ALGEBRA

# I

# ALGEBRA I

**Thursday,** June 15, 2023 — 1:15 to 4:15 p.m., only

Student Name _____

School Name _____

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**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.**

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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.

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**Notice …**

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

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**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]

**1** The expression $9m^2 - 100$ is equivalent to

   (1) $(3m - 10)(3m + 10)$       (3) $(3m - 50)(3m + 50)$

   (2) $(3m - 10)(3m - 10)$       (4) $(3m - 50)(3m - 50)$

**2** Which expression represents an irrational number?

   (1) $\sqrt{16} + \sqrt{1}$                (3) $\sqrt{36} + \sqrt{7}$

   (2) $\sqrt{25} + \sqrt{4}$                (4) $\sqrt{49} + \sqrt{9}$

**3** Which linear equation represents a line that passes through the point $(-3,-8)$?

   (1) $y = 2x - 2$            (3) $y = 2x + 13$

   (2) $y = 2x - 8$            (4) $y = 2x - 14$

**4** The expression $(5x^2 - x + 4) - 3(x^2 - x - 2)$ is equivalent to

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

   (2) $2x^2 + 2x + 10$      (4) $2x^4 - 2x^2 + 10$

**5** The 24$^{th}$ term of the sequence $-5, -11, -17, -23, \dots$ is

   (1) $-149$               (3) $133$

   (2) $-143$              (4) $139$

**6** When completing the square for $x^2 - 18x + 77 = 0$, which equation is a correct step in this process?

(1) $(x - 9)^2 = 4$  (3) $x = \pm 13$

(2) $(x - 3)^2 = 2$  (4) $x - 9 = \pm 9$

**7** Which function will have the greatest value when $x > 1$?

(1) $g(x) = 2(5)^x$  (3) $h(x) = 2x^2 + 5$

(2) $f(x) = 2x + 5$  (4) $k(x) = 2x^3 + 5$

**8** Mike uses the equation $b = 1300(2.65)^x$ to determine the growth of bacteria in a laboratory setting. The exponent represents

(1) the total number of bacteria currently present

(2) the percent at which the bacteria are growing

(3) the initial amount of bacteria

(4) the number of time periods

**9** A company ships an average of 30,000 items each week. The approximate number of items shipped each minute is calculated using the conversion

(1) $\dfrac{30{,}000 \text{ items}}{1 \text{ week}} \cdot \dfrac{7 \text{ days}}{1 \text{ week}} \cdot \dfrac{60 \text{ min}}{1 \text{ hr}} \cdot \dfrac{1 \text{ day}}{24 \text{ hrs}}$
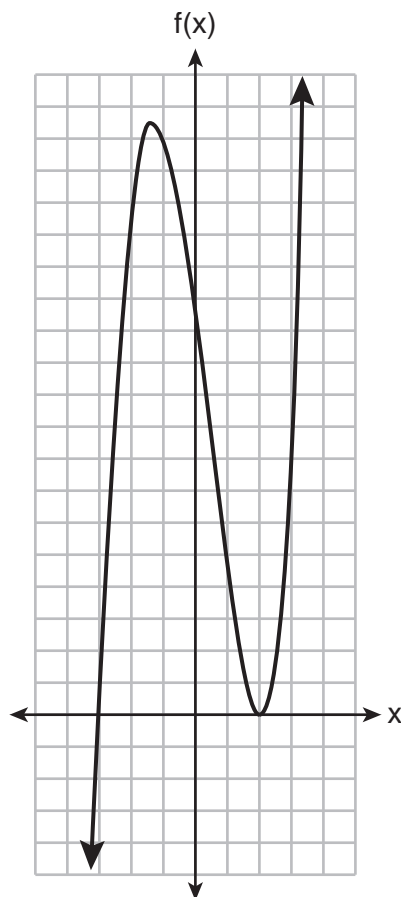
(2) $\dfrac{30{,}000 \text{ items}}{1 \text{ week}} \cdot \dfrac{1 \text{ week}}{7 \text{ days}} \cdot \dfrac{1 \text{ day}}{24 \text{ hrs}} \cdot \dfrac{1 \text{ hr}}{60 \text{ min}}$

(3) $\dfrac{1 \text{ week}}{30{,}000 \text{ items}} \cdot \dfrac{1 \text{ week}}{7 \text{ days}} \cdot \dfrac{1 \text{ day}}{24 \text{ hrs}} \cdot \dfrac{1 \text{ hr}}{60 \text{ min}}$

(4) $\dfrac{1 \text{ week}}{30{,}000 \text{ items}} \cdot \dfrac{7 \text{ days}}{1 \text{ week}} \cdot \dfrac{24 \text{ hrs}}{1 \text{ day}} \cdot \dfrac{60 \text{ min}}{1 \text{ hr}}$

**10** A function is graphed below.

f(x)



A possible equation for this function is

(1) $f(x) = (x + 2)(x - 3)$        (3) $f(x) = (x - 2)^2(x + 3)$

(2) $f(x) = (x - 2)(x + 3)$        (4) $f(x) = (x - 2)(x + 3)(x - 12)$

**11** If $g(x) = -x^2 - x + 5$, then $g(-4)$ is equal to

(1) $-15$                  (3) 17

(2) $-7$                   (4) 25

**12** A movie theater's popcorn box is a rectangular prism with a base that measures 6 inches by 4 inches and has a height of 8 inches. To create a larger box, both the length and the width will be increased by $x$ inches. The height will remain the same. Which function represents the volume, $V(x)$, of the larger box?

(1) $V(x) = (6 + x)(4 + x)(8 + x)$

(2) $V(x) = (6 + x)(4 + x)(8)$

(3) $V(x) = (6 + x) + (4 + x) + (8 + x)$

(4) $V(x) = (6 + x) + (4 + x) + (8)$

**13** The expression $300(4)^{x + 3}$ is equivalent to

(1) $300(4)^x(4)^3$

(3) $300(4)^x + 300(4)^3$

(2) $300(4^x)^3$

(4) $300^x(4)^3$

**14** Ashley only has 7 quarters and some dimes in her purse. She needs at least \$3.00 to pay for lunch. Which inequality could be used to determine the number of dimes, $d$, she needs in her purse to be able to pay for lunch?

(1) $1.75 + d \geq 3.00$

(3) $1.75 + d \leq 3.00$

(2) $1.75 + 0.10d \geq 3.00$

(4) $1.75 + 0.10d \leq 3.00$

**15** The formula for the area of a trapezoid is $A = \dfrac{1}{2}(b_1 + b_2)h$.

The height, $h$, of the trapezoid may be expressed as

(1) $2A - b_1 - b_2$

(3) $\dfrac{1}{2}A - b_1 - b_2$

(2) $\dfrac{2A - b_1}{b_2}$

(4) $\dfrac{2A}{b_1 + b_2}$

**16** The function $f(x) = |x|$ is multiplied by $k$ to create the new function $g(x) = k|x|$. Which statement is true about the graphs of $f(x)$ and $g(x)$ if $k = \dfrac{1}{2}$?

(1) $g(x)$ is a reflection of $f(x)$ over the $y$-axis.

(2) $g(x)$ is a reflection of $f(x)$ over the $x$-axis.

(3) $g(x)$ is wider than $f(x)$.

(4) $g(x)$ is narrower than $f(x)$.

**17** Some adults were surveyed to find out if they would prefer to buy a sports utility vehicle (SUV) or a sports car. The results of the survey are summarized in the table below.

| | SUV | Sports Car | Totals |
|---|---|---|---|
| **Male** | 21 | 38 | 59 |
| **Female** | 135 | 46 | 181 |
| **Totals** | 156 | 84 | 240 |

Of the number of adults that preferred sports cars, approximately what percent were males?

(1) 15.8                    (3) 64.4

(2) 45.2                    (4) 82.6

**18** The solution to $2x^2 = 72$ is

(1) {9,4}                    (3) {6}

(2) {−4,9}                    (4) {±6}

**19** Three quadratic functions are given below.

 I.  $f(x) = (x + 2)^2 + 5$

II.

| x | −4 | −3 | −2 | −1 | 0 | 1 |
|---|---|---|---|---|---|---|
| g(x) | −3 | 2 | 5 | 5 | 2 | −3 |

III.



Which of these functions have the same vertex?

(1) I and II, only                    (3) I and III, only

(2) II and III, only                    (4) I, II, and III

**20** The domain of the function $f(x) = x^2 + x - 12$ is

(1) $(-\infty,-4]$             (3) $[-4,3]$

(2) $(-\infty,\infty)$            (4) $[3,\infty)$

**21** A father makes a deal with his son regarding his weekly allowance. The first year, he agrees to pay his son a weekly allowance of $10. Every subsequent year, the allowance is recalculated by doubling the previous year's weekly allowance and then subtracting 8. Which recursive formula could be used to calculate the son's weekly allowance in future years?

(1) $a_n = 2n - 8$

(2) $a_n = 2(n + 1) - 8$

(3) $a_1 = 10$
$a_{n+1} = 2a_n - 8$

(4) $a_1 = 10$
$a_{n+1} = 2(a_n - 8)$

**22** What is the solution to the inequality below?

$$4 - \frac{2}{5}x \geq \frac{1}{3}x + 15$$

(1) $x \leq 11$             (3) $x \leq -15$

(2) $x \geq 11$             (4) $x \geq -15$

**23** Which statement is correct about the polynomial $3x^2 + 5x - 2$?

(1) It is a third-degree polynomial with a constant term of $-2$.

(2) It is a third-degree polynomial with a leading coefficient of 3.

(3) It is a second-degree polynomial with a constant term of 2.

(4) It is a second-degree polynomial with a leading coefficient of 3.

**24** A store manager is trying to determine if they should continue to sell a particular brand of nails. To model their profit, they use the function $p(n)$, where $n$ is the number of boxes of these nails sold in a day. A reasonable domain for this function would be

(1) nonnegative integers      (3) real numbers

(2) rational numbers         (4) integers

**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** Solve the equation algebraically for $x$:

$$-2.4(x + 1.4) = 6.8x - 22.68$$

**26** The function $f(x)$ is graphed on the set of axes below.
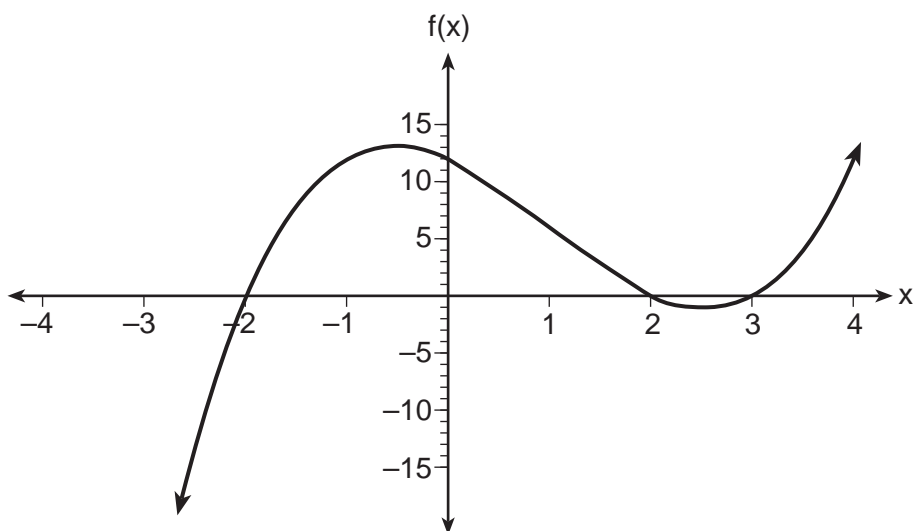


State the zeros of $f(x)$.

Explain your reasoning.

**27** Breanna creates the pattern of blocks below in her art class.
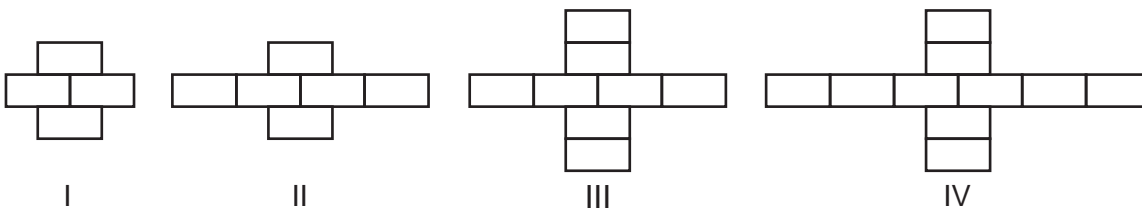


I          II          III          IV

A friend tells her that the number of blocks in the pattern is increasing exponentially.

Is her friend correct?

Explain your reasoning.

**28** The data set 20, 36, 52, 56, 24, 16, 40, 4, 28 represents the number of books purchased by nine book club members in a year.

Construct a box plot for these data on the number line below.

**29** Given:

$$A = x + 5$$
$$B = x^2 - 18$$
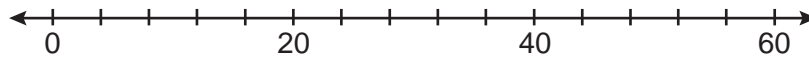
Express $A^2 + B$ in standard form.

**30** The two relations shown below are *not* functions.

Relation I:                                 Relation II:



$\{(-5,-2), (-4,0), (-2,1), (-1,3), (-4,4)\}$
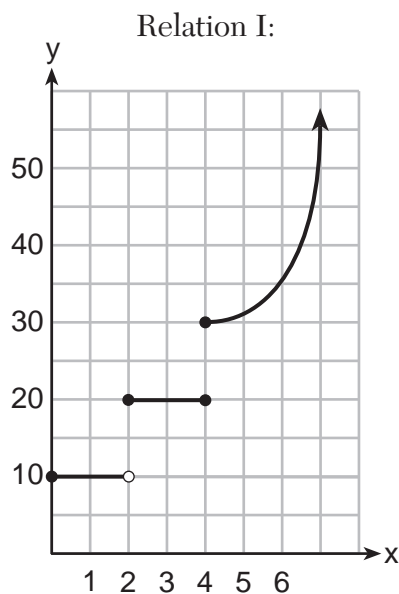
Explain how you could change each relation so that they each become a function.

**31** Factor $2x^2 + 16x - 18$ completely.

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

## 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** Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
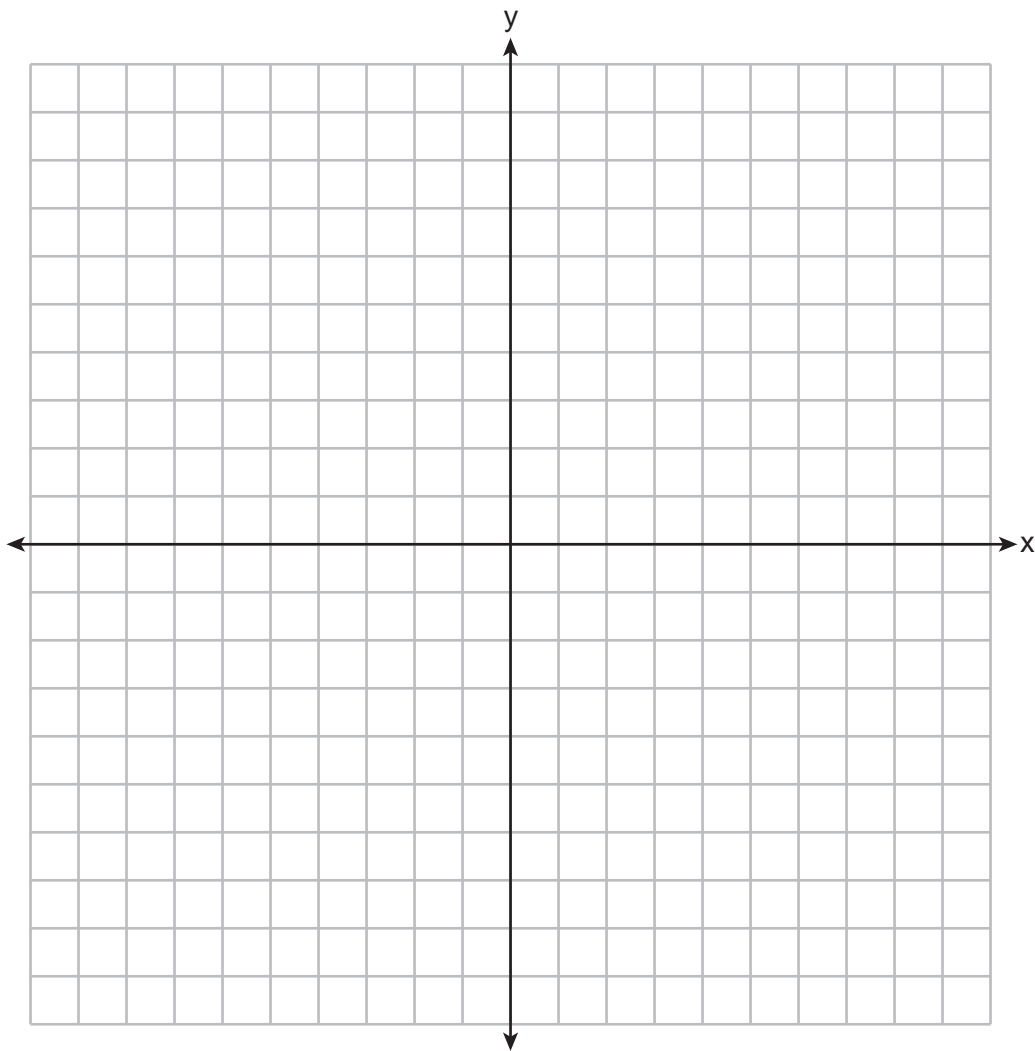


Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.
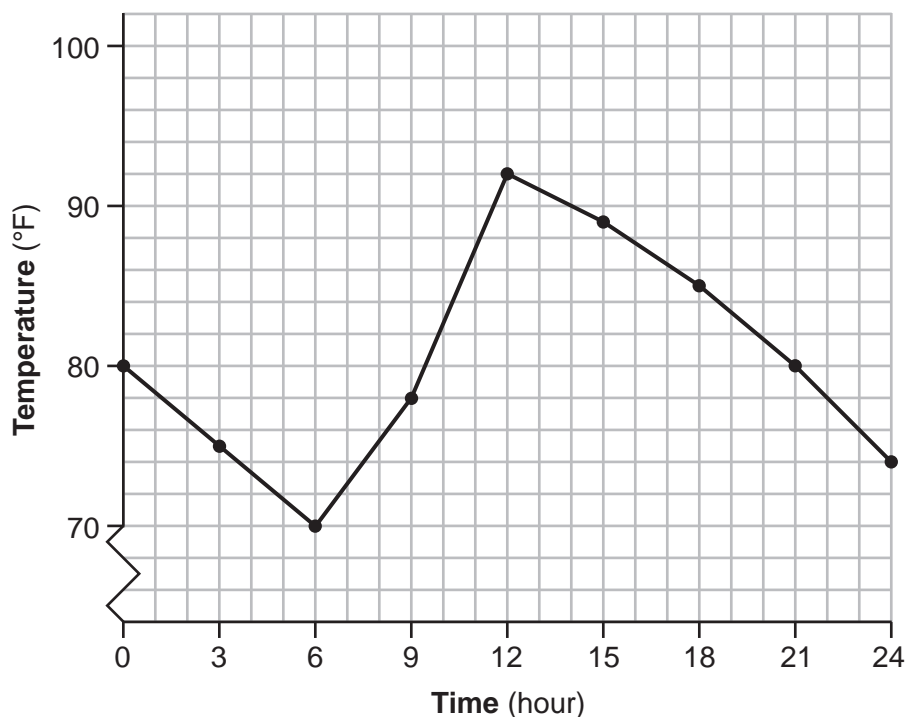


State the entire interval over which the temperature is increasing.

State the three-hour interval that has the greatest rate of change in temperature.

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

**35** Solve the following system of inequalities graphically on the set of axes below.

$$2x + 3y \geq -6$$
$$x < 3y + 6$$

Label the solution set *S*.
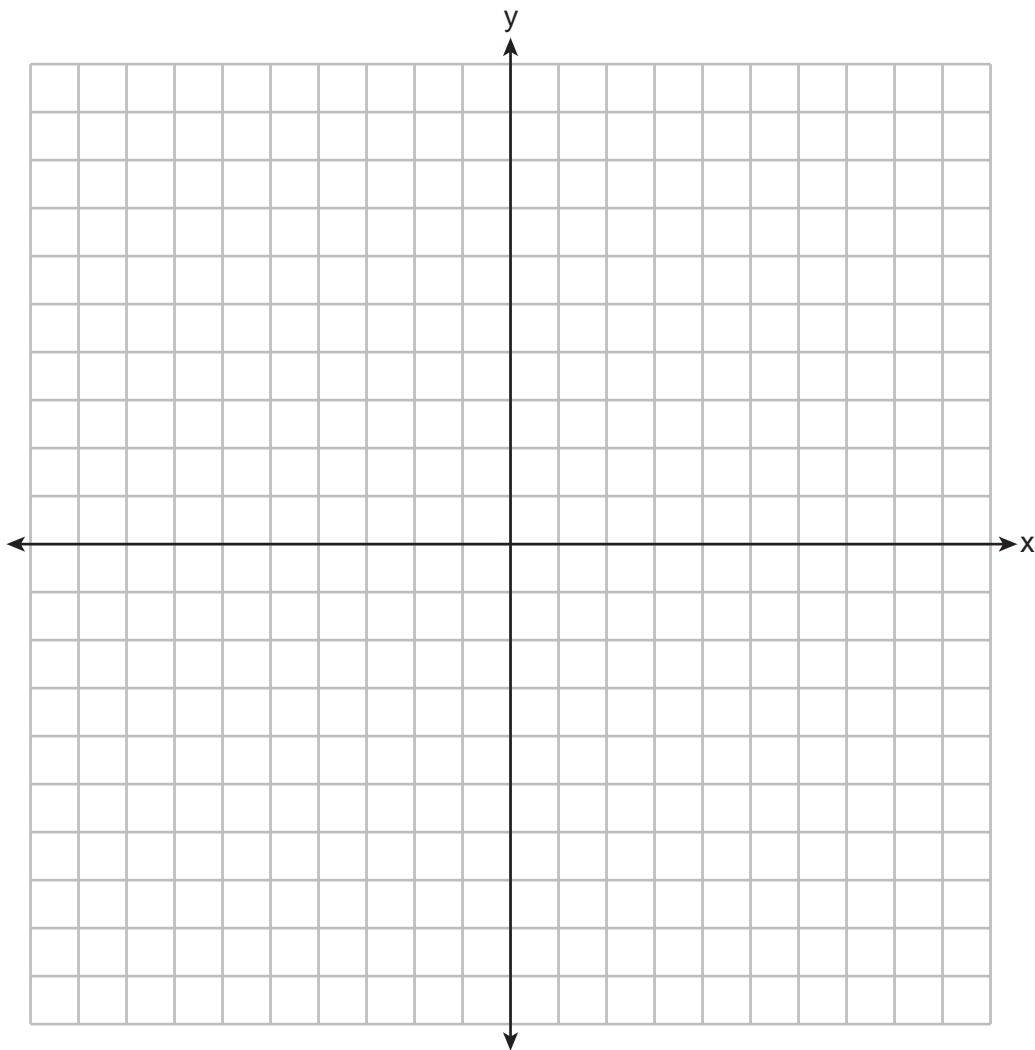


Is the point $(4,-2)$ in the solution set?

Explain your answer.

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

**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 Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

**Question 37 is continued on the next page.**
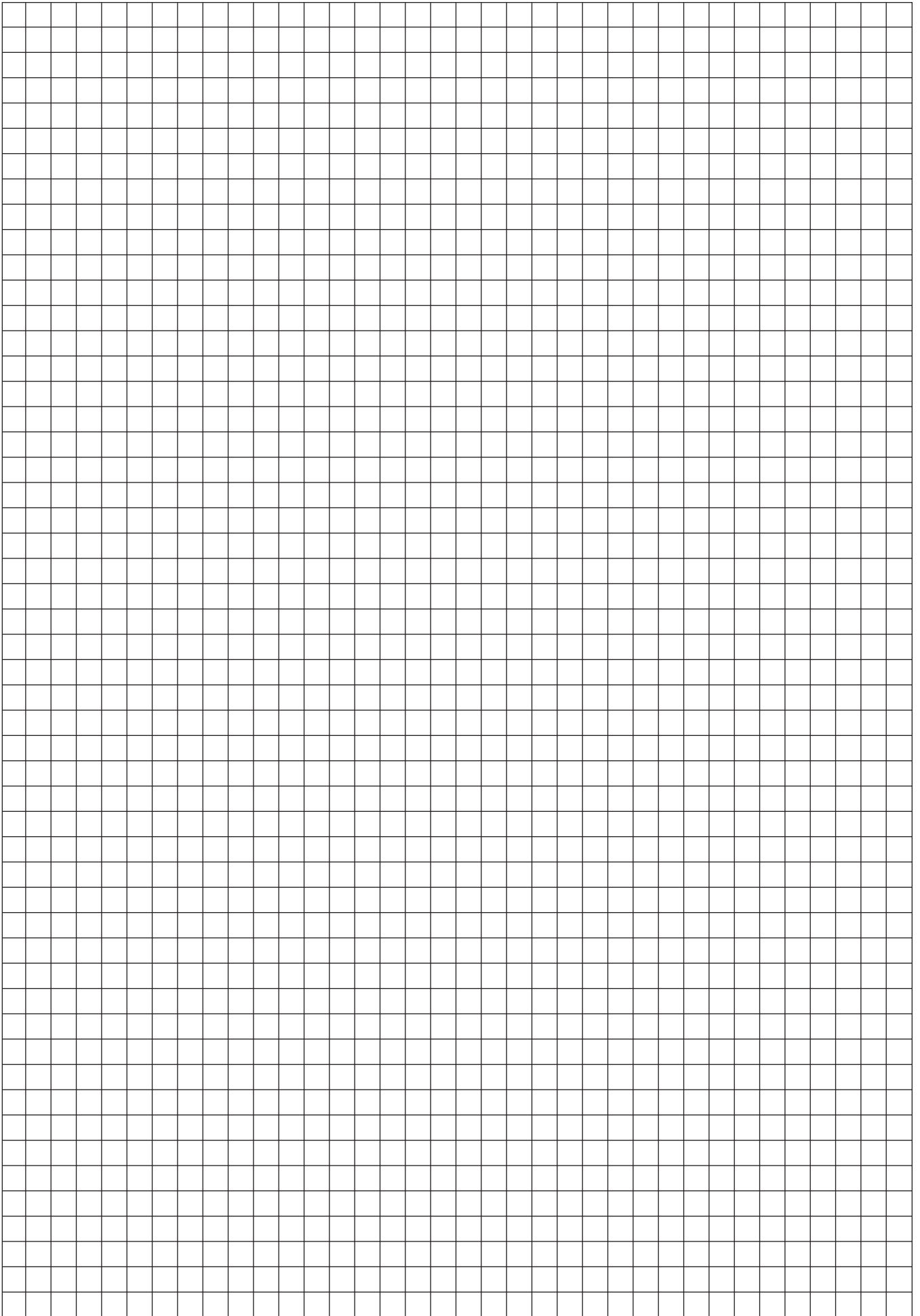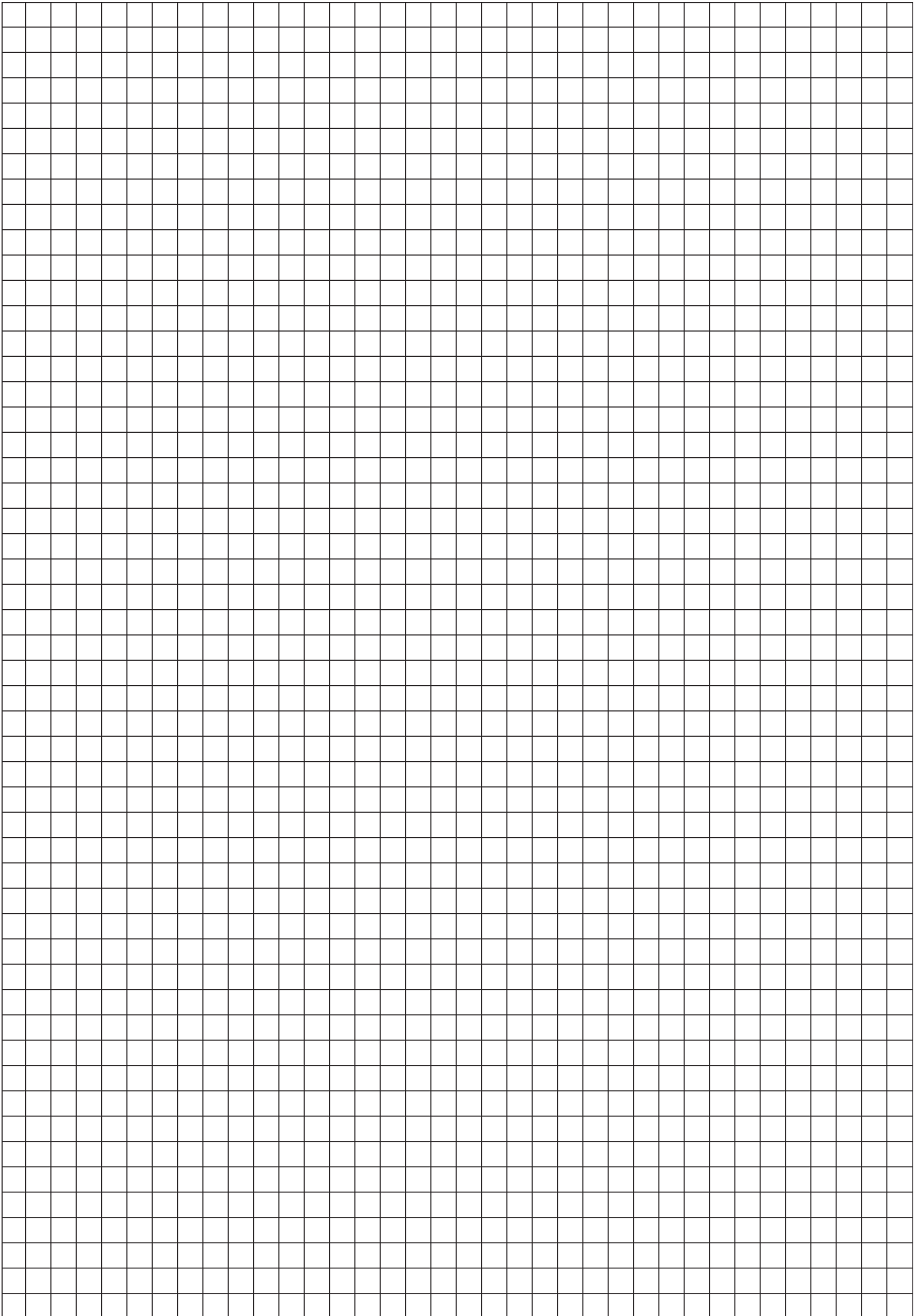
If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

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

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The State Education Department / The University of the State of New York
# Regents Examination in Algebra I – June 2023
## Scoring Key: Part I (Multiple-Choice Questions)

| Examination | Date | Question Number | Scoring Key | Question Type | Credit | Weight |
|---|---|---|---|---|---|---|
| Algebra I | June '23 | 1 | 1 | MC | 2 | 1 |
| Algebra I | June '23 | 2 | 3 | MC | 2 | 1 |
| Algebra I | June '23 | 3 | 1 | MC | 2 | 1 |
| Algebra I | June '23 | 4 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 5 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 6 | 1 | MC | 2 | 1 |
| Algebra I | June '23 | 7 | 1 | MC | 2 | 1 |
| Algebra I | June '23 | 8 | 4 | MC | 2 | 1 |
| Algebra I | June '23 | 9 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 10 | 3 | MC | 2 | 1 |
| Algebra I | June '23 | 11 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 12 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 13 | 1 | MC | 2 | 1 |
| Algebra I | June '23 | 14 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 15 | 4 | MC | 2 | 1 |
| Algebra I | June '23 | 16 | 3 | MC | 2 | 1 |
| Algebra I | June '23 | 17 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 18 | 4 | MC | 2 | 1 |
| Algebra I | June '23 | 19 | 3 | MC | 2 | 1 |
| Algebra I | June '23 | 20 | 2 | MC | 2 | 1 |
| Algebra I | June '23 | 21 | 3 | MC | 2 | 1 |
| Algebra I | June '23 | 22 | 3 | MC | 2 | 1 |
| Algebra I | June '23 | 23 | 4 | MC | 2 | 1 |
| Algebra I | June '23 | 24 | 1 | MC | 2 | 1 |

# Regents Examination in Algebra I – June 2023
## Scoring Key: Parts II, III, and IV (Constructed-Response Questions)

| Examination | Date | Question Number | Scoring Key | Question Type | Credit | Weight |
|---|---|---|---|---|---|---|
| Algebra I | June '23 | 25 | - | CR | 2 | 1 |
| Algebra I | June '23 | 26 | - | CR | 2 | 1 |
| Algebra I | June '23 | 27 | - | CR | 2 | 1 |
| Algebra I | June '23 | 28 | - | CR | 2 | 1 |
| Algebra I | June '23 | 29 | - | CR | 2 | 1 |
| Algebra I | June '23 | 30 | - | CR | 2 | 1 |
| Algebra I | June '23 | 31 | - | CR | 2 | 1 |
| Algebra I | June '23 | 32 | - | CR | 2 | 1 |
| Algebra I | June '23 | 33 | - | CR | 4 | 1 |
| Algebra I | June '23 | 34 | - | CR | 4 | 1 |
| Algebra I | June '23 | 35 | - | CR | 4 | 1 |
| Algebra I | June '23 | 36 | - | CR | 4 | 1 |
| Algebra I | June '23 | 37 | - | CR | 6 | 1 |

| Key |
|---|
| MC = Multiple-choice question |
| CR = Constructed-response question |

The chart for determining students' final examination scores for the **June 2023 Regents Examination in Algebra I** will be posted on the Department's web site at: https://www.nysedregents.org/algebraone/ on the day of the examination. Conversion charts provided for the previous administrations of the Regents Examination in Algebra I must NOT be used to determine students' final scores for this administration.

