

**ALGEBRA I****Thursday, August 16, 2018 — 8:30 to 11:30 a.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 The number of bacteria grown in a lab can be modeled by $P(t) = 300 \cdot 2^{4t}$, where t is the number of hours. Which expression is equivalent to $P(t)$?
- (1) $300 \cdot 8^t$ (3) $300^t \cdot 2^4$
(2) $300 \cdot 16^t$ (4) $300^{2t} \cdot 2^{2t}$

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

Student 1

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

(1)

Student 3

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

(3)

Student 2

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

(2)

Student 4

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

(4)

**Use this space for
computations.**

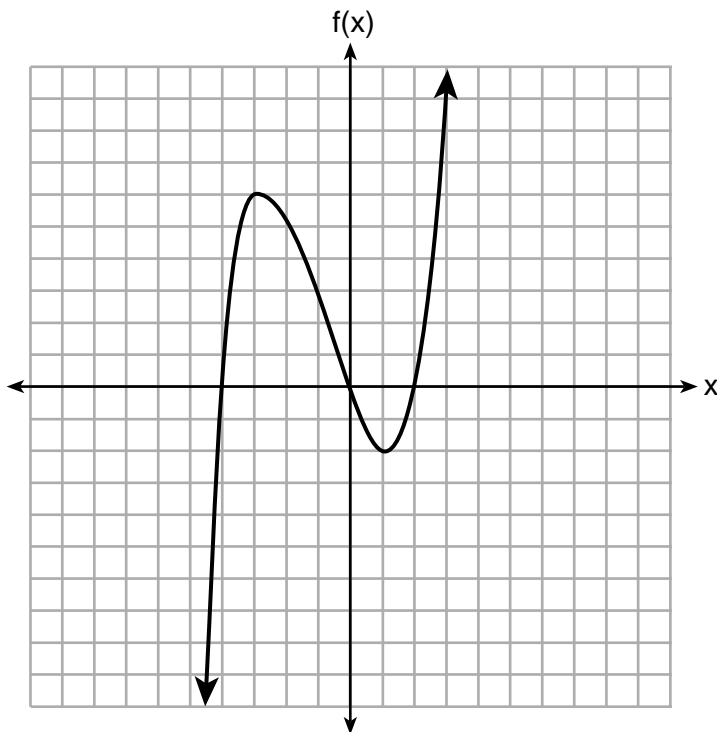
3 David correctly factored the expression $m^2 - 12m - 64$.
Which expression did he write?

- (1) $(m - 8)(m - 8)$ (3) $(m - 16)(m + 4)$
(2) $(m - 8)(m + 8)$ (4) $(m + 16)(m - 4)$

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

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

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



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

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

**Use this space for
computations.**

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

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

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

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

8 Compared to the graph of $f(x) = x^2$, the graph of $g(x) = (x - 2)^2 + 3$ is the result of translating $f(x)$

- (1) 2 units up and 3 units right
(2) 2 units down and 3 units up
(3) 2 units right and 3 units up
(4) 2 units left and 3 units right

9 Lizzy has 30 coins that total \$4.80. All of her coins are dimes, D , and quarters, Q . Which system of equations models this situation?

- (1) $D + Q = 4.80$ (3) $D + Q = 30$
 $.10D + .25Q = 30$ $.25D + .10Q = 4.80$
(2) $D + Q = 30$ (4) $D + Q = 4.80$
 $.10D + .25Q = 4.80$ $.25D + .10Q = 30$

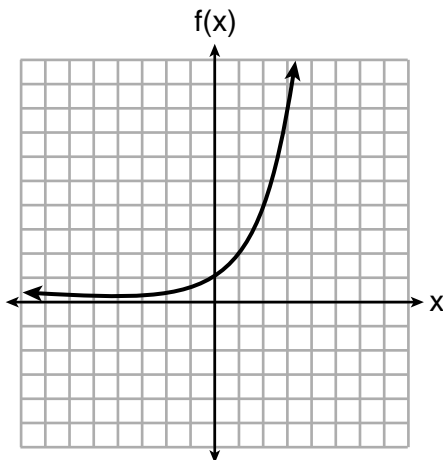
Use this space for computations.

- 10 Gretchen has \$50 that she can spend at the fair. Ride tickets cost \$1.25 each and game tickets cost \$2 each. She wants to go on a minimum of 10 rides and play at least 12 games.

Which system of inequalities represents this situation when r is the number of ride tickets purchased and g is the number of game tickets purchased?

- (1) $1.25r + 2g < 50$
 $r \leq 10$
 $g > 12$
- (2) $1.25r + 2g \leq 50$
 $r \geq 10$
 $g \geq 12$
- (3) $1.25r + 2g \leq 50$
 $r \geq 10$
 $g > 12$
- (4) $1.25r + 2g < 50$
 $r \leq 10$
 $g \geq 12$

- 11 Three functions are shown below.



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

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

Which statement is true?

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

Use this space for computations.

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

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

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

- (1) $\frac{4 \text{ quarts}}{1 \text{ gallon}}$ (3) $\frac{\frac{1}{4} \text{ cup}}{4 \text{ tablespoons}}$
- (2) $\frac{2 \text{ pints}}{1 \text{ quart}}$ (4) $\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}}$

- 13 If $y = 3x^3 + x^2 - 5$ and $z = x^2 - 12$, which polynomial is equivalent to $2(y + z)$?

- (1) $6x^3 + 4x^2 - 34$ (3) $6x^3 + 3x^2 - 22$
- (2) $6x^3 + 3x^2 - 17$ (4) $6x^3 + 2x^2 - 17$

- 14 An outdoor club conducted a survey of its members. The members were asked to state their preference between skiing and snowboarding. Each member had to pick one. Of the 60 males, 45 stated they preferred to snowboard. Twenty-two of the 60 females preferred to ski. What is the relative frequency that a male prefers to ski?

- (1) 0.125 (3) $\overline{0.333}$
- (2) 0.25 (4) $\overline{0.405}$

Use this space for
computations.

15 When the function $g(x) = \begin{cases} 5x, & x \leq 3 \\ x^2 + 4, & x > 3 \end{cases}$ is graphed correctly, how should the points be drawn on the graph for an x -value of 3?

- (1) open circles at (3,15) and (3,13)
- (2) closed circles at (3,15) and (3,13)
- (3) an open circle at (3,15) and a closed circle at (3,13)
- (4) a closed circle at (3,15) and an open circle at (3,13)

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

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

17 Each day, a local dog shelter spends an average of \$2.40 on food per dog. The manager estimates the shelter's daily expenses, assuming there is at least one dog in the shelter, using the function $E(x) = 30 + 2.40x$.

Which statements regarding the function $E(x)$ are correct?

- I. x represents the number of dogs at the shelter per day.
- II. x represents the number of volunteers at the shelter per day.
- III. 30 represents the shelter's total expenses per day.
- IV. 30 represents the shelter's nonfood expenses per day.

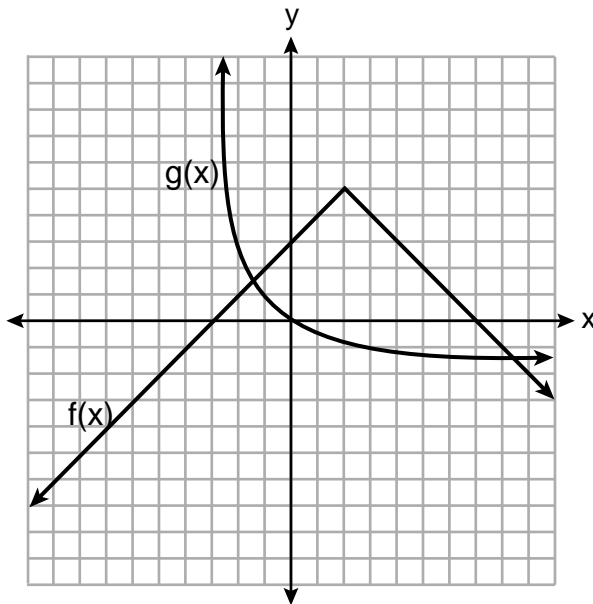
- (1) I and III
- (2) I and IV
- (3) II and III
- (4) II and IV

Use this space for
computations.

18 Which point is *not* in the solution set of the equation $3y + 2 = x^2 - 5x + 17$?

- (1) $(-2, 10)$ (3) $(2, 3)$
(2) $(-1, 7)$ (4) $(5, 5)$

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



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

- (1) the x -intercepts
(2) the y -intercepts
(3) the x -values of the points of intersection
(4) the y -values of the points of intersection

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

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

21 The data obtained from a random sample of track athletes showed that as the foot size of the athlete decreased, the average running speed decreased. Which statement is best supported by the data?

- (1) Smaller foot sizes cause track athletes to run slower.
- (2) The sample of track athletes shows a causal relationship between foot size and running speed.
- (3) The sample of track athletes shows a correlation between foot size and running speed.
- (4) There is no correlation between foot size and running speed in track athletes.

22 Which system of equations will yield the same solution as the system below?

$$\begin{aligned}x - y &= 3 \\2x - 3y &= -1\end{aligned}$$

- (1) $-2x - 2y = -6$
 $2x - 3y = -1$
- (2) $-2x + 2y = 3$
 $2x - 3y = -1$
- (3) $2x - 2y = 6$
 $2x - 3y = -1$
- (4) $3x + 3y = 9$
 $2x - 3y = -1$

23 Which of the three situations given below is best modeled by an exponential function?

- I. A bacteria culture doubles in size every day.
- II. A plant grows by 1 inch every 4 days.
- III. The population of a town declines by 5% every 3 years.

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

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

- (1) -13
 - (2) 13
 - (3) -26
 - (4) 26
-

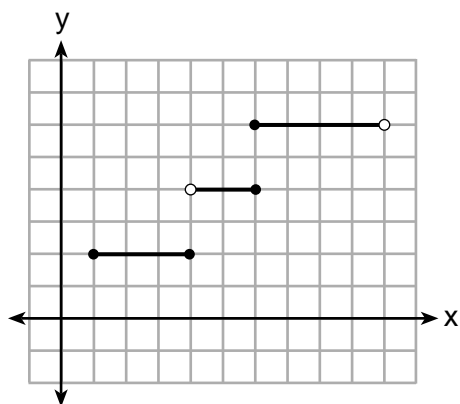
Part II

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

State the zeros of the function.

26 Four relations are shown below.



I

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

II

x	y
-4	1
0	3
4	5
6	6

III

$y = x^2$

IV

State which relation(s) are functions.

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

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

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

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

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

29 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:

$$K = \frac{5}{9}(F + 459.67)$$

Solve for F , in terms of K .

30 Solve the following equation by completing the square:

$$x^2 + 4x = 2$$

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

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

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

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

$$a_1 = 0$$

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

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 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

34 A car was purchased for \$25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

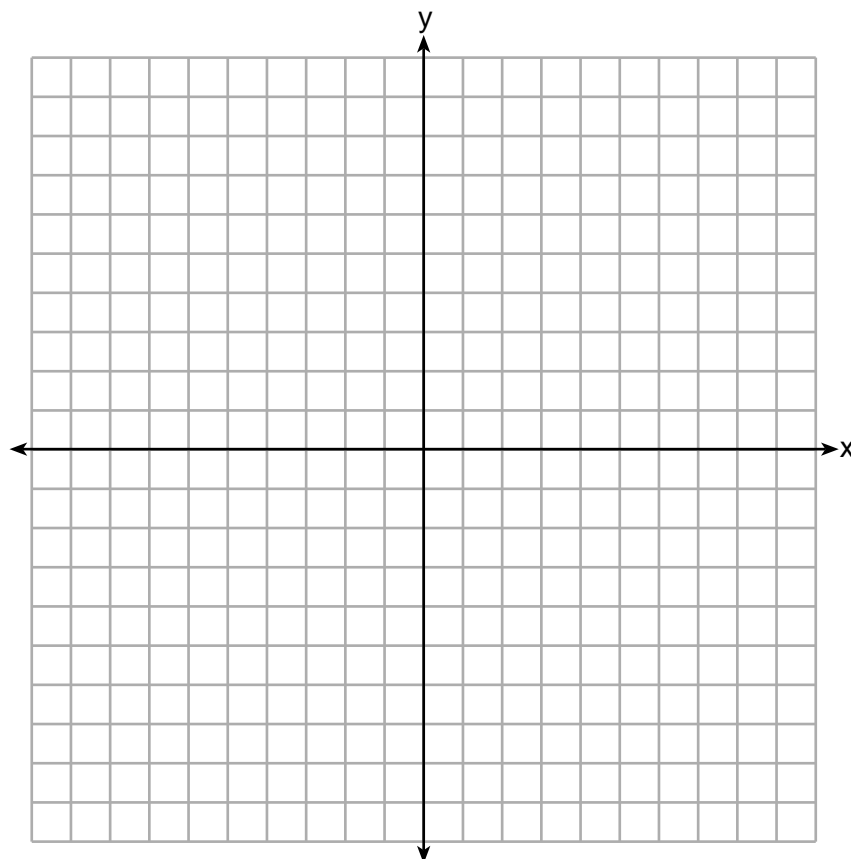
Create a function that will determine the value, $V(t)$, of the car t years after purchase.

