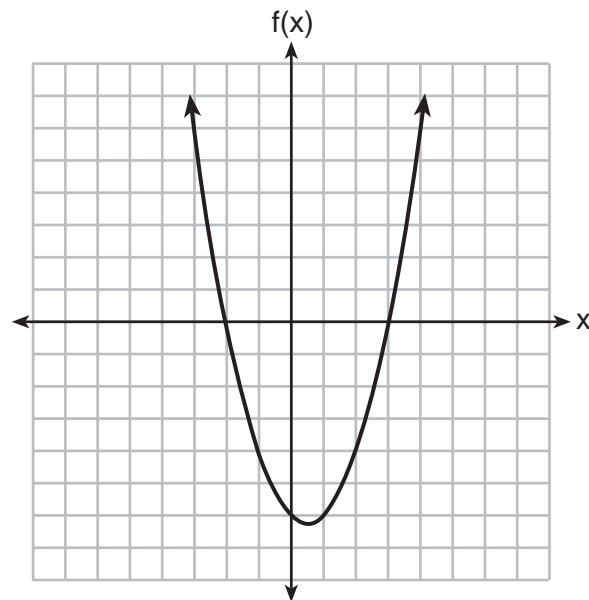
31 At Mountain Lakes High School, the mathematics and physics scores of nine students were compared as shown in the table below.

<b>Mathematics</b>	55	93	89	60	90	45	64	76	89
<b>Physics</b>	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*.

### 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.

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.

<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.

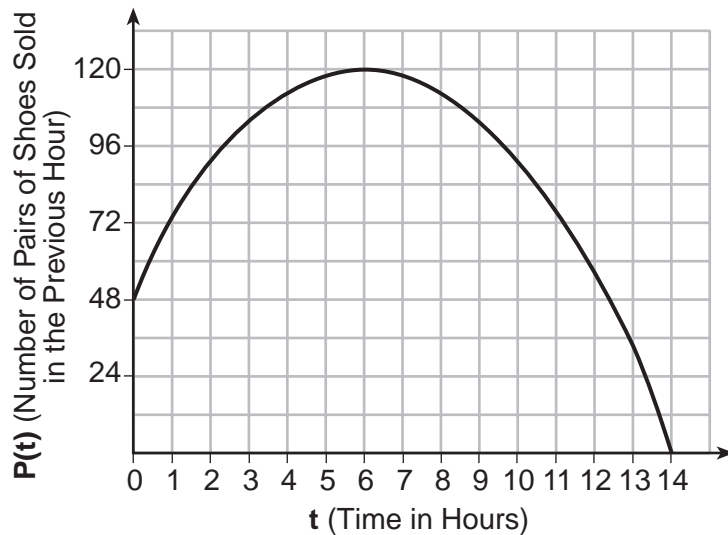


**35** The drama club is running a lemonade stand to raise money for its new production. A local grocery store donated cans of lemonade and bottles of water. Cans of lemonade sell for \$2 each and bottles of water sell for \$1.50 each. The club needs to raise at least \$500 to cover the cost of renting 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.

## 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  $\frac{3}{4}$ .

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.

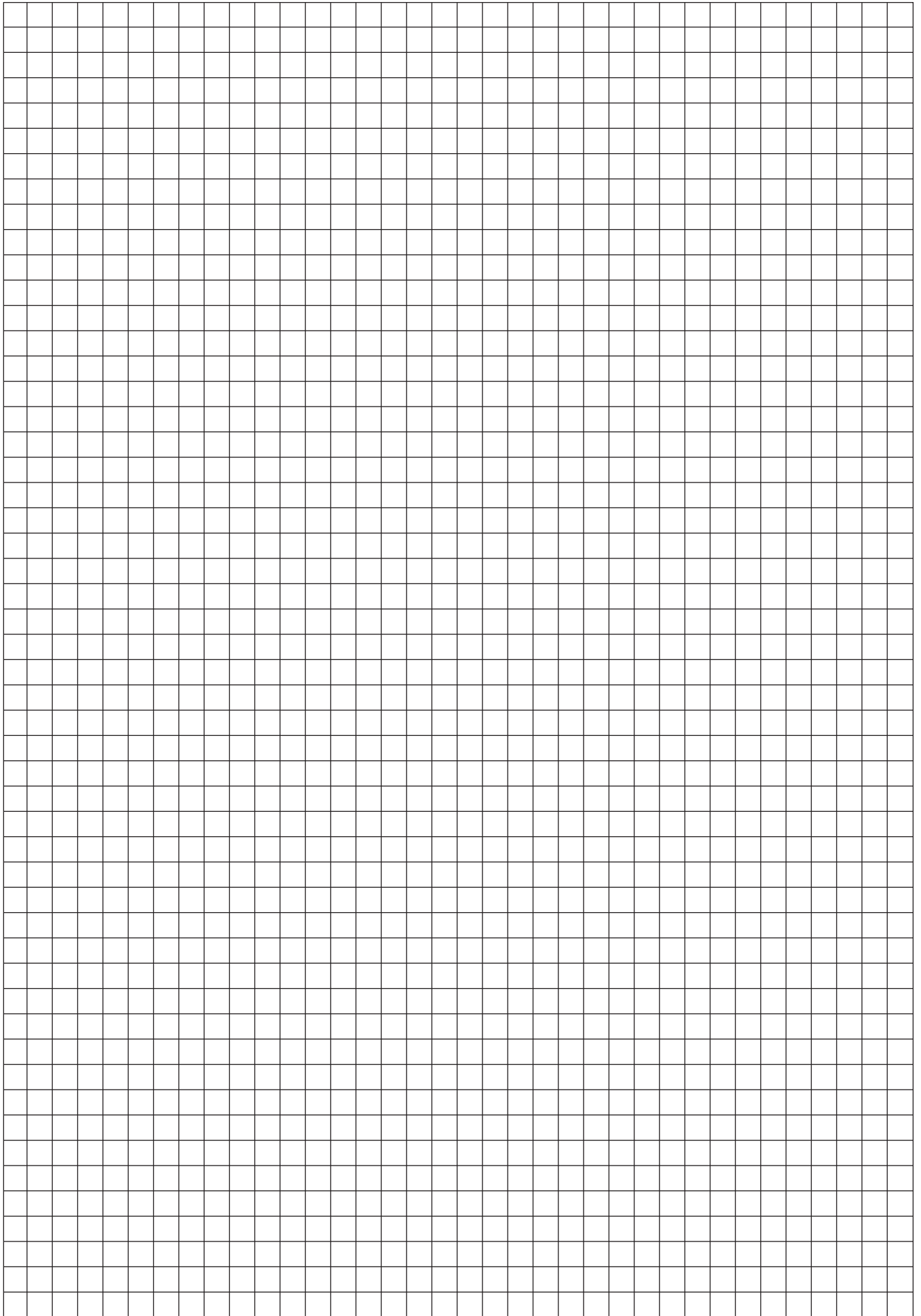
Determine algebraically the number of cats and the number of dogs Bea initially had in her pet shop.



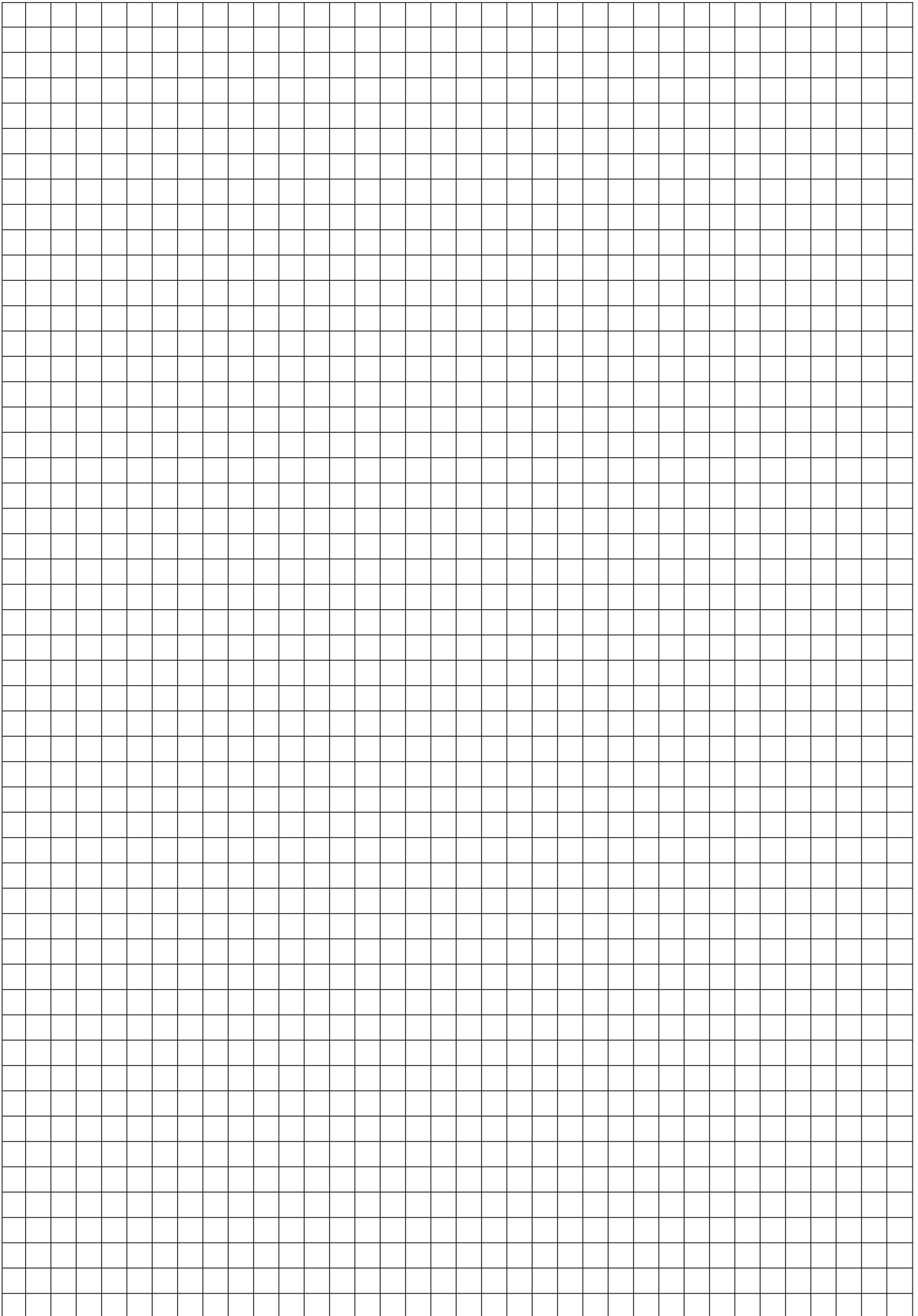
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## High School Math Reference Sheet

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilogram	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n - 1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian = $\frac{180}{\pi}$ degrees
Degrees	1 degree = $\frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

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# FOR TEACHERS ONLY

The University of the State of New York  
REGENTS HIGH SCHOOL EXAMINATION

## ALGEBRA I

Tuesday, January 23, 2018 — 1:15 to 4:15 p.m., only

**\*\* Updated January 25, 2018 \*\***

### SCORING KEY AND RATING GUIDE

#### Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra I. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Algebra I*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the constructed-response questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

**Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.**

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> by Tuesday, January 23, 2018. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

**If the student’s responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.**

### Part I

Allow a total of 48 credits, 2 credits for each of the following.

