

# INTEGRATED ALGEBRA

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

# INTEGRATED ALGEBRA

Friday, June 20, 2014 — 9:15 a.m. to 12:15 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 39 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 graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. 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 30 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [60]

Use this space for  
computations.

1 The product of  $6x^3y^3$  and  $2x^2y$  is

(1)  $3xy^2$

(3)  $12x^5y^4$

(2)  $8x^5y^4$

(4)  $12x^6y^3$

2 Which set of data is qualitative?

(1) laps swum in a race

(2) number of swimmers on the team

(3) swimmers' favorite swimsuit colors

(4) temperature in Fahrenheit of the water in a pool

3 It takes a snail 500 hours to travel 15 miles. At this rate, how many hours will it take the snail to travel 6 miles?

(1) 0.18

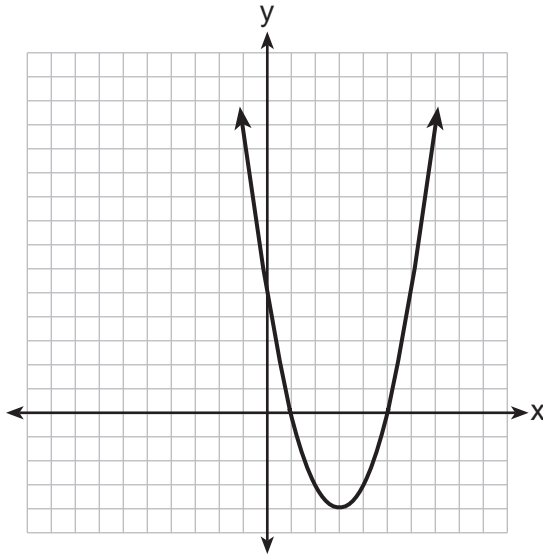
(3) 150

(2) 5.56

(4) 200

Use this space for  
computations.

4 The equation  $y = ax^2 + bx + c$  is graphed on the set of axes below.



Based on the graph, what are the roots of the equation  $ax^2 + bx + c = 0$ ?

- (1) 0 and 5                                      (3) 1 and 5  
(2) 1 and 0                                      (4) 3 and -4

5 When solving for the value of  $x$  in the equation  $4(x - 1) + 3 = 18$ , Aaron wrote the following lines on the board.

- [line 1]                       $4(x - 1) + 3 = 18$   
[line 2]                       $4(x - 1) = 15$   
[line 3]                       $4x - 1 = 15$   
[line 4]                       $4x = 16$   
[line 5]                       $x = 4$

Which property was used *incorrectly* when going from line 2 to line 3?

- (1) distributive                                      (3) associative  
(2) commutative                                      (4) multiplicative inverse

**Use this space for  
computations.**

**6** What is the solution of  $4x - 30 \geq -3x + 12$ ?

- (1)  $x \geq 6$                                   (3)  $x \geq -6$   
(2)  $x \leq 6$                                   (4)  $x \leq -6$

**7** A local government is planning to increase the fee for use of a campsite. If a survey were taken, which group would be most biased in their *opposition* to the increase?

- (1) teachers                                  (3) postal workers  
(2) soccer players                          (4) campers

**8** An example of an algebraic equation is

- (1)  $r^2 + 1$                                   (3)  $5x = 7$   
(2)  $2a + (n - 1)d$                       (4)  $-25\pi + 100$

**9** What is the value of  $x$  in the solution of the system of equations  $3x + 2y = 12$  and  $5x - 2y = 4$ ?

- (1) 8    (3) 3  
(2) 2    (4) 4

**10** What is the slope of a line that passes through the points  $(-2, -7)$  and  $(-6, -2)$ ?

- (1)  $-\frac{4}{5}$                                       (3)  $\frac{8}{9}$   
(2)  $-\frac{5}{4}$                                       (4)  $\frac{9}{8}$

**Use this space for  
computations.**

**11** Which notation is equivalent to the inequality  $-3 < x \leq 7$ ?

- (1)  $[-3, 7]$                       (3)  $[-3, 7)$   
(2)  $(-3, 7]$                      (4)  $(-3, 7)$

**12** What is the value of the expression  $3a^2 - 4|a| + 6$  when  $a = -3$ ?

- (1)  $-24$                               (3)  $21$   
(2)  $-9$                                 (4)  $45$

**13** Which relation is a function?

- (1)  $\{(2, 1), (3, 1), (4, 1), (5, 1)\}$   
(2)  $\{(1, 2), (1, 3), (1, 4), (1, 5)\}$   
(3)  $\{(2, 3), (3, 2), (4, 2), (2, 4)\}$   
(4)  $\{(1, 6), (2, 8), (3, 9), (3, 12)\}$

**14** When  $6x^2 - 4x + 3$  is subtracted from  $3x^2 - 2x + 3$ , the result is

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

**15** The lengths of the sides of a right triangle can be

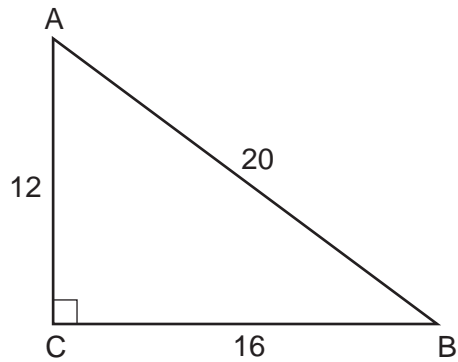
- (1)  $9, 12, 15$                       (3)  $5, 5, 10$   
(2)  $8, 10, 13$                      (4)  $4, 5, 6$

**16** Which equation represents a line that is parallel to the  $y$ -axis?

- (1)  $x = 5$                             (3)  $y = 5$   
(2)  $x = 5y$                          (4)  $y = 5x$

Use this space for  
computations.

- 17 In right triangle  $ABC$  shown below,  $AC = 12$ ,  $BC = 16$ , and  $AB = 20$ .



Which equation is *not* correct?

(1)  $\cos A = \frac{12}{20}$

(3)  $\sin B = \frac{12}{20}$

(2)  $\tan A = \frac{16}{12}$

(4)  $\tan B = \frac{16}{20}$

- 18 Three times the sum of a number and four is equal to five times the number, decreased by two. If  $x$  represents the number, which equation is a correct translation of the statement?

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

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

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

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

- 19 What is the equation of the line that passes through the point  $(3, -7)$  and has a slope of  $-\frac{4}{3}$ ?

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

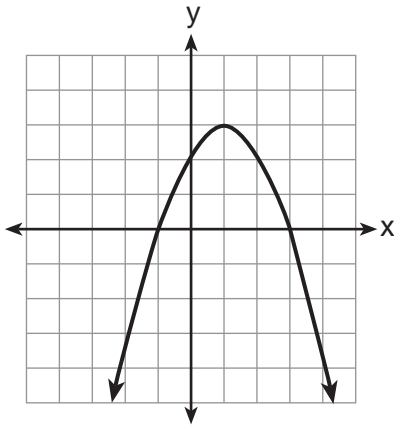
(3)  $y = \frac{37}{3}x - \frac{4}{3}$

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

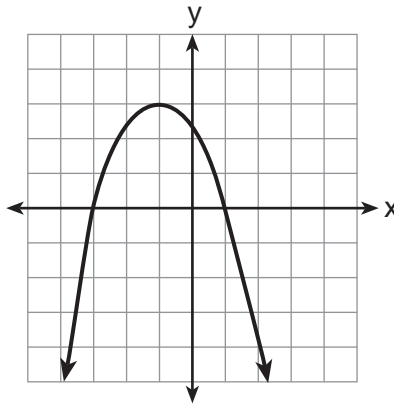
(4)  $y = -\frac{59}{9}x - \frac{4}{3}$

Use this space for computations.

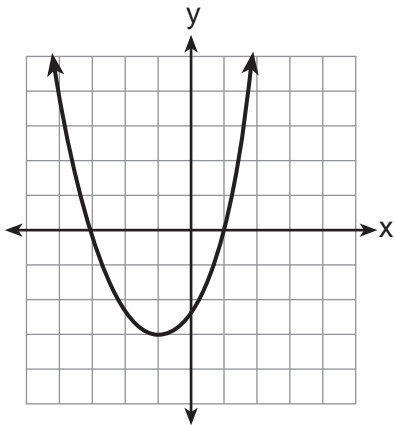
20 Which parabola has an axis of symmetry of  $x = 1$ ?



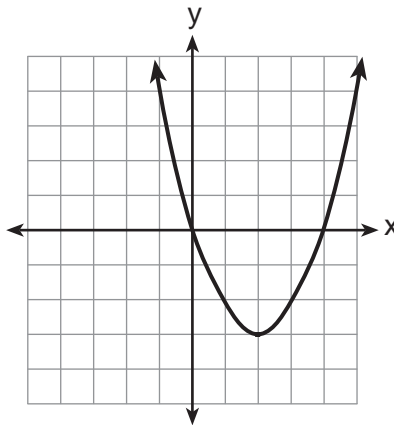
(1)



(3)



(2)



(4)

21 When factored completely, the expression  $3x^2 - 9x + 6$  is equivalent to

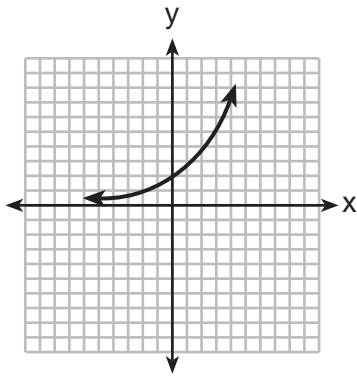
- (1)  $(3x - 3)(x - 2)$                       (3)  $3(x + 1)(x - 2)$   
(2)  $(3x + 3)(x - 2)$                       (4)  $3(x - 1)(x - 2)$

22 The equation  $P = 0.0089t^2 + 1.1149t + 78.4491$  models the United States population,  $P$ , in millions since 1900. If  $t$  represents the number of years after 1900, then what is the estimated population in 2025 to the nearest tenth of a million?

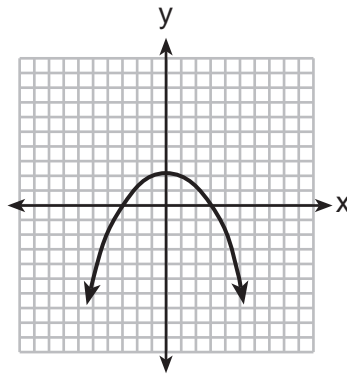
- (1) 217.8                                      (3) 343.9  
(2) 219.0                                      (4) 356.9

Use this space for computations.

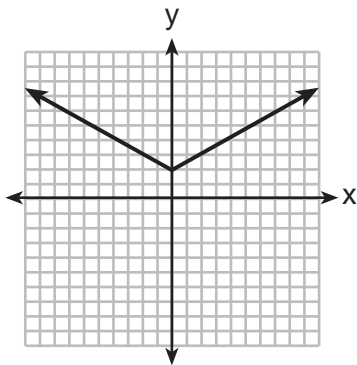
23 Which graph represents an absolute value equation?



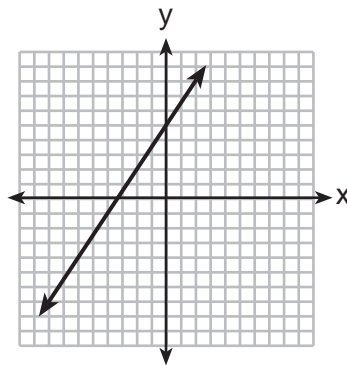
(1)



(3)



(2)



(4)

24 The expression  $\frac{a}{b} - \frac{1}{3}$  is equivalent to

(1)  $\frac{a-1}{b-3}$

(3)  $\frac{3a-b}{3b}$

(2)  $\frac{a-1}{3b}$

(4)  $\frac{3a-b}{b-3}$

25 Which value of  $x$  is the solution of the equation  $2(x - 4) + 7 = 3$ ?

(1) 1

(3) 6

(2) 2

(4) 0



26 Given:

$$M = \{\text{green, red, yellow, black}\}$$

$$N = \{\text{blue, green, yellow}\}$$

Which set represents  $M \cup N$ ?

- (1) {yellow}                      (3) {blue, red, black}  
(2) {green, yellow}            (4) {green, red, yellow, blue, black}

27 Which situation describes a correlation that is *not* a causal relationship?

- (1) the number of miles walked and the total Calories burned  
(2) the population of a country and the census taken every ten years  
(3) the number of hours a TV is on and the amount of electricity used  
(4) the speed of a car and the number of hours it takes to travel a given distance

28 A school offers three classes of math and two classes of science, all of which meet at different times. What is the total number of ways a student can take a math class and a science class?

- (1) 5                              (3) 8  
(2) 6                              (4) 9

29 The expression  $\frac{x-7}{9-x^2}$  is undefined when  $x$  is

- (1) 3 and 7                      (3) 3, only  
(2) 3 and  $-3$                 (4) 9

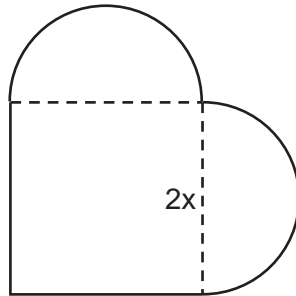
30 What is the product of  $(1.5 \times 10^2)$  and  $(8.4 \times 10^3)$  expressed in scientific notation?