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

35 Graph the following system of inequalities on the set of axes below:

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

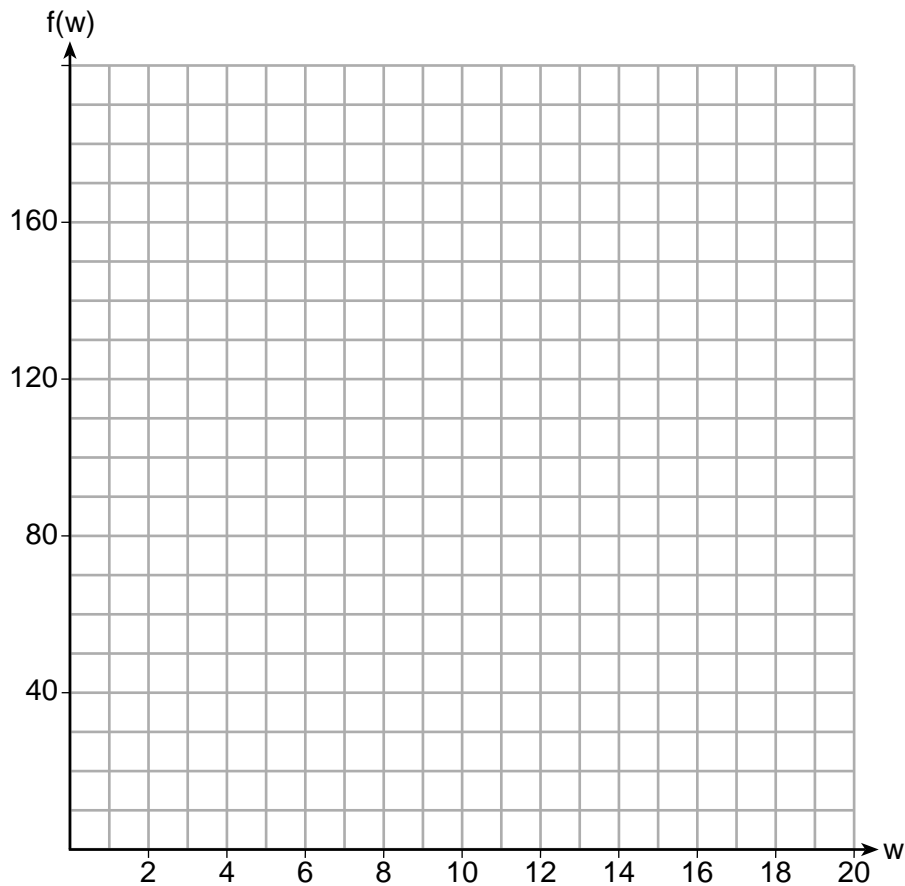
$$y + 2x > -5$$



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

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

On the set of axes below, sketch the graph of $f(w)$.



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

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 the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

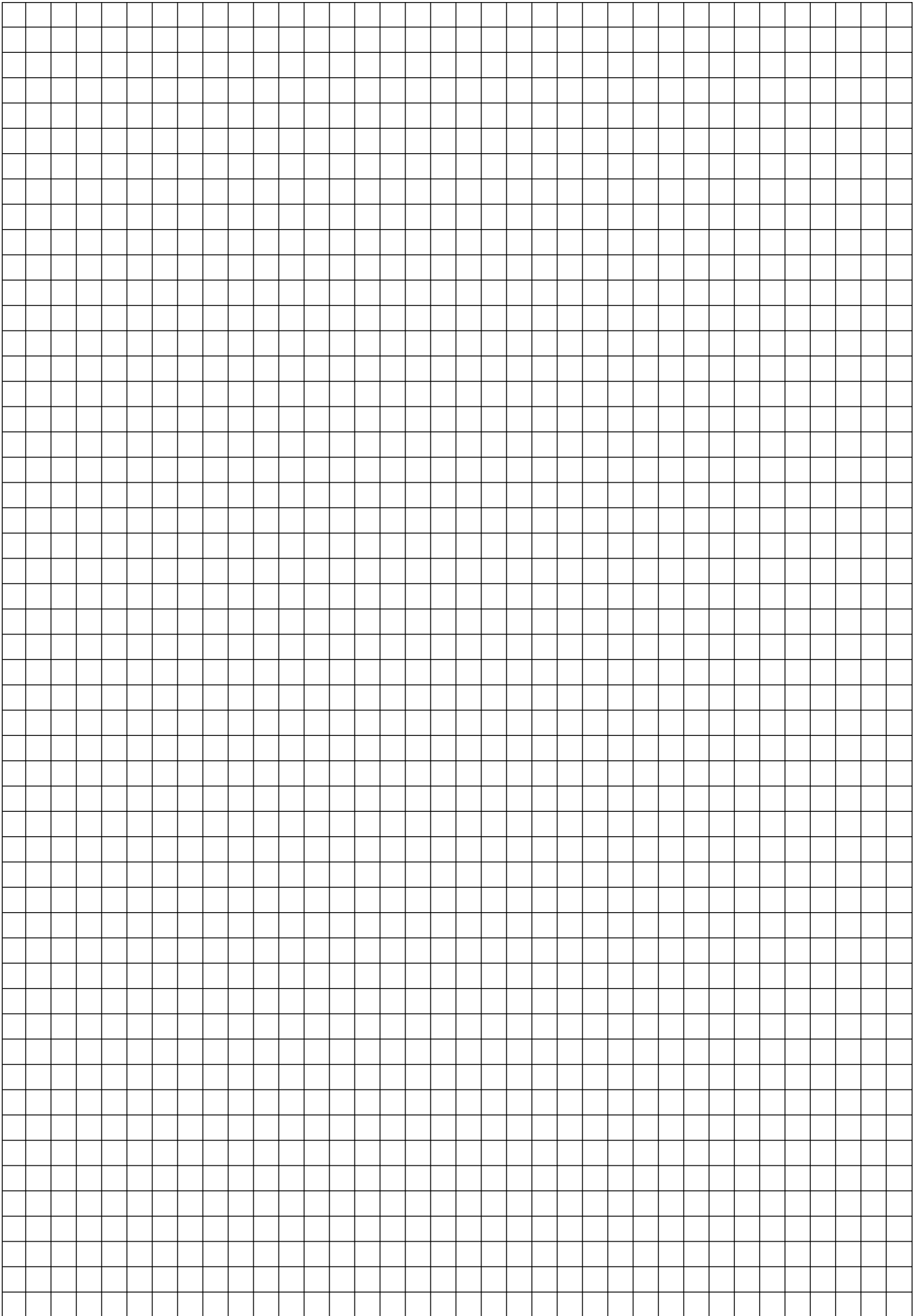
Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

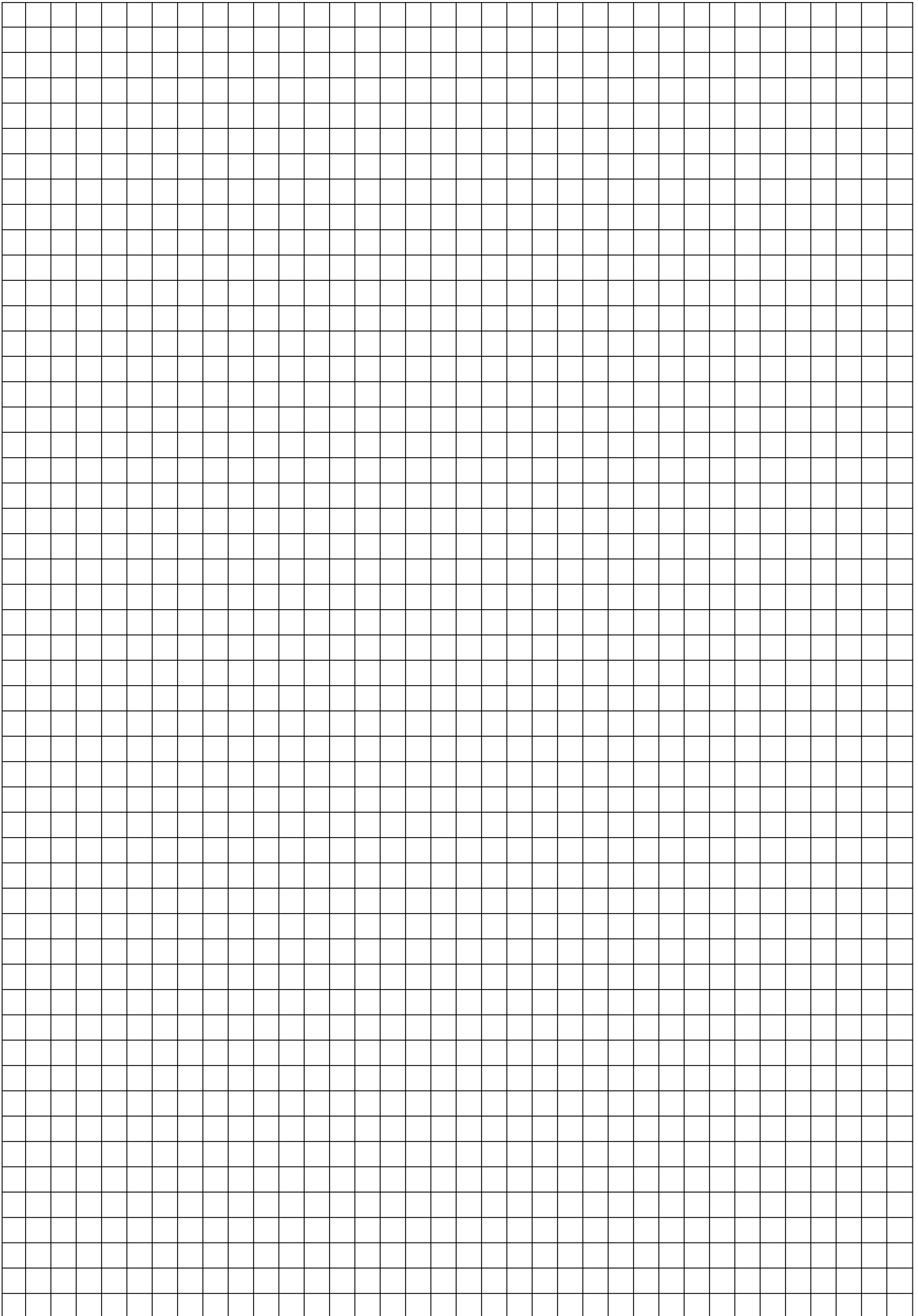
Scrap Graph Paper — this sheet will *not* be scored.

Tear Here

Tear Here



Scrap Graph Paper — this sheet will *not* be scored.



Tear Here

Tear Here

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	$A = A_0 e^{k(t - t_0)} + B_0$

Tear Here

Tear Here

Tear Here

Tear Here

FOR TEACHERS ONLY

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

ALGEBRA I

Thursday, August 16, 2018 — 8:30 to 11:30 a.m., only

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

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 explanation is written, and -3 , 1 , and 8 are stated.

[1] A correct explanation is written, but the zeros are not stated or are stated incorrectly.

or

[1] The correct zeros are stated, 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.

(26) [2] III and IV are stated, and a correct explanation is written.

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

or

[1] III and IV are stated, but the explanation is missing or incorrect.

or

[1] A correct explanation for III and IV being a function is written, but no further correct work is shown.

or

[1] A correct explanation for I and II not being a function 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.