(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 . . . . .

Updated information regarding the rating of this examination may be posted on the New York State Education Department’s web site during the rating period. Check this web site at: <http://www.p12.nysed.gov/assessment/> and select the link “Scoring Information” for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

The Department is providing supplemental scoring guidance, the “Model Response Set,” for the Regents Examination in Algebra I. This guidance is recommended to be part of the scorer training. Schools are encouraged to incorporate the Model Response Sets into the scorer training or to use them as additional information during scoring. While not reflective of all scenarios, the model responses selected for the Model Response Set illustrate how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department’s web site at <http://www.nysedregents.org/algebraone/>.

# General Rules for Applying Mathematics Rubrics

## I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra I are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Algebra I*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

## II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase “such as”), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

## III. Appropriate Work

*Full-Credit Responses:* The directions in the examination booklet for all the constructed-response questions state: “Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.” The student has the responsibility of providing the correct answer **and** showing how that answer was obtained. The student must “construct” the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

*Responses With Errors:* Rubrics that state “Appropriate work is shown, but...” are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has **not** been shown. Other rubrics address incomplete responses.

## IV. Multiple Errors

*Computational Errors, Graphing Errors, and Rounding Errors:* Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

*Conceptual Errors:* A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

For 4- and 6-credit questions, if a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors. Refer to the rubric for specific scoring guidelines.

## Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(25) [2] A correct graph is drawn.

[1] Appropriate work is shown, but one graphing error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(26) [2] 1 and 3, and correct algebraic work is shown.

[1] Appropriate work is shown, but one computational or factoring error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] Appropriate work is shown, but the zeros are stated as (1,0) and (3,0).

*or*

[1] 1 and 3, but a method other than algebraic is used.

*or*

[1]  $(x - 3)(x - 1) = 0$ , but no further correct work is shown.

*or*

[1] 1 and 3, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(27) [2] Feet/minute or feet per minute is stated, and a correct explanation is written.

[1] One conceptual error is made.

*or*

[1] Feet/minute is stated, but the explanation is missing or incorrect.

*or*

[1] A correct explanation is written, but the units are missing or incorrect.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(28) [2] A correct justification indicating a negative response is given.

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] An incomplete justification is given.

[0] “No,” but no work is shown.

*or*

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(29) [2]  $x = 1$ , and a correct justification is given.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1]  $x = 1$ , but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(30) [2]  $r = \sqrt{\frac{GM_1M_2}{F_g}}$ , and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

**or**

[1] Appropriate work is shown, but one conceptual error is made.

**or**

[1]  $r^2 = \frac{GM_1M_2}{F_g}$ , and correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(31) [2] 0.92, and a correct explanation in context is written.

[1] Appropriate work is shown, but one computational error is made.

**or**

[1] Appropriate work is shown, but one conceptual error is made.

**or**

[1] 0.92, but the explanation is missing or incorrect.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(32) [2] A correct explanation indicating a positive response is written.

[1] Appropriate work is shown, but one computational error is made.

**or**

[1] Appropriate work is shown, but one conceptual error is made.

**or**

[1] The explanation is incomplete.

[0] The explanation is missing or incorrect.

**or**

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

### Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33) [4]  $p(x) = 300 + 0.035x$  or an equivalent equation, and 588.75, and correct work is shown.

[3] Appropriate work is shown, but one computational error is made.

*or*

[3] Appropriate work is shown, but the equation is not written in terms of  $p(x)$ , or an expression is written.

[2] Appropriate work is shown, but two or more computational errors are made.

*or*

[2]  $p(x) = 300 + 0.035x$  is written, but no further correct work is shown.

*or*

[2] 588.75, and appropriate work is shown.

[1] The expression  $300 + 0.035x$  is written, but no further correct work is shown.

*or*

[1] 588.75, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(34) [4]  $y = -8.5x + 99.2$ , and two correct explanations in context are written.

[3] Appropriate work is shown, but one computational error is made.

*or*

[3] Appropriate work is shown, but one explanation is missing or incorrect.

*or*

[3] Appropriate work is shown, but the equation is not written in terms of  $x$  and  $y$ .

[2] Appropriate work is shown, but two or more computational errors are made.

*or*

[2]  $y = -8.5x + 99.2$  is stated, but no further correct work is shown.

*or*

[2] Two correct explanations are written, but the equation is missing or incorrect.

[1] One correct explanation is written, but no further correct work is shown.

*or*

[1] The expression  $-8.5x + 99.2$  is written, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.



- (35) [4] A correct system of inequalities is written, 142, and a correct justification is given.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [3] Appropriate work is shown, but the justification is missing or incorrect.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
- or*
- [2] A correct system of inequalities is written, but no further correct work is shown.
- or*
- [2] Appropriate work is shown to find 142, but no further correct work is shown.
- [1] Only one correct inequality is written, but no further correct work is shown.
- or*
- [1] An appropriate system of equations is written, but no further correct work is shown.
- or*
- [1] 142, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (36) [4] A correct explanation is written, from 0 to 6 **or 0 to 14** is stated, and  $-15$ , and a correct explanation in the context of the problem is written.
- [3] Appropriate work is shown, but one computational error is made.
- or*
- [3] Appropriate work is shown, but one explanation is missing or incorrect.
- or*
- [3] Appropriate work is shown, but the interval is missing or incorrect.
- [2] One correct explanation is written and a correct interval is stated, but no further correct work is shown.
- or*
- [2]  $-15$ , and a correct explanation in context is written.
- [1] 0 to 6 **or 0 to 14** is stated, but no further correct work is shown.
- or*
- [1]  $-15$ , but no further correct work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

## Part IV

For this question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(37) [6] A correct equation in one variable or system of equations is written, a correct explanation indicating a negative response is written, and correct algebraic work is shown to find  $c = 9$  and  $d = 13$ .

[5] Appropriate work is shown, but one computational error is made.

*or*

[5] Appropriate work is shown, but the explanation is incomplete.

*or*

[5] Appropriate work is shown, but only the number of cats or the number of dogs is found.

[4] Appropriate work is shown, but two or more computational errors are made.

*or*

[4] Appropriate work is shown, but the numbers of cats and dogs are not found.

*or*

[4] Appropriate work is shown, but the explanation is missing or incorrect.

[3] A correct system of equations is written,  $c = 9$  and  $d = 13$  are stated, but no further correct work is shown.

[2] A correct system of equations or a correct equation in one variable is written, but no further correct work is shown.

*or*

[2] A correct explanation is written, but no further correct work is shown.

[1]  $c = 9$  and  $d = 13$ , but no algebraic work is shown.

[0] “No,” but no explanation is written.

*or*

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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**Map to the Learning Standards  
Algebra I  
January 2018**

<b>Question</b>	<b>Type</b>	<b>Credits</b>	<b>Cluster</b>
1	Multiple Choice	2	A-REI.A
2	Multiple Choice	2	F-LE.A
3	Multiple Choice	2	A-CED.A
4	Multiple Choice	2	F-IF.A
5	Multiple Choice	2	F-LE.A
6	Multiple Choice	2	A-REI.D
7	Multiple Choice	2	F-LE.B
8	Multiple Choice	2	N-RN.B
9	Multiple Choice	2	A-SSE.A
10	Multiple Choice	2	A-REI.D
11	Multiple Choice	2	A-SSE.A
12	Multiple Choice	2	F-IF.A
13	Multiple Choice	2	A-APR.A
14	Multiple Choice	2	A-REI.B
15	Multiple Choice	2	A-REI.C
16	Multiple Choice	2	S-ID.A
17	Multiple Choice	2	A-REI.B
18	Multiple Choice	2	F-IF.A
19	Multiple Choice	2	F-BF.B
20	Multiple Choice	2	A-REI.D

21	Multiple Choice	2	A-SSE.B
22	Multiple Choice	2	A-REI.B
23	Multiple Choice	2	F-IF.C
24	Multiple Choice	2	F-IF.B
25	Constructed Response	2	F-IF.C
26	Constructed Response	2	A-SSE.B
27	Constructed Response	2	N-Q.A
28	Constructed Response	2	A-REI.D
29	Constructed Response	2	F-IF.C
30	Constructed Response	2	A-CED.A
31	Constructed Response	2	S-ID.C
32	Constructed Response	2	A-APR.B
33	Constructed Response	4	F-BF.A
34	Constructed Response	4	S-ID.C
35	Constructed Response	4	A-CED.A
36	Constructed Response	4	F-IF.B
37	Constructed Response	6	A-CED.A

# Regents Examination in Algebra I

January 2018

## Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

**The *Chart for Determining the Final Examination Score for the January 2018 Regents Examination in Algebra I* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> by Tuesday, January 23, 2018. Conversion charts provided for previous administrations of the Regents Examination in Algebra I must NOT be used to determine students' final scores for this administration.**

### Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to <http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm>.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

The University of the State of New York  
REGENTS HIGH SCHOOL EXAMINATION

# ALGEBRA I

Tuesday, January 23, 2018 — 1:15 to 4:15 p.m.