- (1)  $1.26 \times 10^5$                 (3)  $1.26 \times 10^6$   
(2)  $12.6 \times 10^5$                 (4)  $12.6 \times 10^6$

## Part II

Answer all 3 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. 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. [6]

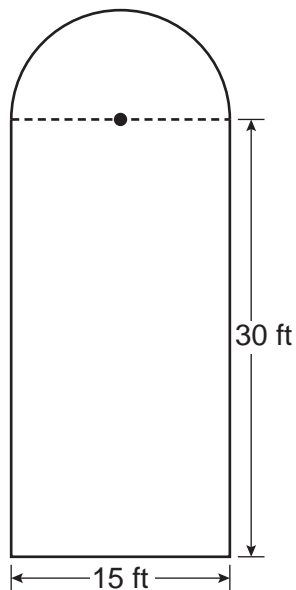
- 31 A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .



**32** Clayton is performing some probability experiments consisting of flipping three fair coins.

What is the probability that when Clayton flips the three coins, he gets two tails and one head?

**33** Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below.



Determine the length of edging, to the *nearest tenth of a foot*, that Ross will need to go completely around the pool.

### Part III

Answer all 3 questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. 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. [9]

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

**35** A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.

**36** Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

#### Part IV

**Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. 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. [12]**

**37** During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

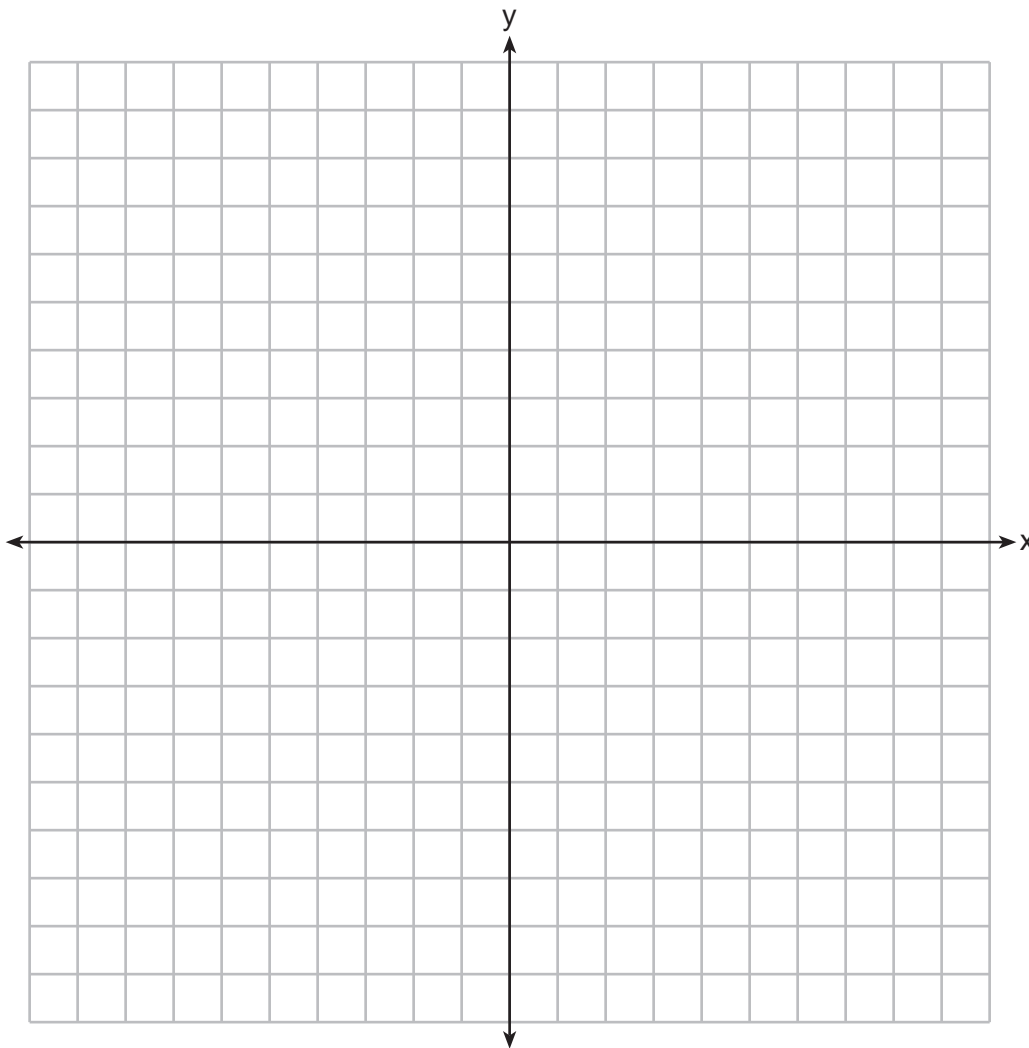


38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set  $S$ .

$$2x + 3y < -3$$

$$y - 4x \geq 2$$



**39** During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

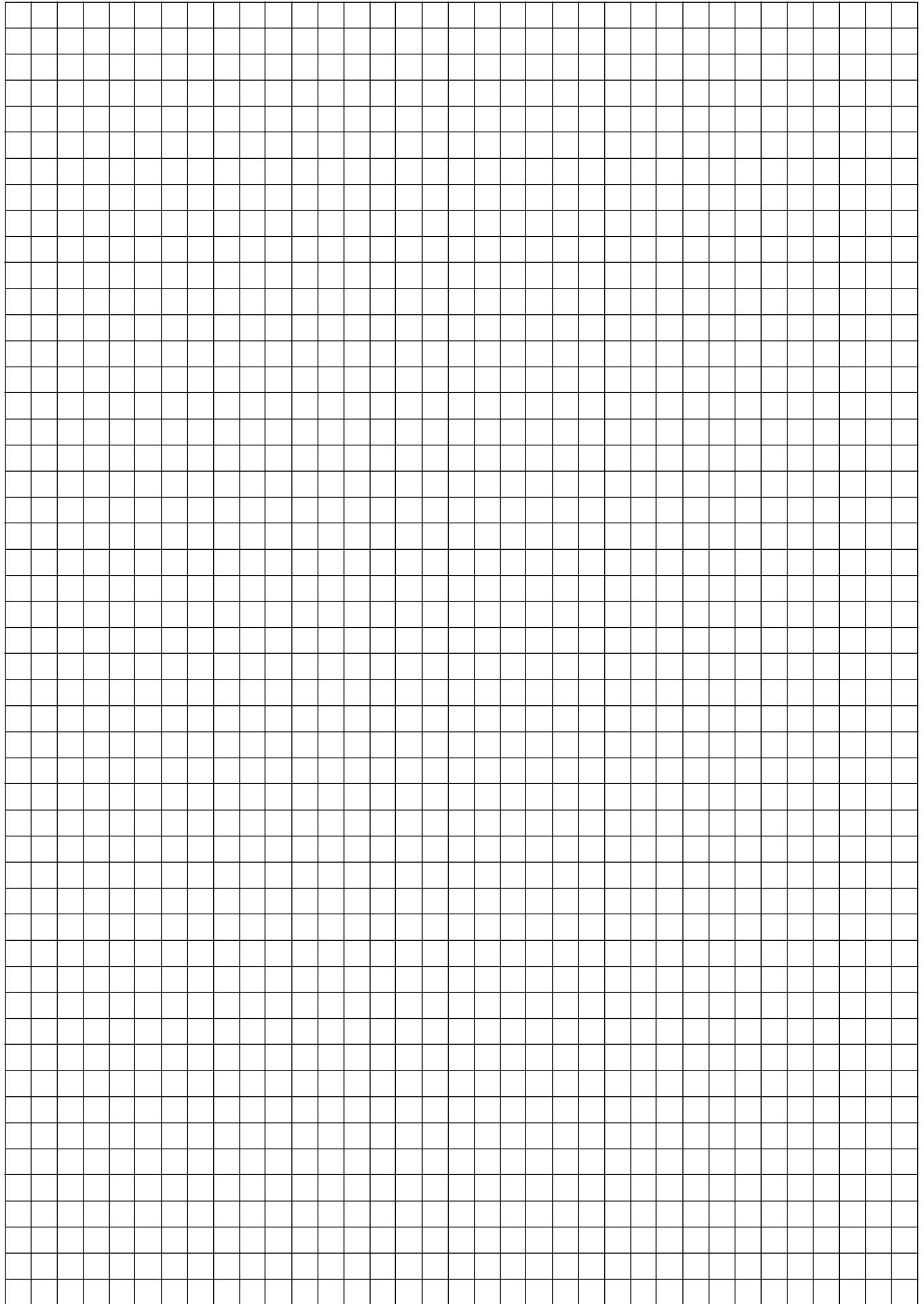
Using the line below, construct a box-and-whisker plot for this set of data.







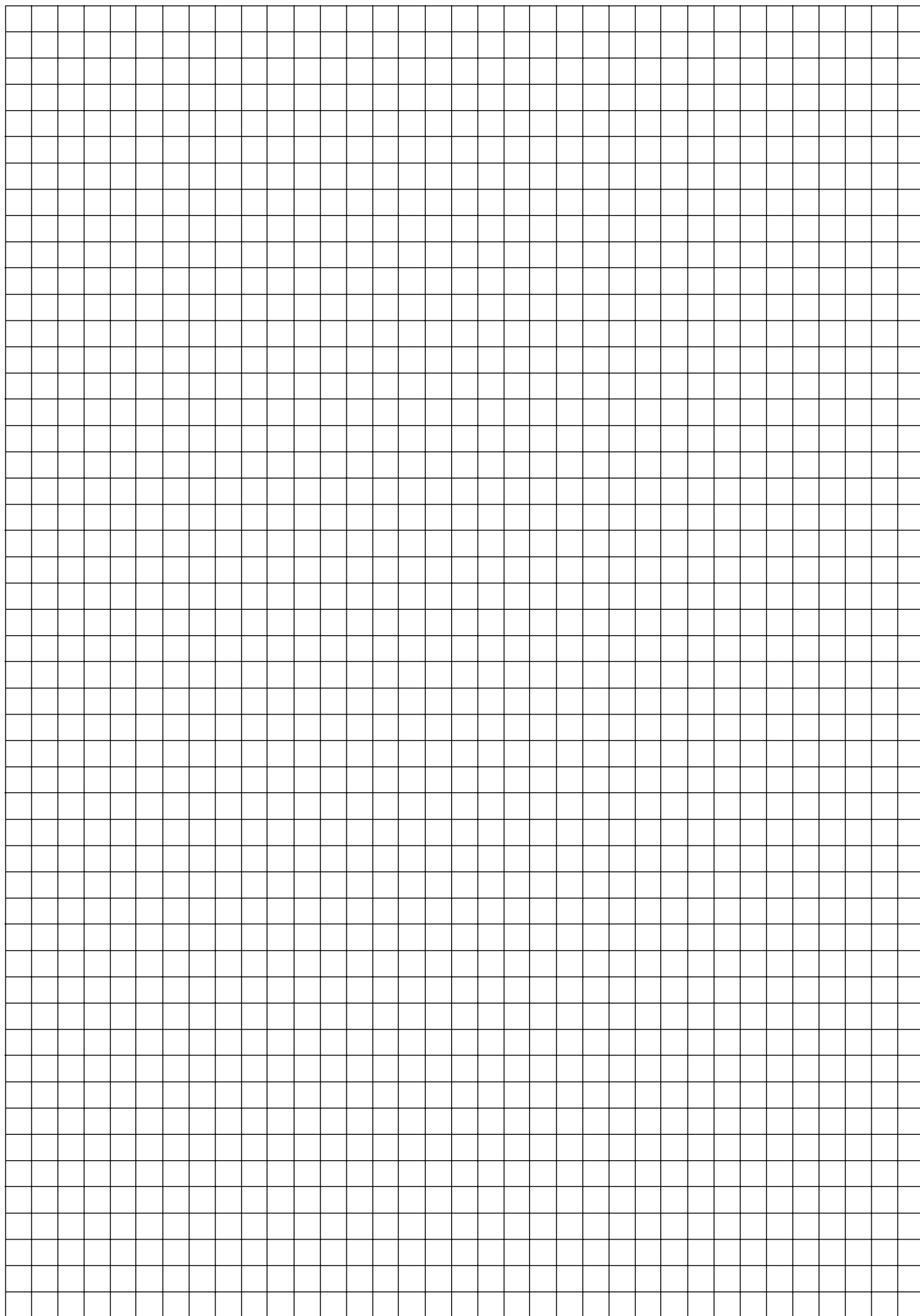
Scrap Graph Paper — This sheet will *not* be scored.



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



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## Reference Sheet

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Trigonometric Ratios

$$\sin A = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\cos A = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan A = \frac{\textit{opposite}}{\textit{adjacent}}$$

Area

trapezoid  $A = \frac{1}{2}h(b_1 + b_2)$

Volume

cylinder  $V = \pi r^2 h$

Surface Area

rectangular prism  $SA = 2lw + 2hw + 2lh$

cylinder  $SA = 2\pi r^2 + 2\pi rh$

Coordinate Geometry

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

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# FOR TEACHERS ONLY

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

## INTEGRATED ALGEBRA

Friday, June 20, 2014 — 9:15 a.m. to 12:15 p.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 Integrated Algebra. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the open-ended 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 open-ended 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/> on Friday, June 20, 2014. 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 60 credits, 2 credits for each of the following.