(27) **[2]** -0.475 is stated, 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] $\frac{3.41 - 6.26}{9 - 3}$ is written, but no further correct work is shown.

or

[1] -0.475 is stated, 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.

(28) **[2]** Irrational, 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.

[0] Irrational, but no justification is given.

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] $F = \frac{9}{5}K - 459.67$ or equivalent equation is written, 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] Appropriate work is shown, but the expression $\frac{9}{5}K - 459.67$ is written.

or

[1] $F = \frac{9}{5}K - 459.67$, 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.

(30) [2] $-2 \pm \sqrt{6}$, and correct work using the method of completing the square 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] $-2 \pm \sqrt{6}$, but a method other than completing the square is used.

or

[1] $-2 \pm \sqrt{6}$, 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.

(31) **[2]** 4th, and a correct explanation is written.

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

or

[1] 4th, but the explanation is incomplete.

[0] 4th, 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.

(32) **[2]** 0, -1, 1, 1, 1.

[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 sequence is stated as -1, 1, 1, 1, 1.

[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] $135 + 72x \geq 580$ or an equivalent inequality, and 7, and correct work is shown.

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

or

[3] The equation $135 + 72x = 580$ is written, and 7, and correct work is shown.

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

or

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

or

[2] Appropriate work is shown to find 7, but no further correct work is shown.

[1] $135 + 72x = 580$ is written, but no further correct work is shown.

or

[1] 7, 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] $V(t) = 25,000(1 - 0.185)^t$ or $V(t) = 25,000(0.815)^t$, and 2503.71, and correct work is shown.

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

or

[3] Appropriate work is shown, but the function is not written in terms of $V(t)$ and t .

or

[3] Appropriate work is shown, but an expression is written instead of a function.

or

[3] Appropriate work is shown, but the difference is not stated.

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

or

[2] $V(t) = 25,000(1 - 0.185)^t$ is written, but no further correct work is shown.

[1] 2503.71, 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.

- (35) [4] The system of inequalities is graphed correctly, and at least one is labeled, and explanations for both points are written.
- [3] Appropriate work is shown, but one graphing or labeling error is made.
- or***
- [3] Appropriate work is shown, but the explanation is incomplete.
- [2] Appropriate work is shown, but two or more graphing or labeling errors are made.
- or***
- [2] The system of inequalities is graphed and labeled correctly, but no further correct work is shown.
- [1] Appropriate explanations are written based on substituting the values into each inequality, but no further correct work is shown.
- or***
- [1] One inequality is graphed and labeled correctly, 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.
- (36) [4] A correct sketch is drawn, and a correct explanation in context is written.
- [3] Appropriate work is shown, but one graphing error is made.
- or***
- [3] A correct sketch is drawn, but the explanation is incomplete.
- [2] Appropriate work is shown, but two or more graphing errors are made.
- or***
- [2] A correct sketch is drawn, but the explanation is missing or incorrect.
- or***
- [2] A correct explanation is written, but no further correct work is shown.
- [1] Work is shown to find (9, 162), but no further correct work is shown.
- [0] (9, 162), 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.
-

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 system of equations is written, correct algebraic work is shown to find 38 and 8, and correct work is shown to find 7.

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

or

[5] Appropriate work is shown, but a method other than algebraic is used to find 38 and 8.

or

[5] Appropriate work is shown, but only one age is found.

or

[5] Appropriate work is shown to find 38 and 8, but no work is shown to find 7.

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

or

[4] Appropriate work is shown, but the number of years is not found.

[3] A correct system of equations is written, but a method other than algebraic is used to find 38 and 8, and no further correct work is shown.

[2] A correct system of equations is written, but no further correct work is shown.

or

[2] Both equations are incorrect, but the system is solved appropriately, but no further correct work is shown.

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

or

[1] 38, 8, and 7, 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.

**Map to the Core Learning Standards
Algebra I
August 2018**

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

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

Regents Examination in Algebra I

August 2018

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

The *Chart for Determining the Final Examination Score for the August 2018 Regents Examination in Algebra I* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> by Thursday, August 16, 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

Thursday, August 16, 2018 — 8:30 to 11:30 a.m.

MODEL RESPONSE SET

Table of Contents

Question 25	2
Question 26	6
Question 27	11
Question 28	14
Question 29	20
Question 30	24
Question 31	29
Question 32	33
Question 33	37
Question 34	43
Question 35	48
Question 36	54
Question 37	61

Question 25

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

To determine the zeros of $f(x) = (x+3)(x-1)(x-8)$ you need to make each set in parentheses equal zero and solve for x .

State the zeros of the function.

$$\begin{array}{lll} x+3=0 & x-1=0 & x-8=0 \\ x=-3 & x=1 & x=8 \end{array}$$

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

Question 25

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

-3 1 8

I plugged $f(x) = (x+3)(x-1)(x-8)$ into my calculator into $Y=$. Then I clicked 2nd TRACE and hit ZERO

State the zeros of the function.

The zeros are -3, 1, 8

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

Question 25

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

You graph it and whatever values are on the x-axis are your zeros

State the zeros of the function.

$$x^2 - 1x + 3x - 3$$
$$x^2 + 2x - 3$$

Score 1: The student wrote a correct explanation.

Question 25

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

$$x + 3 = 0 \quad x - 1 = 0 \quad x - 8 = 0$$

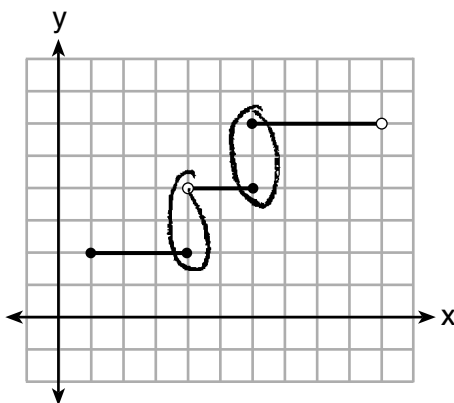
$$(3, 0) \quad (-1, 0) \quad (-8, 0)$$

State the zeros of the function.

Score 0: The student showed how to determine the zeros, but did not write an explanation.

Question 26

26 Four relations are shown below.



I

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

II

function

x	y
-4	1
0	3
4	5
6	6

III

$$y = x^2 \text{ function}$$

IV

State which relation(s) are functions.

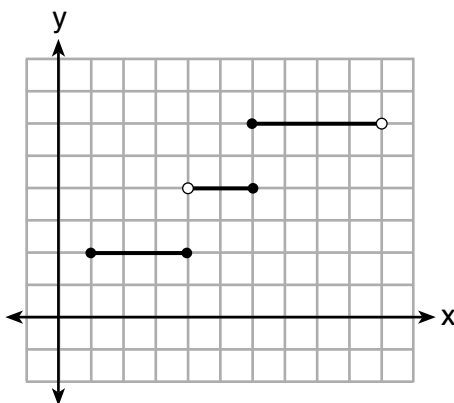
Explain why the other relation(s) are *not* functions.

The other relations are not functions because their x value repeats with different y values

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

Question 26

26 Four relations are shown below.



x	y
-4	1
0	3
4	5
6	6

III

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

II

$y = x^2$

IV

State which relation(s) are functions.

III and IV are functions

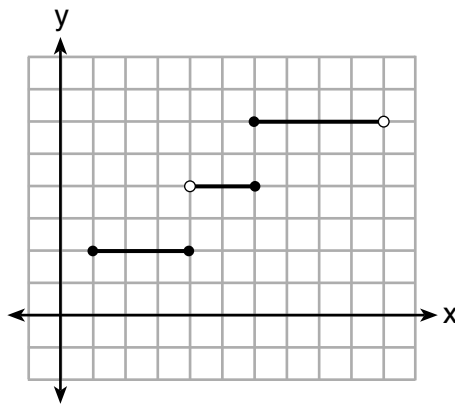
Explain why the other relation(s) are *not* functions.

I does not pass the vertical line test
and II has two outputs for the input 2.

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

Question 26

26 Four relations are shown below.



I

x	y
-4	1
0	3
4	5
6	6

III

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

II

$$y = x^2$$

IV

State which relation(s) are functions.

I III IV are functions

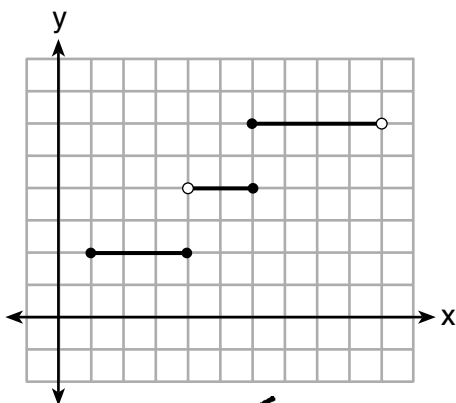
Explain why the other relation(s) are *not* functions.

II is not because it has another y value for the same x value
 $[(2,5), (2,-5)]$

Score 1: The student wrote an appropriate explanation for their response.

Question 26

26 Four relations are shown below.



~~I~~

x	y
-4	1
0	3
4	5
6	6

III

~~{(1,2), (2,5), (3,8), (2,-5), (1,-2)}~~

~~II~~

$y = x^2$

IV

State which relation(s) are functions.

III and IV

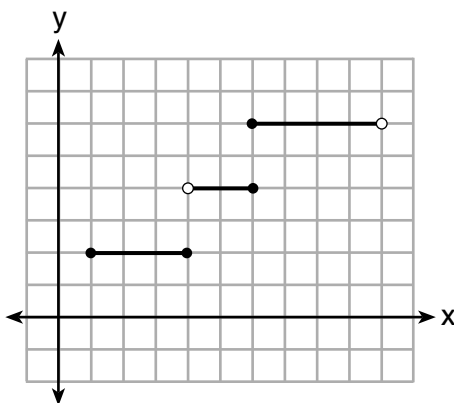
because the x-values do not repeat

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

Score 1: The student explained why III and IV are functions, but not why I and II are not functions.

Question 26

26 Four relations are shown below.



I

x	y
-4	1
0	3
4	5
6	6

III

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

II

$$y = x^2$$

IV

State which relation(s) are functions.

3 = function

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

2 = not a function
Domain repeat

Score 0: The student did not show enough correct work in either part to receive any credit. The student only addressed relations II and III.

Question 27

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

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

Handwritten annotations: A bracket on the left side of the table spans from $t=3$ to $t=9$ and is labeled "6". A bracket on the right side of the table spans from $P(3)=6.26$ to $P(9)=3.41$ and is labeled "2.85".

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

$\frac{\Delta y}{\Delta x}$ = rate of change

$$\begin{array}{r} 3 \quad 6.26 \\ 9 \quad 3.41 \\ \hline -6 \quad \frac{2.85}{-6} = -.475 \end{array}$$

Answer: -.475

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

Question 27

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

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

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

$$M = \frac{3.41 - 6.26}{9 - 3} = \frac{-2.85}{-6} = .475 \text{ feet per second}$$

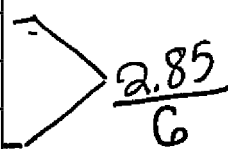
The average rate of change from 3 to 9 seconds is .475 feet per second.

Score 1: The student made one computational error.

Question 27

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

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


$$\frac{2.85}{6}$$

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

47% change

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

Question 28

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

$$b^2 - 4ac$$

$$3^2 - 4(2)(-10)$$

$$89$$

Irrational, I found the discriminant of the equation by using $b^2 - 4ac$, If the discriminant cant be square rooted perfectly its irrational.

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

Question 28

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

$$\begin{array}{l} a=2 \\ b=3 \\ c=-10 \\ -3 \pm \sqrt{3^2 - 4(2)(-10)} \\ \hline -3 \pm \sqrt{9+80} \\ -3 \pm \sqrt{89} \\ \hline 4 \end{array}$$

$$\frac{-3 + \sqrt{89}}{4}$$

$$\frac{-3 - \sqrt{89}}{4}$$

$$1.608495283$$

$$-3.108495283$$

Irrational

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

Question 28

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

$$X = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-10)}}{2(2)}$$

$$X = \frac{-3 \pm \sqrt{89}}{4}$$

$$X = \frac{-3 + \sqrt{89}}{4}, \quad \frac{-3 - \sqrt{89}}{4}$$

- .641504717 -5.358495283

The solution of the quadratic equation is irrational. It does not simplify to a rational number.