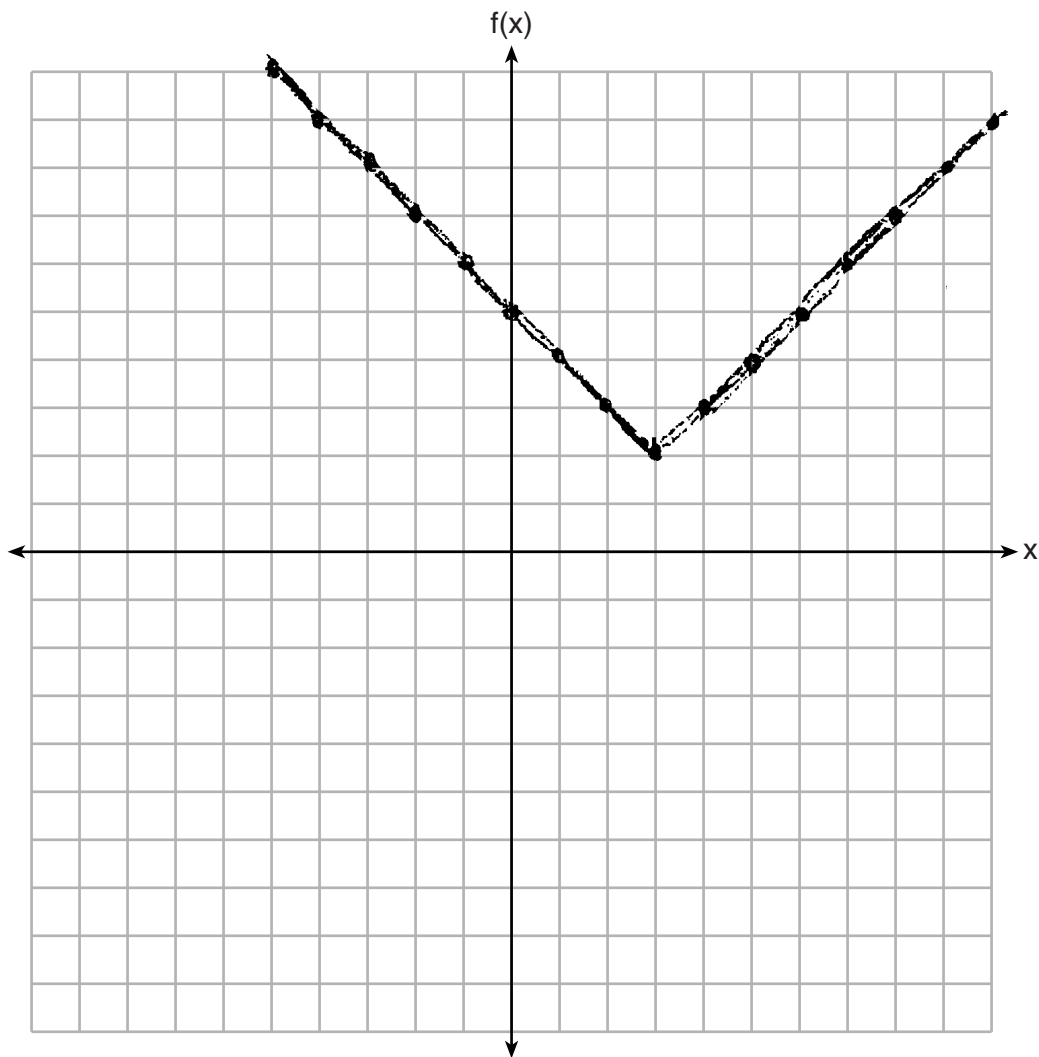
## MODEL RESPONSE SET

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**Question 25**

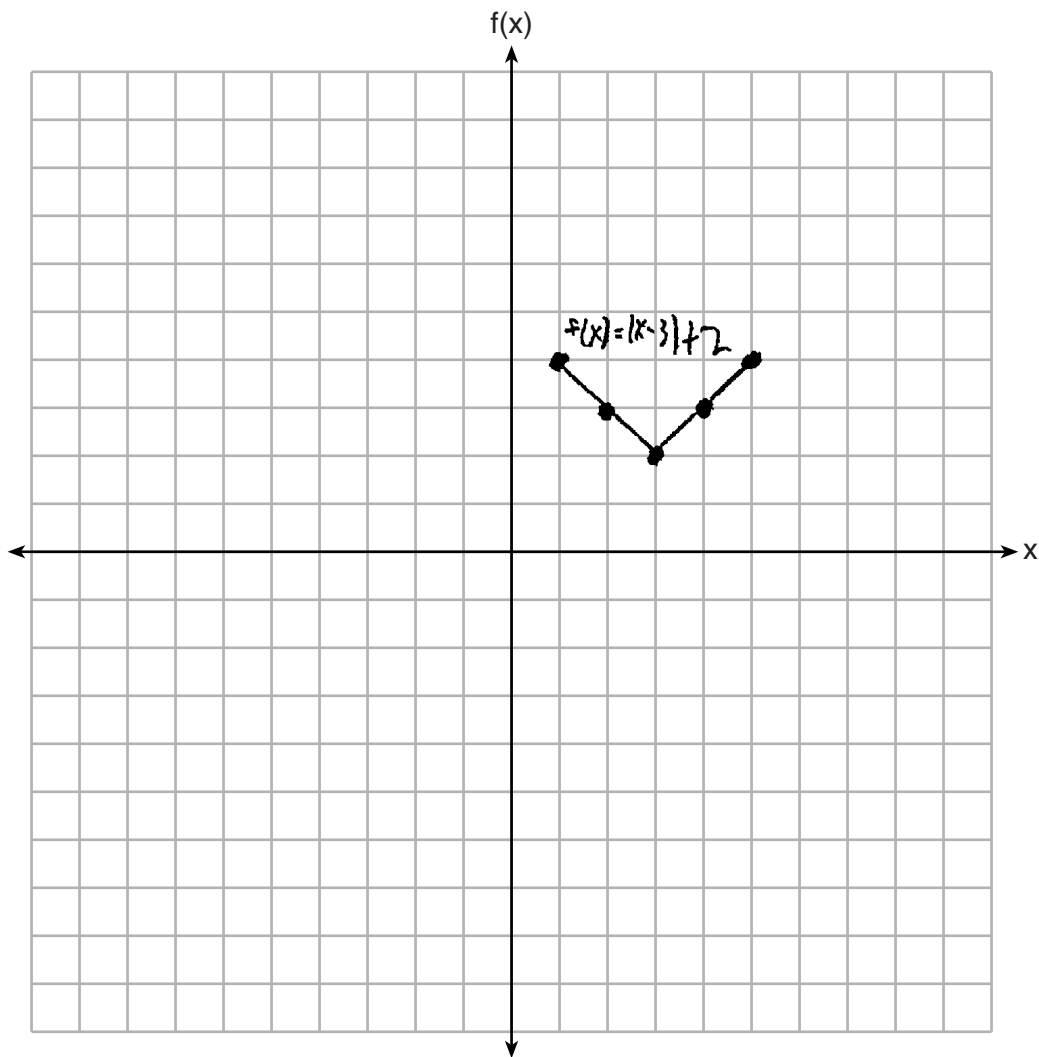
25 On the set of axes below, graph  $f(x) = |x - 3| + 2$ .