(1) . . . . . 3 . . . . .	(11) . . . . . 2 . . . . .	(21) . . . . . 4 . . . . .
(2) . . . . . 3 . . . . .	(12) . . . . . 3 . . . . .	(22) . . . . . 4 . . . . .
(3) . . . . . 4 . . . . .	(13) . . . . . 1 . . . . .	(23) . . . . . 2 . . . . .
(4) . . . . . 3 . . . . .	(14) . . . . . 2 . . . . .	(24) . . . . . 3 . . . . .
(5) . . . . . 1 . . . . .	(15) . . . . . 1 . . . . .	(25) . . . . . 2 . . . . .
(6) . . . . . 1 . . . . .	(16) . . . . . 1 . . . . .	(26) . . . . . 4 . . . . .
(7) . . . . . 4 . . . . .	(17) . . . . . 4 . . . . .	(27) . . . . . 2 . . . . .
(8) . . . . . 3 . . . . .	(18) . . . . . 1 . . . . .	(28) . . . . . 2 . . . . .
(9) . . . . . 2 . . . . .	(19) . . . . . 2 . . . . .	(29) . . . . . 2 . . . . .
(10) . . . . . 2 . . . . .	(20) . . . . . 1 . . . . .	(30) . . . . . 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.

Beginning in January 2013, the Department is providing supplemental scoring guidance, the "Sample Response Set," for the Regents Examination in Integrated Algebra. This guidance is not required as part of the scorer training. It is at the school's discretion to incorporate it into the scorer training or to use it as supplemental information during scoring. While not reflective of all scenarios, the sample student responses selected for the Sample Response Set illustrate how less common student responses to open-ended questions may be scored. The Sample Response Set will be available on the Department's web site at <http://www.nysedregents.org/IntegratedAlgebra/>.

# General Rules for Applying Mathematics Rubrics

## I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Integrated Algebra 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 Examinations in Mathematics*, 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 any response. 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. A response with one conceptual error can receive no more than half credit.

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.

If a response shows two (or more) different major conceptual errors, it should be considered completely incorrect and receive no credit.

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; i.e., awarding half credit for the conceptual error and deducting 1 credit for each mechanical error (maximum of two deductions for mechanical errors).

## 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.

(31) [2]  $4x^2 + \pi x^2$  or an equivalent expression in terms of  $\pi$ , 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 answer is expressed as a decimal.

*or*

[1]  $4x^2 + \pi x^2$ , 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.

(32) [2]  $\frac{3}{8}$  or an equivalent, 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]  $\frac{3}{8}$ , 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.

(33) [2] 98.6, and correct work is shown.

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

*or*

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

*or*

[1] Appropriate work is shown to find  $75 + 7.5\pi$ , but no further correct work is shown.

*or*

[1] 98.6, but no work is shown.

[0] 75, but no further correct 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 III

For each question, use the specific criteria to award a maximum of 3 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(34) [3]  $x = -3$ ,  $y = -5$ , and  $x = 3$ ,  $y = 7$  or an equivalent answer, and correct algebraic work is shown.

[2] Appropriate work is shown, but one computational or factoring error is made. Appropriate values of  $x$  and  $y$  are stated.

*or*

[2] Appropriate work is shown, but only one pair of values of  $x$  and  $y$  are stated.

*or*

[2] Appropriate work is shown, but only the  $x$ -values are found correctly.

[1] Appropriate work is shown, but two or more computational or factoring errors are made. Appropriate values are stated.

*or*

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

*or*

[1]  $x = -3$ ,  $y = -5$  and  $x = 3$ ,  $y = 7$ , but a method other than algebraic is used.

*or*

[1]  $x^2 - 9 = 0$  or  $x^2 = 9$  is written, but no further correct work is shown.

*or*

[1]  $x = -3$ ,  $y = -5$  and  $x = 3$ ,  $y = 7$ , 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.

- (35) [3] 0.054, and correct work is shown.
- [2] Appropriate work is shown, but one computational or rounding error is made. An appropriate relative error is stated.
- or***
- [2]  $\frac{384 - 364.25}{364.25}$  or an equivalent expression is written, but no further correct work is shown.
- [1] Appropriate work is shown, but two or more computational or rounding errors are made. An appropriate relative error is stated.
- or***
- [1] Appropriate work is shown, but one conceptual error is made, such as dividing by 384.
- or***
- [1] Appropriate work is shown to find 384 and 364.25, but no further correct work is shown.
- or***
- [1] 0.054, 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) [3]  $189\sqrt{2}$ , and correct work is shown.

[2] Appropriate work is shown, but one computational or simplification error is made. An appropriate answer is written in simplest radical form.

*or*

[2] Appropriate work is shown to find  $21\sqrt{2} + 168\sqrt{2}$ , or  $27\sqrt{98}$ , but not further correct work is shown.

[1] Appropriate work is shown, but two or more computational or simplification errors are made. An appropriate answer is written in simplest radical form.

*or*

[1] Appropriate work is shown, but one conceptual error is made. An appropriate answer is written in simplest radical form.

*or*

[1]  $3\sqrt{98}$  and  $12\sqrt{392}$ , but no further correct work is shown.

*or*

[1] Appropriate work is shown to find  $3\sqrt{7}(9\sqrt{14})$ , but no further correct work is shown.

*or*

[1]  $189\sqrt{2}$ , 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.

---



## Part IV

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.

- (37) [4] 64 apples and 44 oranges, and correct algebraic work is shown.
- [3] Appropriate work is shown, but one computational error is made. Appropriate numbers of apples and oranges are stated.
- or*
- [3] Appropriate work is shown to find 64 and 44, but the answers are not labeled or are labeled incorrectly.
- or*
- [3] Appropriate work is shown to find either 64 apples or 44 oranges, but no further correct work is shown.
- [2] Appropriate work is shown, but two or more computational errors are made. Appropriate numbers of apples and oranges are stated.
- or*
- [2] Appropriate work is shown, but one conceptual error is made. Appropriate numbers of apples and oranges are stated.
- or*
- [2] 64 apples and 44 oranges, but a method other than algebraic is used.
- [1] Appropriate work is shown, but one conceptual error and one computational error are made. Appropriate numbers of apples and oranges are stated.
- or*
- [1] A correct equation in one variable or system of equations is written, but no further correct work is shown.
- or*
- [1] 64 apples and 44 oranges, but no work is shown.
- [0] 64 and 44, but the answers are not labeled or are labeled incorrectly, and 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.

- (38) [4] Both inequalities are graphed and shaded correctly, and at least one is labeled. The solution set is labeled  $S$ .
- [3] Appropriate work is shown, but one computational or graphing error is made, such as drawing a solid line for  $y < -\frac{2}{3}x - 1$  or shading incorrectly. An appropriate solution set is labeled  $S$ .
- or***
- [3] Both inequalities are graphed and shaded correctly, and the solution set is labeled  $S$ , but the graphs are not labeled or are labeled incorrectly.
- or***
- [3] Both inequalities are graphed and shaded correctly, and at least one is labeled, but the solution set is not labeled or is labeled incorrectly.
- [2] Appropriate work is shown, but two or more computational or graphing errors are made. An appropriate solution set is labeled  $S$ .
- or***
- [2] Appropriate work is shown, but one conceptual error is made, such as graphing the lines  $y = 4x + 2$  and  $y = -\frac{2}{3}x - 1$ , with at least one labeled, and labeling the point of intersection  $S$ .
- or***
- [2] One of the inequalities is graphed, labeled, and shaded correctly, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made. An appropriate solution set is labeled  $S$ .
- or***
- [1] The lines  $y = 4x + 2$  and  $y = -\frac{2}{3}x - 1$  are graphed correctly, and at least one is labeled, 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.

- (39) [4] A correct box-and-whisker plot is drawn, and minimum = 8, Q1 = 20, median = 32, Q3 = 36, and maximum = 40 are stated.
- [3] All five values are stated and labeled correctly, but the graph is missing or is incorrect.
- or***
- [3] Four values are stated and labeled correctly, and an appropriate graph is drawn.
- [2] A correct box-and-whisker plot is drawn, but the five values are not stated.
- or***
- [2] Four values are stated and labeled correctly, but the graph is missing or is incorrect.
- or***
- [2] Three values are stated and labeled correctly, and an appropriate graph is drawn.
- [1] Three values are stated and labeled correctly, but the graph is missing or is incorrect.
- or***
- [1] Two values are stated and labeled correctly, and an appropriate graph is drawn.
- [0] Two values are stated and labeled correctly, but the graph is missing or is 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.
-

## Map to Core Curriculum

Content Strands	Item Numbers
Number Sense and Operations	5, 12, 30, 36
Algebra	1, 6, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 21, 22, 24, 25, 26, 29, 31, 34, 37
Geometry	4, 13, 20, 23, 32, 38
Measurement	3, 35
Statistics and Probability	2, 7, 27, 28, 33, 39

### Regents Examination in Integrated Algebra

June 2014

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

**The *Chart for Determining the Final Examination Score for the June 2014 Regents Examination in Integrated Algebra* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Friday, June 20, 2014. Conversion charts provided for previous administrations of the Regents Examination in Integrated Algebra 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

# INTEGRATED ALGEBRA

Friday, June 20, 2014 — 9:15 a.m. to 12:15 p.m.

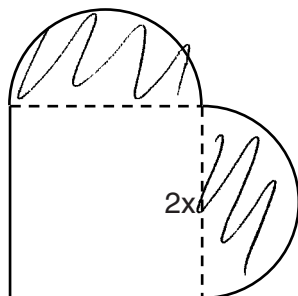
## SAMPLE RESPONSE SET

### Table of Contents

Question 31 . . . . .	2
Question 32 . . . . .	8
Question 33 . . . . .	13
Question 34 . . . . .	18
Question 35 . . . . .	26
Question 36 . . . . .	35
Question 37 . . . . .	43
Question 38 . . . . .	51
Question 39 . . . . .	59

**Question 31**

- 31** A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .



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

$$\pi(x)^2 = x^2\pi$$

$$\text{Area} = 4x^2 + x^2\pi$$

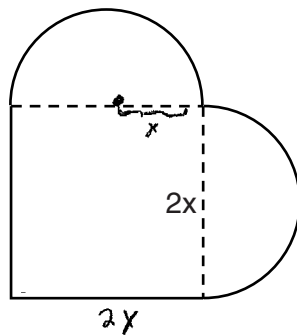
**Score 2:** The student has a complete and correct response.

---

**Question 31**

---

- 31** A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .



$$\text{Area of } \odot = \pi r^2 = x^2 \pi$$

$$\text{area of } \square = (2x)(2x) = 4x^2$$

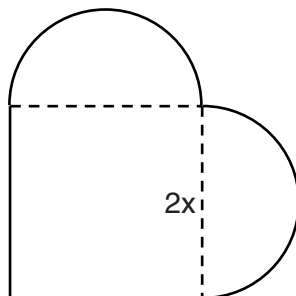
$$\text{patio} = x^2 \pi + 4x^2 = x^2 (\pi + 4)$$

---

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

Question 31

31 A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .



$$2x + 2x = 4x^2 \text{ - square area}$$

$$\pi x^2 = 2 \text{ semicircle area}$$

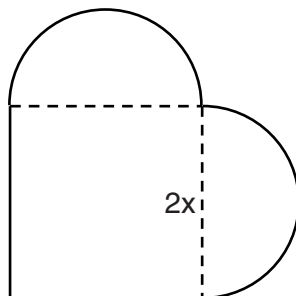
$$\pi 5x^2$$

**Score 1:** The student made one computational error when combining the areas.



### Question 31

- 31 A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .

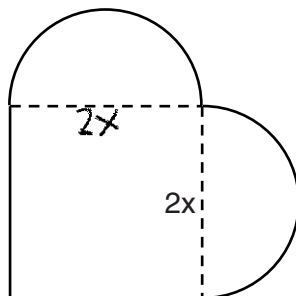


$$\pi(2x)^2 + (2x)^2$$
$$4x^2\pi + 4x^2$$
$$\text{Area} = 4x^2\pi + 4x^2$$

**Score 1:** The student made one conceptual error by using a radius of  $2x$  for the area of the semicircles.

Question 31

31 A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .



$$A = \pi r^2$$

$$2x \div 2 = x$$

$$\pi x^2 + \pi x^2 + 4x$$

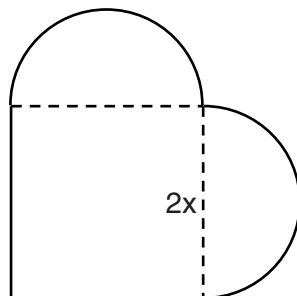
$$A = L \times W$$
$$4x$$

$$2\pi x^2 + 4x$$

**Score 0:** The student found the areas of two circles instead of two semicircles and then made one computational error when finding the area of the square.

Question 31

31 A patio consisting of two semicircles and a square is shown in the diagram below. The length of each side of the square region is represented by  $2x$ . Write an expression for the area of the entire patio, in terms of  $x$  and  $\pi$ .



$$\begin{aligned} A &= l \cdot w + \pi r^2 \\ (2x)(2x) + \pi(2x) \\ 4x + 2x\pi \end{aligned}$$

6xπ

**Score 0:** The student made one conceptual error by finding the circumference of the semicircles and then made another conceptual error when squaring  $2x$ .

**Question 32**

**32** Clayton is performing some probability experiments consisting of flipping three fair coins.

What is the probability that when Clayton flips the three coins, he gets two tails and one head?

Handwritten probability tree for three coin flips:

- H H H
- T H H
- H T H
- T T H
- H H T
- T H T
- H T T
- T T T

Three outcomes are circled: T T H, T H T, and H T T.