# FOR TEACHERS ONLY

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

# ALGEBRA I

**Thursday,** June 15, 2023 — 1:15 to 4:15 p.m., only

## RATING GUIDE

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: https://www.nysed.gov/state-assessment/high-school-regents-examinations 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 intended 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 https://www.nysedregents.org/algebraone/.

**Note: The rubric definition for a 0-credit response has been updated based on feedback from New York State mathematics educators.**

# 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 constructed-response 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: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Thursday, June 15, 2023. 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.

# 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]** 2.1, and correct algebraic 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]** 2.1, but a method other than algebraic is used.

*or*

**[1]** 2.1, but no work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** −2, 2, and 3, and a correct explanation is written.

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

*or*

**[1]** −2, 2, and 3, but the explanation is missing or incorrect.

*or*

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

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(27) **[2]** A correct explanation indicating a negative response is written.

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

*or*

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

*or*

**[1]** An incomplete explanation is written.

**[0]** No, but no explanation is written.

*or*

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[2]** A correct box plot with Min = 4, $Q_1$ = 18, $Q_2$ = 28, $Q_3$ = 46, Max = 56 is drawn.

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

*or*

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

*or*

**[1]** Min = 4, $Q_1$ = 18, $Q_2$ = 28, $Q_3$ = 46, and Max = 56 are stated, but no further correct work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[2]** $2x^2 + 10x + 7$, 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 is not written in standard form.

*or*

**[1]** Appropriate work is shown to find $x^2 + 10x + 25$, but no further correct work is shown.

*or*

**[1]** $2x^2 + 10x + 7$, but no work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[2]** Two correct explanations are written.

**[1]** One correct explanation is written.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[2]** $2(x + 9)(x - 1)$, and correct work is shown.

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

*or*

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

*or*

**[1]** $2(x + 9)(x - 1)$, but no work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(32) **[2]** 2.2 and 0.5, and correct algebraic 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, but only one correct solution is found.

*or*

**[1]** 2.2 and 0.5, but a method other than algebraic is used.

*or*

**[1]** Appropriate work is shown to find $\dfrac{8 \pm \sqrt{28}}{6}$, but no further correct work is shown.

*or*

**[1]** 2.2 and 0.5, but no work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, 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]** $f(x)$ and $g(x)$ are graphed correctly, and 0 and 5 are stated.

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

*or*

**[3]** Appropriate work is shown, but only 0 or 5 is stated.

*or*

**[3]** Appropriate work is shown, but the solutions are stated as (0,1) and (5,6).

**[2]** Both $f(x)$ and $g(x)$ are graphed correctly, but no further correct work is shown.

**[1]** Either $f(x)$ or $g(x)$ is graphed correctly, but no further correct work is shown.

*or*

**[1]** 0 and 5, but no work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(34) **[4]** $6-12$, $9-12$, and $-\dfrac{3}{2}$ or equivalent are stated, and a correct explanation is written.

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

*or*

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

*or*

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

**[2]** Both intervals are stated correctly, but no further correct work is shown.

*or*

**[2]** $-\dfrac{3}{2}$ is stated and a correct explanation is written, but no further correct work is shown.

**[1]** One correct interval is stated, but no further correct work is shown.

<div align="center">*or*</div>

**[1]** $-\dfrac{3}{2}$ is stated, but no further correct work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(35) **[4]** Both inequalities are graphed correctly and at least one is labeled, the solution is labeled $S$, and a correct explanation indicating a negative response is written.

**[3]** Appropriate work is shown, but one computational, graphing, or labeling error is made.

<div align="center">*or*</div>

**[3]** Appropriate work is shown, but the solution is not labeled $S$.

<div align="center">*or*</div>

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

<div align="center">*or*</div>

**[3]** One inequality is graphed incorrectly, but the system is used appropriately.

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

<div align="center">*or*</div>

**[2]** Both inequalities are graphed correctly with at least one labeled, but no further correct work is shown.

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

<div align="center">*or*</div>

**[1]** One inequality is graphed and labeled correctly, but no further correct work is shown.

<div align="center">*or*</div>

**[1]** $2x + 3y = -6$ and $x = 3y + 6$ are graphed correctly and at least one is labeled, but no further correct work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(36) **[4]** $y = 184.89x - 1706.07$, 0.99, and a correct explanation in context is written.

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

*or*

**[3]** The full display of the student's calculator showing incorrect values for $a, b$, and $r$ is written, but used appropriately.

*or*

**[3]** Appropriate work is shown, but the expression $184.89x - 1706.07$ is written.

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

**[1]** A correct explanation in context is written, but no further correct work is shown.

*or*

**[1]** 0.99, but no further correct work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, 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]** $3r + 2d = 31.88$ and $2r + d = 18.92$ are stated, correct algebraic work is shown to find $r = 5.96$ and $d = 7.00$, and correct work is shown to find 8.80.

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

*or*

**[5]** Appropriate work is shown to find either $r = 5.96$ or $d = 7.00$, and correct work is shown to find 8.80.

*or*

**[5]** One equation is written incorrectly, but the system is solved appropriately, and correct work is shown to find 8.80.

*or*

**[5]** Appropriate work is shown, but a method other than algebraic is used to find $r = 5.96$ and $d = 7.00$, and correct work is shown to find 8.80.

**[4]** Appropriate work is shown to find $r = 5.96$ and $d = 7.00$, but no further correct work is shown.

*or*

**[4]** A correct system of equations is written, and correct work is shown to find 8.80.

**[3]** A correct system of equations is written, and 8.80 is stated, but no further correct work is shown.

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

*or*

**[2]** Correct work is shown to find 8.80, but no further correct work is shown.

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

*or*

**[1]** 8.80 is stated, but no work is shown.

*or*

**[1]** $r = 5.96$ and $d = 7.00$, but no work is shown.

**[0]** A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

# Map to the Learning Standards
## Algebra I
## June 2023

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

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

# Regents Examination in Algebra I

## June 2023

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

The *Chart for Determining the Final Examination Score for the June 2023 Regents Examination in Algebra I* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations by Thursday, June 15, 2023. 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 https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.

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,** June 15, 2023 — 1:15 to 4:15 p.m., only

## MODEL RESPONSE SET

### Table of Contents

**25** Solve the equation algebraically for $x$:

$$-2.4(x + 1.4) = 6.8x - 22.68$$

$$-2.4x - 3.36 = 6.8x - 22.68$$
$$+ 22.68 \qquad\qquad +22.68$$
$$-2.4x + 19.32 = 6.8x$$
$$+2.4x \qquad\qquad +2.4x$$
$$\frac{19.32}{9.2} = \frac{9.2x}{9.2}$$
$$\boxed{x = 2.1}$$

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

**25** Solve the equation algebraically for $x$:

$$-2.4(x + 1.4) = 6.8x - 22.68$$

$-2.4x - 3.36 = 6.8x - 22.68$

$-6.8x$

$-9.2x - 3.36 = -22.68$

$+ 3.36$

$-9.2x = -19.32$

$5.75 \longleftarrow$ answer.

**Score 1:** The student divided by $-3.36$.

25 Solve the equation algebraically for $x$:

$$-2.4(x + 1.4) = 6.8x - 22.68$$

$-2.4(x+1.14) = 6.8x - 22.68$

$-2.4x - 2.736 = 6.8x - 22.68$
$-6.8x \qquad\qquad -6.8x$

$-8.2x \quad -2.736 = -22.68$
$\qquad\quad -2.736 \quad\; -2.736$

$\dfrac{-8.2x}{-8.2} = \dfrac{-25.416}{-8.2}$

$x = 3.09951219S$

$x \approx 3.1$

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

**26** The function $f(x)$ is graphed on the set of axes below.
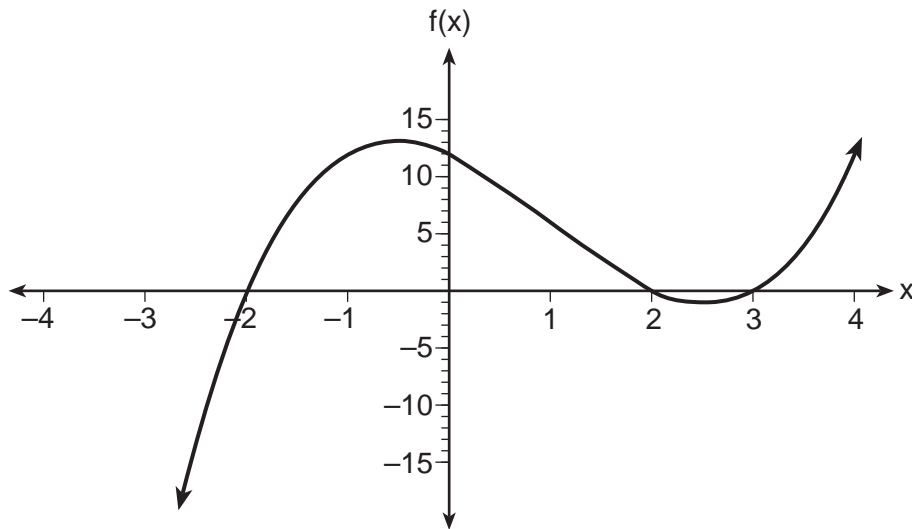


State the zeros of $f(x)$.

$\{-2, 2, 3\}$

Explain your reasoning.

the zeros are the points where the graph touches the x-axis

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

**26** The function $f(x)$ is graphed on the set of axes below.
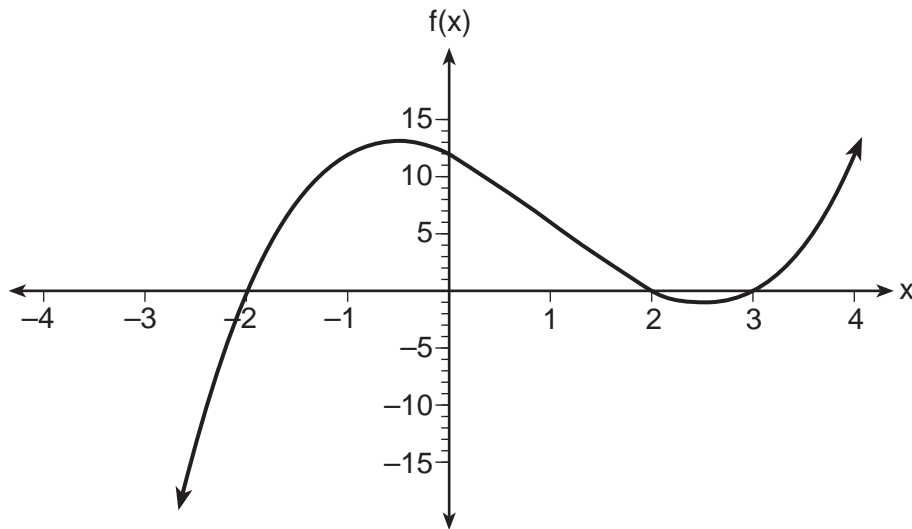


State the zeros of $f(x)$.

The zeroes are -2, 2, and 3.

Explain your reasoning.

I know this because these are the x-intercepts (zeroes).

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

**26** The function $f(x)$ is graphed on the set of axes below.
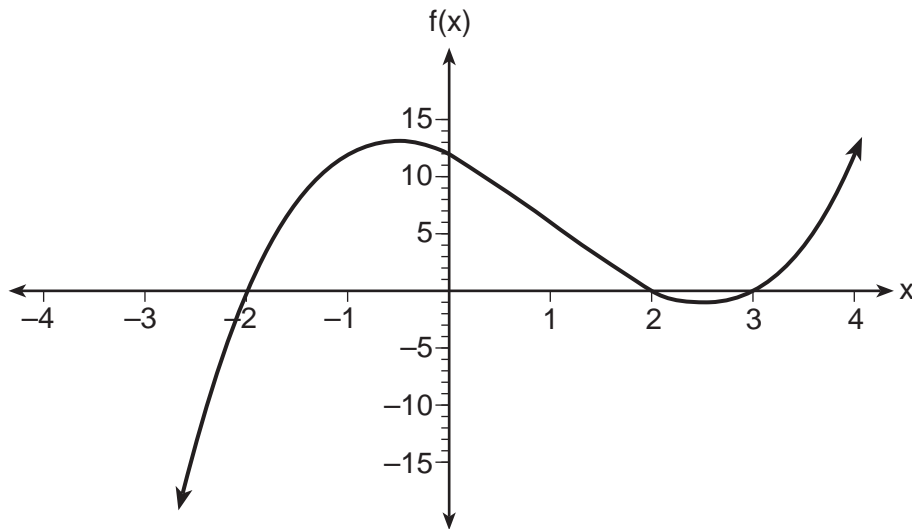


State the zeros of $f(x)$.

$-2, 2,$ and $3,$ because they are the

Explain your reasoning. points crossing 0 on the x axis.

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

**26** The function $f(x)$ is graphed on the set of axes below.
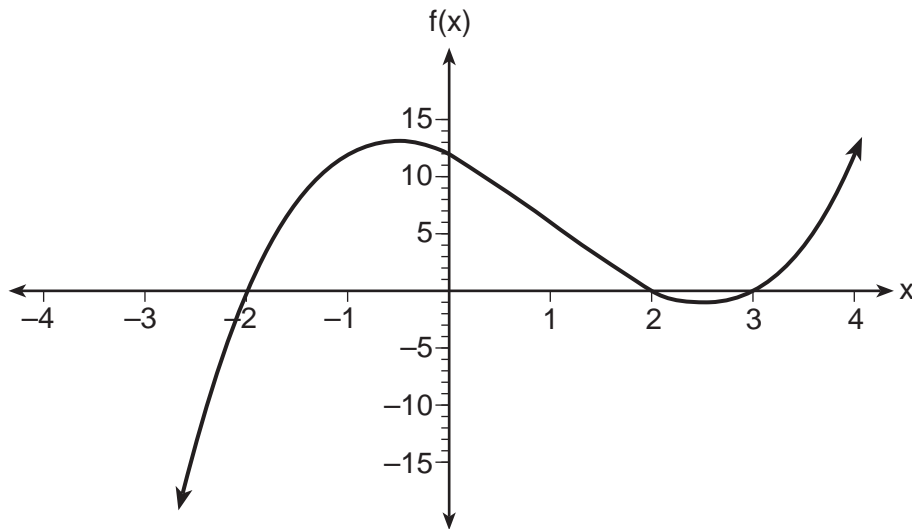


State the zeros of $f(x)$.

Explain your reasoning.   The zero is 12 because it falls on the y-axis

**Score 1:**   The student found the $y$-intercept.

**26** The function $f(x)$ is graphed on the set of axes below.
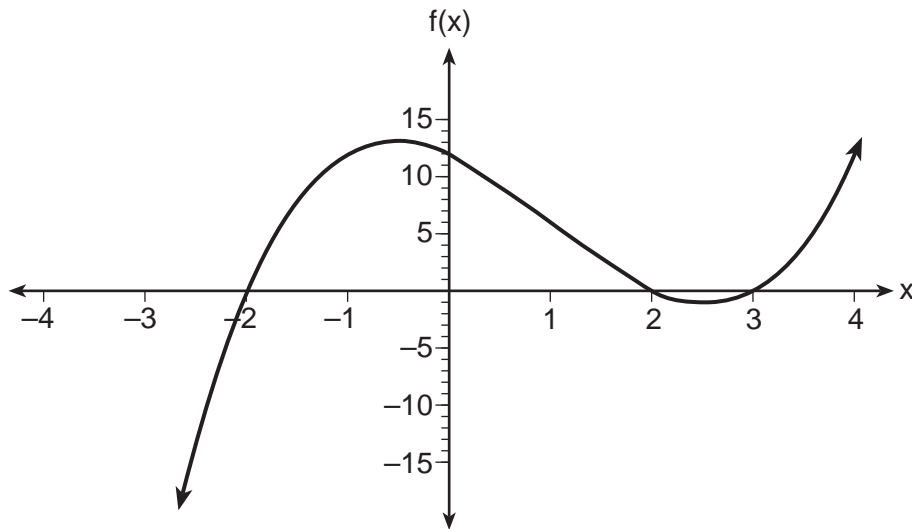


State the zeros of $f(x)$.

Zeros: $\{-2, 2\}$

Explain your reasoning.

The zeros are when it cross the x-axis, when "y" is zero.

**Score 1:** The student did not include 3 when stating the zeros.

26 The function $f(x)$ is graphed on the set of axes below.
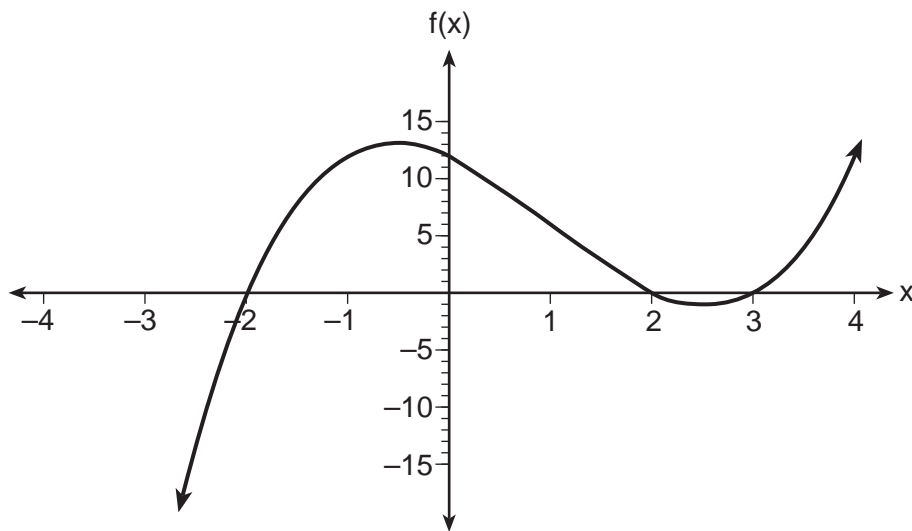


State the zeros of $f(x)$.