**Score 2:** The student gave a complete and correct response.

**Question 25**

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

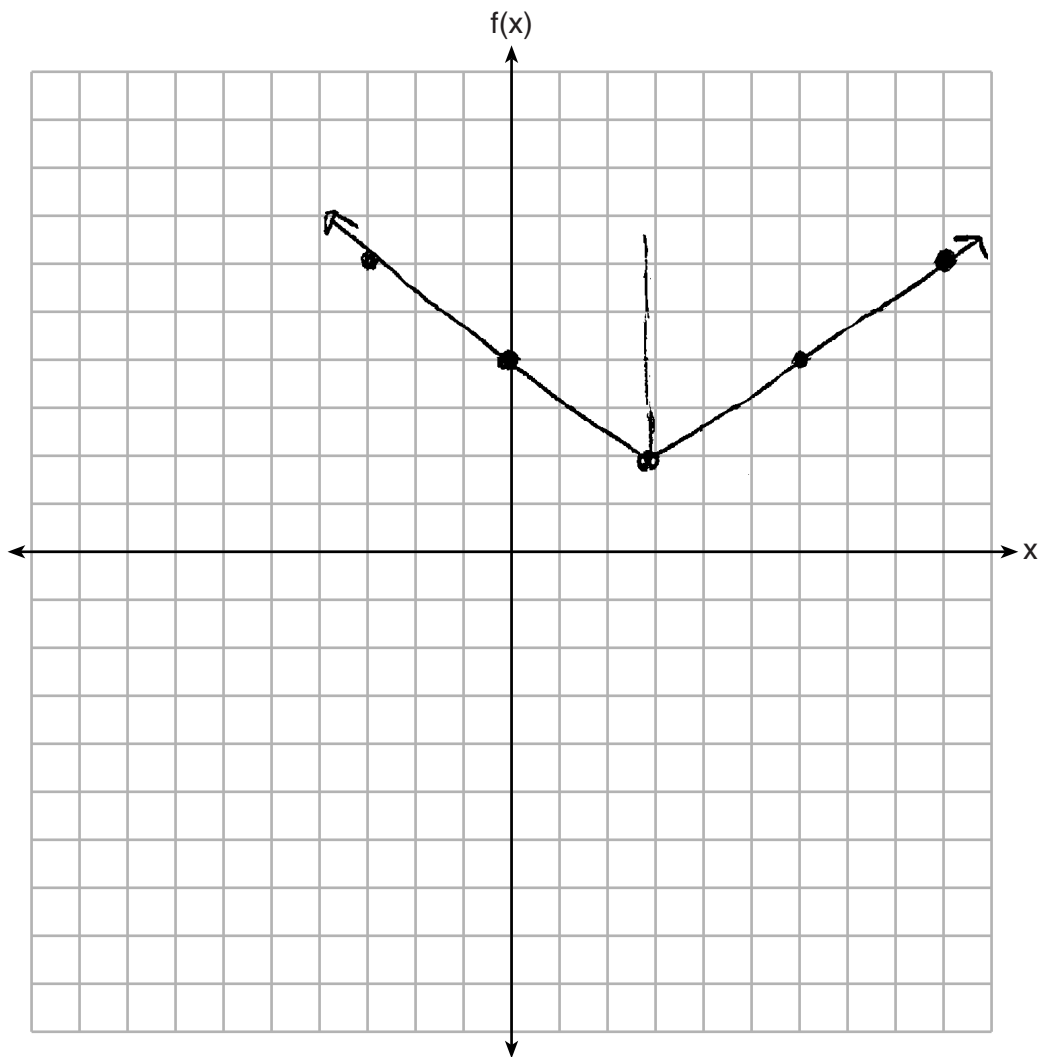


**Score 1:** The student only graphed the absolute value over the interval  $1 \leq x \leq 5$ .



**Question 25**

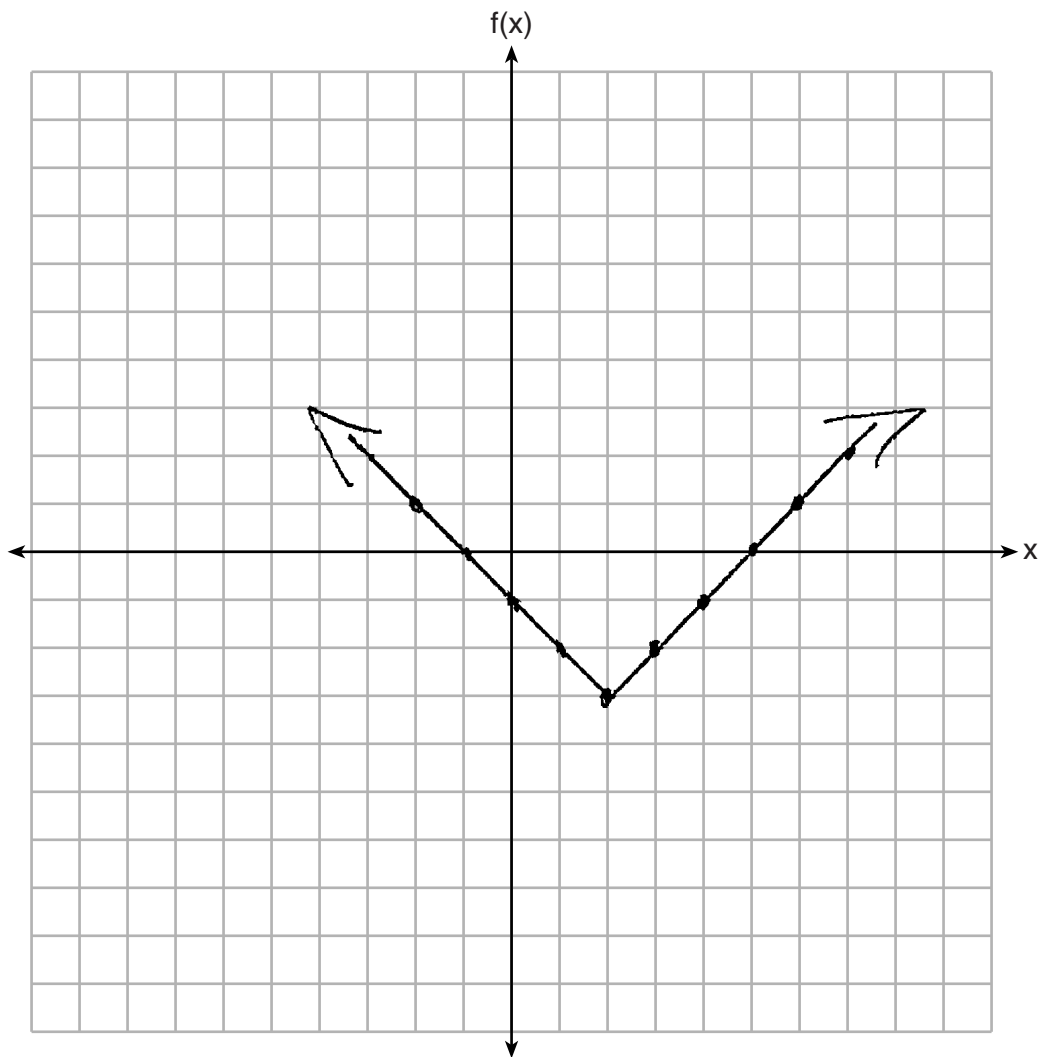
**25** On the set of axes below, graph  $f(x) = |x - 3| + 2$ .



**Score 1:** The student only graphed (3,2), the vertex of the absolute value, correctly.

**Question 25**

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



**Score 0:** The student interchanged the horizontal and vertical shifts and shifted in the wrong direction.

---

**Question 26**

---

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

$$\begin{array}{c} (x-3)(x-1) \\ \hline x-3=0 \quad x-1=0 \\ \begin{array}{c} +3 \quad +3 \\ \hline x=3 \end{array} \quad \begin{array}{c} +1 \quad -1 \\ \hline x=1 \end{array} \end{array}$$

**Score 2:** The student gave a complete and correct response.

---

**Question 26**

---

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

$$x = \boxed{1, 3}$$

---

**Score 1:** The student did not show any work.

Question 26

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

$$\begin{array}{l} x^2 - 4x + 3 = 0 \\ (x+1)(x-4) = 0 \\ \hline \begin{array}{l} x+1=0 \\ +1+1 \end{array} \quad \begin{array}{l} x-4=0 \\ +4+4 \end{array} \\ \hline \boxed{x=-1} \quad \boxed{x=4} \end{array}$$

**Score 0:** The student factored incorrectly and made a computational error.

Question 27

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.

$$d = rt \rightarrow \text{mins}$$

feet  $\swarrow$   $\searrow$  ?

The rate of speed would be feet per minute. This is because it is measuring how far something is traveling in a certain amount of minutes.

**Score 2:** The student gave a complete and correct response.

---

**Question 27**

---

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.

$$\frac{\text{feet}}{\text{min}}$$

**Score 1:** The student wrote the correct units, but no explanation.

---

**Question 27**

---

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.

Mph, because if your finding the rate of speed it wouldn't make sense to do minutes or feet because none of those have anything to do with speed.

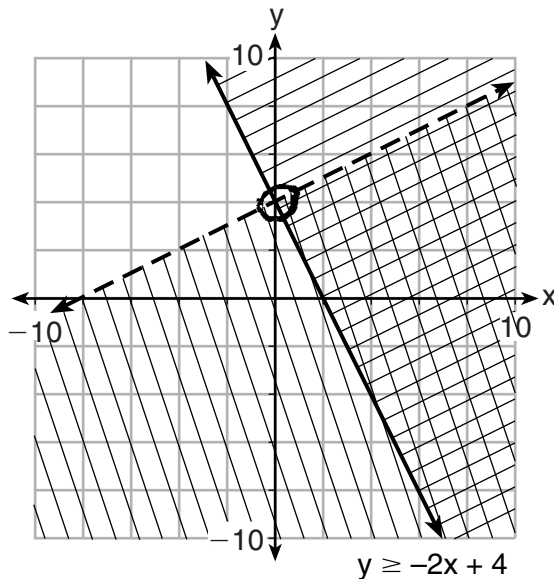
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**Score 0:** The student wrote a completely incorrect response.



Question 28

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

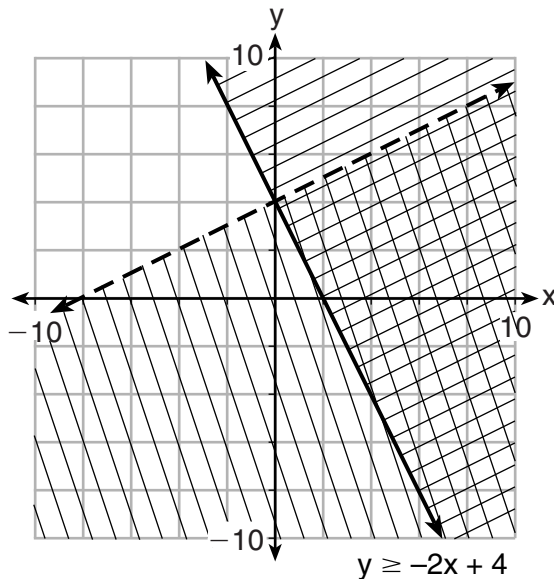


No because the line with the positive slope is a dashed line meaning if a point falls on the line it is not a solution.

**Score 2:** The student gave a complete and correct response.

**Question 28**

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



$$y < \frac{1}{2}x + 4$$

$$4 < \frac{1}{2} \cdot 0 + 4$$

$$4 < 4 \quad \text{NO!}$$

$$y \geq -2x + 4$$
$$4 \geq -2 \cdot 0 + 4$$

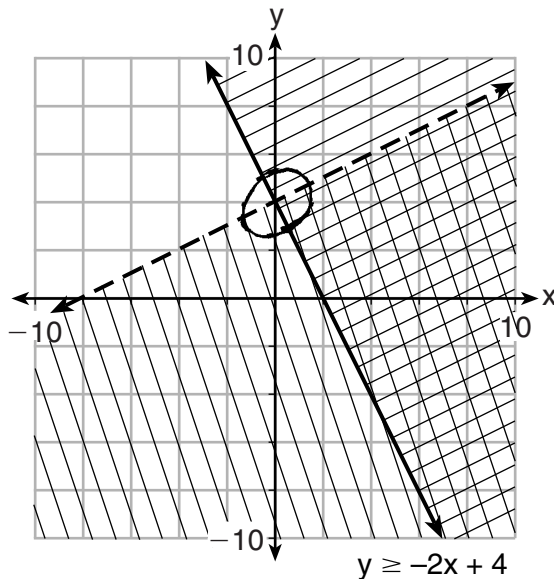
$$4 \geq 4 \quad \text{YES!}$$

$(0,4)$  IS NOT IN BOTH

**Score 2:** The student gave a complete and correct response.

Question 28

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

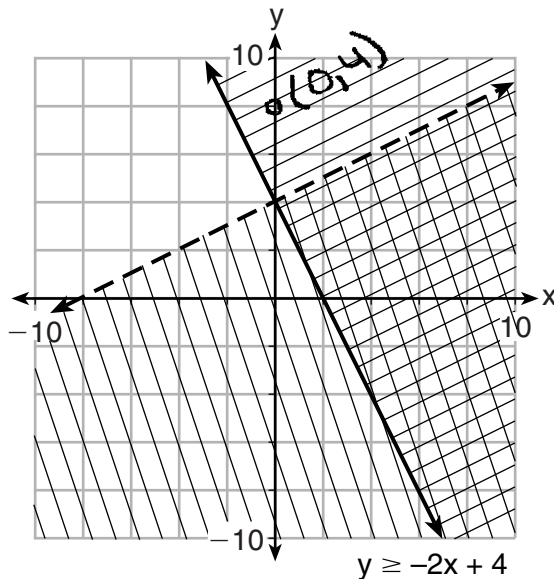


$(0,4)$  is a solution to the inequalities because it is the point of intersection of the two lines.