Score 1: The student made a computational error by dividing only $\sqrt{89}$ by 4.

Question 28

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

$$0 = \frac{(2x+5)(x-2)}{2x+5=0 \quad | \quad x-2=0}$$
$$x = -\frac{5}{2} \quad | \quad x = 2$$

Rational

Score 1: The student made a factoring error which resulted in a rational answer.

Question 28

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

Irrational because the equation is written backwards, and it has an exponent.

Score 0: The student wrote a completely incorrect explanation as their justification.

Question 28

28 Is the solution to the quadratic equation written below rational or irrational? Justify your answer.

$$0 = 2x^2 + 3x - 10$$

$$a=2 \quad b=3 \quad c=-10$$

$$x = \frac{-3 \pm \sqrt{(3)^2 - (4)(2)(-10)}}{2(2)}$$

$$\frac{-3 \pm \sqrt{89}}{4}$$

$$\frac{-3 + \sqrt{89}}{4} = 21.5 \quad \frac{-3 - \sqrt{89}}{4} = -23$$

The solution is irrational
because has a positive
and negative number

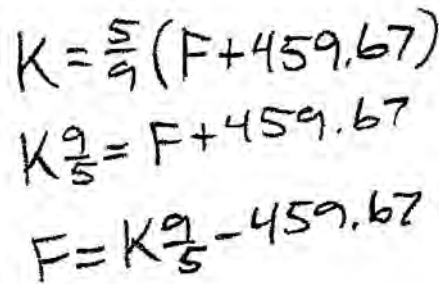
Score 0: The student did not show enough correct work to receive any credit.

Question 29

29 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:

$$K = \frac{5}{9}(F + 459.67)$$

Solve for F , in terms of K .



Handwritten student work showing the derivation of the formula for F in terms of K :

$$K = \frac{5}{9}(F + 459.67)$$
$$K \frac{9}{5} = F + 459.67$$
$$F = K \frac{9}{5} - 459.67$$

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

Question 29

29 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:

$$K = \frac{5}{9}(F + 459.67)$$

Solve for F , in terms of K .

$$\frac{K}{\cancel{5/9}} = \frac{\cancel{5/9}(F + 459.67)}{\cancel{5/9}}$$

$$\frac{K}{\cancel{5/9}} = F + 459.67$$
$$-459.67 \quad -459.67$$

$$\frac{K}{\cancel{5/9}} - 459.67 = F$$

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

Question 29

29 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:

$$K = \frac{5}{9}(F + 459.67)$$

Solve for F , in terms of K .

$$K = \frac{5}{9}(F + 459.67)$$

$$K = \frac{5}{9}F + 255.3722222$$
$$\underline{-255.372222 \quad -255.372222}$$

$$\frac{K - 255.372222}{5/9} = \frac{5}{9}F$$

$$F = \frac{K - 255.37}{5/9}$$

Score 1: The student rounded their answer.

Question 29

29 The formula for converting degrees Fahrenheit (F) to degrees Kelvin (K) is:

$$K = \frac{5}{9}(F + 459.67)$$

Solve for F , in terms of K .

$$K = \frac{5}{9}(F + 459.67)$$
$$K = \frac{5}{9}F + 255.372$$

Score 0: The student did not show enough grade-level work to receive any credit.

Question 30

30 Solve the following equation by completing the square:

$$x^2 + 4x = 2$$

$$x^2 + 4x + 4 = 2 + 4$$
$$\sqrt{(x+2)^2} = \sqrt{6}$$

$$x + 2 = \sqrt{6}$$

$$\begin{array}{r} x + 2 = \sqrt{6} \\ -2 \quad -2 \\ \hline \end{array}$$

$$x = -2 \pm \sqrt{6}$$

$$-2 + \sqrt{6} = .4494897428$$

$$-2 - \sqrt{6} = -4.449489743$$

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

Question 30

30 Solve the following equation by completing the square:

$$x^2 + 4x = 2 + 4 \quad \left(\frac{4}{2}\right)^2 = 2^2 = 4$$

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

Score 1: The student only completed the square correctly.

Question 30

30 Solve the following equation by completing the square:

$$x^2 + 4x = 2$$

$$\left(\frac{4}{2}\right)^2$$

$$x^2 + 4x + 4 = 2 + 4$$

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

$$x + 2 = \sqrt{6}$$

$$x = -2 + \sqrt{6}$$

Score 1: The student completed the square correctly, but found only one solution.

Question 30

30 Solve the following equation by completing the square:

$$x^2 + 4x = 2$$

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

$$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(-2)}}{2(1)}$$

$$x = \frac{-4 \pm \sqrt{24}}{2}$$

Score 1: The student used a method other than completing the square.

Question 30

30 Solve the following equation by completing the square:

$$x^2 + 4x = 2$$

$$x^2 + \frac{4x}{2} = 2$$

$$x^2 + 4x + 4 = 2$$

$$(x+2)(x+2) = 2$$

$$\sqrt{(x+2)^2} = \sqrt{2}$$

$$x+2 = \sqrt{2} - 2$$

$$x = -2\sqrt{2}$$

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

Question 31

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

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

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

The class with the largest spread of scores was Period 4 because the first and third quartiles were farther apart and because the interquartile range is greater.

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

Question 31

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

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

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

4th period has the largest spread because their σ_x is greater than 6th period.

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

Question 31

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

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

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

$$87.5 - 69 = 18.5 \quad 4^{\text{th}} \text{ period}$$
$$88 - 71.5 = 16.5$$

Score 1: The student gave an appropriate justification, but did not write an explanation.

Question 31

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

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

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

4th Period because it has a wider range from going to 77.75 or 87.5 back down to 20.

Score 0: The student gave a completely incorrect response.

Question 32

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

$$a_1 = 0$$

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

$$a_2 = 2(a_{2-1})^2 - 1$$

$$a_2 = 2(0)^2 - 1$$

$$a_2 = -1$$

$$a_3 = 2(a_{3-1})^2 - 1$$

$$a_3 = 2(-1)^2 - 1$$

$$a_3 = 1$$

$$a_4 = 2(a_{4-1})^2 - 1$$

$$a_4 = 2(1)^2 - 1$$

$$a_4 = 1$$

$$a_5 = 2(a_{5-1})^2 - 1$$

$$a_5 = 2(1)^2 - 1$$

$$a_5 = 1$$

$\{0, -1, 1, 1, 1\}$

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

Question 32

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

$$a_1 = 0$$

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



A handwritten sequence of five terms: 0, -1, 1, 1, 1. The terms are enclosed in a hand-drawn oval.

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

Question 32

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

$$a_1 = 0$$

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

$$a_2 = 2(a_{2-1})^2 - 1$$

$$a_2 = 2(a_1)^2 - 1$$

$$a_2 = 2(0)^2 - 1$$

$$a_2 = -1$$

$$a_3 = 2(a_2)^2 - 1$$

$$a_3 = 2(-1)^2 - 1$$

$$a_3 = 4 - 1$$

$$a_3 = 3$$

$$a_4 = 2(a_3)^2 - 1$$

$$a_4 = 2(3)^2 - 1$$

$$a_4 = 36 - 1$$

$$a_4 = 35$$

$$a_1 = 0$$

$$a_2 = -1$$

$$a_3 = 3$$

$$a_4 = 35$$

$$a_5 = 4849$$

$$a_5 = 2(a_4)^2 - 1$$

$$a_5 = 2(35)^2 - 1$$

$$a_5 = (70)^2 - 1$$

$$a_5 = 4849$$

Score 1: The student squared $(2a_{n-1})$ in each step.

Question 32

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

$$a_1 = 0$$

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

$$a_1 = 2(0)^2 - 1$$

$$a_1 = -1$$

$$a_2 = 2(0)^2 - 1$$

$$a_2 = -1$$

$$a_3 = 2(2)^2 - 1$$

$$a_3 = 7$$

$$a_4 = 2(3)^2 - 1$$

$$a_4 = 17$$

$$a_5 = 2(4)^2 - 1$$

$$a_5 = 31$$

$$a_1 = -1$$

$$a_2 = -1$$

$$a_3 = 7$$

$$a_4 = 17$$

$$a_5 = 31$$

Score 0: The student made multiple errors.

Question 33

33 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

Let $x =$ the number of weeks

$$46 \cdot \frac{3}{4} = 72 \quad 135 + 72x \geq 580$$

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

$$\begin{array}{r} 135 + 72x \geq 580 \\ -135 \quad \quad -135 \\ \hline \end{array}$$

$$\begin{array}{r} 72x \geq 445 \\ \hline 72 \quad \quad 72 \end{array}$$

$$x \geq 6.2$$

She must work a minimum of
7 weeks to get \$580.

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

Question 33

33 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

$$96 \cdot \frac{3}{4} \\ 72 \quad 135 + 72x \geq 580$$

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

$$\begin{array}{r} 135 + 72x \geq 580 \\ -135 \quad \quad -135 \\ \hline 72x \geq 445 \\ \frac{72x}{72} \geq \frac{445}{72} \\ x \geq 6.1805 \end{array}$$

~~6.1805 weeks~~
6.1806 weeks

Score 3: The student made a rounding error

Question 33

33 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

Let $w =$
weeks

$$135 + 96w \geq 580$$

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

$$\begin{array}{r} 135 + 96w \geq 580 \\ -135 \\ \hline 96w \geq 445 \\ \frac{96w}{96} \geq \frac{445}{96} \end{array}$$

5 weeks

Score 3: The student did not find $\frac{3}{4}$ of 96 before writing their inequality.

Question 33

33 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

$$\frac{3}{4} \cdot 96 \cdot x + 135 = 580$$

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

$$\begin{aligned} 72x + 135 &= 580 \\ 72x &= 445 \\ x &= 6.180\bar{5} \end{aligned}$$

Score 2: The student wrote and solved an equation, but did not state an appropriate number of weeks.

Question 33

33 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

$$135 + 96 \times \left(\frac{3}{4}\right) = 580$$

$$\frac{3}{4}$$

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

$$135 + 96 \times \left(\frac{3}{4}\right) = 580$$
$$135 + 96(6.5) \times \frac{3}{4} = 580$$

Sarah needs
to work $6\frac{1}{2}$ weeks
to get \$603 for her
snowboard

Score 1: The student wrote an equation.

Question 33

33 Sarah wants to buy a snowboard that has a total cost of \$580, including tax. She has already saved \$135 for it. At the end of each week, she is paid \$96 for babysitting and is going to save three-quarters of that for the snowboard.

Write an inequality that can be used to determine the *minimum* number of weeks Sarah needs to babysit to have enough money to purchase the snowboard.

$$96 + 135x = 580$$

Determine and state the *minimum* number of full weeks Sarah needs to babysit to have enough money to purchase this snowboard.

$$\frac{135x}{135} = \frac{484}{135}$$

$$x = 3.6 \text{ week} \rightarrow$$

3 weeks

Score 0: The student gave a completely incorrect response.

Question 34

34 A car was purchased for \$25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

Create a function that will determine the value, $V(t)$, of the car t years after purchase.

$$V(t) = 25000(1 - .185)^t$$

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

$$3 \text{ years} = 25000(1 - .185)^3 = 13533.58438$$

$$4 \text{ years} = 25000(1 - .185)^4 = 11029.87127$$

$$\begin{array}{r} 3 \text{ years} \\ - 4 \text{ years} \\ \hline 2503.713114 \end{array}$$

$$\text{\$}2503.71$$

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

Question 34

34 A car was purchased for \$25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

Create a function that will determine the value, $V(t)$, of the car t years after purchase.

$$V(t) = 25000 \cdot 0.815^t$$

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

$$13534 - 11030 = \text{\$2504}$$

Score 3: The student rounded incorrectly.

Question 34

34 A car was purchased for \$25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

Create a function that will determine the value, $V(t)$, of the car t years after purchase.

$$V(t) = 25,000(0.185)^t$$

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

$$\begin{array}{r} 4.18 \\ 158.29 \\ -20.28 \\ \hline \$129.01 \end{array}$$

Score 2: The student wrote an incorrect function, but found an appropriate solution.