$(-2,0), (0,12), (2,0), (3,0)$

Explain your reasoning.

These are all numbers that either lie on the x axis making y 0, or on the y axis making x 0,

**Score 0:** The student expressed the zeros as coordinates and made a conceptual error in the explanation.

**26** The function $f(x)$ is graphed on the set of axes below.
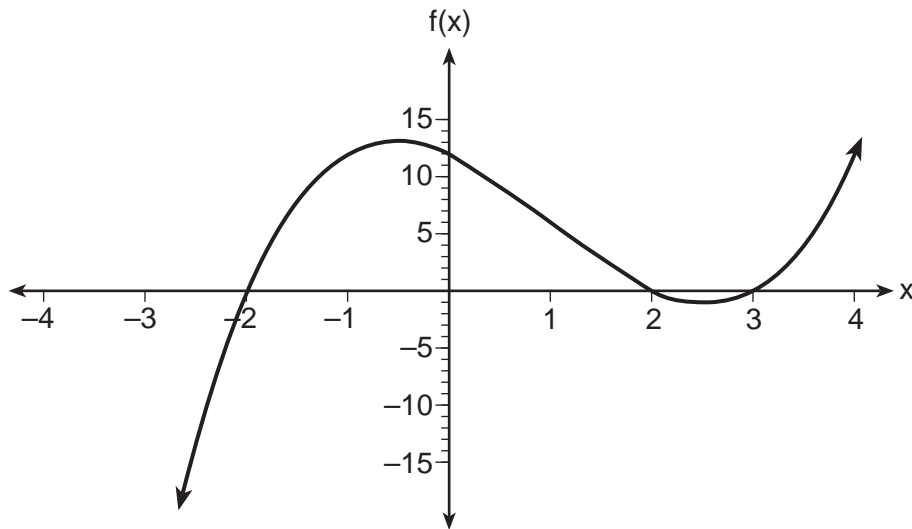


State the zeros of $f(x)$.

The zeros are

Explain your reasoning.

$f(x) = 2$

$f(x) = -2$

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

**27** Breanna creates the pattern of blocks below in her art class.

4       6       8       10

I       II       III       IV
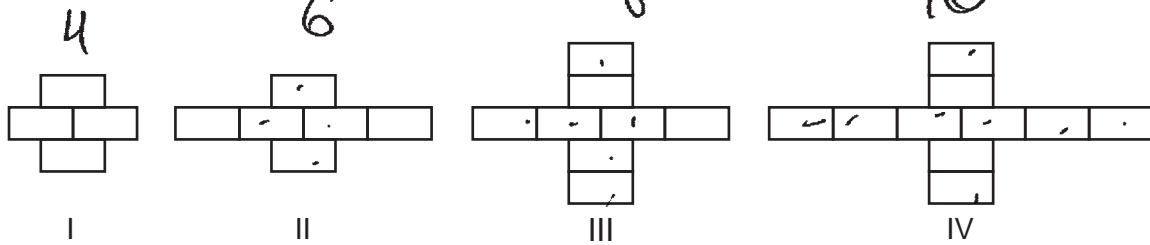
A friend tells her that the number of blocks in the pattern is increasing exponentially.

Is her friend correct?

Explain your reasoning. NO, the numbers aren't increasing by a power each time, it keeps increasing by 2, which means it is linear.

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

**27** Breanna creates the pattern of blocks below in her art class.



I                    II                    III                    IV
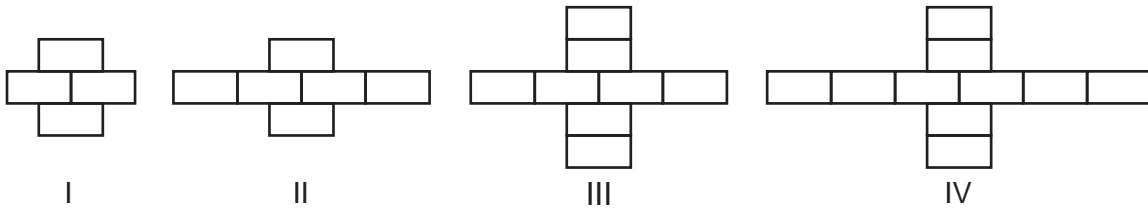
A friend tells her that the number of blocks in the pattern is increasing exponentially.

Is her friend correct?

*The friend is not correct.*

Explain your reasoning.

*It is increasing by 2.*

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

27 Breanna creates the pattern of blocks below in her art class.



I          II          III          IV
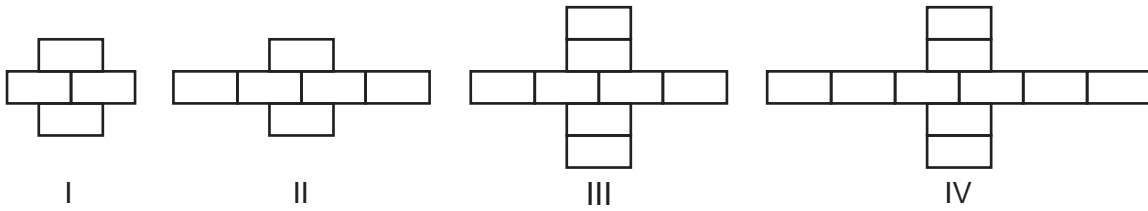
A friend tells her that the number of blocks in the pattern is increasing exponentially.

Is her friend correct?

Explain your reasoning.  The friend is correct because exponential means to grow at a constant rate. the Block grow by one on each side then One on the top and bottom every other.

**Score 1:**     The student confused linear and exponential patterns.

27 Breanna creates the pattern of blocks below in her art class.



I          II          III          IV
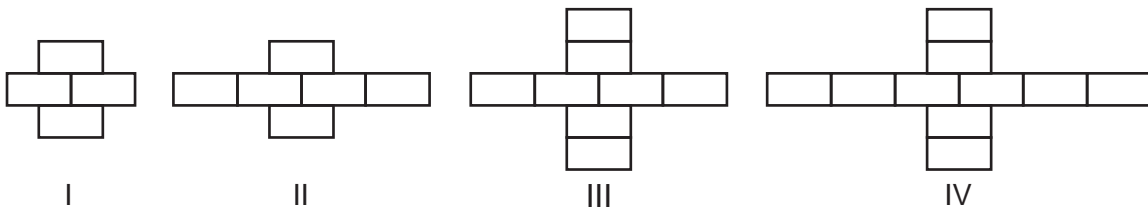
A friend tells her that the number of blocks in the pattern is increasing exponentially.

Is her friend correct?

Explain your reasoning.

Yes, her friend is right b/c in figure two
She adds on 2/4 sides. every figure goes
up by one but skips if it add the Left and
Right or up and down

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

**28** The data set 20, 36, 52, 56, 24, 16, 40, 4, 28 represents the number of books purchased by nine book club members in a year.

Construct a box plot for these data on the number line below.
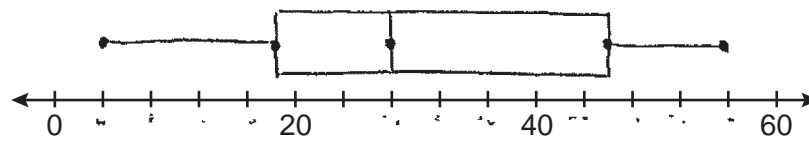


**Score 2:** The student gave a complete and correct response.

**28** The data set 20, 36, 52, 56, 24, 16, 40, 4, 28 represents the number of books purchased by nine book club members in a year.

Construct a box plot for these data on the number line below.

4, 16, 20, 24, 28, 36, 40, 52, 56

Median: 28

Q₁: 18

Q₃ = 46
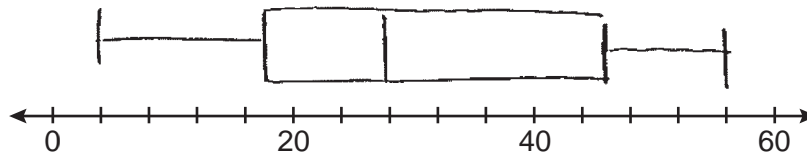


**Score 2:** The student gave a complete and correct response.

4, 16, 20, 24 (28) 36, 40, 52, 56

**28** The data set 20, 36, 52, 56, 24, 16, 40, 4, 28 represents the number of books purchased by nine book club members in a year.

Construct a box plot for these data on the number line below.
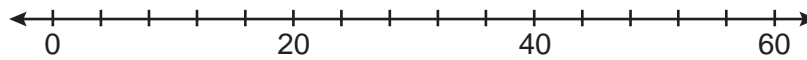


Min: 4

Q1: 18

Q2: 28

Q3: 46

Max: 56

**Score 1:** The student did not construct a box plot.

**28** The data set 20, 36, 52, 56, 24, 16, 40, 4, 28 represents the number of books purchased by nine book club members in a year.

4, 16, 20, 24, 28, 36, 40, 52, 56

↑ min
↓ Q₁
↑ median
↓ Q₃
↑ max

Construct a box plot for these data on the number line below.
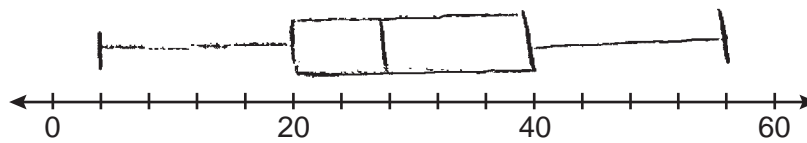


**Score 1:** The student made the same error twice when finding $Q_1$ and $Q_3$.

**28** The data set 20, 36, 52, 56, 24, 16, 40, 4, 28 represents the number of books purchased by nine book club members in a year.

Construct a box plot for these data on the number line below.
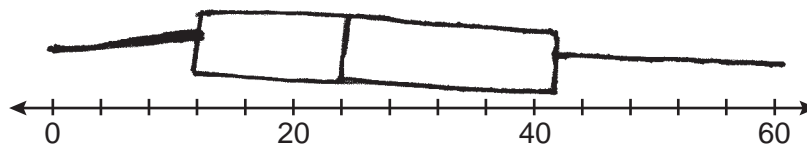


**Score 0:** The student did not show enough correct work to receive any credit.

## Question 29

**29** Given:

$$A = x + 5$$
$$B = x^2 - 18$$

Express $A^2 + B$ in standard form.

$$(x+5)^2 + x^2 - 18$$
$$(x^2 + 10x + 25) + x^2 - 18$$
$$2x^2 + 10x + 7$$

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

**29** Given:

$$A = x + 5$$
$$B = x^2 - 18$$

Express $A^2 + B$ in standard form.

$$(x+5)^2 + x^2 - 18$$



$$x^2 + 10x + 25$$

$$2x^2 + 10x + 7$$

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

29 Given:

$$A = x + 5$$
$$B = x^2 - 18$$

Express $A^2 + B$ in standard form.

$$( x+5 )( x+5 )$$

$$5x + 25 + x^2 + 5x$$

$$10x + x^2 + 25 + x^2 - 18$$

$$10x + x^2 + x^2 + 7$$

$$\boxed{10x + 2x^2 + 7}$$

**Score 1:** The student did not write the expression in standard form.

**29** Given:

$$A = x + 5$$
$$B = x^2 - 18$$

Express $A^2 + B$ in standard form.

$$(x+5)^2 + x^2 - 18$$

$$x^2 + 10x + 25 + x^2 - 18$$

$$\boxed{x^4 + 10x + 7}$$

**Score 1:**    The student did not combine like terms correctly.

---

**29** Given:

$$A = x + 5$$
$$B = x^2 - 18$$

Express $A^2 + B$ in standard form.

$$\left(x+5\right)^2 \ast \left(x^2-18\right)$$

$$\left(x+5\right)\ast\left(x+5\right)+\left(x^2-18\right)$$

$$2x+10+x^2-18$$

$$x^2+2x-8$$

---

**Score 1:** The student squared $x + 5$ incorrectly.

**29** Given:

$$A = x + 5$$
$$B = x^2 - 18$$

Express $A^2 + B$ in standard form.

$$(x+5)^2 + x^2 - 18)$$

$$x^2 + 25 \cancel{x^2} - 18$$

$$-x^2$$

$$25 - 18$$

$$\boxed{7}$$

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

**30** The two relations shown below are *not* functions.

Relation I:                                     Relation II:

$\{(-5,-2), (-4,0), (-2,1), (-1,3), (-4,4)\}$
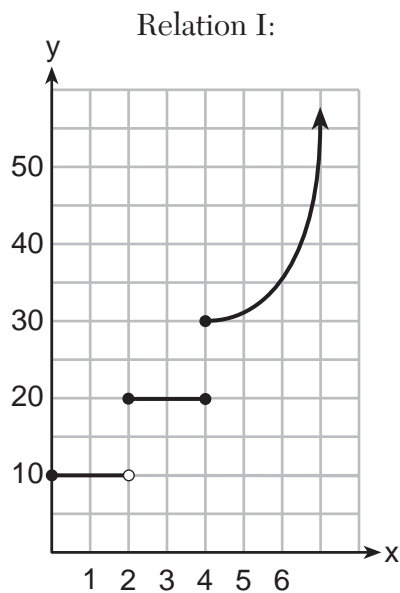


Explain how you could change each relation so that they each become a function.

For Relation I, Change the Closed dot
at (4,20) to ~~that~~ an open Circle.

For Relation II, remove (-4,4)

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

---

**30** The two relations shown below are *not* functions.

<div align="center">Relation I:</div>



Relation II:

$\{(-5,-2), (-4,0), (-2,1), (-1,3), (-4,4)\}$

Remove this point.

Remove this piece.
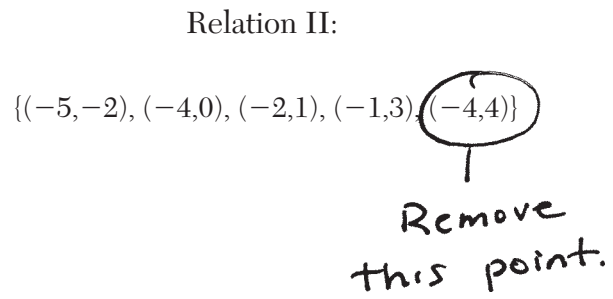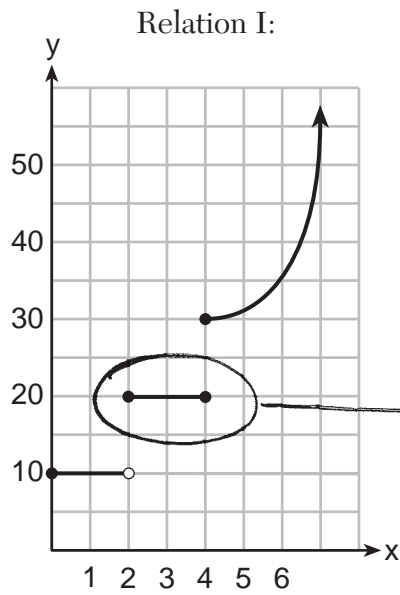
Explain how you could change each relation so that they each become a function.

---

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

**30** The two relations shown below are *not* functions.

Relation I:                                            Relation II:



$\{(-5,-2), (-4,0), (-2,1), (-1,3), (-4,4)\}$
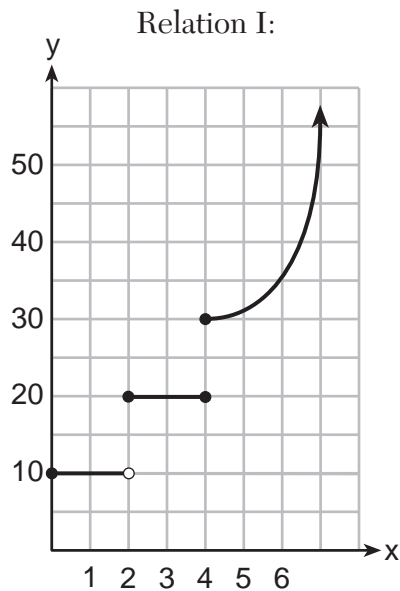
Explain how you could change each relation so that they each become a function.