**Score 1:** The student did not understand that a point on a dashed line is not part of the solution set.

### Question 28

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

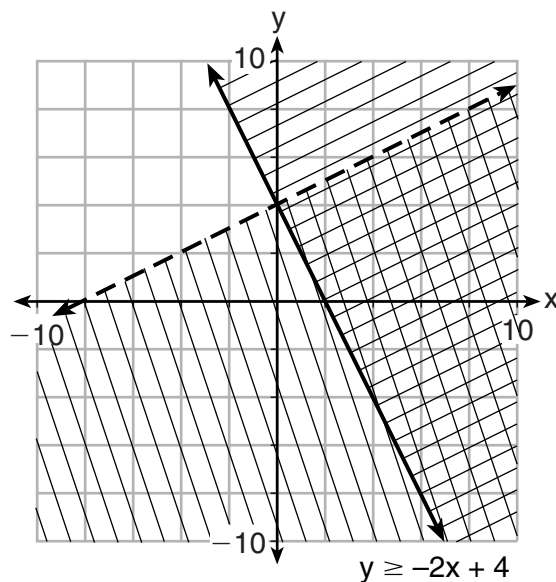


Point  $(0,4)$  is only a solution to one of the inequality's graphed. It is only a point in the top section with diagonal or horizontal lines. It is not in the waffle cross section or the other section

**Score 1:** The student graphed  $(0,4)$  incorrectly, but gave an appropriate justification.

**Question 28**

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



$(0,4)$  is not a solution to the system of inequalities.

**Score 0:** The student did not give any justification.

---

**Question 29**

---

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.

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

$$x = 1$$

**Score 2:** The student gave a complete and correct response.

**Question 29**

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.

$x$	$y$
$-1$	$-12$
$0$	$-15$
$1$	$-16$
$2$	$-15$
$3$	$-12$

$$(x+3)(x-5) = y$$

$$x = 1$$

**Score 2:** The student gave a complete and correct response.

---

**Question 29**

---

**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.

1, because ~~the~~  $-3$  and  $5$  are 8 apart and half way ~~on~~ ~~with~~ a graph is 1

**Score 1:** The student did not write the equation, but had a correct justification.



---

**Question 29**

---

**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.

$$(x+3)(x-5) = 0$$

$$y = x^2 - 2x - 15$$

**Score 0:** The student did not show enough work to receive any credit.

Question 30

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  $M_2$ .

$$\begin{aligned} r & F_g = \frac{GM_1M_2}{r^2} \\ r & F_g = \frac{GM_1M_2}{r^2} \\ \cdot r & F_g = \frac{GM_1M_2}{r^2} \\ r & = \frac{GM_1M_2}{F_g} \\ r & = \sqrt{\frac{GM_1M_2}{F_g}} \end{aligned}$$

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

**Score 2:** The student gave a complete and correct response.

---

**Question 30**

---

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  $M_2$ .

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

**Score 1:** The student solved for  $r^2$ , not  $r$ .

**Question 30**

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  $M_2$ .

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

$$r^2 F_g = GM_1M_2$$

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

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

**Score 1:** The student solved for both values of  $r$ .

**Question 30**

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  $M_2$ .

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

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

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

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

**Score 0:** The student made multiple errors.

**Question 31**

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

<b>Mathematics</b>	55	93	89	60	90	45	64	76	89
<b>Physics</b>	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.

$$y = 0.8x + 15.19$$

$$r = 0.92$$

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

$$r = 0.92$$

There is a high positive correlation between mathematics & physics scores.

**Score 2:** The student gave a complete and correct response.

**Question 31**

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

<b>Mathematics</b>	55	93	89	60	90	45	64	76	89
<b>Physics</b>	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.

$$y = 0.81x + 15.19 \quad \frac{0.81}{\frac{0.81}{0.81}} \frac{15.19}{\frac{15.19}{0.81}}$$

$$r = 0.92$$

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

It means that the predicted almost represents the actual data perfectly

**Score 1:** The student wrote a correct correlation coefficient, but the explanation was not in context.

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**Question 31**

---

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

<b>Mathematics</b>	55	93	89	60	90	45	64	76	89
<b>Physics</b>	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.

$$r = 0.92$$

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

There is a strong positive correlation.

---

**Score 1:** The student wrote an explanation that was not in context.



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**Question 31**

---

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

<b>Mathematics</b>	55	93	89	60	90	45	64	76	89
<b>Physics</b>	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.

.9215

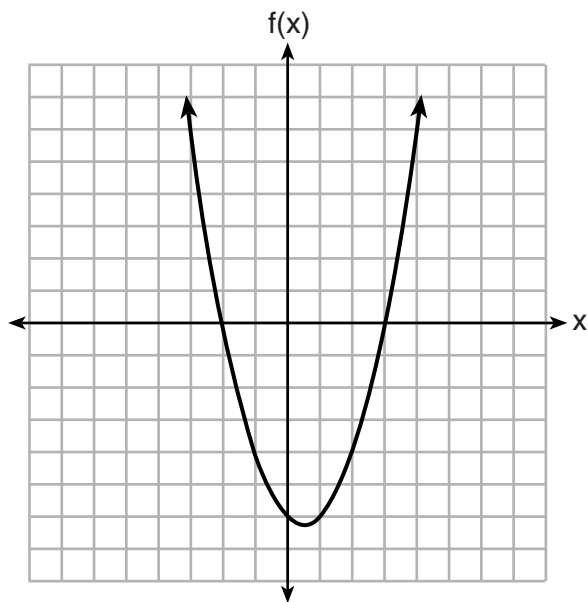
Explain what the correlation coefficient means with regard to the context of this situation.

It's a best fit

**Score 0:** The student made a rounding error and wrote an incorrect explanation.

**Question 32**

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



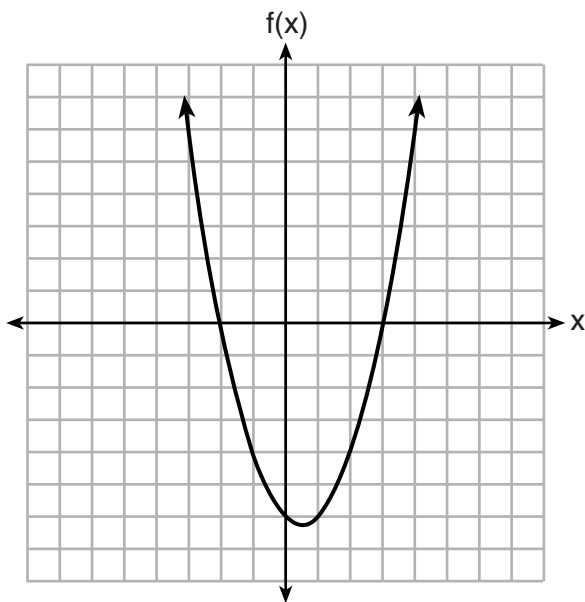
Could the factors of  $f(x)$  be  $(x + 2)$  and  $(x - 3)$ ? Based on the graph, explain why or why *not*.

yes, because the x intercepts are  $(-2, 0)$  and  $(3, 0)$

**Score 2:** The student gave a complete and correct response.

**Question 32**

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*.

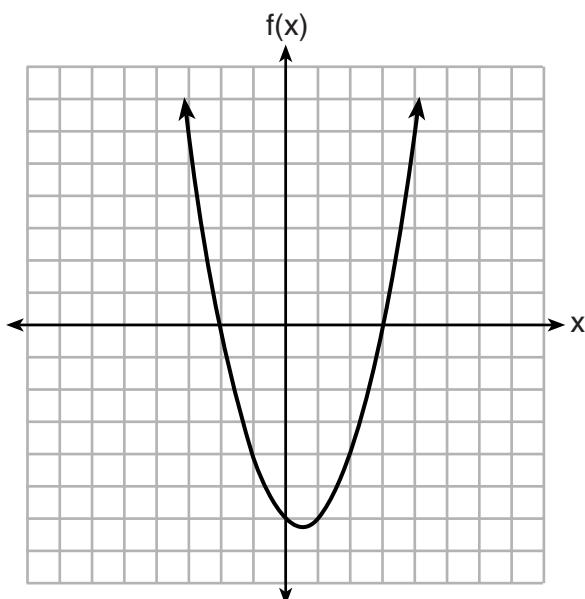
yes.  $(x+2)=0$   
-2 -2  
 $x = -2 \checkmark$

$x-3=0$   
+3 +3  
 $x = 3 \checkmark$

**Score 1:** The student gave a justification, not an explanation.

**Question 32**

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*.

$$\begin{aligned} (x+2) &= 0 \\ x &= -2 \end{aligned}$$

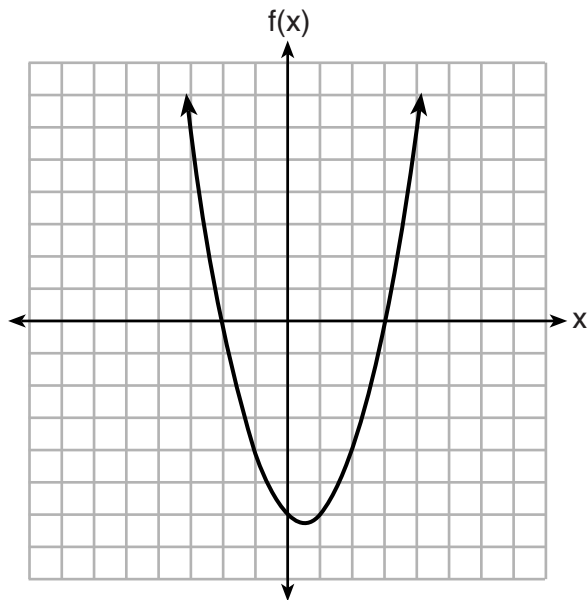
$$\begin{aligned} (x-3) &= 0 \\ x &= 3 \end{aligned}$$

yes because both negative 2  
+ 3 are both represented in the  
graph.