Question 34

34 A car was purchased for \$25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

Create a function that will determine the value, $V(t)$, of the car t years after purchase.

$$V(t) = 25,000 - 18.5t$$

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

$$V(t) = 25,000 - 18.5(3)$$

$$V(t) = 24,944.50$$

$$V(t) = 25,000 - 18.5(4)$$

$$V(t) = 24,926$$

$$\begin{array}{r} 24,945 \\ - 24,926 \\ \hline \text{\$19} \end{array}$$

Score 1: The student wrote and solved an incorrect function and rounded to the nearest dollar.

Question 34

34 A car was purchased for \$25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

Create a function that will determine the value, $V(t)$, of the car t years after purchase.

$$V(t) = 25000 \div 18.5t$$

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

$$V(t) = 25000 \div 18.5(4)$$

$$V(t) = 25000 \div 74$$

$$V(t) = 5405.41$$

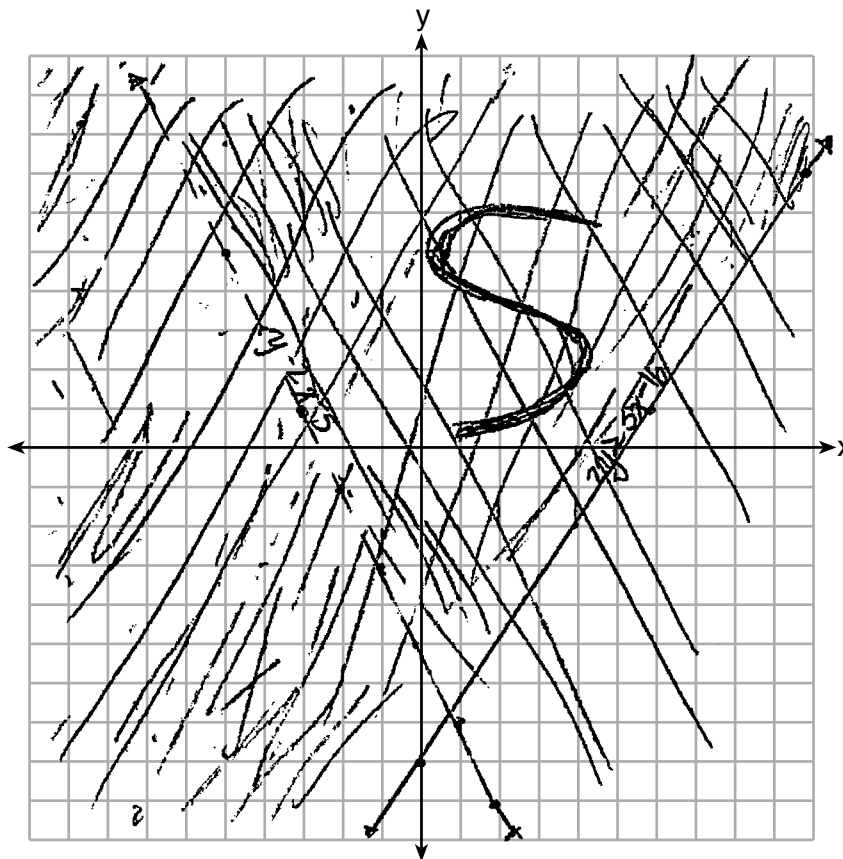
Score 0: The student gave a completely incorrect response.

Question 35

35 Graph the following system of inequalities on the set of axes below:

$$2y \geq 3x - 16 \quad y \geq \frac{3}{2}x - 8$$

$$y + 2x > -5 \quad y > -2x - 5$$



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

$(6,1)$ is a solution because it falls on the line of the inequality where y is greater than or equal to, it has a possibility of being a solution. $(-6,7)$ is not a solution because it falls on the line of the inequality where the sign is greater than, so it doesn't have a possibility of being a solution.

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

Question 35

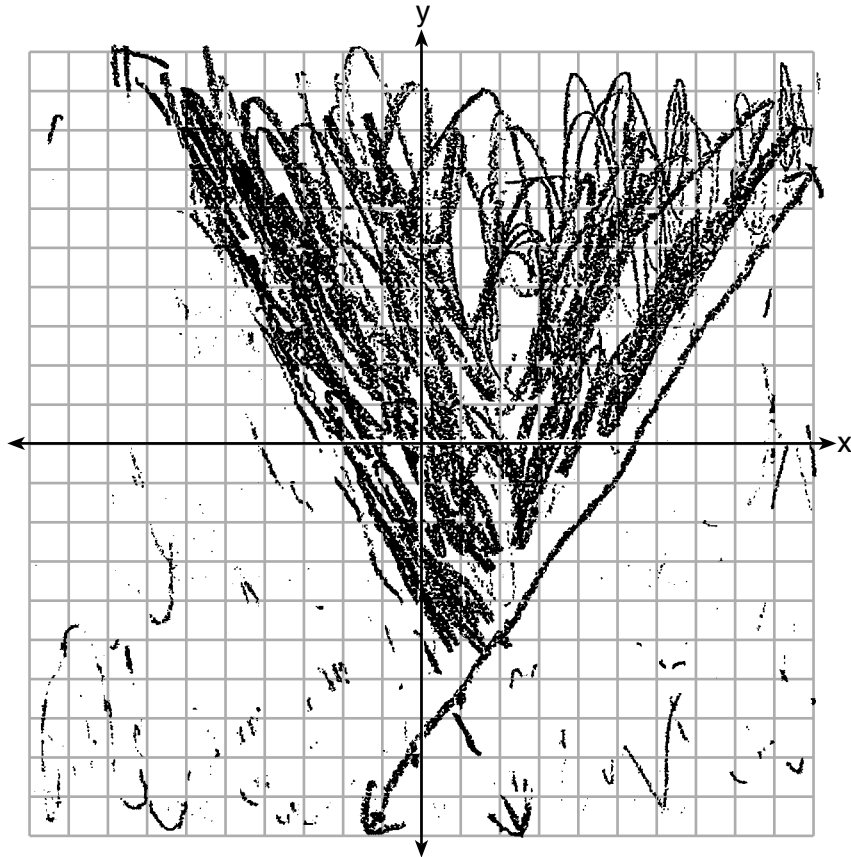
35 Graph the following system of inequalities on the set of axes below:

$$\begin{aligned}x + 2x &> -5 \\ -2x & -2x \\ x &> -2x - 5\end{aligned}$$

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

$$y + 2x > -5$$

$$\begin{aligned}2y &\geq 3x - 16 \\ \frac{2y}{2} & \frac{3x - 16}{2} \\ y &\geq 1.5x - 8\end{aligned}$$



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

$(6,1)$ is on a line where y can be equal to the line but $(-6,7)$ is not.

Score 3: The student did not label either inequality.

Question 35

35 Graph the following system of inequalities on the set of axes below:

$$\begin{array}{r} y+2x > -5 \\ -2x \quad -2x \\ \hline y > -2x-5 \end{array}$$

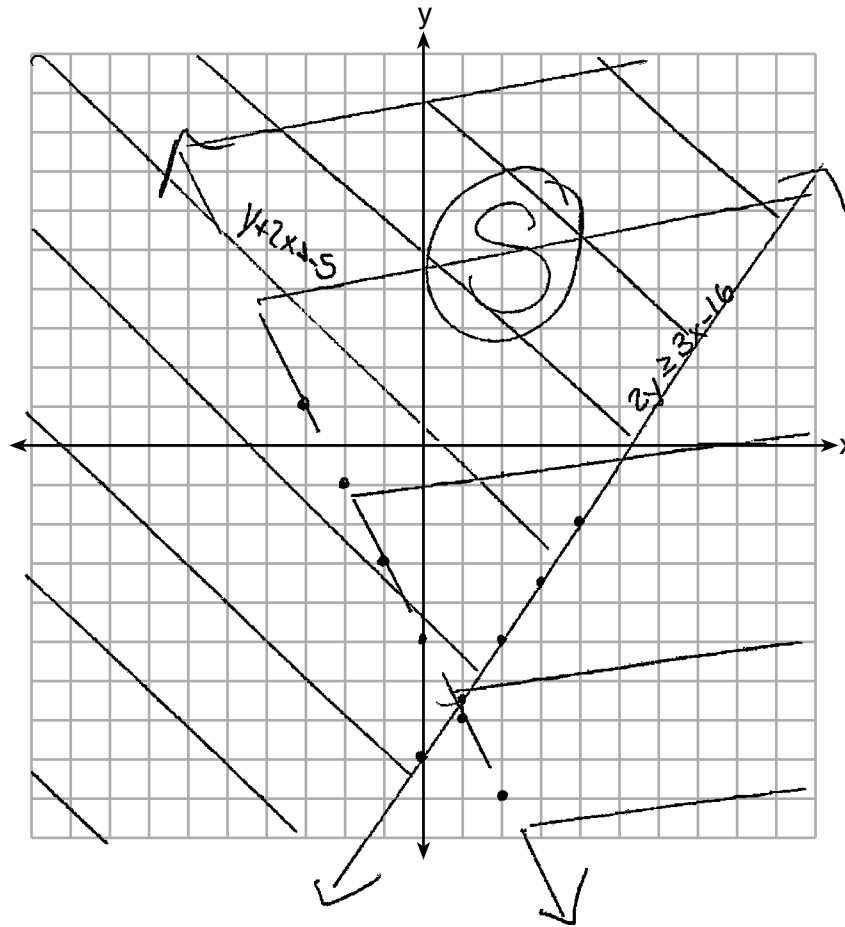
$$\begin{array}{l} m = -2 \\ b = -5 \end{array}$$

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

$$y + 2x > -5$$

$$\frac{2y}{2} \geq \frac{3x-16}{2}$$

$$\begin{array}{l} y \geq 1.5x - 8 \\ m = 1.5 \\ b = -8 \end{array}$$



$tp(0,0)$
 $2y > 3x - 16$
 $2(0) > 3(0) - 16$
 $0 > -16$
 True
 $tp(0,0)$
 $y + 2x > -5$
 $0 + 2(0) > -5$
 $0 > -5$

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

(6,1) is in the solution
and (-6,7) isn't

Score 2: The student graphed the system of inequalities correctly.

Question 35

35 Graph the following system of inequalities on the set of axes below:

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

$$y + 2x > -5$$

Handwritten work for the first inequality:

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

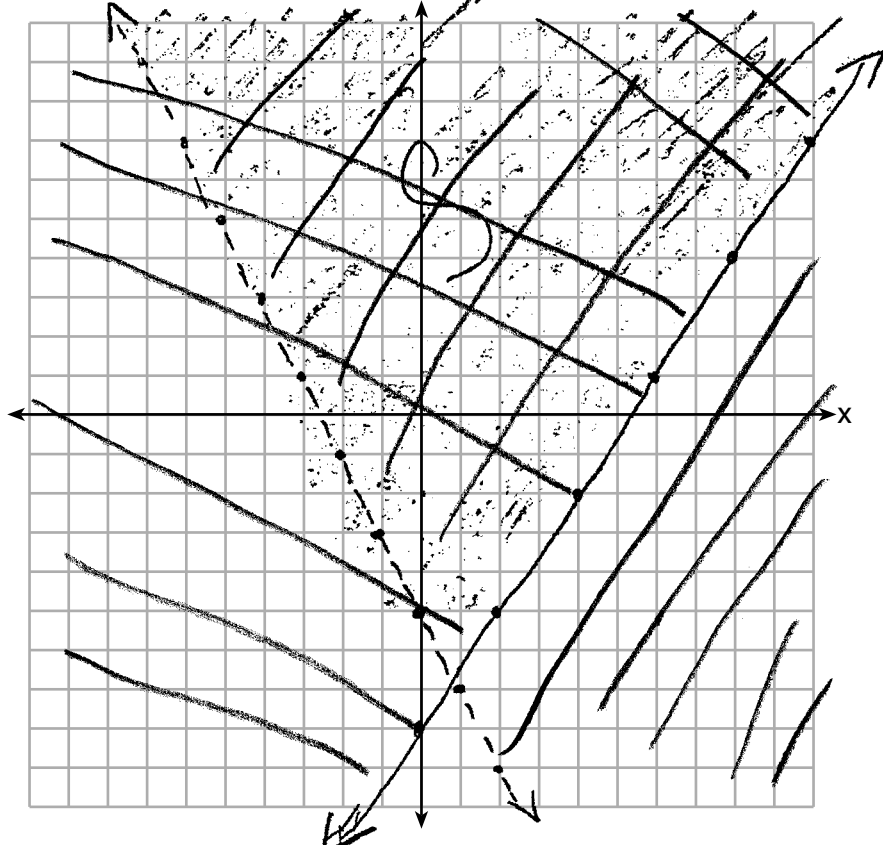
$$\frac{2y}{2} \geq \frac{3x - 16}{2}$$

$$y \geq \frac{3}{2}x - 8$$

Handwritten work for the second inequality:

$$y + 2x > -5$$

$$y - 2x > -5$$



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

Handwritten explanation:

\Rightarrow NO $(6,1)$ is not a solution ~~to~~ it
 was to inside of shaded line. ~~been~~ $(6,7)$
 is not a solution because it not.