Relation I: they can't be on the same vertical line. You would have to move (4,20) over to (3,20)

Relation 2: You can't have repeating x-values You would have to change one of the (-4)

**Score 1:** The student wrote an incomplete explanation for Relation II.
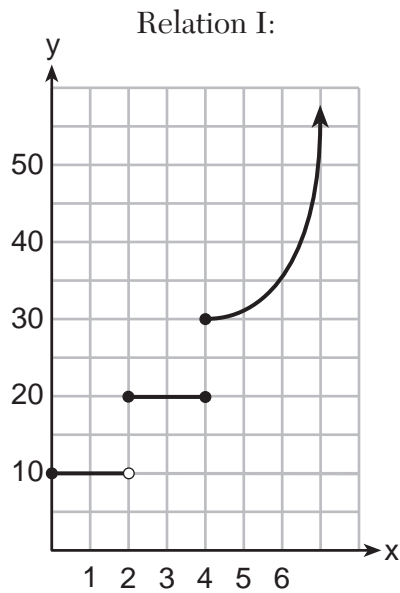
**30** The two relations shown below are *not* functions.

Relation I:

Relation II:

$\{(-5,-2), (-4,0), (-2,1), (-1,3), (-4,4)\}$



Explain how you could change each relation so that they each become a function.

for relation I you could make the white dot filled in not for relation II you could

make (~5,~2) just (~5,2).

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

**31** Factor $2x^2 + 16x - 18$ completely.

$$2x^2 + 16x - 18$$

$$2(x^2 + 8x - 9)$$

$$2(x + 9)(x - 1)$$

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

**31** Factor $2x^2 + 16x - 18$ completely.

$$2x^2 + 16x - 18$$

$$(2x - 2)(x + 9)$$

**Score 1:** The student did not factor out the greatest common factor.

**31** Factor $2x^2 + 16x - 18$ completely.

$$2(x^2 + 8x - 9)$$

$$2(x-9)(x+1)$$

**Score 1:** The student wrote incorrect signs on 9 and 1.

**31** Factor $2x^2 + 16x - 18$ completely.

$$\frac{2x^2}{2} + \frac{16x}{2} \quad \frac{-18}{2}$$

$$2\left(x^2 + 8x - 9\right)$$

$$2\left(x - 1\right)\left(x + 9\right)$$

$$\downarrow \qquad X - 1 = 0 \qquad X + 9 = 0$$

$$2 \qquad \boxed{X = 1} \qquad \boxed{X = -9}$$

**Score 1:** The student wrote $2(x - 1)(x + 9)$ correctly, but wrote further incorrect work and circled it.

**31** Factor $\underline{2x^2 + 16x - 18}$ completely.
$\overline{2}$

$x^2 + 8x - 9$         $\cancel{-9} + 1$

$(x-1)(x+9)$          $9 - 1$

$(x-1)(x+9)$

**Score 1:** The student did not write the greatest common factor in their final answer.

**31** Factor $2x^2 + 16x - 18$ completely.

$$2\left(x^2 + 8x - 9\right)$$

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

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

$$3d^2 - 8d + 3 = 0$$

$$\frac{8 \pm \sqrt{(-8)^2 - 4(3)(3)}}{2(3)}$$

$$d = 2.215250437, \quad 0.4514162296$$

$$\boxed{d = 0.5, 2.2}$$

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

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

$$3d^2 - 8d + 3 = 0$$

$d = 8.9 \text{ or } d = 7.1$

$X = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   $a = 3 \ b = -8 \ c = 3$

$X = \dfrac{8 \pm \sqrt{(-8)^2 - 4(3)(3)}}{2(3)}$

$X = \dfrac{8 \pm \sqrt{28}}{6}$

$X = \dfrac{8 + \sqrt{28}}{6}$   $X = \dfrac{8 - \sqrt{28}}{6}$

$X = 8.881917104$   $X = 7.118082896$
$X = 8.9$   $X = 7.1$

**Score 1:** The student calculated $8 \pm \sqrt{28} \div 6$.

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth.*

$$X = -\frac{b \pm \sqrt{b^2 - 4ac}}{2a} \qquad 3d^2 - 8d + 3 = 0$$

$a = 3$
$B = -8$
$C = 3$

$$X = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(3)}}{2(3)}$$

$\boxed{X \approx 2.2}$ $\qquad \boxed{X \approx .6}$

**Score 1:** The student only gave one correct answer.

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

$$d = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad a = 3 \quad b = -8 \quad c = 3$$

$$d = \frac{-(-8) \pm \sqrt{-8^2 - 4(3)(3)}}{2(3)}$$

$$d = \frac{8 \pm \sqrt{-100}}{6}$$

no real roots

**Score 1:** The student made one computational error.

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$d = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(3)}}{2(3)}$$

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

**32** Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

$$3d^2 - 8d + 3 = 0$$
$$\lfloor 9d^2 \rfloor$$

$$3\cancel{d}^2 - 8d + 3 \div \frac{9}{3}$$

$$d = \frac{8 \pm \sqrt{(-8)^2 + 4(3)(3)}}{2(3)}$$

$$d = \frac{8 \pm 10}{6}$$

$$d = 3$$
$$d = -\frac{1}{3}$$

**Score 0:** The student wrote an incorrect operation in the formula and did not express the answer to the nearest tenth.

## Question 32

32 Solve $3d^2 - 8d + 3 = 0$ algebraically for all values of $d$, rounding to the *nearest tenth*.

$$\underset{-8}{\overset{9}{-9 \diagdown 1}}$$

$$\left(3d^2 - 9d\right)\left(+1d + 3\right)$$

$$3d(d - 3) \quad -1(d - 3)$$

$$\underline{(d - 3)(3d - 1)} = 0$$

$$\boxed{d = 3 \quad d = \frac{1}{3}}$$

**Score 0:** The student factored incorrectly and did not express the answer to the nearest tenth.

33 Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
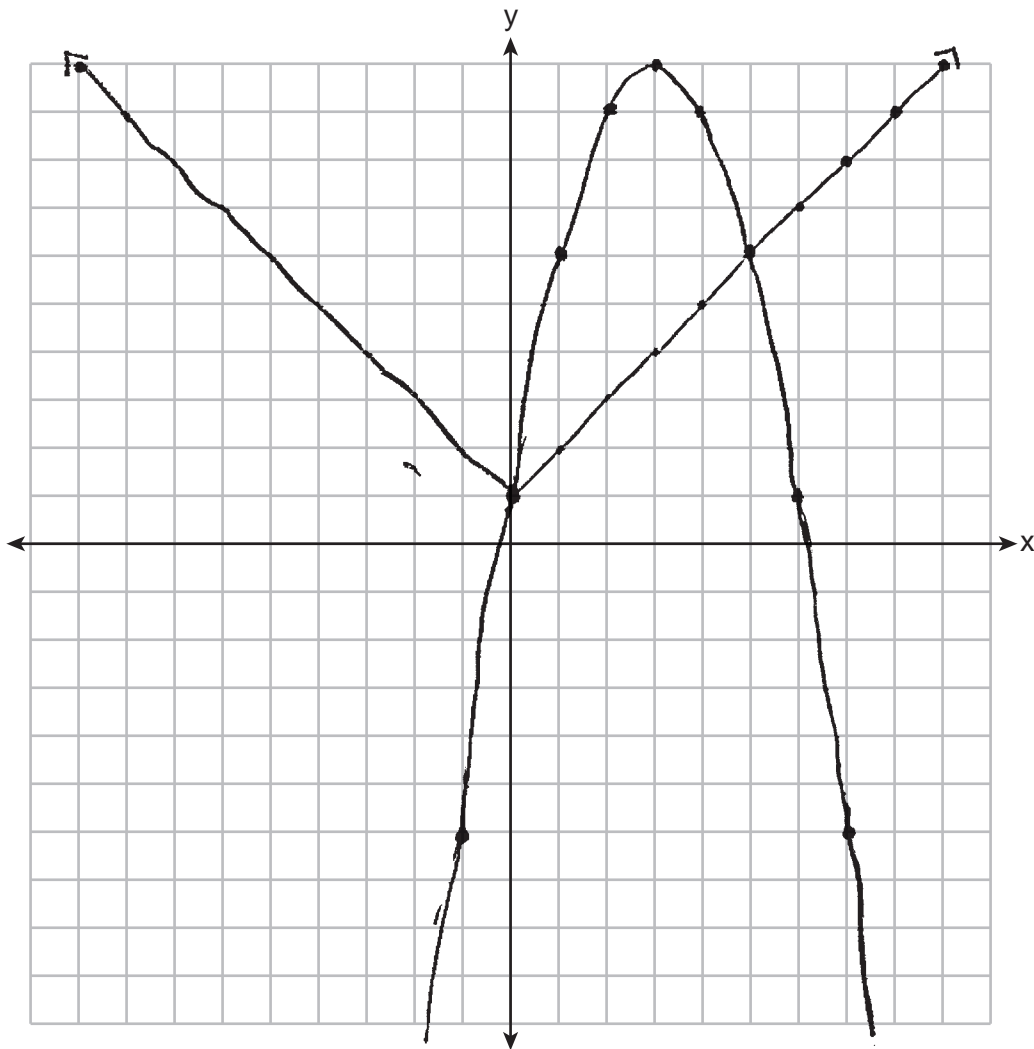


Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

$$x = 0, \quad x = 6$$

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

**33** Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
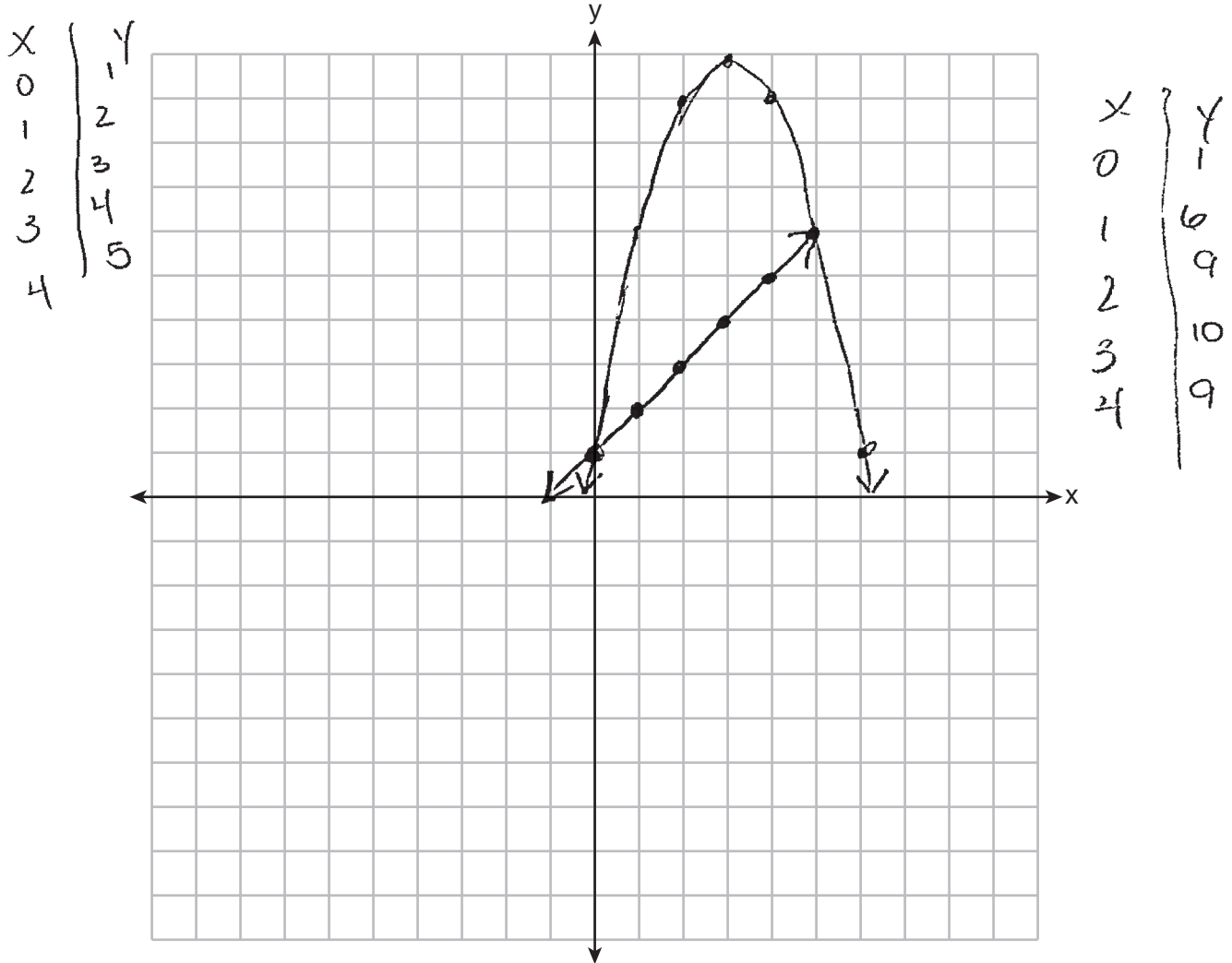


Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

0,5

**Score 3:** The student graphed $f(x)$ incorrectly.

**33** Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
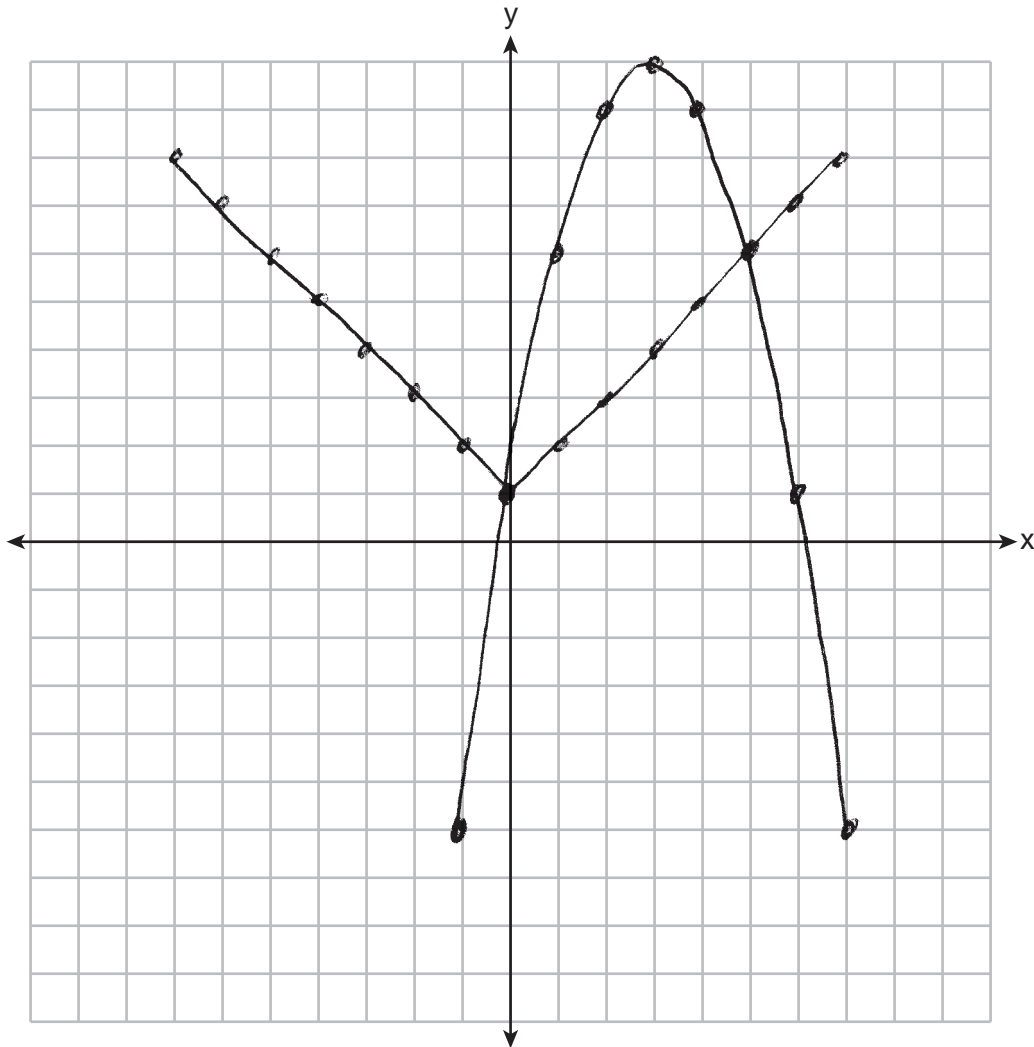


Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

$$X = 0 \quad \text{and} \quad X = 5$$

**Score 3:** The student made one graphing error.

33 Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
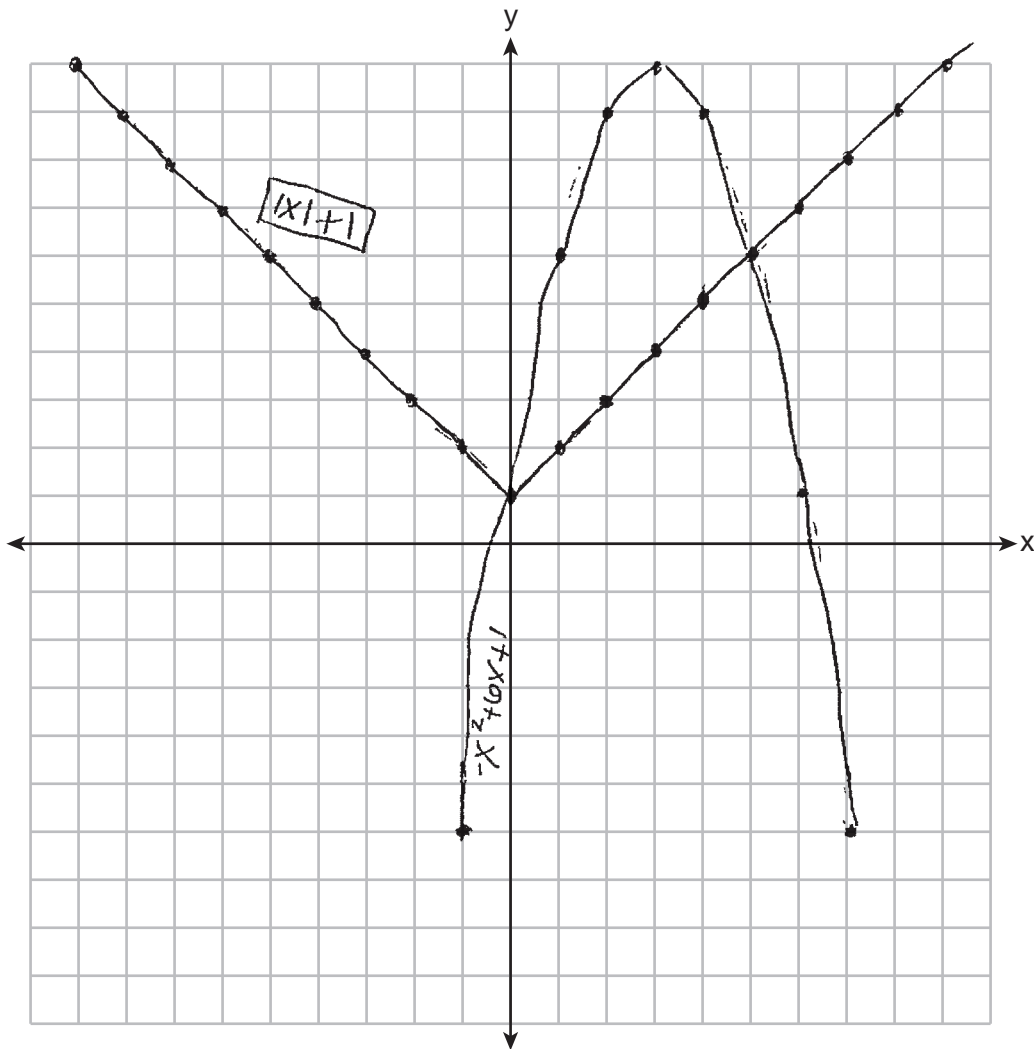


Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

$(0,1) \, (5,6)$

**Score 2:** The student did not put arrows on $g(x)$ and stated the solutions as coordinate pairs.

**33** Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
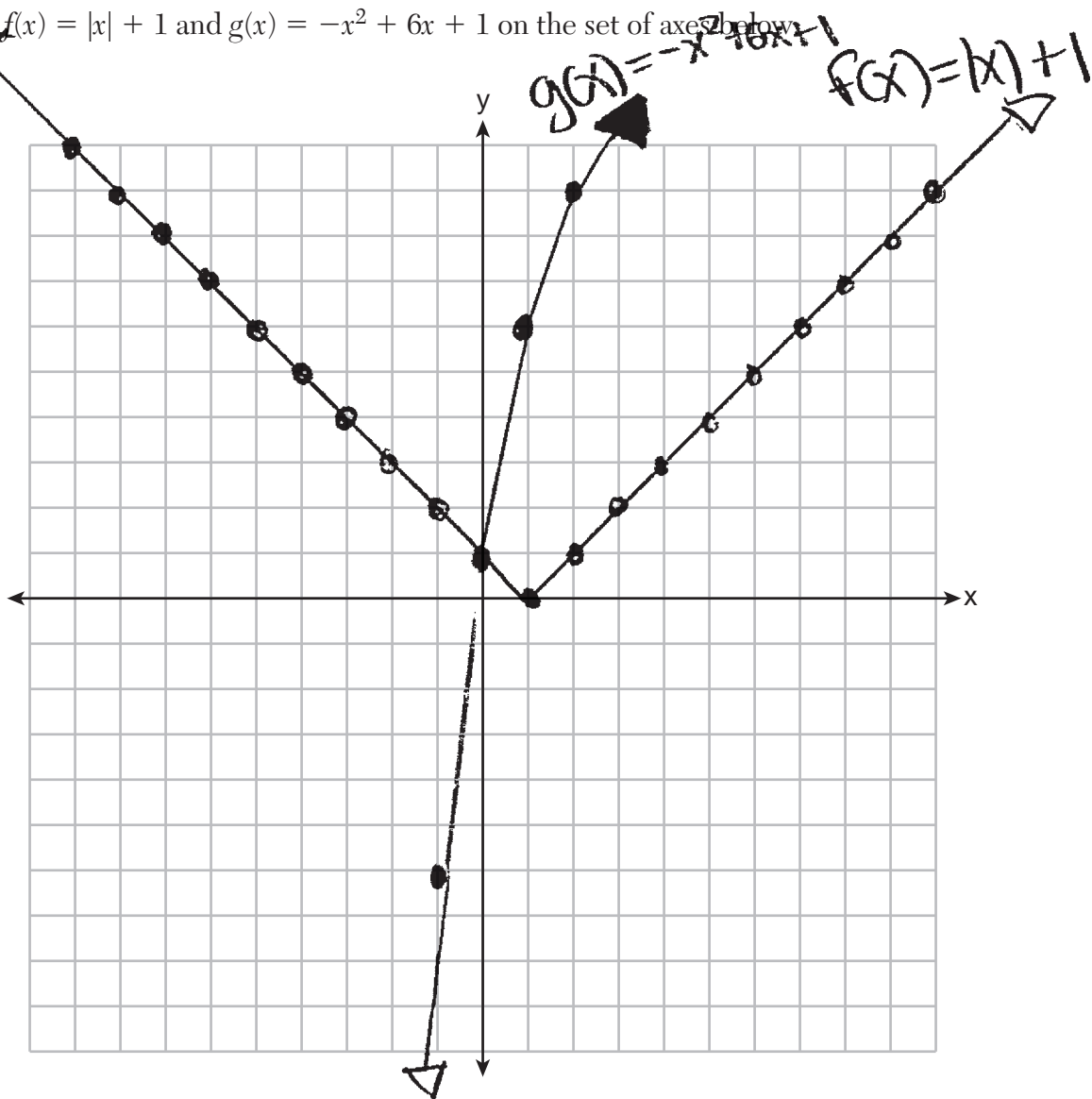
$$g(x) = -x^2 + 6x + 1 \qquad f(x) = |x| + 1$$



Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

∴ The x values that satisfy the equations $f(x) = g(x)$ are: 0.

**Score 2:** The student stated an appropriate solution, based on incorrect graphs.

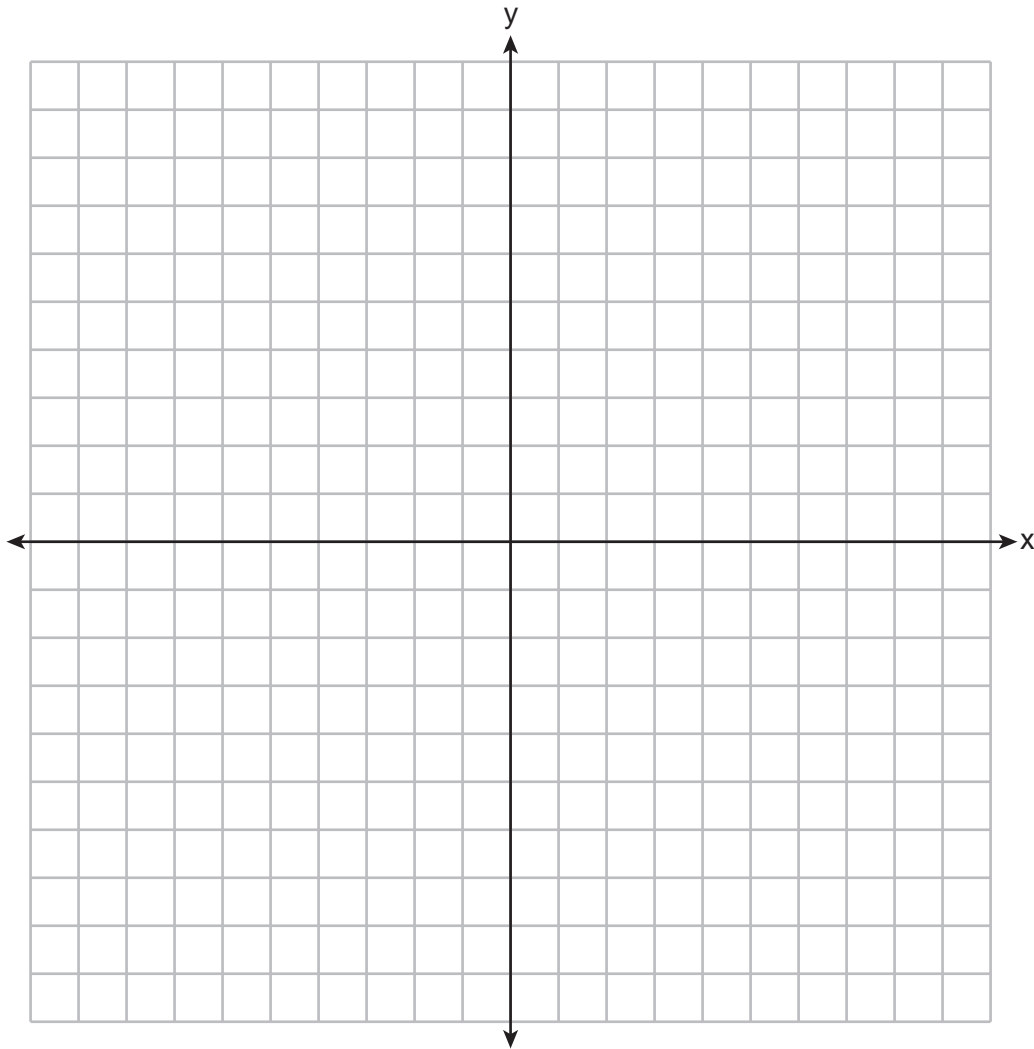**33** Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.
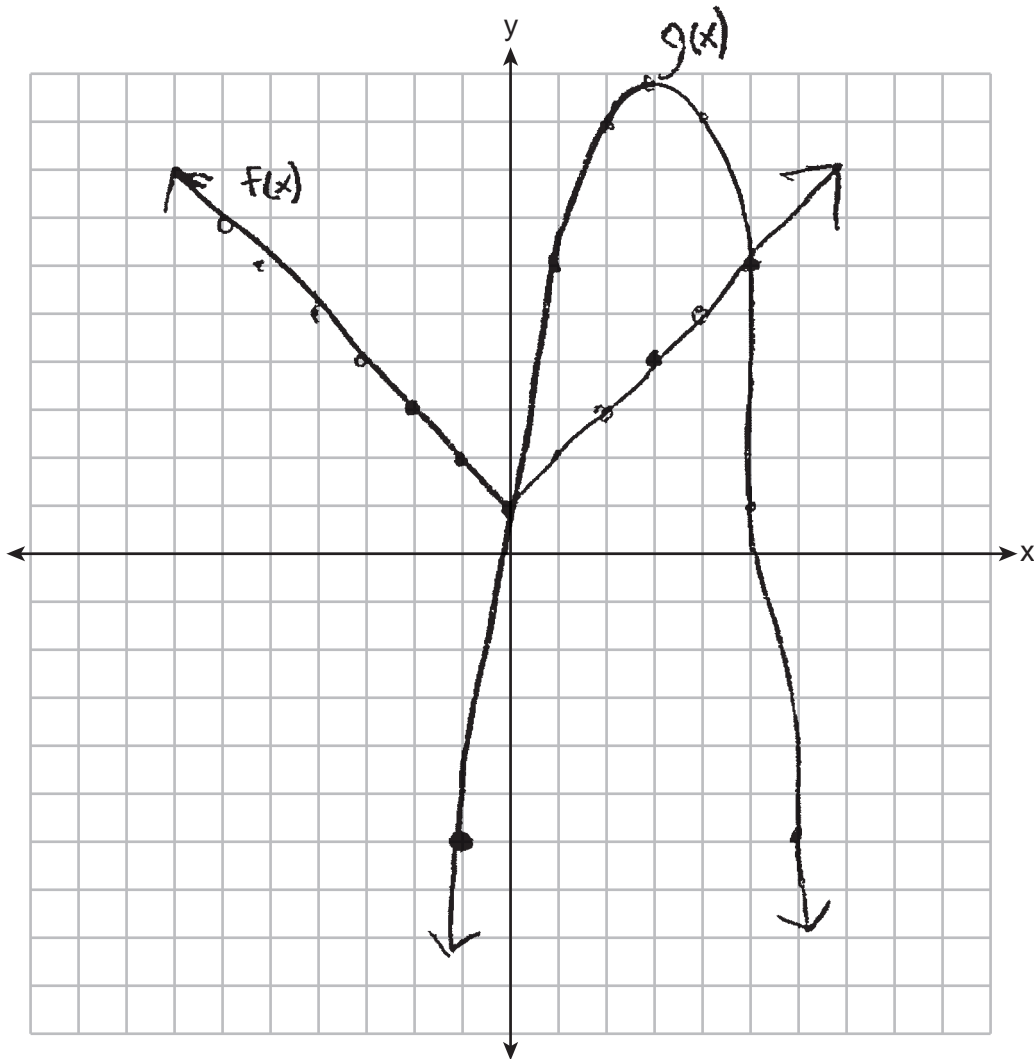


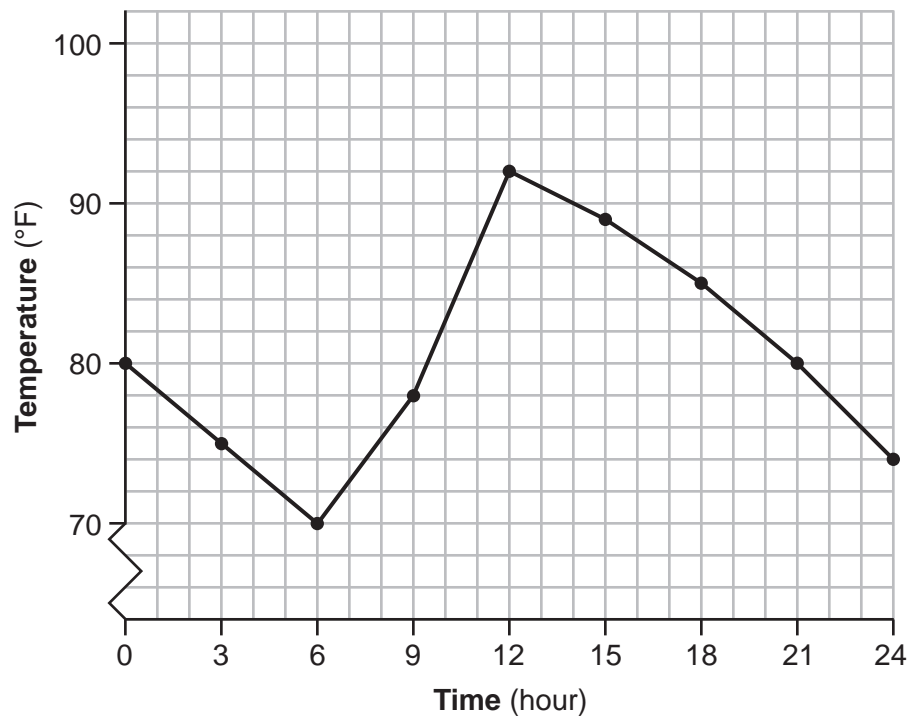Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

$(1, 0)$

**Score 1:** The student only graphed $f(x)$ correctly.

**33** Graph $f(x) = |x| + 1$ and $g(x) = -x^2 + 6x + 1$ on the set of axes below.



Based on your graph, determine all values of $x$ for which $f(x) = g(x)$.

$(0, 1)$ $\qquad$ $(5, 6)$

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

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.



State the entire interval over which the temperature is increasing.

$(6-12)$

State the three-hour interval that has the greatest rate of change in temperature.