**Score 1:** The student wrote an incomplete explanation.

**Question 32**

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*.

No, because its not on the parabola.

**Score 0:** The student wrote a completely incorrect response.

**Question 33**

- 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.

$$P(x) = 300 + 0.035x$$

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

~~$P(x) = 300 + 0.035x$~~   
 ~~$P(8250) = 300 + 0.035(8250)$~~   
 ~~$P(8250) = 300 + 288.75$~~   
 ~~$P(8250) = 588.75$~~

$$P(x) = 300 + .035(x)$$
$$P(x) = 300 + .035(8250)$$
$$P(x) = 300 + 288.75$$
$$P(x) = 588.75$$

**Score 4:** The student gave a complete and correct response.

**Question 33**

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.

Q3

$$300 + 0.035x = \text{total pay for the week}$$

The function is

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

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

If Jim's total sales is \$8250, Jim's total pay would be \$3187.50.

$$300 + 0.035(8250) = p(x) \text{ for the week}$$
$$300 + 288.75 = p(x) \text{ for the week}$$
$$3187.5 = p(x) \text{ for the week}$$

**Score 3:** The student made a computational error in calculating Jim's pay.

---

**Question 33**

---

- 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.

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

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

$$300 + .035(8250) = p(x)$$

**Score 3:** The student made a correct substitution into their correct function, but did not complete the calculation.



---

**Question 33**

---

**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.

$$\begin{aligned} &300 + .035(8250) \\ &300 + 288.75 \\ &588.75 \end{aligned}$$

---

**Score 2:** The student showed appropriate work to determine Jim's pay.

**Question 33**

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.

~~$P = 300 + 0.035x$~~   
 ~~$P = 300 + 0.035x$~~   
 $P = 300 + (x)(.035)$

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

$$P = 300 + (8,250)(.035)$$

$$P = 300 + (409.02)$$

$$P = \$709.02$$

$$\begin{array}{r} 8,250 \\ \times .035 \\ \hline 24750 \\ 251500 \\ \hline 409020 \end{array}$$

**Score 2:** The student did not write the function in terms of  $P(x)$  and made a multiplication error.

Question 33

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.

0.035

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

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

$$\begin{array}{r} 8250 = 300 + 0.035x \\ \underline{300} \quad \underline{-300} \\ 7950 = 0.035x \\ \underline{\phantom{0}0.035} \quad \underline{\phantom{0}0.035} \end{array}$$

$$x = \$227142.86$$

**Score 2:** The student wrote the correct function, but no further correct work was shown.

---

**Question 33**

---

**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.

$$300 + .035x$$

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

$$300 + .035(8250)$$

**Score 1:** The student wrote an expression and substituted the 8250 for the only variable in the expression.

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**Question 33**

---

**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.

$$300 + .35x$$

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

$$8250 = 300 + .35x$$

$$7950 = .35x$$

$$x = 22714.29$$

**Score 0:** The student did not show enough correct work to receive any credit.

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**Question 34**

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- 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.

<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.

$$y = -8.5x + 99.2$$

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

how long the rope originally was before any knots were tied.

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

how much shorter the rope gets after each knot is tied

**Score 4:** The student gave a complete and correct response.

### Question 34

- 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 original length of the rope was 99.2 cm.

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

The rope is shorter by 8.5 <sup>cm</sup> ~~inches~~ with each knot that is tied.

**Score 4:** The student gave a complete and correct response.

### Question 34

- 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.

$$y = -8.5x + 49.2$$

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

The  $y$  intercept is your length of rope before tying any knots

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

As the number of knots increases the length of the rope decreases

**Score 3:** The student wrote an incomplete explanation for the slope. The student did not indicate that there was a constant rate of change.



### Question 34

- 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.

$$f(x) = -8.5x + 99.2$$

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

The length of the rope at 0 knots is 99.2 cm

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

Each knot decreases the length of rope by 8.5 cm

**Score 3:** The student wrote an equation that was not written in terms of  $x$  and  $y$ .

### Question 34

- 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.

$$y = 64 - 6x$$

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

The  $y$  intercept means that the original length of the rope was 64 cm.

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

The slope means that the length of the rope is decreasing by 6 cm each time.

**Score 2:** The student wrote an incorrect equation, but wrote two appropriate explanations.

**Question 34**

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.

$$y = ax + b$$

$$a = -8.5$$

$$b = 99.2$$

$$-8.5(4) + 99.2$$

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

The  $y$ -intercept means length of rope

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

The slope means the number of knots

**Score 2:** The student wrote a correct equation, but the explanations were incomplete or incorrect.

---

**Question 34**

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- 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.

<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.

*y-intercept is the length of the rope without any knots.*

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

*length of rope left after each knot*

**Score 1:** The student wrote one correct explanation.

---

**Question 34**

---

- 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.

<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.

$$y = 1x + 64$$

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

It is the length of the rope.

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

It means go up 1 to the right one.

**Score 0:** The student did not show enough correct work to receive any credit.

Question 35

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.

Price

$$\begin{array}{l} 2x + 1.5y \geq 500 \\ x + y \leq 360 \end{array}$$

dollars

cans

$x$  = # of lemonade cans

$y$  = # of water bottles

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.

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

$$\begin{array}{r} 288 + 1.5y \geq 500 \\ -288 \quad -288 \end{array}$$

$$\begin{array}{r} 1.5y \geq 212 \\ \hline 1.5 \quad 1.5 \end{array}$$

$$y \geq 141.\bar{3}$$

↓

$$\textcircled{142}$$

**Score 4:** The student gave a complete and correct response.

**Question 35**

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.

$$\begin{aligned}x &= \text{cans} \\ y &= \text{bottles}\end{aligned}$$

$$2x + 1.50y \geq 500$$

$$x + y \leq 360$$

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.

$$\begin{aligned}x &= \text{cans} \\ y &= \text{bottles}\end{aligned}$$

$$2 \cdot 144 + 1.50y \geq 500$$

$$\begin{array}{r} \cancel{288} + 1.50y \geq 500 \\ - \cancel{288} \quad \quad \quad - \cancel{288} \end{array}$$

$$\frac{1.50y \geq 212}{1.50 \quad 1.50}$$

$$y \geq 141.\bar{3}$$

She can  
have at least  
141 bottles.

**Score 3:** The student made a rounding error when determining the least number of bottles.

Question 35

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.

$$1.50x + 2y \geq 500$$

$$x + y \leq 360$$

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.

$$\begin{array}{r} 360 \\ -144 \\ \hline 216 \end{array}$$



142 bottles, so they still have ~~360~~ less than 360 cans + bottle but make at least \$500.

**Score 3:** The student wrote a correct system of inequalities, but no work was shown to get 142.



**Question 35**

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.

$$\begin{aligned}x &= \text{cans} \\ y &= \text{bottles}\end{aligned}$$

$$\begin{aligned}2x + 1.5y &\geq 500 \\ x + y &\leq 360\end{aligned}$$

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.

$$\begin{aligned}2(144) + 1.5y &\geq 500 \\ \cancel{288} + 1.5y &\geq 500 \\ \underline{-288} & \quad \underline{-288}\end{aligned}$$

$$\frac{1.5y}{1.5} \geq \frac{212}{1.5}$$

**Score 3:** The student did not complete their calculations to determine the least number of bottles.

### Question 35

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.

~~$360(2x + 1.50x) = 500$~~

$2x + 1.5x = 360$

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.

$$144 \times 2 = \$288$$

$$\$500 - \$288 = \$212$$

$$\$212 \div \$1.50 = 141.\bar{3}$$

so they would need 142  
water bottles to reach their  
\$500 goal.

**Score 2:** The student did not write a correct system of inequalities.

### Question 35

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.

$c$  = cans of lemonade  
 $b$  = bottles of water

$$c + b \leq 360$$

$$4(2.00) + b(1.5) \geq 500$$

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.

$$144 + b = 360$$

$$b = 216$$

with 144 cans of lemonade,  
there can be only 216  
bottles to reach the max  
of 360.

**Score 2:** The student wrote a correct system of inequalities.

### Question 35

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.

$l$  = lemonade  
 $w$  = water

$$l + w = 360$$
$$2l + 1.5w \geq 500$$

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.

$$\begin{array}{r} 360 \\ - 144 \\ \hline 216 \end{array}$$

The club can buy up to 216 bottles of water because they can only get 360 cans and bottles and they got 144 cans already.

**Score 1:** The student wrote one correct inequality.

### Question 35

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.

$C = \text{Cans and bottles}$

$$360 \geq C$$

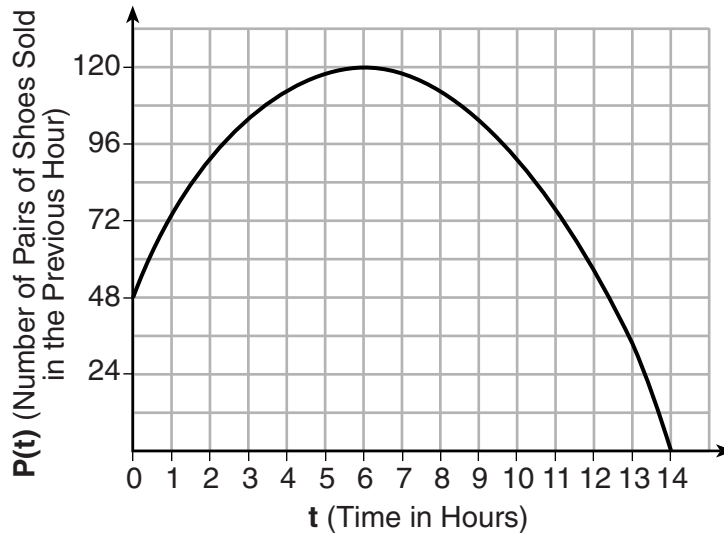
The club sells 144 cans of lemonade. What is the *least* number of bottles of water that must be sold to cover the cost of renting costumes? Justify your answer.