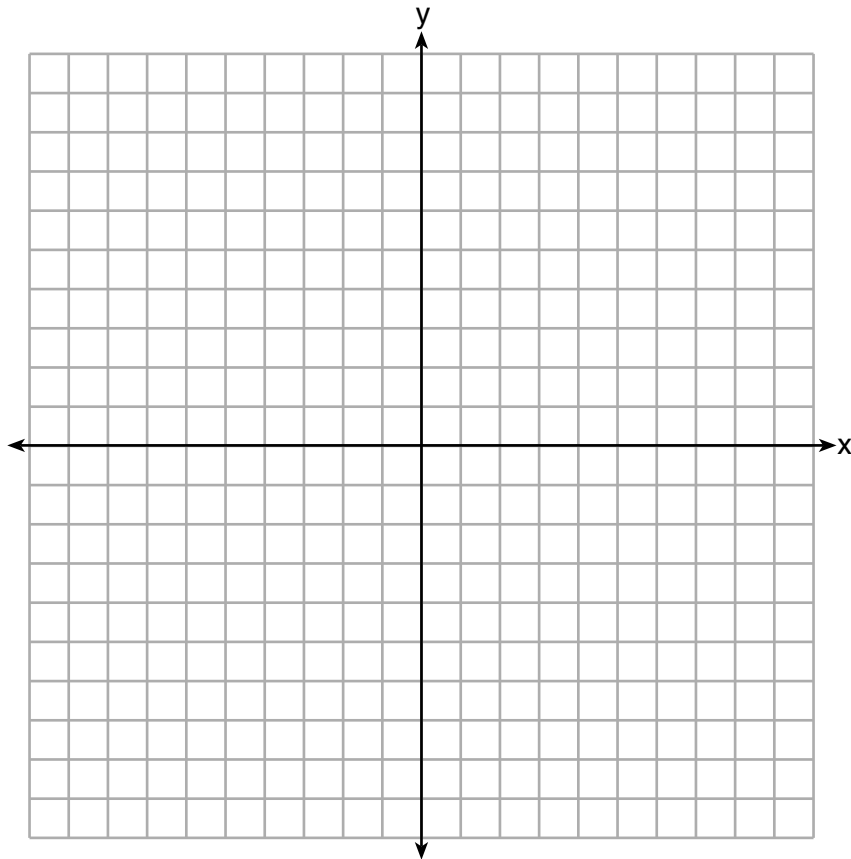
Score 1: The student did not label either inequality.

Question 35

35 Graph the following system of inequalities on the set of axes below:

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

$$y + 2x > -5$$



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

$$\begin{array}{l}
 2y \geq 3x - 16 \\
 2 \cdot 1 \geq 3 \cdot 6 - 16 \\
 2 \geq 18 - 16 \\
 2 \geq 2 \text{ yes} \\
 (6,1) \text{ works in both inequalities} \\
 \text{so it's a solution.}
 \end{array}
 \quad
 \begin{array}{l}
 y + 2x > -5 \\
 1 + 2 \cdot 6 > -5 \\
 1 + 12 > -5 \\
 13 > -5 \text{ yes}
 \end{array}$$

$$\begin{array}{l}
 2y \geq 3x - 16 \\
 2 \cdot 7 \geq 3 \cdot (-6) - 16 \\
 14 \geq -18 - 16 \\
 14 \geq -34 \text{ yes} \\
 (-6,7) \text{ doesn't work in both} \\
 \text{so it's not a solution.}
 \end{array}
 \quad
 \begin{array}{l}
 y + 2x > -5 \\
 7 + 2 \cdot (-6) > -5 \\
 7 + (-12) > -5 \\
 -5 > -5 \text{ no}
 \end{array}$$

Score 1: The student used a method other than the graph in their explanation.

Question 35

35 Graph the following system of inequalities on the set of axes below:

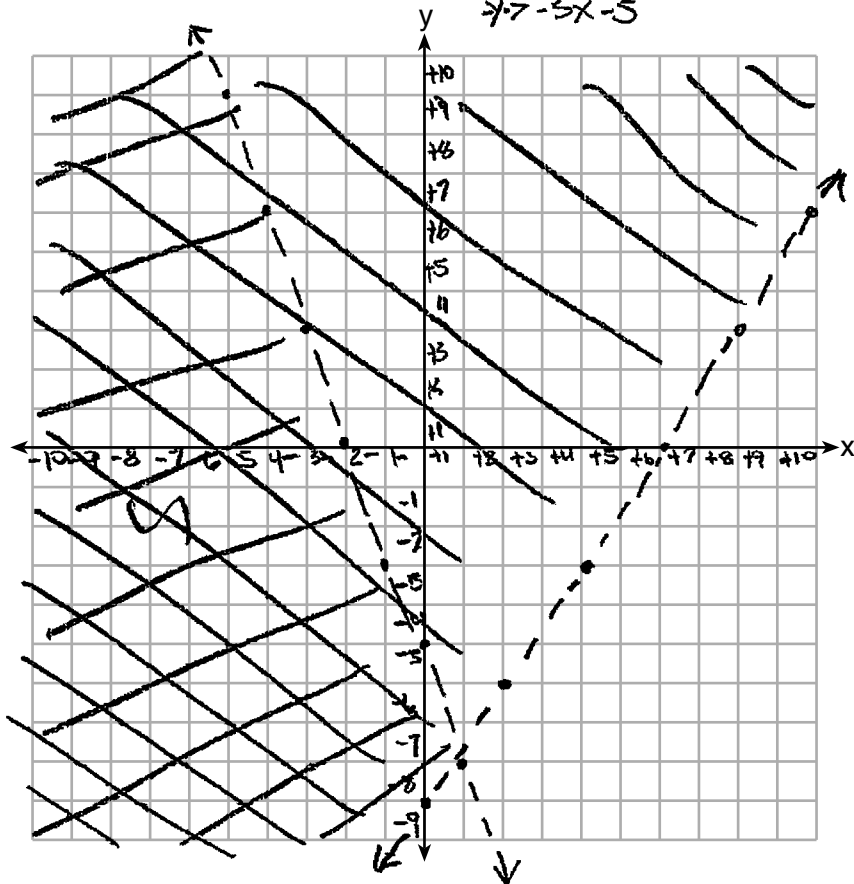
$$2y \geq 3x - 16$$

$$y + 2x > -5$$

$$\frac{2y}{2} \geq \frac{3x-16}{2}$$

$$y \geq \frac{3}{2}x - 8$$

$$\begin{array}{r} 2x + y - 5 \\ + 2x \\ \hline 4x - 5x - 5 \end{array}$$



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

It is in striped line and that means it is a solution

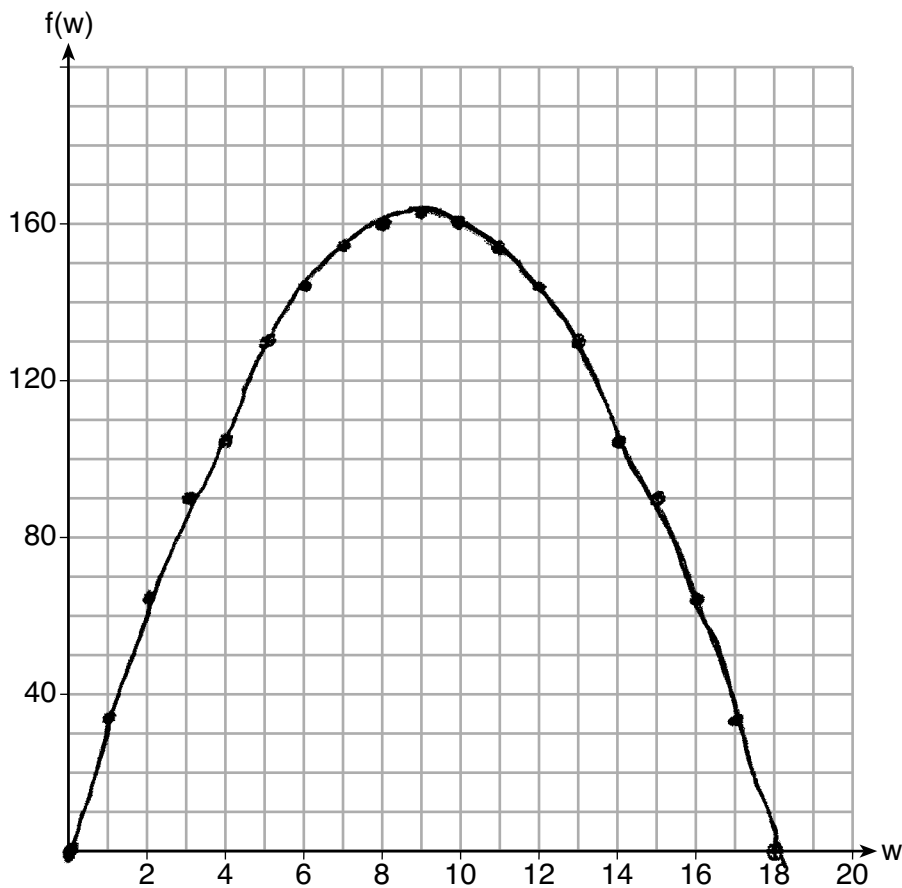
Score 0: The student did not graph either inequality correctly.

Question 36

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

$$f(w) = 36w - 2w^2$$

On the set of axes below, sketch the graph of $f(w)$.



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

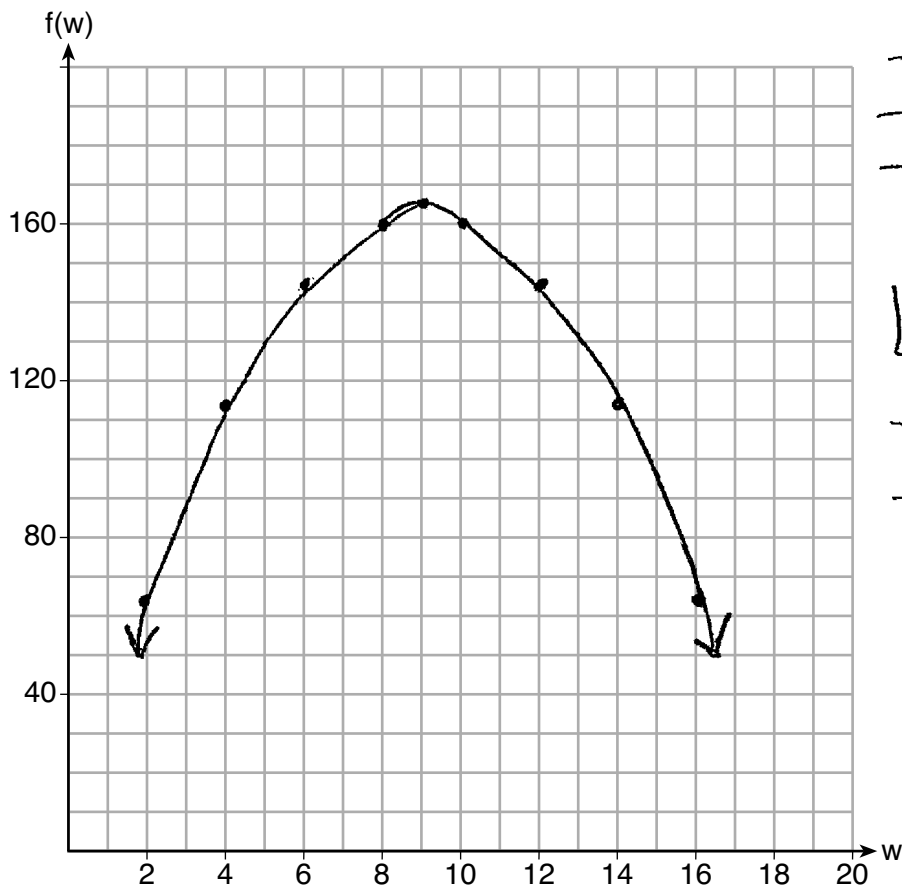
When the width of the garden was 9 ~~feet~~ the area was 162 in square ft.