Handwritten fraction:  $\frac{3}{8}$

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

---

**Question 32**

---

**32** Clayton is performing some probability experiments consisting of flipping three fair coins.

What is the probability that when Clayton flips the three coins, he gets two tails and one head?

$$\begin{array}{ccc} T & T & H \\ \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ & \frac{1}{8} & \\ & + & \frac{1}{8} \\ & + & \frac{1}{8} \\ & & \frac{3}{8} \end{array}$$

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

---

**Question 32**

---

32 Clayton is performing some probability experiments consisting of flipping three fair coins.

What is the probability that when Clayton flips the three coins, he gets two tails and one head?

$$\begin{array}{c} T \quad T \quad H \\ \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2} \end{array}$$

$$\begin{array}{c} H \quad T \quad T \\ \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2} \end{array}$$

$$\begin{array}{c} T \quad H \quad T \\ \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2} \end{array}$$

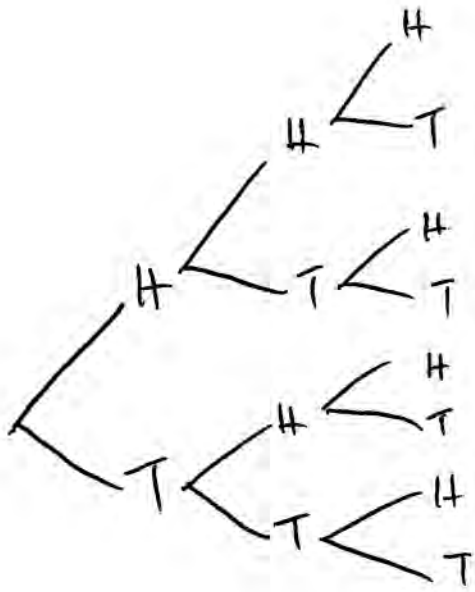
$$\frac{3}{2} + \frac{3}{2} + \frac{3}{2} = \frac{9}{2}$$

**Score 1:** The student made one conceptual error by adding  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$  to get  $\frac{3}{2}$ . This conceptual error resulted in a probability greater than 1.

**Question 32**

**32** Clayton is performing some probability experiments consisting of flipping three fair coins.

What is the probability that when Clayton flips the three coins, he gets two tails and one head?



$$\frac{3}{14}$$

**Score 1:** The student made one conceptual error by using each branch of the tree diagram as the denominator.

---

**Question 32**

---

**32** Clayton is performing some probability experiments consisting of flipping three fair coins.

What is the probability that when Clayton flips the three coins, he gets two tails and one head?

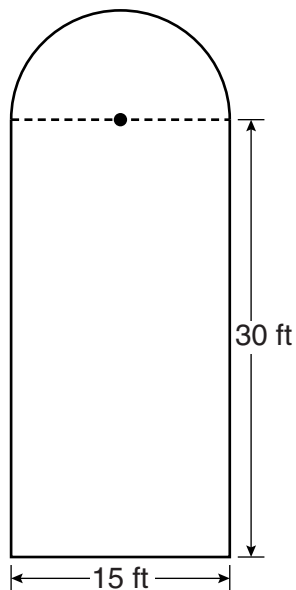
$$T T H = \frac{2}{3}$$

**Score 0:** The student listed one correct outcome, but showed no work to support an incorrect answer.



**Question 33**

**33** Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below.



Determine the length of edging, to the *nearest tenth of a foot*, that Ross will need to go completely around the pool.

$$\begin{aligned} & 30 + 30 + 15 = 75 \\ & \quad + 23.6 \\ & \quad \hline & \quad 98.6 \end{aligned}$$

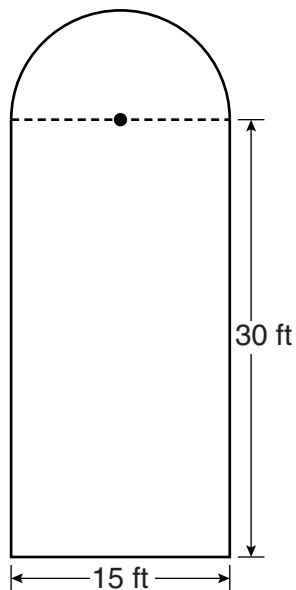
$\frac{15\pi}{2} = 23.6$

98.6 Ft

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

**Question 33**

**33** Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below.



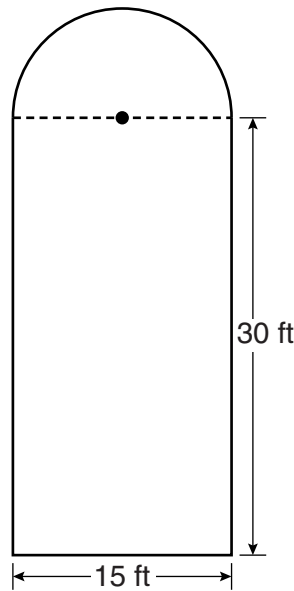
Determine the length of edging, to the *nearest tenth of a foot*, that Ross will need to go completely around the pool.

$$\begin{array}{r} 30 \\ +30 \\ +15 \\ \hline 471 \\ \hline 122.1 \end{array}$$
$$\begin{array}{l} C = \pi d \\ C = \pi (15) \\ C = 47.1 \end{array}$$

**Score 1:** The student made one conceptual error by finding the circumference of the circle instead of the semicircle.

**Question 33**

**33** Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below.



Determine the length of edging, to the *nearest tenth of a foot*, that Ross will need to go completely around the pool.

$$\square P = (2\pi r)^{\frac{1}{2}} \text{ ft}$$

$$\square P = 2l + 2w \text{ ft}$$

$$\square P = 117.5 \text{ ft}$$

$$\square P = 23.5619449 \text{ ft}$$

$$\square = 90 \text{ ft}$$

$$\square P = 2(30) + 2(15) \text{ ft}$$

$$\square P = 60 \text{ ft } 30 \text{ ft}$$

$$P = 113.5619449 \text{ ft}$$

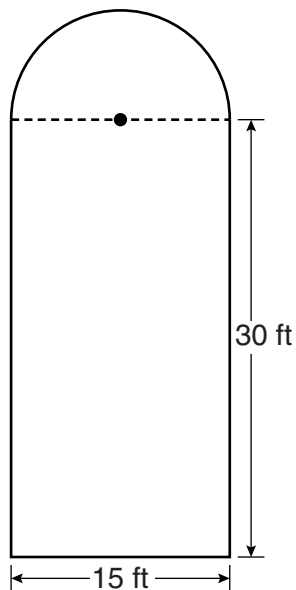
$$\square P = 90 \text{ ft}$$

$$\boxed{113.6 \text{ ft}}$$

**Score 1:** The student made one conceptual error by finding the perimeter of the rectangle instead of the sum of just three sides.

**Question 33**

**33** Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below.



Determine the length of edging, to the *nearest tenth of a foot*, that Ross will need to go completely around the pool.

$$30 \times 15 = 450$$

$$\pi (7.5)^2$$

$$56.25\pi$$

$$176.7$$

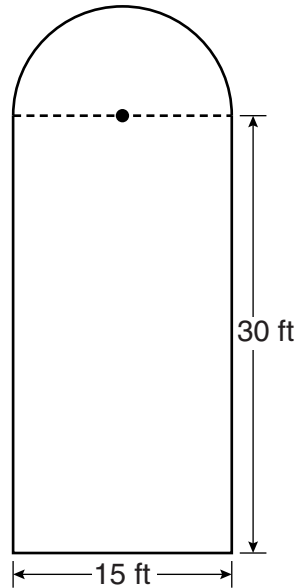
$$4200 - 176.7$$

$$(273 \text{ feet})$$

**Score 0:** The student made more than one conceptual error.

**Question 33**

**33** Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below.



Determine the length of edging, to the *nearest tenth of a foot*, that Ross will need to go completely around the pool.

$$30 + 30 + 15$$

$$75 \text{ ft}$$

**Score 0:** The student found 75, but did no further work.

Question 34

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$\begin{array}{r} x^2 + 2x - 8 = 2x + 1 \\ -2x - 1 \quad -2x - 1 \\ \hline x^2 - 9 = 0 \end{array}$$

$$x^2 - 9 = 0$$

$$(x - 3)(x + 3)$$

$$\boxed{x = 3}, \quad \boxed{x = -3}$$

$$\begin{array}{l} y = 2x + 1 \\ y = 2(3) + 1 \\ y = 6 + 1 \\ \boxed{y = 7} \end{array}$$

$$\begin{array}{l} y = 2x + 1 \\ y = 2(-3) + 1 \\ y = -6 + 1 \\ \boxed{y = -5} \end{array}$$

**Score 3:** The student has a complete and correct response.

Question 34

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$\begin{array}{r} 2x+1 = x^2 + 2x - 8 \\ -2x-1 \quad -2x-1 \end{array}$$

$$x^2 - 9$$

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

$$\begin{array}{l} x-3=0 \\ x=3 \end{array}$$

$$\begin{array}{l} x+3=0 \\ x=-3 \end{array}$$

$$y = 2x + 1$$

$$y = 2(3) + 1$$

$$y = 2(-3) + 1$$

$$y = 7 \text{ and } y = -5$$

$$(3, 7) \text{ and } (-3, -5)$$

**Score 3:** The student has a complete and correct response.

**Question 34**

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$x^2 + 2x - 8 = 2x + 1$$

$$x^2 - 9 = 0$$

$$x^2 = 9$$

$$x = 3$$

$$x = 3 \quad y = 2(3) + 1 = 7 \quad (3, 7)$$

**Score 2:** The student found only one pair of values for  $x$  and  $y$ .



Question 34

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$\begin{array}{r} x^2 + 2x - 8 = 2x + 1 \\ -2x - 1 \quad = \quad -2x - 1 \\ \hline \end{array}$$

$$x^2 - 9 = 0$$

$$x^2 = 9$$

$$x = \pm 3$$

**Score 2:** The student showed correct work, but only found the  $x$ -values.

---

**Question 34**

---

**34** Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$x^2 + 2x - 8 = 2x + 1$$

$$x^2 + 2x - 9 = \cancel{2x} - \cancel{2x}$$

$$x^2 - 9 = 0$$

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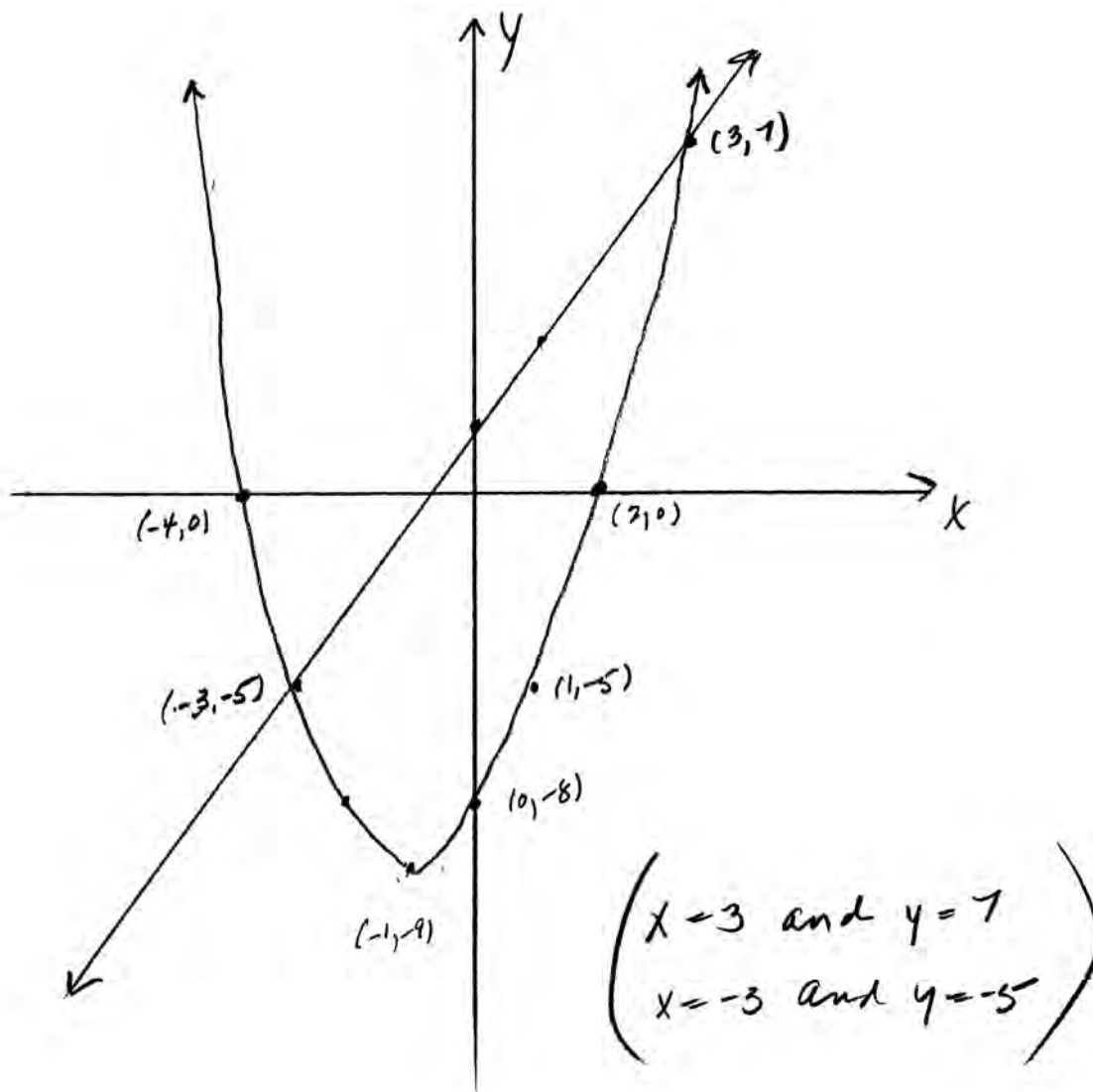
**Score 1:** The student showed correct work to find  $x^2 - 9 = 0$ , but showed no further correct work.