$(9-12)$

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

$\frac{rise}{Run} = \frac{18}{-12} = \boxed{-1.5}$ This means that the temperature is decreasing by 1.5° every hour from hour 12 to hour 24.
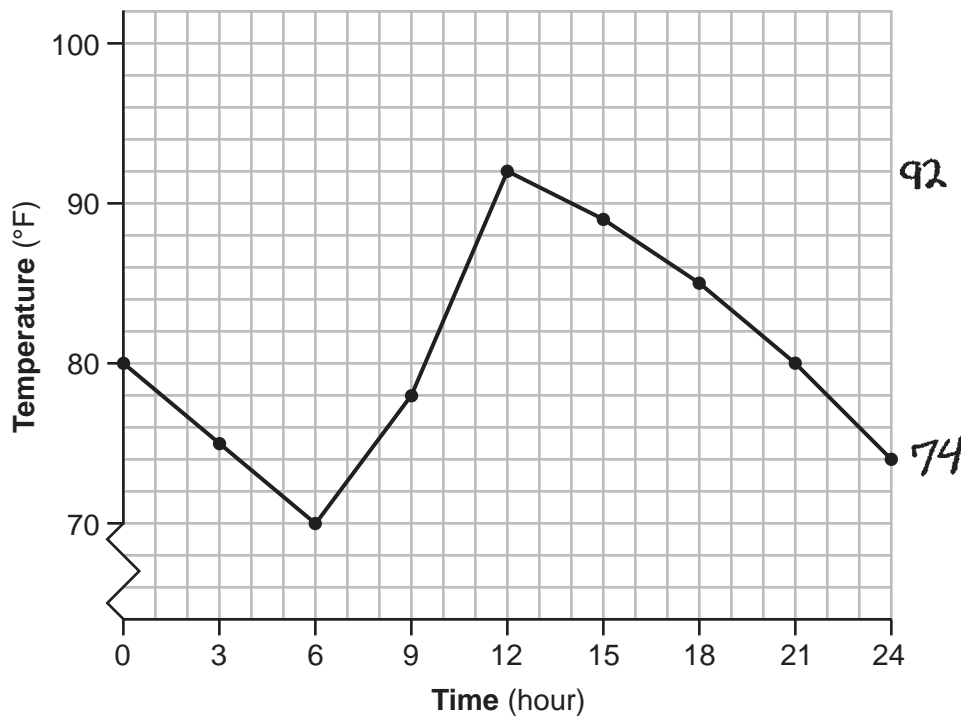
**Score 4:** The student gave a complete and correct response.

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.



State the entire interval over which the temperature is increasing.

$6-12$

State the three-hour interval that has the greatest rate of change in temperature.

$9-12$

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

This means the temp drops 3° every 2 hours.

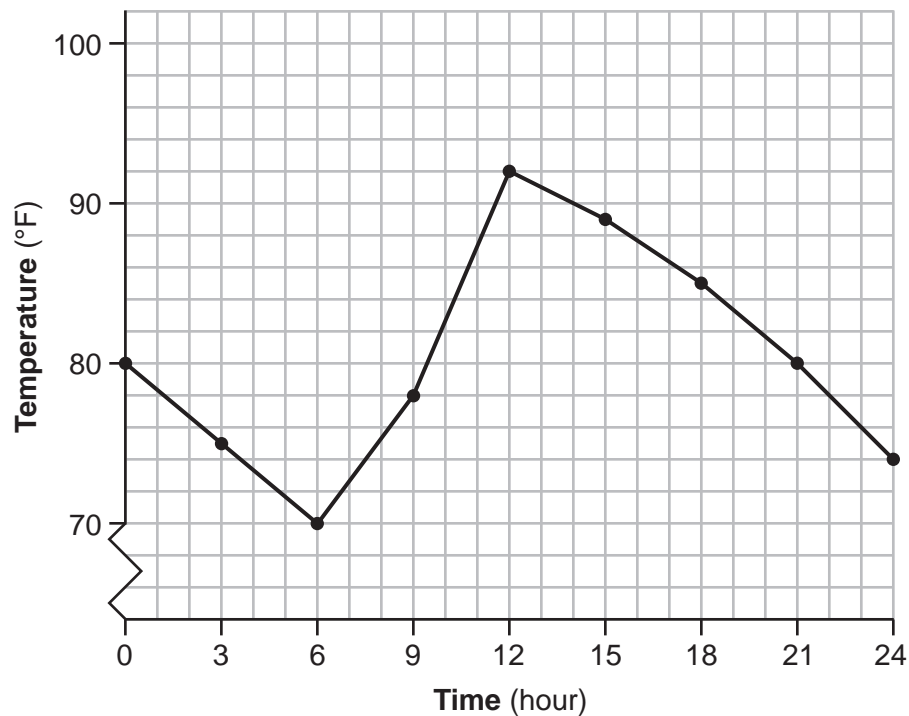$\left( \dfrac{92-74}{12-24} \quad \dfrac{18}{-12} \quad \boxed{-\dfrac{3}{2}} \right)$

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

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.



State the entire interval over which the temperature is increasing.

6 to 12 hours

State the three-hour interval that has the greatest rate of change in temperature.

9 to 12 hours

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

$$\frac{74-92}{24-12} = \frac{-18}{12}$$
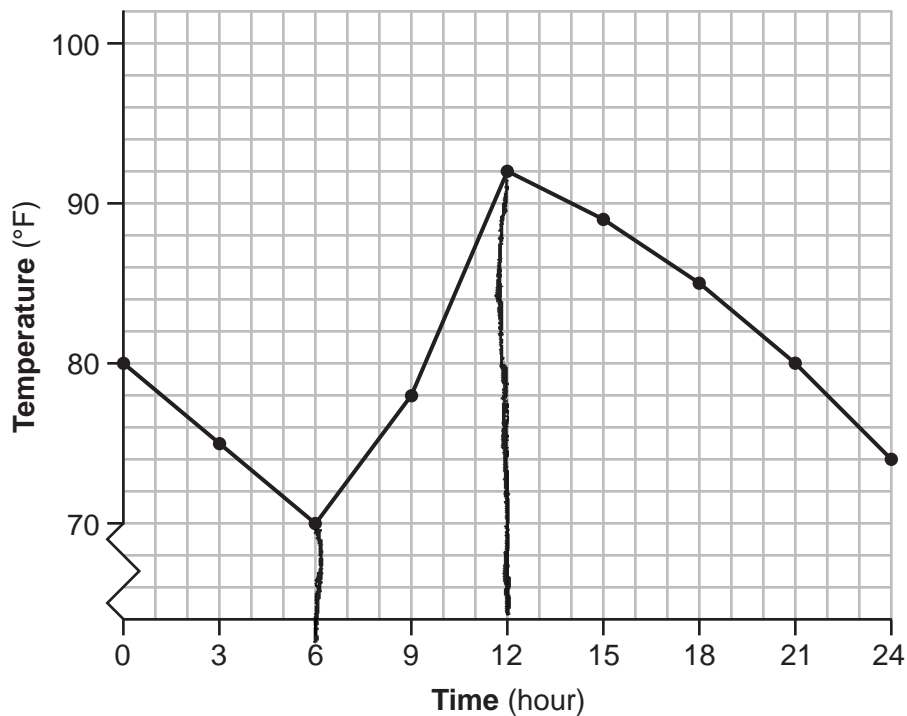
The temperature decreased 18°F every 12 hours.

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

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| **Time** (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| **Temperature** (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below ⌄5 ⌄5 ⌄8 ⌄14 3 4 5 ⌄6



State the entire interval over which the temperature is increasing.

$(6, 12)$

State the <u>three-hour</u> interval that has the <u>greatest rate of change in temperature.</u>

$(9, 12)$

State the average rate of change from hour <u>12</u> to hour <u>24</u>. Explain what this means in the context of the problem.

The average rate of change is -4.5°F.
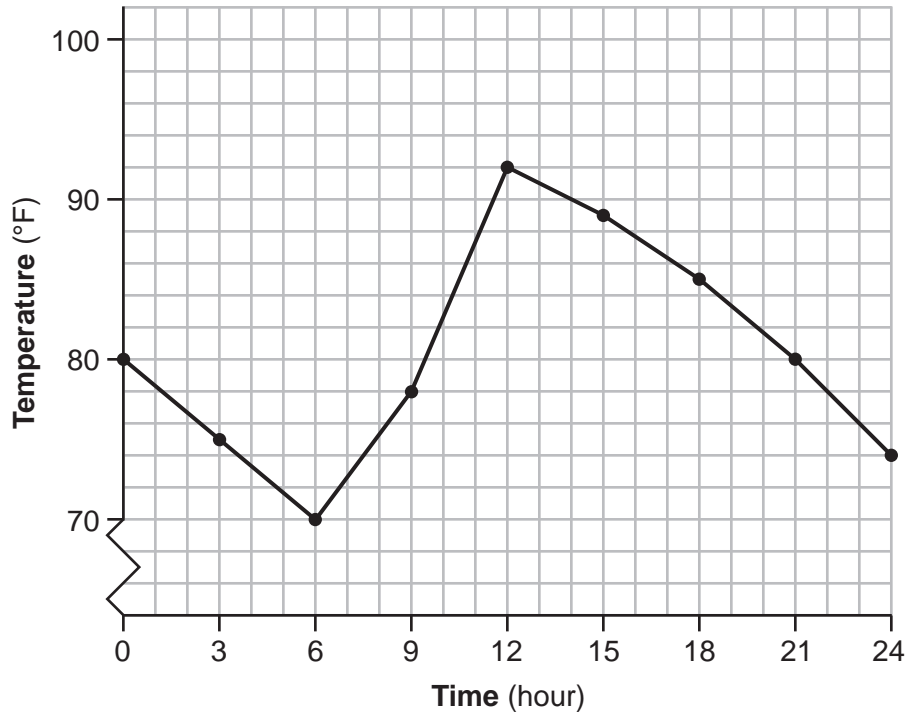This means that on average the temperature drops 4.5 F° every 3 hours.

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

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.



State the entire interval over which the temperature is increasing.

6-12

State the three-hour interval that has the greatest rate of change in temperature.

9-12

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

It's dropin

$$y = \frac{-2}{3} \cdot y = \frac{-2\frac{1}{2}}{3} \quad y =$$
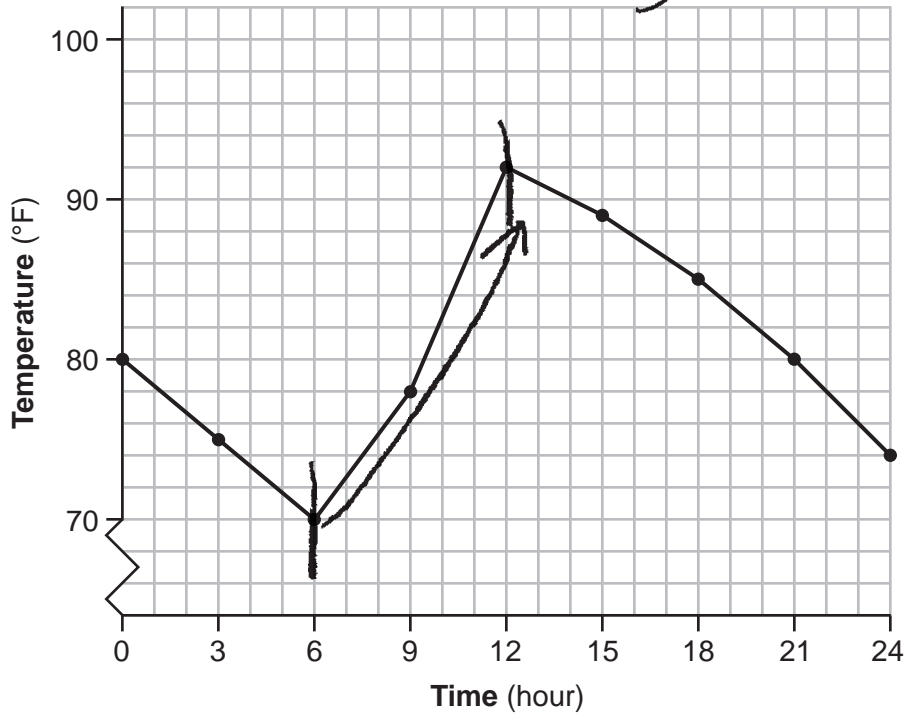
**Score 2:** The student stated 6-12 and 9-12 correctly.

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

3

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

$\frac{\Delta y}{\Delta x}$

Her data are modeled on the graph below.

3



**Temperature** (°F)

**Time** (hour)

State the entire interval over which the temperature is increasing.

$6 \leq x \leq 12$

State the three-hour interval that has the greatest rate of change in temperature.

$6 \leq x \leq 12$

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

This means that depending on the time, the rate of change changes.

1.5 degrees Farenheit/hr

**Score 1:** The student stated the first interval correctly.

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.
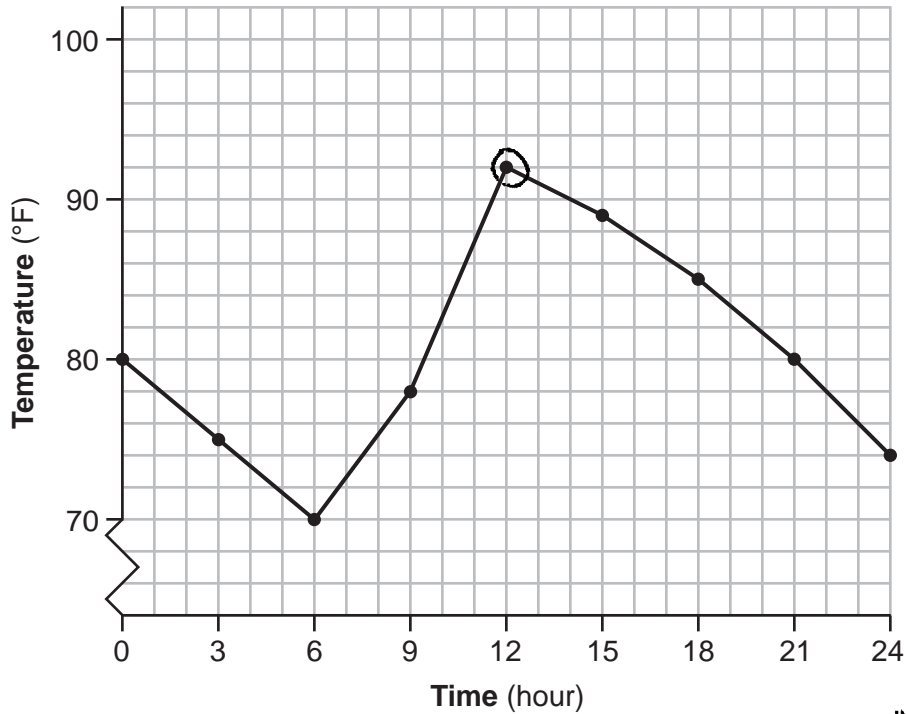


State the entire interval over which the temperature is increasing.

$$\text{The interval is } (12, 92)$$
$$(\text{hour}) \quad (°F)$$

State the three-hour interval that has the greatest rate of change in temperature.

$$\text{The interval is } (12, 92)$$

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

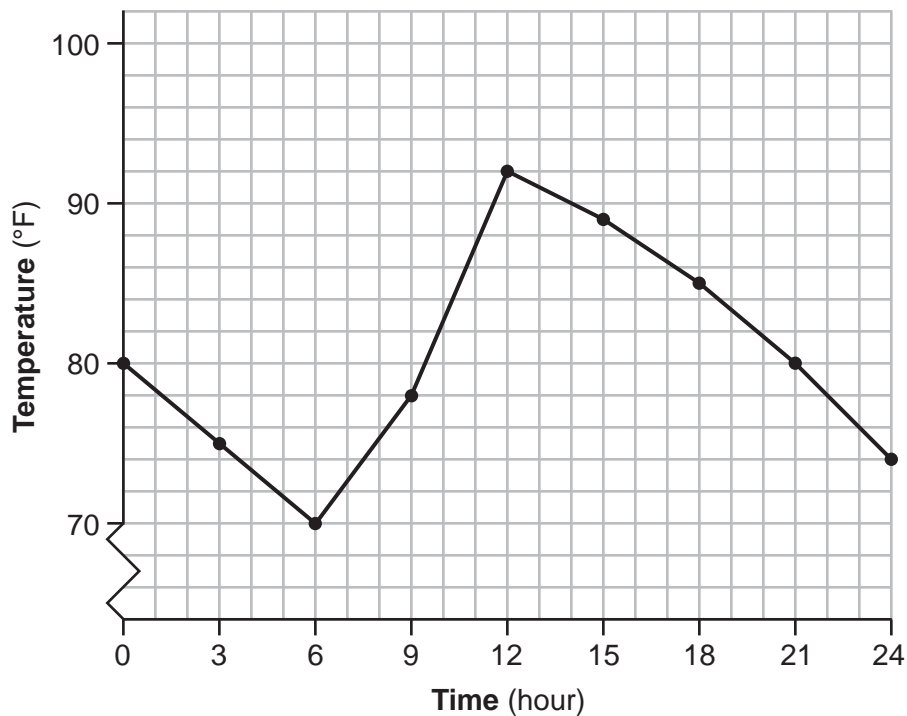$$\frac{74-92}{24-12} = \frac{-18}{12} = -1.5$$

the rate of
cange is
-1.5

**Score 1:** The student stated the average rate of change correctly.

**34** Jean recorded temperatures over a 24-hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.



State the entire interval over which the temperature is increasing.