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

Question 36

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

On the set of axes below, sketch the graph of $f(w)$.



x	y
0	0
2	64
4	112
6	144
8	160
10	160
vertex	
9	162
12	144
14	112
16	64
18	0

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

The meaning of the vertex in the context of the problem is at the point $(9, 162)$.

$$w(36 - 2w) = 0$$

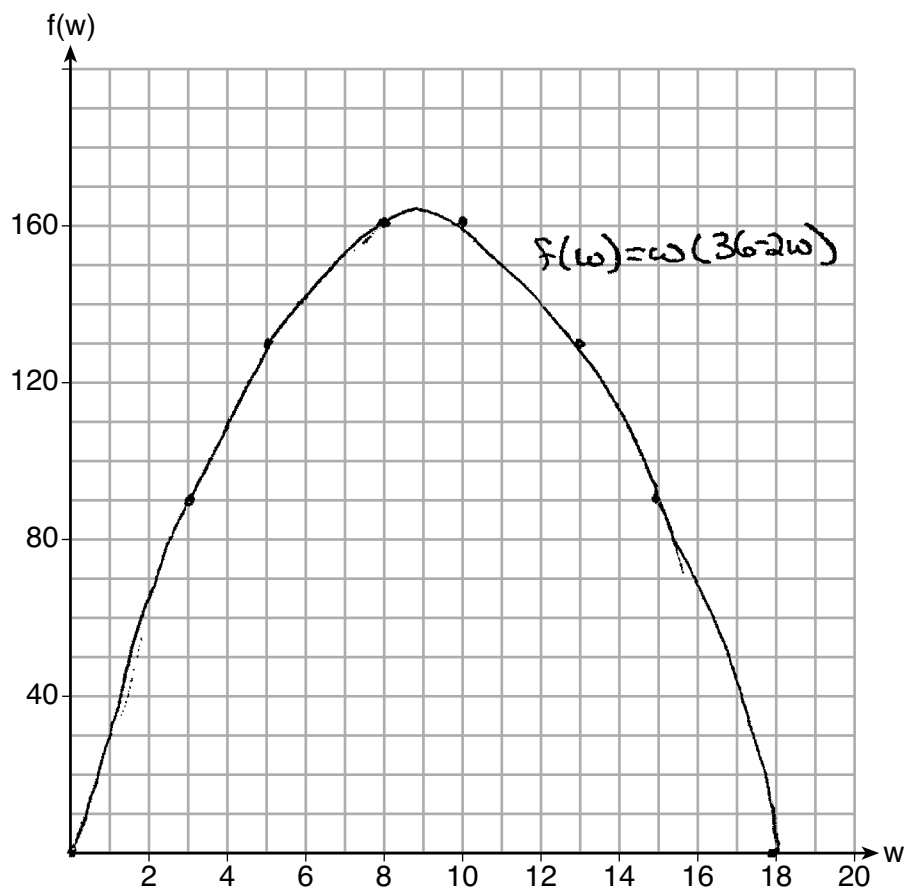
$$36w - 2w^2 = 0$$

Score 3: The student did not explain the meaning of the vertex in context.

Question 36

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

On the set of axes below, sketch the graph of $f(w)$.



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

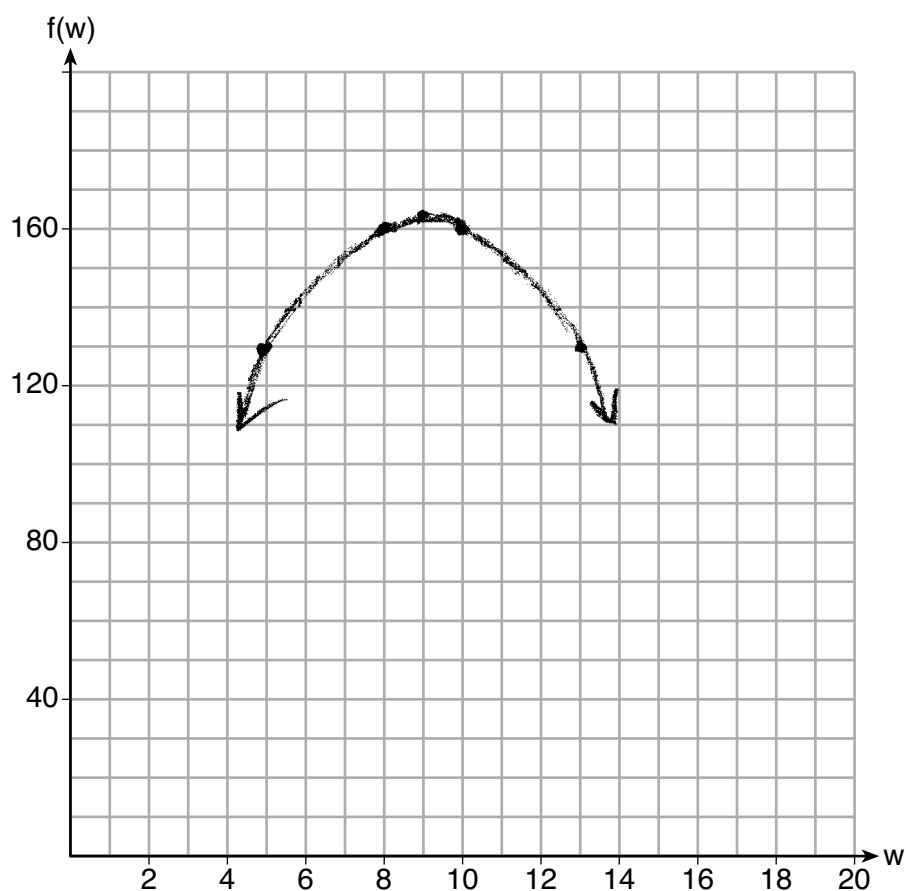
In this situation, the vertex of 162 means that the area of the garden cannot be greater than 162 square feet in total if Paul only uses 36 feet of fence

Score 3: The student explained the meaning of only the y -coordinate of the vertex in context.

Question 36

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

On the set of axes below, sketch the graph of $f(w)$.



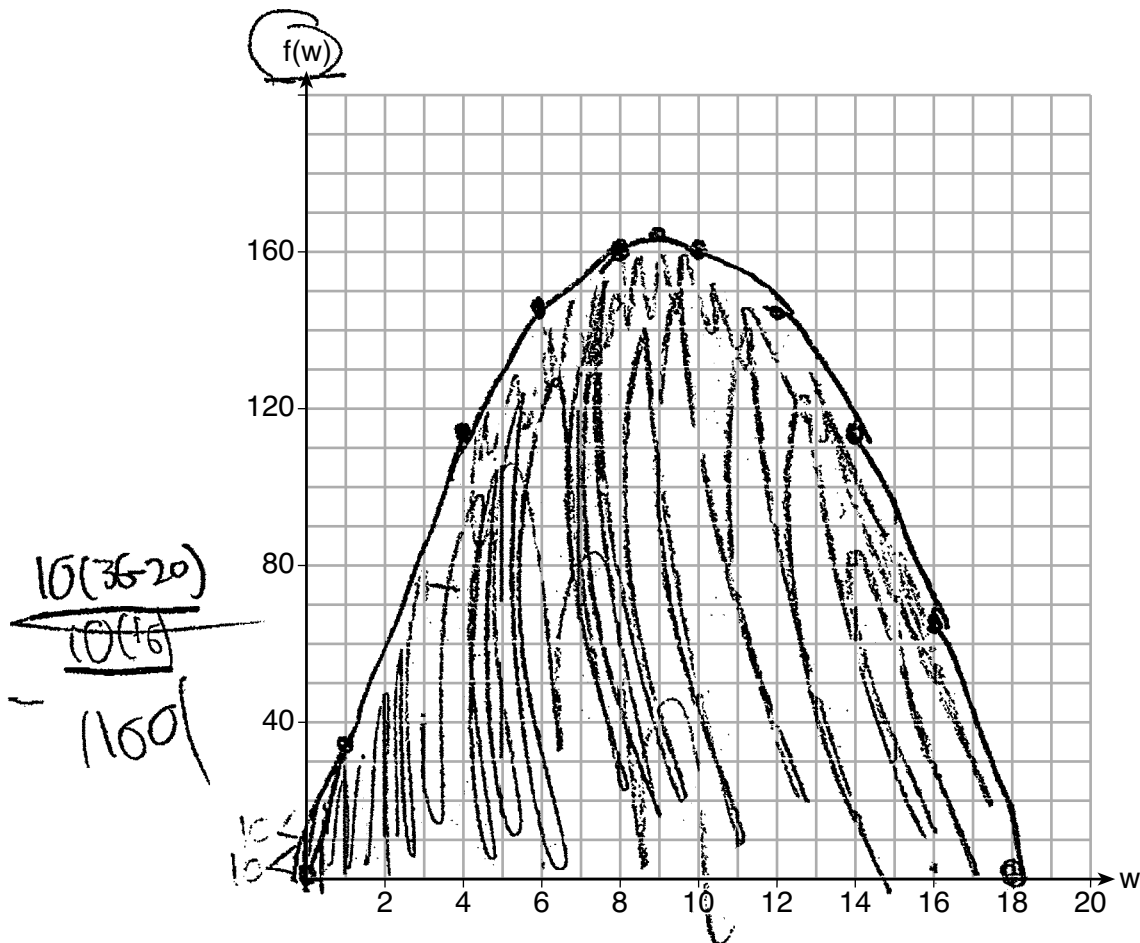
Explain the meaning of the vertex in the context of the problem.

Score 2: The student made a correct sketch.

Question 36

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

On the set of axes below, sketch the graph of $f(w)$.



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

The vertex is 36 feet of fence
so it's a set amount it only goes down

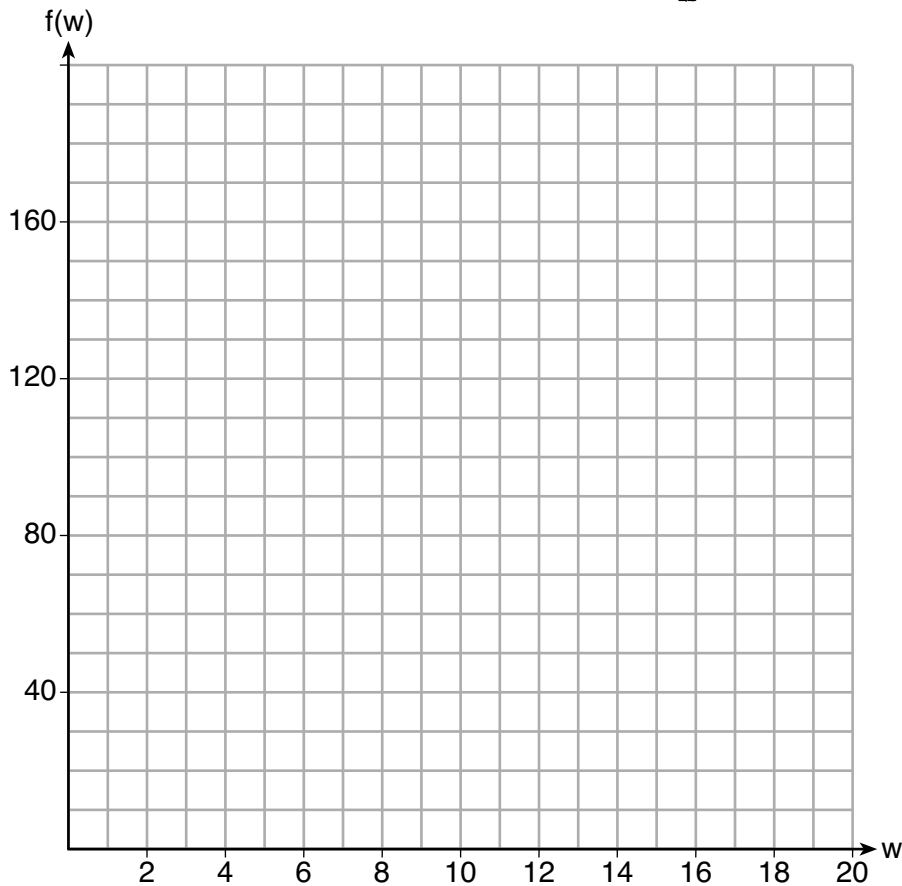
Score 1: The student made a graphing error by shading in the area under the parabola.