**Question 34**

**34** Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$



**Score 1:** The student found the correct answer using a graphical method.

Question 34

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$Y = x^2 + 2x - 8$$

$$Y = (x+4)(x-2)$$

$$Y = 2x - \cancel{2} + \cancel{2}$$

$$+ 2$$

---

$$\frac{2y}{2} = \frac{2x}{2}$$

$$y = 2x + \cancel{1} - \cancel{1} \quad \text{Y} = x$$

$$- y = 2x$$

**Score 0:** The student wrote incorrect and irrelevant work.

---

**Question 34**

---

34 Solve the following system of equations algebraically for all values of  $x$  and  $y$ .

$$y = x^2 + 2x - 8$$

$$y = 2x + 1$$

$$\begin{array}{r} x^2 + 2x - 8 = 2x + 1 \\ + 2x + 1 \quad \quad + 2 + 1 \end{array}$$

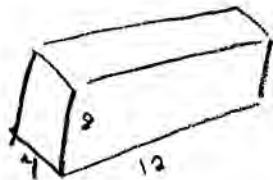
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$$x^2 + 4x - 7 = 0$$

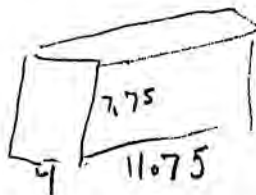
**Score 0:** The student made one conceptual error and showed no further correct work to find the appropriate values.

Question 35

35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.



$$V = 4 \cdot 8 \cdot 12 = 384 \text{ cu. in.}$$



$$V = 4 \cdot 7.5 \cdot 11.75 = 364.25$$

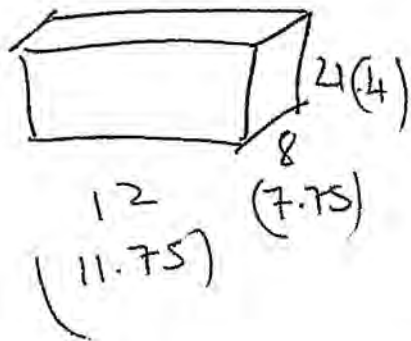
$$\frac{384 - 364.25}{364.25} = \frac{19.75}{364.25} = .0542210021$$

.054

**Score 3:** The student has a complete and correct response.

Question 35

35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.



$$\frac{(12 \cdot 8 \cdot 4) - (11.75 \cdot 7.75 \cdot 4)}{(11.75 \cdot 7.75 \cdot 4)} \approx$$

$$\approx 0.054$$

**Score 3:** The student has a complete and correct response.

---

**Question 35**

---

**35** A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.

$$\begin{aligned} V &= lwh \\ &= 12 \cdot 8 \cdot 4 \\ &= 384 \end{aligned}$$

$$\begin{aligned} V &= lwh \\ &= 11.75 \cdot 7.75 \cdot 4 \\ &= 364 \end{aligned}$$

$$\frac{384 - 364}{364} = .055$$

---

**Score 2:** The student made one error by prematurely rounding when computing the actual volume.



Question 35

35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the nearest thousandth.

|Actual - calculated|

Actual

$$\begin{array}{r}
 12 \\
 \underline{8} \\
 246 \\
 \underline{4} \\
 384
 \end{array}$$

$$\begin{array}{r}
 11.75 \\
 \underline{7.75} \\
 158175 \\
 82250 \\
 \underline{82250} \\
 910625 \\
 \underline{4.0000} \\
 364.25000000
 \end{array}$$

$$\begin{array}{r}
 19.75 \\
 \underline{364.25}
 \end{array}$$

$$\begin{array}{r}
 384.00 \\
 \underline{364.25} \\
 19.75
 \end{array}$$

$$\begin{array}{r}
 364.25 \overline{) 19.7500} \\
 \underline{182125} \\
 153750
 \end{array}$$

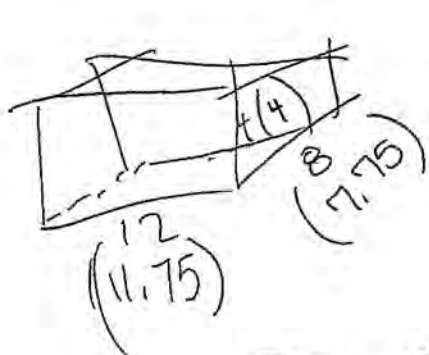
$$\begin{array}{r}
 364.25 \\
 \underline{5} \\
 145700
 \end{array}$$

The relative error is 0.050.

Score 2: The student made one computational error.

**Question 35**

35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.



$$\begin{aligned}V^1 &= lwh \\V^1 &= 12 \cdot 8 \cdot 4 \\V^1 &= 384\end{aligned}$$

$$\begin{aligned}V^2 &= lwh \\V^2 &= 11.75 \cdot 7.75 \cdot 4 \\V^2 &= 364.25\end{aligned}$$

$$RE = \frac{384 - 364.25}{364.25} \times 100$$

$$RE = \frac{19.75}{364.25} \times 100$$

$$RE = 5.422$$

**Score 2:** The student made one error by giving the answer as a percent by multiplying by 100.

Question 35

- 35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the nearest thousandth.

$$V = 2lh + 2lw + 2wh$$

$$2 \cdot 12 \cdot 8 + 2 \cdot 12 \cdot 4 + 2 \cdot 4 \cdot 8$$

$$352.000$$

$l = 12$   
 $h = 8$   
 $w = 4$

$$V = 2lh + 2lw + 2wh$$

$$2 \cdot 11.75 \cdot 7.75 + 2 \cdot 11.75 \cdot 4 + 2 \cdot 4 \cdot 7.75$$

$$338.125$$

$l = 11.75$   
 $h = 7.75$   
 $w = 4.00$

$$RE = \frac{m - a}{a}$$

$$RE = \frac{352 - 338.125}{338.125}$$

$$RE = .041$$

**Score 1:** The student made one conceptual error by finding the relative error of the surface area.

---

**Question 35**

---

**35** A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.

$$\begin{aligned} V &= lwh \\ &= 12 \cdot 8 \cdot 4 \\ &= 384 \end{aligned}$$

$$\begin{aligned} V &= 11.75 \cdot 7.75 \cdot 4 \\ &= ~~384~~ 364 \end{aligned}$$

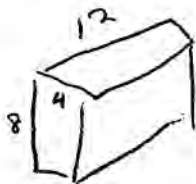
$$\frac{384 - 364}{384} = \frac{20}{384} = .052$$

---

**Score 0:** The student made one conceptual error by dividing by 384 and one error by prematurely rounding.

### Question 35

35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.



$$2(4 \cdot 8) + 2(12 \cdot 4) + 2(12 \cdot 8) = 352$$

$$2(4 \cdot 7.75) + 2(4 \cdot 11.75) + 2(7.75 \cdot 11.75) = 338.125$$

$$\frac{352 - 338.125}{352} \approx .039$$

**Score 0:** The student made two conceptual errors by using the surface area and dividing by 352.

Question 35

35 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.

$$\frac{4-4}{4}$$

$$\frac{8-7.75}{7.75}$$

$$\frac{12-11.75}{11.75}$$

$$0 + 0.0322580645 + 0.0212765957 = 0.0535346603$$

$$0.054$$

**Score 0:** The student obtained a correct answer by an obviously incorrect procedure.

---

**Question 36**

---

**36** Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{7}(\sqrt{14} + 8\sqrt{14})$$

$$3\sqrt{7}(9\sqrt{14})$$

$$189\sqrt{2}$$

---

**Score 3:** The student has a complete and correct response.

Question 36

36 Perform the indicated operations and express the answer in simplest radical form.

$$\begin{aligned} & 3\sqrt{7}(\sqrt{14} + 4\sqrt{56}) \\ & 3\sqrt{98} + 12\sqrt{392} \\ & 3\sqrt{16 \cdot 6} + 12\sqrt{4 \cdot 98} \\ & 12\sqrt{6} + 24\sqrt{98} \\ & 12\sqrt{6} + 24\sqrt{16 \cdot 6} \\ & 12\sqrt{6} + 96\sqrt{6} \\ & 108\sqrt{6} \end{aligned}$$

**Score 2:** The student made one computational error in factoring 98 as  $6 \cdot 16$ , but wrote an appropriate answer in simplest radical form.



Question 36

36 Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{98} + 12\sqrt{392}$$

$$3\sqrt{49 \cdot 2} + 12\sqrt{49 \cdot 8}$$

$$3 \cdot 7\sqrt{2} + 12 \cdot 7\sqrt{8}$$

$$14\sqrt{2} + 84\sqrt{4} \sqrt{2}$$

$$84 \cdot 2\sqrt{2}$$

$$14\sqrt{2} + 168\sqrt{2}$$

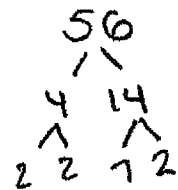
$$182\sqrt{2}$$

**Score 2:** The student made one computational error, but wrote an appropriate answer in simplest radical form.

Question 36

36 Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$



$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{4}\sqrt{14})$$

$$3\sqrt{7}(\sqrt{14} + 4(2)\sqrt{14})$$

$$3\sqrt{7}(\sqrt{14} + 8\sqrt{14})$$

$$3\sqrt{7}(9\sqrt{14})$$

$$3\sqrt{7}(9\sqrt{7}\sqrt{2})$$

$$27\sqrt{7}(\sqrt{2})$$

**Score 2:** The student made one computational error when multiplying  $\sqrt{7} \cdot \sqrt{7}$ .

**Question 36**

36 Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{7}(\sqrt{7 \cdot 2} + 4\sqrt{8 \cdot 7})$$

$$3\sqrt{7}(2\sqrt{7 \cdot 2} + 4\sqrt{2 \cdot 7})$$

$$3\sqrt{7}(\sqrt{7 \cdot 2} + 8\sqrt{7 \cdot 2})$$

$$3\sqrt{7}(8\sqrt{7 \cdot 2})$$

$$3\sqrt{7}(8\sqrt{14})$$

$$24\sqrt{98}$$

$$24\sqrt{2 \cdot 49}$$

$$24\sqrt{2 \cdot 7}$$

$$169\sqrt{2}$$

**Score 1:** The student made two computational errors:  $\sqrt{7 \cdot 2} + 8\sqrt{7 \cdot 2} = 8\sqrt{7 \cdot 2}$  and then  $7 \cdot 24 = 169$ .

Question 36

36 Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{98} + 12\sqrt{392}$$

can't be simplified anymore

$$3\sqrt{98}$$

$$\downarrow$$
$$29.69848481$$

$$\downarrow$$
$$29.70$$

$$12\sqrt{392}$$

$$\downarrow$$
$$237.5828785$$

$$\downarrow$$
$$237.59$$

**Score 1:** The student showed correct work to find  $3\sqrt{98}$  and  $12\sqrt{392}$ , but showed no further correct work.

Question 36

36 Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

7937253927

267.28

**Score 0:** The student expressed the answer as a decimal, only.

Question 36

36 Perform the indicated operations and express the answer in simplest radical form.

$$3\sqrt{7}(\sqrt{14} + 4\sqrt{56})$$

$$3\sqrt{21} + 12\sqrt{63}$$

$$3\sqrt{21} + 12 \cdot 3\sqrt{7}$$

$$3\sqrt{21} + 26\sqrt{7}$$

$$29\sqrt{28}$$

$$58\sqrt{7}$$

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

**Question 37**

**37** During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

$$\text{apples} = x = 64$$
$$\text{oranges} = y = 44$$

$$\begin{array}{r} 108 \\ -64 \\ \hline 44 \end{array}$$

$$\begin{array}{r} 1x + y = 108 \\ -1x \phantom{+ y} \\ \hline \phantom{1x} + y = 108 \end{array} \quad \begin{array}{r} 5x + 3y = 452 \\ -5x \phantom{+ 3y} \\ \hline \phantom{5x} + 3y = 452 - 5x \end{array}$$
$$\frac{108 - x}{1} = \frac{452 - 5x}{3}$$

$$3(108 - x) = 452 - 5x$$
$$\begin{array}{r} 324 - 3x = 452 - 5x \\ -324 + 5x \phantom{=} \quad -324 + 5x \\ \hline 2x = 128 \end{array}$$
$$\frac{2x = 128}{2} = \frac{128}{2}$$
$$x = 64$$

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

Question 37

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

$$\begin{aligned} 5a &= \text{2nd week apples} \\ 3b &= \text{2nd week oranges} \end{aligned}$$

$$a + b = 108$$

$$\begin{aligned} 5a + 3b &= 452 \\ (a + b = 108) \cdot 3 & \\ \hline 5a + 3b &= 452 \\ -3a - 3b &= -324 \\ \hline 2a &= 128 \end{aligned}$$

$$\begin{aligned} 64 + b &= 108 \\ -64 & \quad -64 \\ \hline b &= 44 \end{aligned}$$

$$\begin{aligned} 2a &= 128 \\ \frac{2a}{2} & \quad \frac{128}{2} \\ a &= 64 \end{aligned}$$

They sold 64 apples and 44 oranges the first week.

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



Question 37

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

let  $a$  = apples  
let  $o$  = oranges

$$\begin{array}{r} (a + o = 108) \cdot 3 \\ (5a + 3o = 452) \cdot (-1) \\ -5a - 3o = -452 \\ + 3a + 3o = 324 \\ \hline -2a = -128 \\ \frac{-2a}{-2} = \frac{-128}{-2} \end{array}$$

$$a = 64$$

$$\begin{array}{r} 64 + o = 108 \\ -64 \quad -64 \\ \hline \end{array}$$

$$o = 34$$

64 apples and 34 oranges were sold during the first week.