The least number of bottles that can be purchased is 216 bottles

**Score 0:** The student had no correct work.

**Question 36**

**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*.

Time can be fractions and decimals

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

$$0 < x < 6$$

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

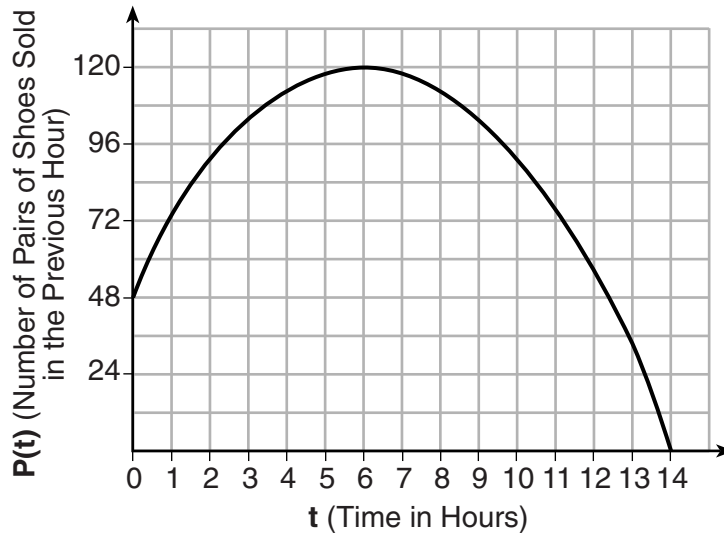
$$\frac{(6, 120) - (14, 0)}{6 - 14} = \frac{120 - 0}{-8} = -15$$

15 less pairs of shoes were sold each hour.

**Score 4:** The student gave a complete and correct response.

**Question 36**

**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*. *Because there is shoes being sold within the hour therefore it should not be individual integers because that would mean only that exact second of the hour for example 1pm with his domain 1:00pm < X < 2:00pm would not be recorded.*

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

$$0 \leq x < 6$$

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

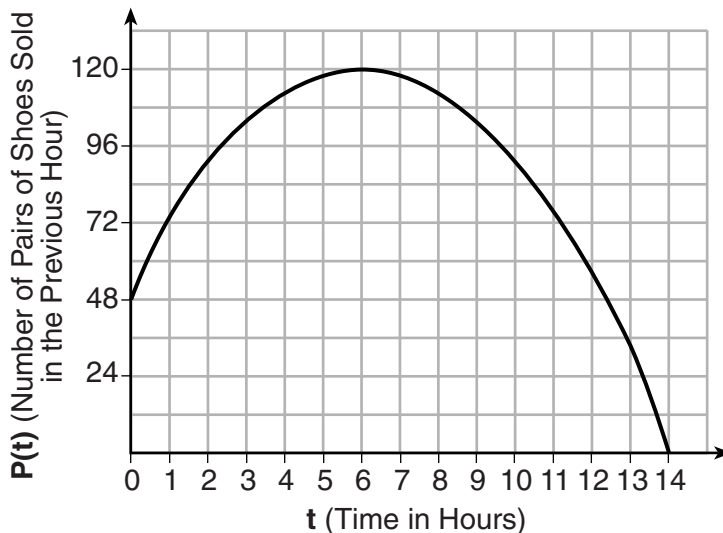
$(6, 120)$   $(14, 0)$        $\frac{14-6}{120-0} = \frac{8}{120} = \frac{1}{15}$

$-\frac{1}{15}$  the amount of pairs of shoes being bought is decreasing by 15 every hour

**Score 3:** The student stated an incorrect average rate of change.

### Question 36

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*.

He is incorrect because integers have negative and you can't sell negative amounts of shoes.

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

0 hours to 6 hours the number of shoes kept increasing.

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

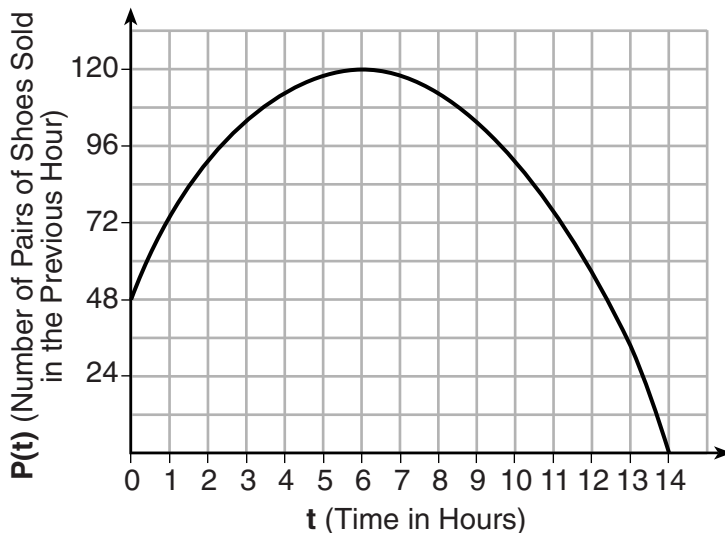
Rate of change means that every hour after 6 the amount sales is decreasing by the same amount.

**Score 2:** The student stated a correct interval and explained the rate of change in the context of the problem.



### Question 36

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.

*Time can't be negative*

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

*[0, 6]*

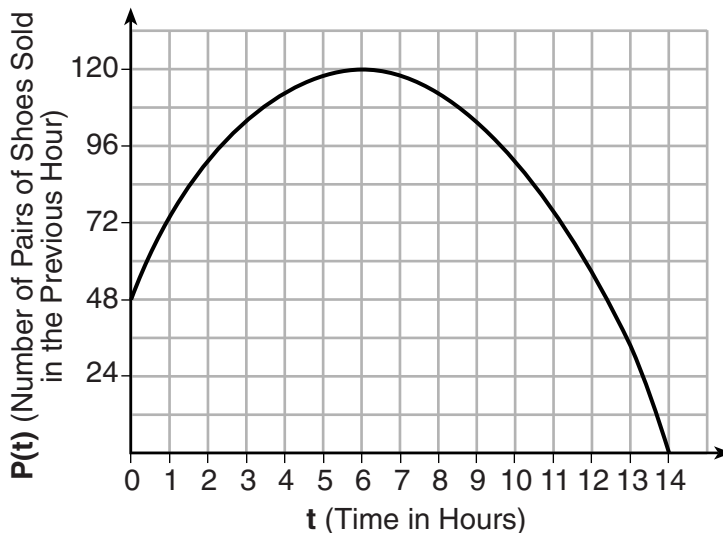
Determine the average rate of change between the sixth and fourteenth hours, and explain what it means in the context of the problem.

*It decreases*

**Score 2:** The student wrote a correct explanation for the domain and stated a correct interval.

**Question 36**

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.

Can only be in quadrant 1

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

$$0 \leq x \leq 6$$

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

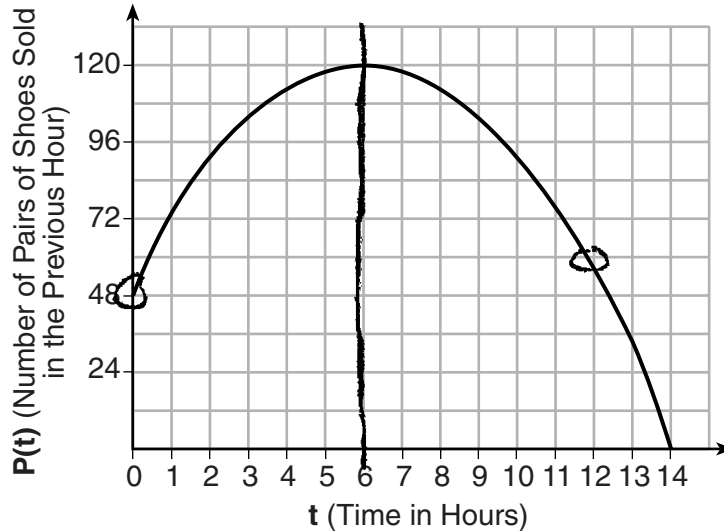
$$\frac{120-0}{14-6} = \frac{120}{6} = 15$$

15 less pair of shoes were sold each hour

**Score 2:** The student stated a correct interval and wrote a correct explanation in the context of the problem.

Question 36

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*.

Yes he correct because the domain is 14 for Elapsed time in hours

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

From 0 to 6

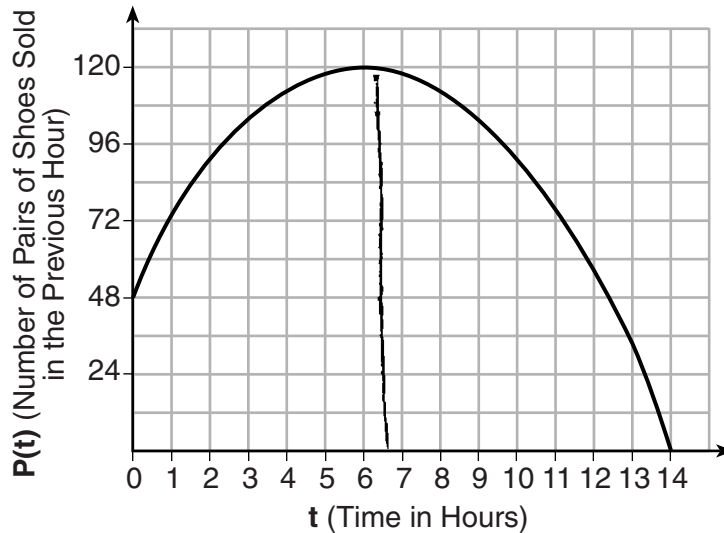
Determine the average rate of change between the sixth and fourteenth hours, and explain what it means in the context of the problem.

out of 120, add all them up and divide by 8. In 8 hours he has 60 shoes sold.