Question 36

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

On the set of axes below, sketch the graph of $f(w)$.

$$\begin{aligned} f(w) &= 36w - 2w^2 \\ &= -2w^2 + 36w \end{aligned}$$



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

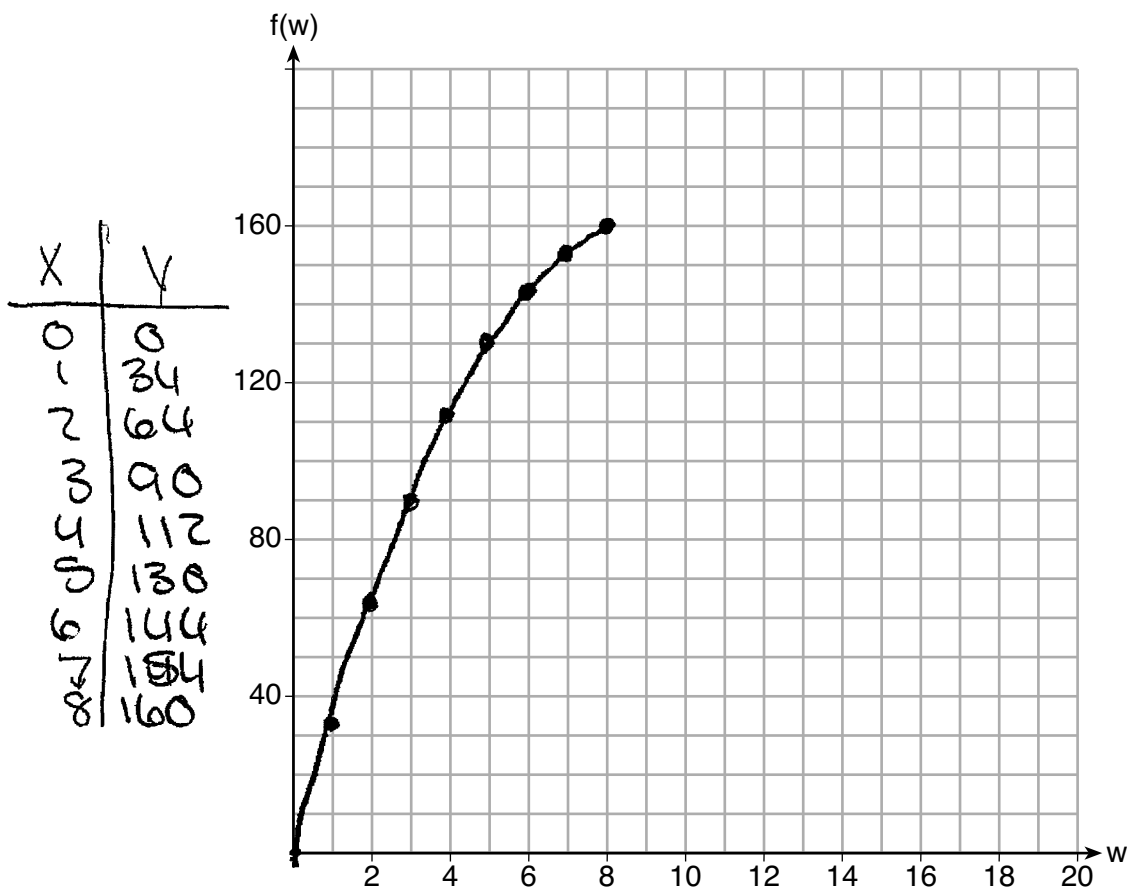
$$\begin{aligned} f(w) &= -2(w^2 - 18w) \\ f(w) &= -2(w^2 - 18w + 81) \\ f(w) - 162 &= -2(w - 9)^2 \\ f(w) &= -2(w - 9)^2 + 162 \\ \text{Vertex } &(9, 162) \end{aligned}$$

Score 1: The student showed work to find (9,162).

Question 36

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

On the set of axes below, sketch the graph of $f(w)$.



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

the vertex is the
turning point

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

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$b = 6 + 4s$$

$$b - 3 = 7(s - 3)$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{array}{r}
 b = 6 + 4s \\
 b - 3 = 7(s - 3) \\
 \hline
 b - 3 = 7s - 21 \\
 +3 \quad +3 \\
 \hline
 b = 7s - 18
 \end{array}$$

$$\begin{array}{r}
 6 + 4s = 7s - 18 \\
 -4s \quad -4s \\
 \hline
 6 = 3s - 18 \\
 +18 \quad +18 \\
 \hline
 24 = 3s \\
 \frac{24}{3} = \frac{3s}{3} \\
 \boxed{8 = s}
 \end{array}$$

$b = 6 + 4s$ Mrs. Bee is 38
 $b = 6 + 4(8)$ and her son
 $b = 38$ is 8.

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

Let x = years

$$\begin{array}{r}
 38 + x = 3(8 + x) \\
 38 + x = 24 + 3x \\
 \hline
 -x \quad -x \\
 \hline
 38 = 24 + 2x \\
 -24 \quad -24 \\
 \hline
 14 = 2x \\
 \frac{14}{2} = \frac{2x}{2} \\
 \boxed{7 = x}
 \end{array}$$

In 7 years Mrs. Bee will be 3 times as old as her son will be then.

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

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$7(s-3) = b - 3$$

and

$$4s + 6 = b$$

$$4s + 6 = 7(s - 3) + 3$$

$$Mrs\ Bee's\ age = 38\ years\ old$$

$$son's\ age = 8\ years\ old$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

Check

$$4 \cdot 8 + 6 = 38$$

$$7(8 - 3) = 38 - 3$$

$$35 = 35$$

$$4s + 6 = 7(s - 3) + 3$$

$$4s + 6 = 7s - 21 + 3$$

$$4s + 6 = 7s - 18$$

$$-7s + 18 \quad -7s + 18$$

$$-3s + 24 = 0$$

$$-1$$

$$3s - 24 = 0$$

$$3s - 24 = 0$$

$$+24 \quad +24$$

$$3s = 24$$

$$\frac{3s}{3} = \frac{24}{3}$$

$$s = 8$$

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

b	s
38	8
39	9
40	10
41	11
42	12
43	13
44	14
45	15

$3b = s$
In 7 years, Mrs Bee will be 3 times as old as her son

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

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$b = 4s + 6$$

$$b = 7s$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{aligned} b &= 4s + 6 \\ b &= 7s \end{aligned}$$

$$\begin{array}{r} 7s = 4s + 6 \\ -4s \quad -4s \\ \hline 3s = 6 \\ \frac{3s}{3} = \frac{6}{3} \\ s = 2 \end{array}$$

$$\begin{aligned} b &= 7s \\ b &= 7(2) \\ b &= 14 \end{aligned}$$

Mrs. Bee = 14 yrs
Her son = 2 yrs

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

<u>Age now</u>	<u>1 year</u>	<u>2 years</u>	<u>3 years</u>
Mrs. Bee = 14 son = 2	Mrs. Bee = 15 son = 3	Mrs. Bee = 16 son = 4	Mrs. Bee = 17 son = 5

18 ÷ 3 = 6
4 years
Mrs. Bee = 18
son = 6

In 4 years from now, Mrs. Bee will be three times as old as her son will be then.

Score 5: The student wrote one incorrect equation, but solved their system appropriately and found an appropriate number of years.

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$\begin{array}{l} B \\ S \end{array} \quad \begin{array}{l} B \\ S \end{array} \quad \begin{array}{l} 4s+6=B \\ 7(s-3)=B-3 \\ 7(s-3)+3=B \end{array}$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{array}{l} \text{son} = 8 \\ \text{Mrs. Bee} = 38 \end{array} \quad \begin{array}{l} 4s+6 = 7(s-3)+3 \\ 7s-21+3 \\ 6+4s = 7s-18 \\ 6 = 3s-18 \\ 24 = 3s \\ s = 8 \end{array}$$

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

in 7 years from now Mrs. Bee will be 45 and her son will be 15

Score 5: The student did not show work to find 7.

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$\begin{aligned} b &= 4s + 6 \\ b - 3 &= 7(s - 3) \end{aligned}$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{aligned} b - 3 &= 7(s - 3) \\ (4s + 6) - 3 &= 7(s - 3) \\ 4s + 6 - 3 &= 7s - 21 \\ 4s + 3 &= 7s - 21 \\ -4s & \quad -4s \\ \hline 3 &= 3s - 21 \\ +21 & \quad +21 \\ \hline 24 &= 3s \\ 8 &= s \end{aligned}$$

$$\begin{aligned} b &= 4s + 6 \\ b &= 4(8) + 6 \\ b &= 32 + 6 \\ b &= 38 \end{aligned}$$

Mrs. Bee is
38 years old
and her son
is 8 years old.

Check

$$\begin{array}{r} 8(8) = 32 \\ + 6 \\ \hline 38 \\ - 3 \\ \hline 35 \\ \frac{35}{5} = 7 \end{array}$$

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

Let $x =$ years

about 14 years.

$$\begin{aligned} 3(38) &= 8x \\ \frac{114}{8} &= \frac{8x}{8} \\ 14.25 &= x \end{aligned}$$

Score 4: The student wrote a correct system of equations and solved it correctly.

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$\begin{aligned} 4s + 6 &= b \\ 7s - 3 &= b \end{aligned}$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{aligned} 4s + 6 &= 7s - 3 \\ -4s &\quad -4s \\ \hline 6 &= 3s - 3 \\ +3 &\quad +3 \\ \hline 9 &= 3s \\ \frac{9}{3} &= \frac{3s}{3} \\ \boxed{3} &= s \end{aligned}$$

$$\begin{aligned} 4s + 6 &= b \\ 12 + 6 &= b \\ \boxed{18} &= b \end{aligned}$$

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

2 years

Years	b	s
1	19	4
2	20	5
3	21	6
4	22	7
5	23	8
6	24	9
7	25	10
8	26	11
9	27	12
10	28	13
11	29	14
12	30	15
13	31	16
14	32	17
15	33	18
16	34	19
17	35	20
18	36	21
19	37	22
20	38	23

Score 3: The student wrote one incorrect equation, but solved their system appropriately.

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

$$\begin{aligned} b &= 6s + 4 \\ b - 3 &= 7s - 3 \end{aligned}$$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{aligned} b &= 6s + 4 \\ b - 3 &= 7s - 3 \\ \hline 6s + 4 - 3 &= 7s - 3 \\ s &= 4 \\ b &= 28 \end{aligned}$$

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

Score 2: The student wrote an incorrect system of equations, but solved it appropriately.

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$B = 4s + 6$$

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

4 years

Score 1: The student wrote one correct equation.

Question 37

37 At the present time, Mrs. Bee's age is six years more than four times her son's age. Three years ago, she was seven times as old as her son was then.

If b represents Mrs. Bee's age now and s represents her son's age now, write a system of equations that could be used to model this scenario.

Present: $4s + 6b$

3 years ago: $7b + s$

Use this system of equations to determine, algebraically, the ages of both Mrs. Bee and her son now.

$$\begin{array}{r} 4s + 6b = 7b + s \\ -s -s \\ \hline 3s + 6b = 7b \\ -6b -6b \\ \hline 3s = 1b \\ \frac{3s}{3} = \frac{1b}{3} \\ \boxed{s = \frac{1}{3}b} \end{array}$$

$$\begin{array}{r} 4s + 6 = 7b + s \\ -s -s \\ \hline 3s + 6 = 7b \\ -3s -3s \\ \hline 6 = 4b + s \end{array}$$

Mrs. Bee: 46

Her son: 10

Determine how many years from now Mrs. Bee will be three times as old as her son will be then.

7 years.

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

Regents Examination in Algebra I – August 2018

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

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