**Score 3:** The student made one computational error in subtracting 64 from 108.

Question 37

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

$$\begin{array}{r} 108 \\ / \quad \backslash \\ 54 \quad 54 \\ \times 5 \quad \times 3 \\ \hline 270 \quad 162 \\ \hline 270 \\ + 162 \\ \hline 432 \end{array} \qquad \begin{array}{r} 108 \\ / \quad \backslash \\ 56 \quad 52 \\ \times 5 \quad \times 3 \\ \hline 280 \quad 156 \\ \hline 280 \\ + 156 \\ \hline 436 \end{array}$$

$\begin{array}{r} 108 \\ / \quad \backslash \\ 64 \quad 44 \\ \times 5 \quad \times 3 \\ \hline 320 \quad 132 \\ \hline 320 \\ + 132 \\ \hline 452 \end{array}$	oranges = 44
	apples = 64

**Score 2:** The student used a method other than algebraic to find the number of apples and oranges.

Question 37

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

$$1^{\text{st}} \text{ week: total} = 108$$

$$2^{\text{nd}} = 5a + 3x, \text{ total} = 452$$

$$\begin{array}{r} 5a + 3x = 452 \\ + 3(a + x = 108) \\ \hline \end{array}$$

$$\begin{array}{r} 5a + 3x = 452 \\ + 3a + 3x = 324 \\ \hline 8a = 776 \\ \frac{8}{8} \quad \frac{8}{8} \\ a = 97 \end{array}$$

$$\begin{array}{r} 108 \\ - 97 \\ \hline 11 = x \end{array}$$

97 apples  
were sold  
and 11  
oranges  
were sold.

**Score 2:** The student made one conceptual error in solving the system of equations.

Question 37

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

let

o = oranges  
a = apples

~~$3a + 3o = 108$~~   
 ~~$5a + 3o = 452$~~

44 oranges

~~$3(a + o = 108)$~~   
 ~~$5a + 3o = 452$~~

~~$-3a = 324$~~   ~~$a = 108$~~   
 ~~$5a = 452$~~

~~$-5a - 5o = -540$~~

~~$-5(a + o = 108)$~~

~~$5a + 3o = 452$~~   
 ~~$-5o = -540$~~   
 ~~$\frac{-5o}{-5} = \frac{-540}{-5}$~~

**Score 1:** The student wrote a correct system of equations, but showed no further correct work.

---

**Question 37**

---

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

Let  $x =$  apples  
 $y =$  oranges

$$x + y = 108$$

$$5x + 3y = 452$$

$$6x + 4y = 560$$

---

**Score 1:** The student wrote a correct system of equations.

Question 37

37 During its first week of business, a market sold a total of 108 apples and oranges. The second week, five times the number of apples and three times the number of oranges were sold. A total of 452 apples and oranges were sold during the second week. Determine how many apples and how many oranges were sold the *first* week. [Only an algebraic solution can receive full credit.]

$$\begin{aligned}5x + 3x + 108 &= 452 \\8x + 108 &= 452 \\-108 &-108 \\ \hline 8x &= 344 \\ \frac{8x}{8} &= \frac{344}{8} \\ x &= 43 \text{ apples}\end{aligned}$$

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

Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.

$$2x + 3y < -3$$

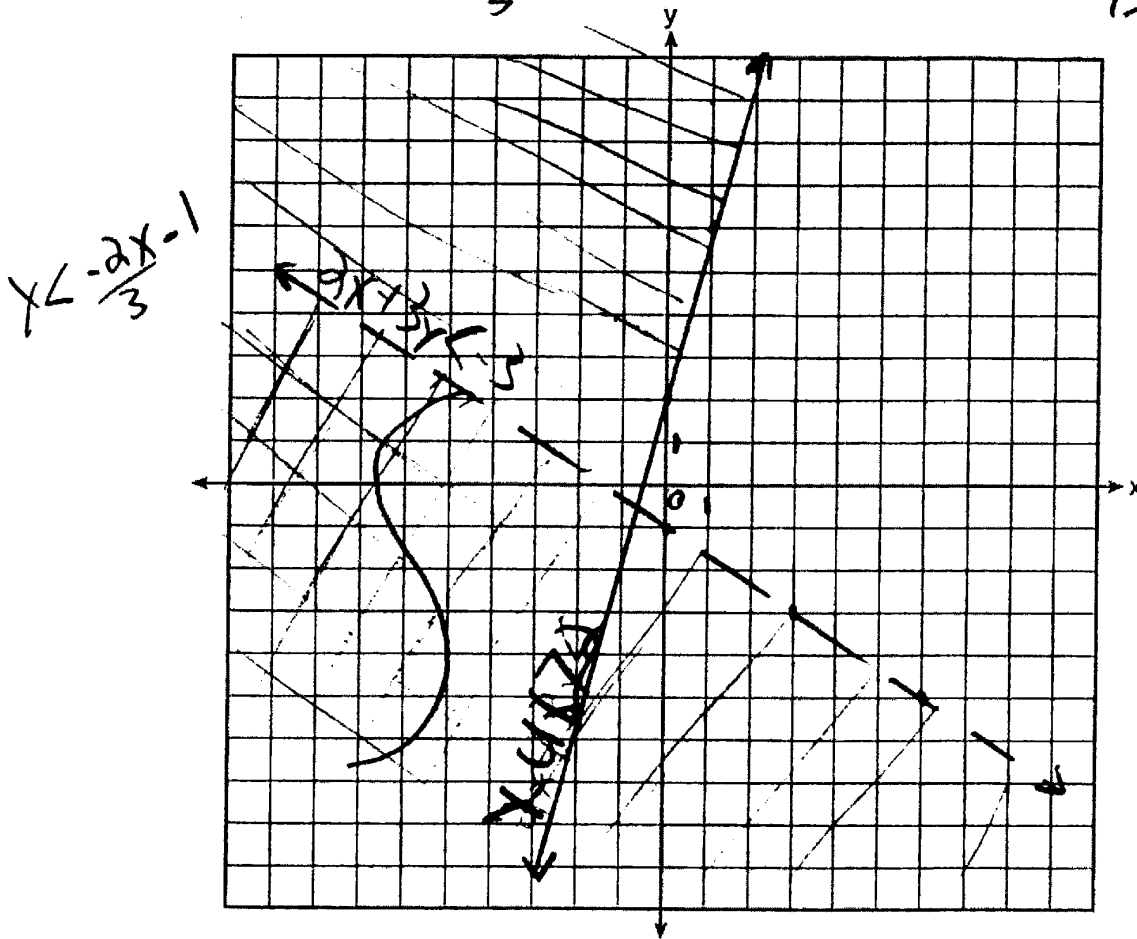
$$y - 4x \geq 2$$

$$-\frac{2x}{3} + 3y < -3$$

$$y < -\frac{2x}{3} - 3$$

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

$$y \geq 4x + 2$$

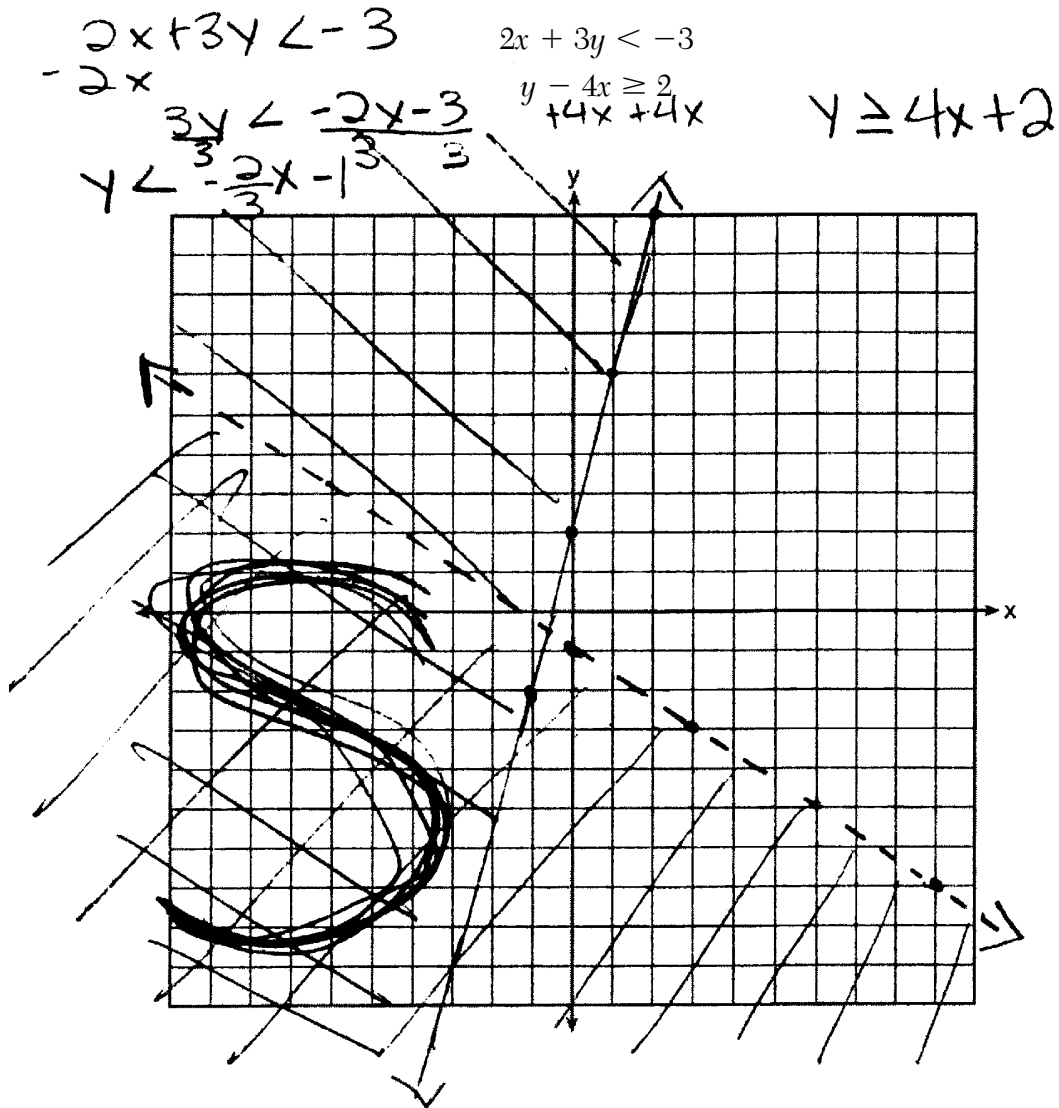


Score 4: The student has a complete and correct response.

Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.



Score 3: The student did not label at least one graph.

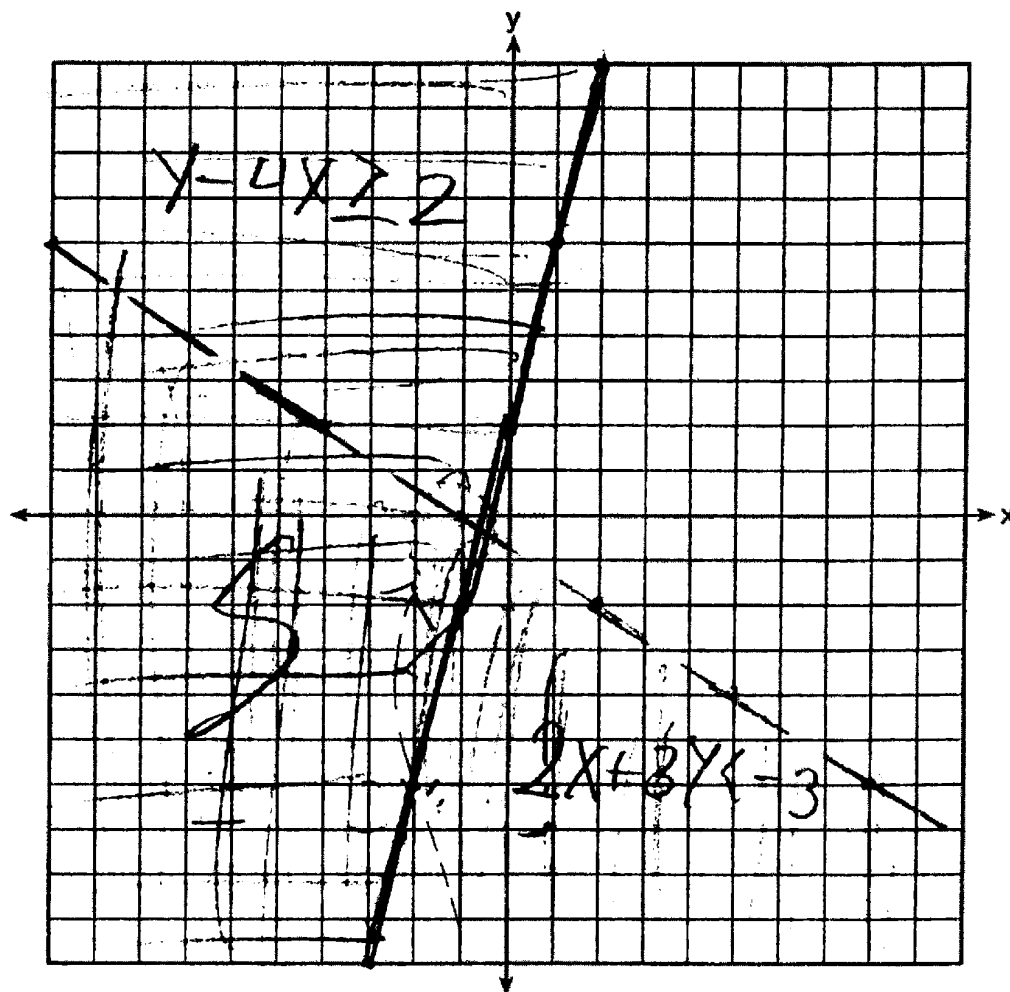


Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.