**Score 1:** The student stated a correct interval.

**Question 36**

**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*.

He is incorrect because the independent variable is always the domain. In this situation, the independent variable is time and dependent variable is shoe number.

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

Between 0 and 6.5, the shoes sold increased, to 120 pairs of shoes sold. After that every pairs sold decreased and sold 48-120 pairs between 0-6.5

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

Between 6-14 hours it decreased.

**Score 0:** The student had no correct work.

**Question 37**

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.

$$\begin{cases} d = 2c - 5 \\ \frac{c+3}{d+3} = \frac{3}{4} \end{cases}$$

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

If Bea's Pet Shop have 15 cats and 20 dogs

$$20 = 2 \times 15 - 5$$

$$20 = 30 - 5$$

$$20 = 25 \text{ (false)}$$

$$\frac{15+3}{20+3} = \frac{18}{23} \neq \frac{3}{4}$$

Bea's Pet shop could not have 15 cats and 20 dogs because when I put the number into the equation, it can't make sense. These two number can not match the conditions.

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

$$\frac{c+3}{d+3} = \frac{3}{4}$$

$$4(c+3) = 3(d+3)$$

$$4c+12 = 3d+9$$

$$\therefore d = 2c - 5$$

$$\therefore 4c+12 = 3(2c-5)+9$$

$$4c+12 = 6c-15+9$$

$$6c-4c = 12+15$$

$$2c = 12+15-9$$

$$2c = 21-9$$

$$2c = 18$$

$$c = 9$$

$$\therefore d = 2 \times 9 - 5$$

$$= 18 - 5$$

$$= 13$$

The number of cats in Bea's Pet Shop is 9 and the number of dogs in Bea's Pet Shop is 13.

**Score 6:** The student gave a complete and correct response.

**Question 37**

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.

$$d = 2c - 5$$

$$\frac{c+3}{d+3} = \frac{3}{4}$$

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

$$20 = 2(15) - 5$$

$$20 = 30 - 5$$

$$20 \neq 25$$

No it doesn't work in the equation.

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

$$\begin{aligned} d &= (2c - 5) \\ \frac{c+3}{(2c-5)+3} &= \frac{3}{4} \end{aligned}$$

$$\begin{aligned} 4c + 12 &= 6c - 15 + 9 \\ 4c + 12 &= 6c - 6 \\ -2c &= -18 \\ c &= 9 \end{aligned}$$

9 cats 13 dogs

**Score 6:** The student gave a complete and correct response.

**Question 37**

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.

$$d = 2c - 5$$

$$\frac{c+3}{d+3} = \frac{3}{4}$$

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

$$(20) = (15)(2) - 5$$

$$20 = 30 - 5$$

$$20 \neq 25$$

$$\frac{15+3}{20+3} = \frac{18}{23} \neq \frac{9}{11.5}$$

No, because when you plug the numbers into the equation, they do not work together.

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

$$d = 2c - 5$$

$$\frac{c+3}{d+3} = \frac{3}{4} \rightarrow \frac{6}{8} \rightarrow \frac{12}{16}$$

$c = 9$   
 $d = 13$

$$2(9) - 5 = (13)$$

$$13 = 13$$
~~$$6 - 3 = 3$$~~
~~$$8 - 5 = 3$$~~

$$\frac{12 - 3}{16 - 3} = \frac{9}{13}$$

**Score 5:** The student used a method other than algebraic to solve the problem.

Question 37

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.

$$\begin{aligned} y &= \text{dogs} \\ x &= \text{cats} \\ y &= 2x - 5 \\ \frac{x+3}{y+3} &= \frac{3}{4} \end{aligned}$$

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

No because if  $x$  was 15 and  $y$  was 20 it would be  $\frac{18}{23}$  which  $\neq \frac{3}{4}$ .

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

$$\begin{aligned} 2x - 5 &= y \\ +3 &+3 \\ \hline 2x &= y + 5 \\ x &= \frac{1}{2}y + 2.5 \end{aligned}$$

$$\begin{aligned} (x+3)\left(\frac{x+3}{y+3}\right) &= \left(\frac{3}{4}\right)(y+3) \\ x+3 &= \frac{3}{4}y + \frac{3}{4}y + \frac{3}{4} \cdot 3 \\ x &= \frac{3}{4}y - 0.75 \end{aligned}$$

$$\begin{aligned} 4x &= 2y + 10 \\ 3x &= \frac{3}{4}y - 3 \\ \hline 0 &= -\frac{1}{4}y + 13 \\ y &= 52 \\ x &= 13 \end{aligned}$$

13 Dogs  
and  
8 cats

**Score 5:** The student redefined their variables, but stated an incorrect number of cats.



**Question 37**

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.

dogs =  $x$    cats =  $y$

$$x = 2y - 5$$

$$\frac{(y+3)}{(x+3)} = \frac{3}{4}$$

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

No it could not because if you take the equation  $x = 2y - 5$  and replace "y" with 15, you would get 25 dogs.

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

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

Cats: 3
Dogs: 2

$$6y - 15 + 9 = 4x + 12$$

$$6y - 24 = 4x + 12$$

$$\begin{array}{r} +24 \qquad +24 \\ 6y - 24 = 4x + 12 \\ \hline 6y = 4x + 36 \end{array}$$

$$\frac{6y}{6} = 4x + \frac{36}{6} \rightarrow y = \frac{4x}{4} + \frac{6}{4} \rightarrow y = \frac{3}{2}x$$

**Score 4:** The student made multiple errors in solving for the number of cats and dogs.

**Question 37**

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  $\frac{3}{4}$ .

$d = 2c - 5$  let  $d = \text{dogs}$ , let  $c = \text{cats}$

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.

$$\begin{cases} d = 2c - 5 \\ \frac{d+3}{c+3} = \frac{3}{4} \end{cases}$$

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

$$\begin{array}{l} c = 15 \\ d = 20 \end{array} \quad \begin{array}{l} 20 = 2(15) - 5 \\ 20 = 30 - 5 \\ 20 \neq 25 \end{array} \quad \begin{array}{l} \frac{18}{23} = \frac{3}{4} \\ 72 \neq 69 \end{array}$$

NO because using the formula  $\frac{d+3}{c+3} = \frac{3}{4}$  the ratio of cats to dogs is not  $\frac{3}{4}$ .

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

let  $d = \text{dogs}$  and  $c = \text{cats}$

$$\begin{array}{l} d = 2(c) - 5 \\ c = \frac{d-5}{2} \end{array}$$

$$\begin{array}{l} d = 2c - 5 \\ \frac{d-5}{2} = \frac{2c}{2} \\ \frac{d-5}{2} = c \end{array}$$

**Score 3:** The student wrote one correct equation in two variables and wrote a correct explanation.

**Question 37**

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.

$$d = 2c - 5$$

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

No because  $20 \neq 2(15) - 5$   
 $20 \neq 25$

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

$$\neq 2(0)$$

**Score 2:** The student wrote one correct equation in two variables and gave a justification instead of writing an explanation.

**Question 37**

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.

$$d = (2c - 5) + 3$$

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

$$\begin{aligned} 20 &= (2(15) - 5) + 3 \\ 20 &= (30 - 5) + 3 \\ 20 &= 25 + 3 \\ 20 &\neq 28 \end{aligned}$$

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

$$\begin{aligned} d &= (2c - 5) + 3 \\ d &= 2c - 2 \\ +15 \quad +15 \\ \hline 15 + d &= 2c + 13 \\ \frac{15}{6} + \frac{d}{6} &= \frac{2c}{6} + \frac{13}{6} \\ 3 + \frac{d}{6} &= \frac{2c}{6} + \frac{13}{6} \\ 3 &= c \end{aligned}$$
$$\begin{aligned} d &= (2(3) - 5) + 3 \\ d &= (6 - 5) + 3 \\ d &= 1 + 4 = 4 \end{aligned}$$

**Score 1:** The student gave a justification, not an explanation, based upon their incorrect equation.

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**Question 37**

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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.

$$d = 2c - 5$$

$$\frac{3}{4} = \frac{c+3}{d+3}$$

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

$$\text{Yes, } \frac{3}{4} = \frac{15}{20}$$

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

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**Score 1:** The student wrote one correct equation in two variables.

**Question 37**

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.

$$d - 5 = 2c$$

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

$$\frac{15}{20} = \frac{3}{4} \quad \text{yes b/c}$$

Here still is a  $\frac{3}{4}$  ratio

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

15 cats and 20 dogs

**Score 0:** The student did not have any correct work.

## Regents Examination in Algebra I – January 2018

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the January 2018 exam only.)

Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level
86	100	5	57	81	4	28	66	3
85	99	5	56	81	4	27	65	3
84	98	5	55	81	4	26	64	2
83	97	5	54	80	4	25	63	2
82	96	5	53	80	4	24	62	2
81	94	5	52	80	4	23	60	2
80	93	5	51	80	4	22	59	2
79	92	5	50	79	3	21	57	2
78	91	5	49	79	3	20	56	2
77	91	5	48	79	3	19	55	2
76	90	5	47	78	3	18	52	1
75	89	5	46	78	3	17	50	1
74	88	5	45	78	3	16	48	1
73	88	5	44	77	3	15	46	1
72	87	5	43	77	3	14	44	1
71	86	5	42	77	3	13	42	1
70	86	5	41	76	3	12	39	1
69	86	5	40	76	3	11	37	1
68	85	5	39	75	3	10	34	1
67	84	4	38	74	3	9	31	1
66	84	4	37	74	3	8	29	1
65	84	4	36	73	3	7	26	1
64	83	4	35	73	3	6	22	1
63	83	4	34	72	3	5	19	1
62	83	4	33	71	3	4	16	1
61	82	4	32	70	3	3	12	1
60	82	4	31	69	3	2	8	1
59	82	4	30	68	3	1	4	1
58	82	4	29	67	3	0	0	1

To determine the student’s final examination score (scale score), find the student’s total test raw score in the column labeled “Raw Score” and then locate the scale score that corresponds to that raw score. The scale score is the student’s final examination score. Enter this score in the space labeled “Scale Score” on the student’s answer sheet.

**Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.**

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student’s final score. The chart above is usable only for this administration of the Regents Examination in Algebra I.