$$2x + 3y < -3 = \frac{3y < -2x - 3}{3} = y < -\frac{2}{3}x - 1$$
$$y - 4x \geq 2 = y \geq 4x + 2$$



**Score 3:** The student made one graphing error in graphing the  $y$ -intercept on the  $x$ -axis.

Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.

$$y - 4x \geq 2 \quad 2x + 3y < -3$$

$$+4x \quad +4x \quad y - 4x \geq 2$$

$$y \geq 4x + 2$$

$m=4$   
 $b=2$

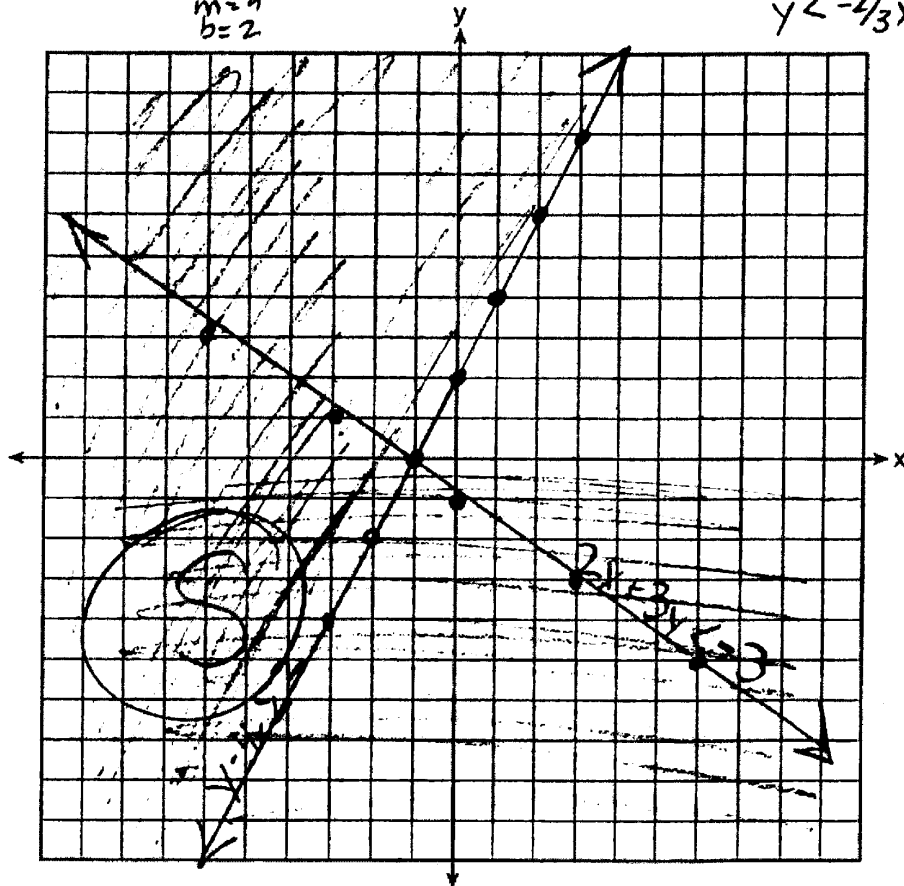
$$2x + 3y < -3$$

$$-2x \quad -2x$$

$$\frac{3y}{3} < \frac{-2x - 3}{3}$$

$$y < -\frac{2}{3}x - 1$$

$m = -2/3$   
 $b = -1$



**Score 2:** The student made three graphing errors by drawing a solid line and shading incorrectly for  $2x + 3y < -3$ . The student graphed a slope of 2 instead of  $4$  for  $y - 4x \geq 2$ .

**Question 38**

**38** On the set of axes below, solve the following system of inequalities graphically.

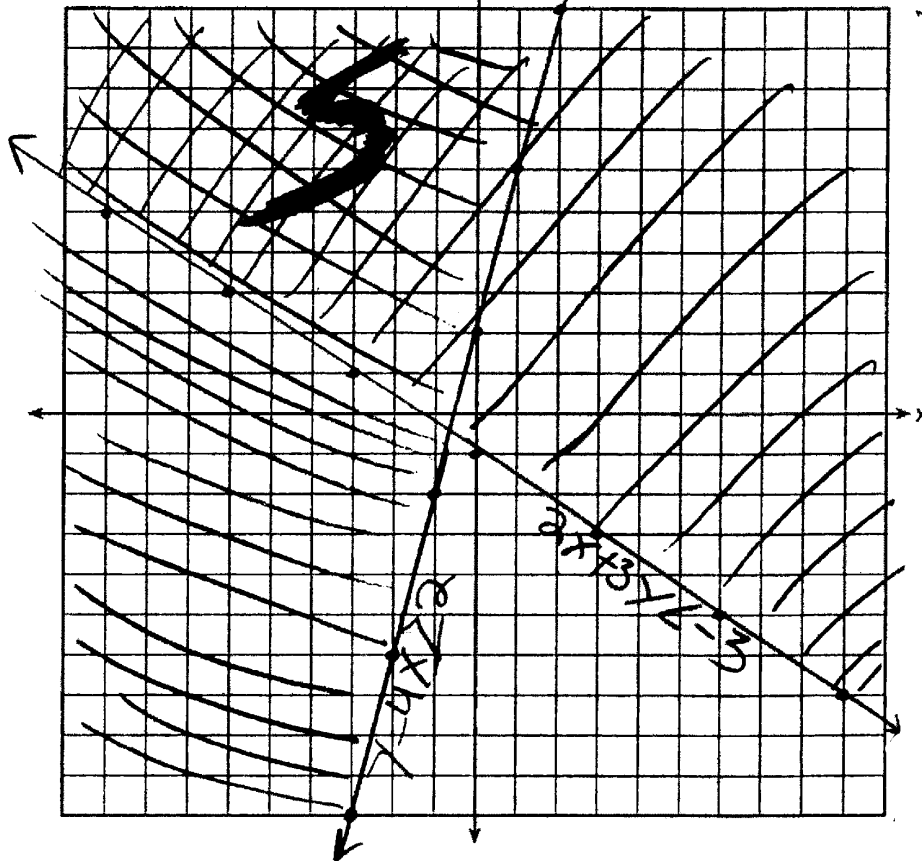
Label the solution set S.

$$2x + 3y < -3$$

$$y - 4x \geq 2$$

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

$$\begin{array}{r} 2x + 3y < -3 \\ -2x \\ \hline 3y < -3 - 2x \\ \frac{3y}{3} < \frac{-3 - 2x}{3} \\ y < -1 - \frac{2}{3}x \\ y < -\frac{2}{3}x - 1 \end{array}$$



**Score 2:** The student made two graphing errors. The student used a solid line in graphing  $2x + 3y < -3$  and also shaded incorrectly.

Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.

$$2x + 3y < -3$$

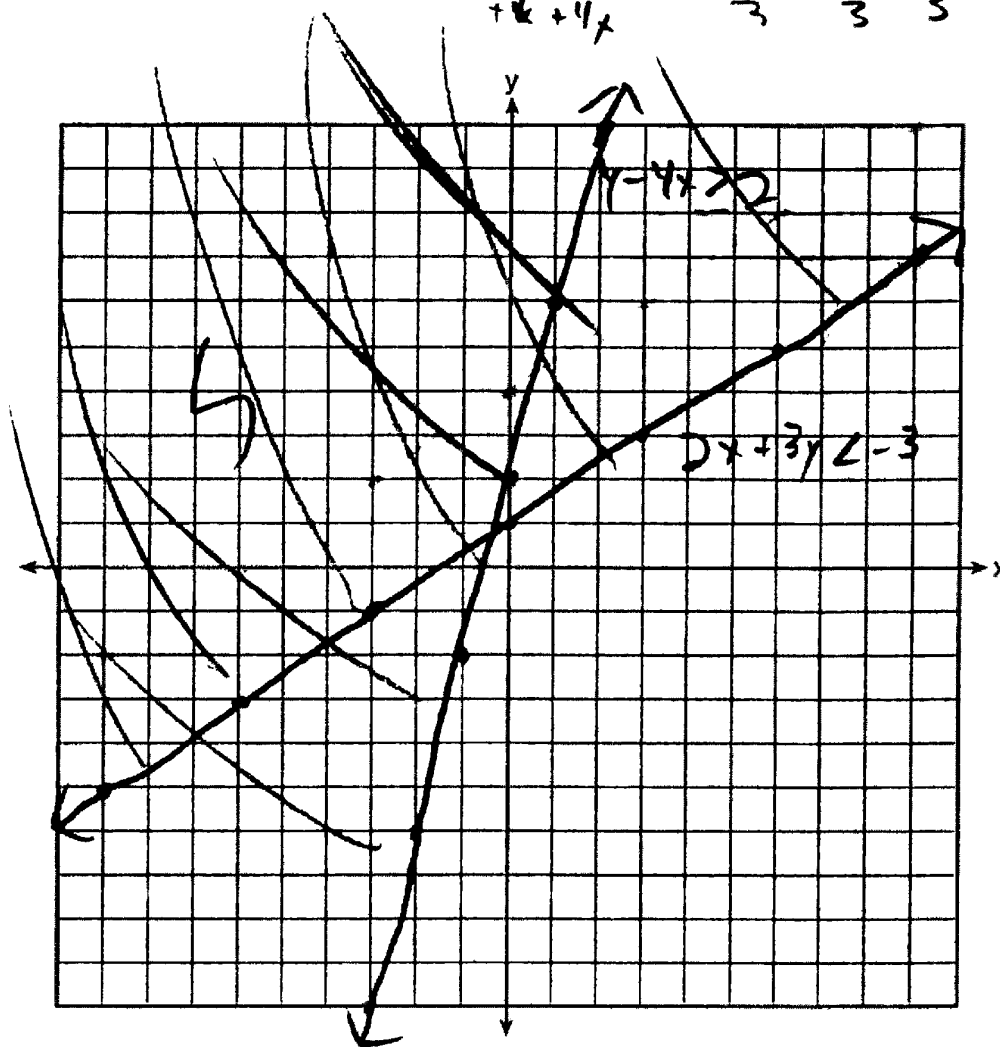
$$\rightarrow y - 4x \geq 2$$

$$+4x + 4x$$

$$\frac{3y < -3 - 2x}{3} \quad \frac{-3 - 2x}{3}$$

$$y < 1 - \frac{2x}{3}$$

$$y \geq 4x + 2$$



Score 2: The student graphed, labeled, and shaded one inequality correctly.

Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.

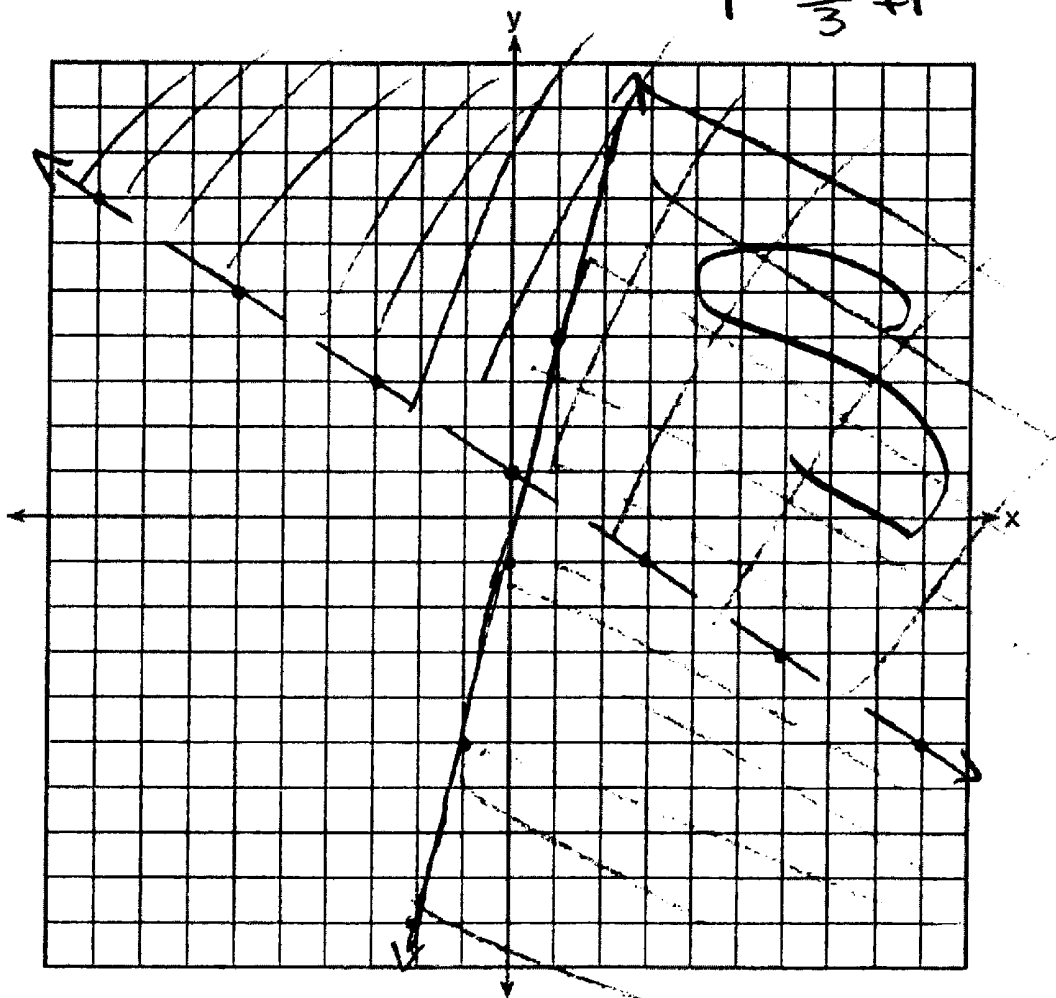
$$2x + 3y < -3$$

$$y - 4x \geq 2$$

$$y \leq 4x - 2$$

$$-\frac{3y}{3} > -\frac{2x}{3} + \frac{3}{3}$$

$$y > -\frac{2}{3}x + 1$$



**Score 0:** The student gave a completely incorrect and incoherent response.

Question 38

38 On the set of axes below, solve the following system of inequalities graphically.

Label the solution set S.

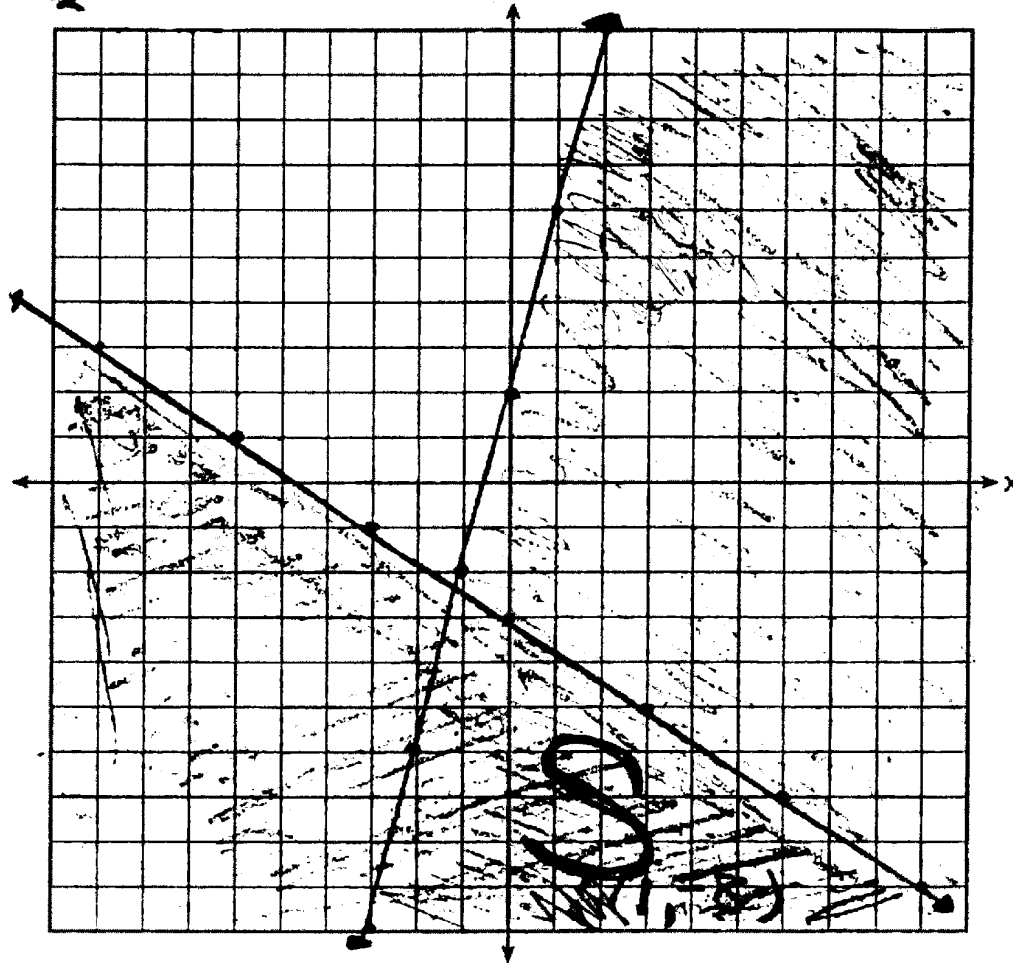
$$\frac{3y < -2x - 3}{3} \quad \frac{-2x - 3}{3}$$

$$y < \frac{-2x - 3}{3}$$

$$\frac{2x + 3y < -3}{-2x} \quad \frac{-2x}{-2x}$$

$$y - 4x \geq 2$$

$$y \geq 4x + 2$$



**Score 0:** The student made one conceptual error in solving  $2x + 3y < -3$ . The student made a graphing error by drawing a solid line for  $2x + 3y < -3$  and another graphing error by shading incorrectly for  $y - 4x \geq 2$ . Neither graph was labeled.

Question 39

39 During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

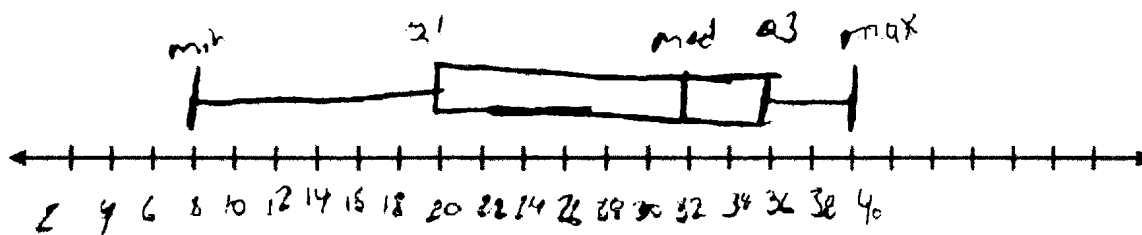
35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

~~8, 8, 11, 19, 20, 22, 24, 32, 32, 33, 35, 36, 38, 40, 40~~

State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

min: 8  
1st quartile: 20  
median: 32  
3rd quartile: 36  
max: 40

Using the line below, construct a box-and-whisker plot for this set of data.



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

**Question 39**

**39** During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

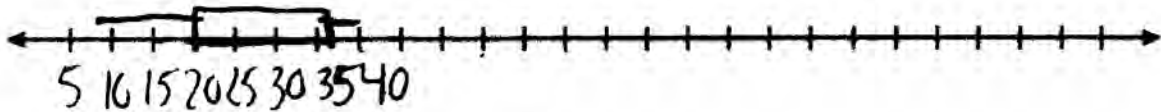
35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

~~8, 11, 19, 20, 22, 24, 32, 32, 33, 35, 36, 36, 38, 40, 40~~

State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

min 8  
1 20  
med. 32  
3 36  
max 40

Using the line below, construct a box-and-whisker plot for this set of data.



**Score 3:** The student did not correctly graph the median.



**Question 39**

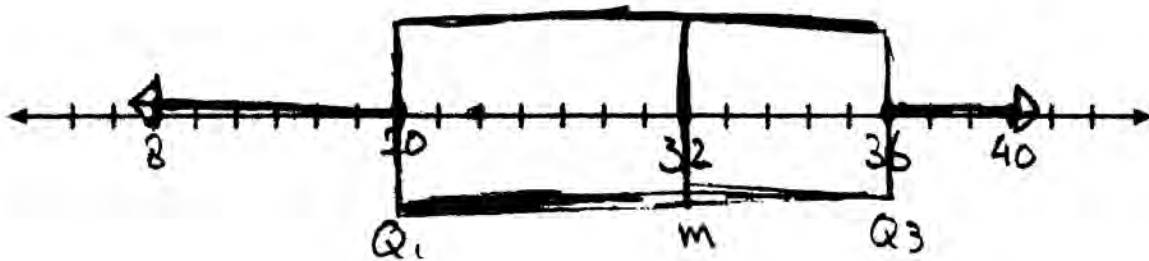
**39** During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

8, 11, 19, 20, 22, 24, 32 | 32, 33, 35, 36, 38, 40, 40  
min ↓ 1<sup>st</sup>Q ↓ 32 ↓ median ↓ 36 ↓ 3<sup>rd</sup>Q ↓ max

Using the line below, construct a box-and-whisker plot for this set of data.



**Score 2:** The student stated an appropriate five-number summary, but excluded one value from the data. The student also made an incorrect box-and-whisker plot.

Question 39

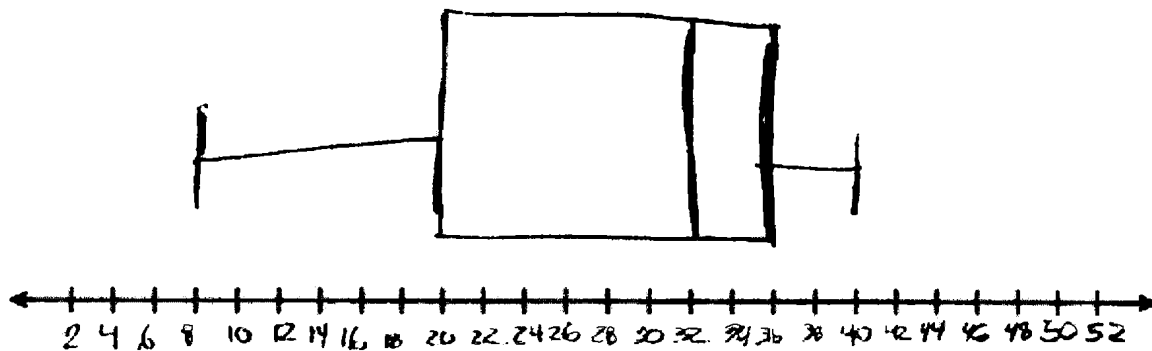
39 During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

8, 11, 19, 20, 22, 24, 32, 32, 35, 35, 36, 36, 38, 40, 40

State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

Using the line below, construct a box-and-whisker plot for this set of data.



**Score 2:** The student drew a correct box-and-whisker plot, but did not state or label any values.

Question 39

39 During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

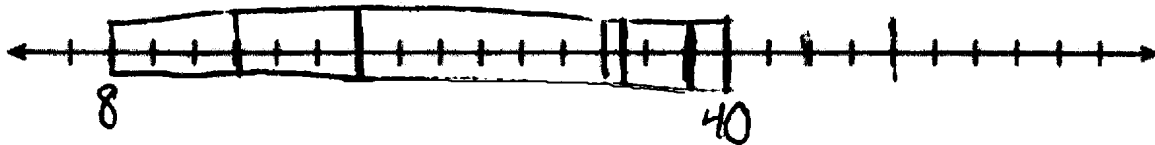
35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

8, 11, 19, 20, 22, 29, 32, 32, 33, 35, 36, 36, 38, 40

State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

minimum - 8  
1st Quartile - 20  
Median - 33  
3rd Quartile - 38  
Maximum - 40

Using the line below, construct a box-and-whisker plot for this set of data.



**Score 1:** The student stated and labeled three values and drew an incorrect box-and-whisker plot.

Question 39

39 During the last 15 years of his baseball career, Andrew hit the following number of home runs each season.

35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8

~~35, 24, 32, 36, 40, 32, 40, 38, 36, 33, 11, 20, 19, 22, 8~~

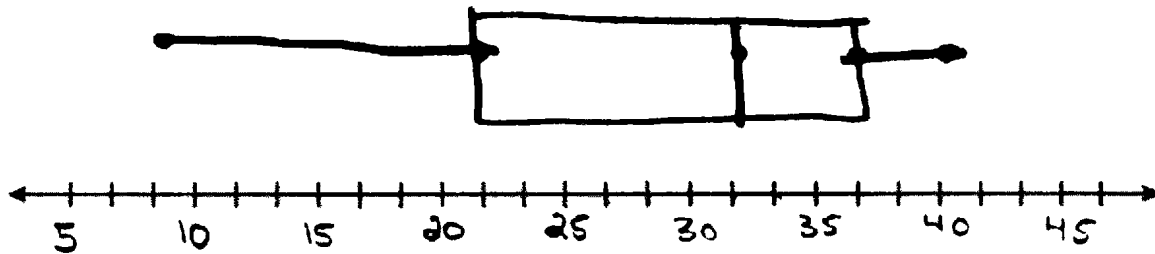
State and label the values of the minimum, 1st quartile, median, 3rd quartile, and maximum.

Mean - 32.5

Lower - 21

Upper - 26

Using the line below, construct a box-and-whisker plot for this set of data.



Score 0: The student wrote a completely incorrect response.

## Regents Examination in Integrated Algebra – June 2014

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

Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score
87	100	65	85	43	76	21	53
86	99	64	84	42	76	20	51
85	97	63	84	41	75	19	49
84	96	62	84	40	74	18	47
83	95	61	83	39	74	17	45
82	94	60	83	38	73	16	43
81	93	59	83	37	72	15	41
80	93	58	82	36	71	14	39
79	92	57	82	35	70	13	37
78	91	56	82	34	70	12	35
77	90	55	81	33	69	11	32
76	90	54	81	32	68	10	30
75	89	53	81	31	67	9	27
74	89	52	80	30	65	8	25
73	88	51	80	29	64	7	22
72	88	50	79	28	63	6	19
71	87	49	79	27	62	5	16
70	87	48	79	26	60	4	13
69	86	47	78	25	59	3	10
68	86	46	78	24	57	2	7
67	86	45	77	23	56	1	3
66	86	44	77	22	54	0	0

To determine the student’s final examination 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 Integrated Algebra.