State the three-hour interval that has the greatest rate of change in temperature.

$$9 \geq x \leq 12$$

State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

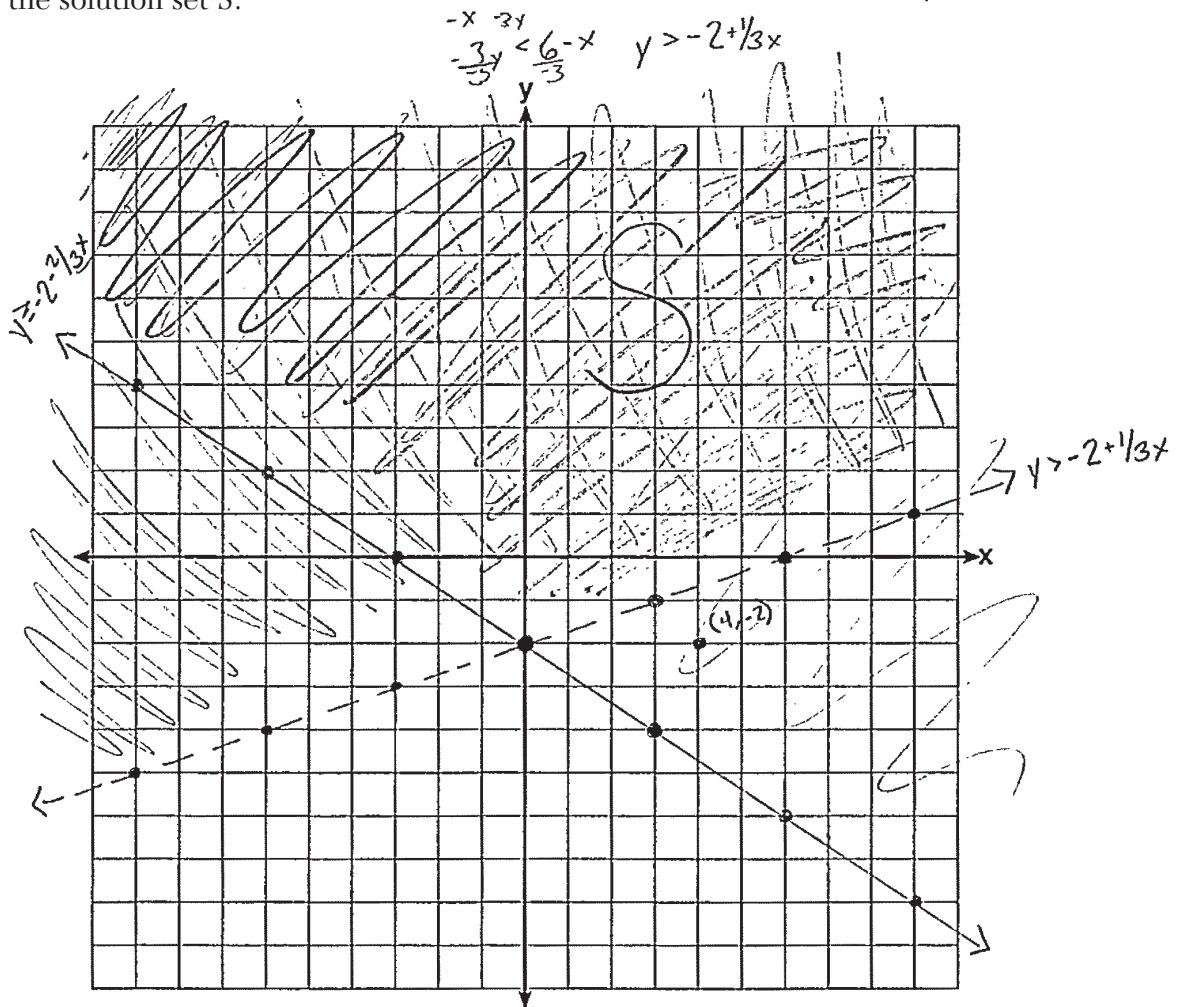**Score 0:** The student did not show enough correct work to receive any credit.

**35** Solve the following system of inequalities graphically on the set of axes below.

$$2x + 3y \geq -6$$
$$x < 3y + 6$$

$2x + 3y \geq -6 - \frac{2}{3}x$

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

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

Label the solution set $S$.

$-x \quad 3y$

$\frac{-3y}{-3} < \frac{6-x}{-3} \quad y > -2 + \frac{1}{3}x$



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

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

$(4,-2)$

Is the point $(4,-2)$ in the solution set?

Explain your answer. No. It's a solution to the first inequality, but not to both.

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

**35** Solve the following system of inequalities graphically on the set of axes below.

$$2x + 3y \geq -6$$
$$x < 3y + 6$$

$$x < 3y + 6$$
$$-6 \qquad -6$$
$$\overline{\quad x - 6 < 3y \quad}$$
$$\frac{x-6}{3} < \frac{3y}{3}$$
$$\frac{1}{3}x - 2 < y$$
$$y > \frac{1}{3}x - 2$$

$$2x + 3y \geq -6$$
$$-2x \qquad -2x$$
$$\overline{\qquad\qquad}$$
$$\frac{3y}{3} \geq \frac{-6-2x}{3}$$
$$y \geq -2 - \frac{2}{3}x$$
$$y \geq -\frac{2}{3}x - 2$$

Label the solution set $S$.
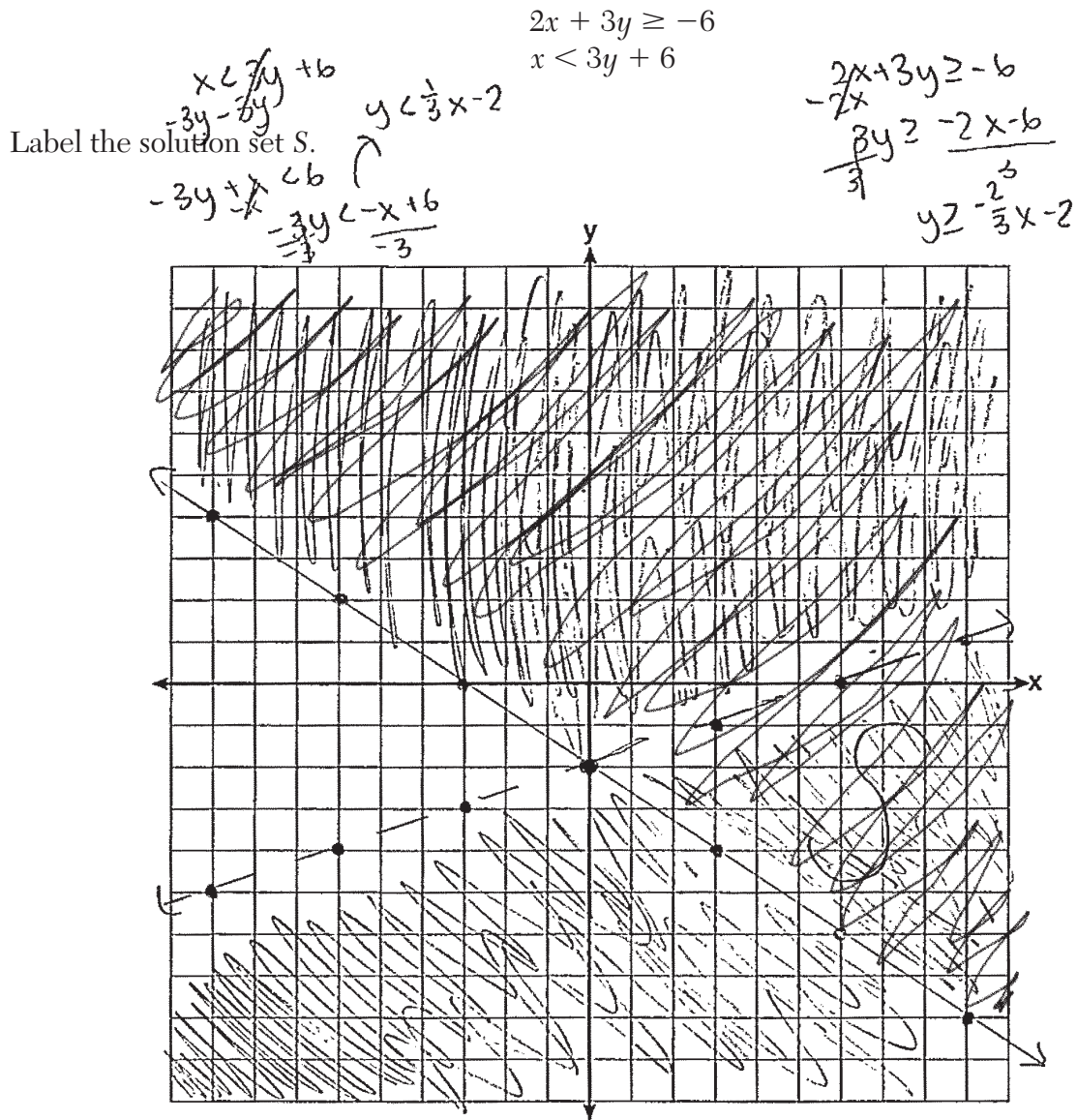


Is the point $(4,-2)$ in the solution set?

Explain your answer.

Point $(4,-2)$ is not in the solution set due to the fact that it is only found in ONE inequality and not both which is required to be in a solution set.

**Score 3:** The student did not label at least one of the inequalities.

**35** Solve the following system of inequalities graphically on the set of axes below.

$$2x + 3y \geq -6$$
$$x < 3y + 6$$

Label the solution set S.

$x < 3y + 6$

$\frac{-3y \quad -3y}{}$

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

$-3y + x < 6$

$\frac{-3y < -x + 6}{-3}$

$-2x + 3y \geq -6$

$-2x$

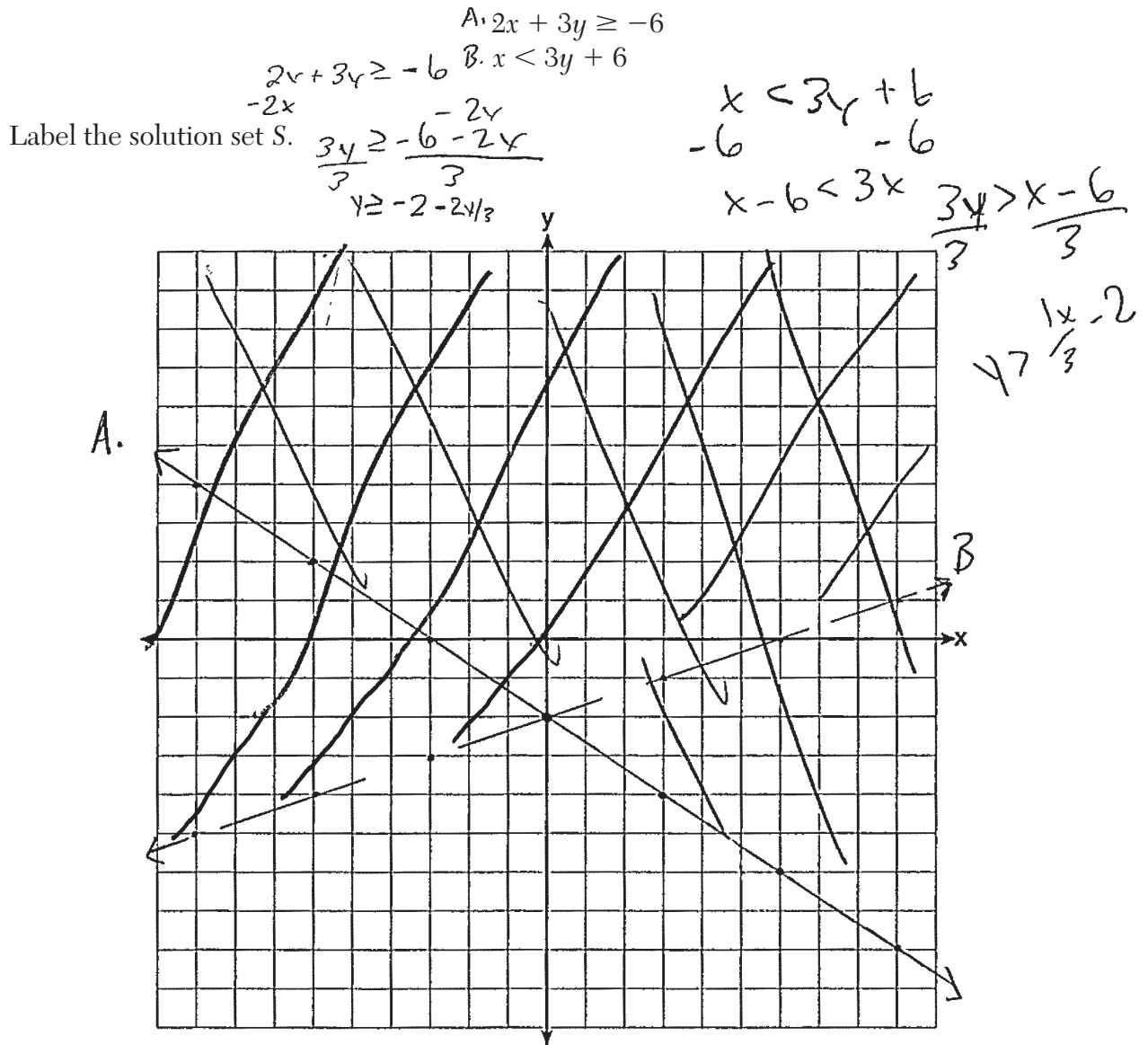$\frac{3y \geq -2x - 6}{3}$

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



Is the point $(4, -2)$ in the solution set?

Explain your answer. Yes because when shaded the point $(4, -2)$ is in both equations' shaded area.

**Score 2:** The student did not label at least one graph and shaded $x < 3y + 6$ incorrectly.

**35** Solve the following system of inequalities graphically on the set of axes below.

$$A. \ 2x + 3y \geq -6$$
$$B. \ x < 3y + 6$$

Label the solution set S.

$2x + 3y \geq -6$
$-2x \qquad -2x$
$\dfrac{3y}{3} \geq \dfrac{-6 - 2x}{3}$
$y \geq -2 - 2x/3$

$x < 3y + 6$
$-6 \qquad -6$
$x - 6 < 3x$
$\dfrac{3y}{3} > \dfrac{x - 6}{3}$
$y > \dfrac{1x}{3} - 2$

A.

B.

Is the point $(4, -2)$ in the solution set?

Explain your answer.

Yes because it is in were the lines are.

**Score 2:** The student graphed and labeled both inequalities correctly.

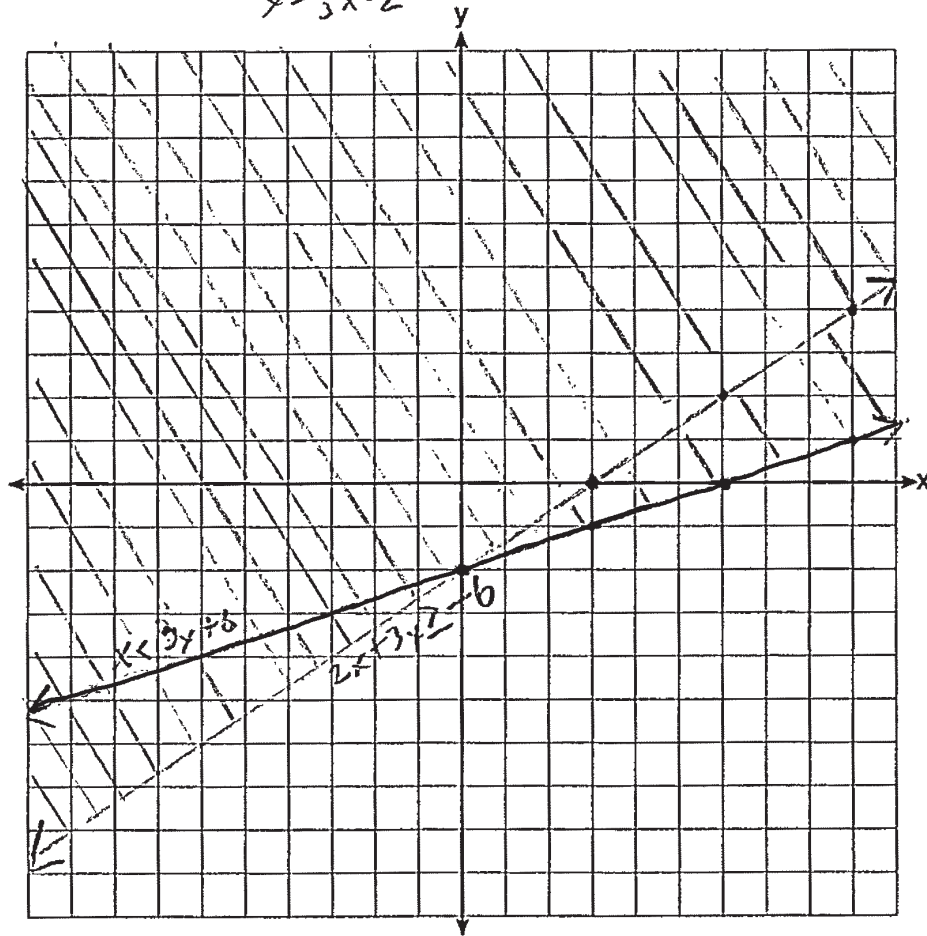**35** Solve the following system of inequalities graphically on the set of axes below.

$$2x + 3y \geq -6$$
$$x < 3y + 6$$

$-x \geq -6$

Label the solution set *S*.

$2x \geq -3y - 6$

$x \leq \dfrac{-3}{2}$

$3y \geq -2x - 6$

$y \geq \dfrac{2}{3}x - 2$

$-3y < -x + 6$

$y > \dfrac{1}{3}x - 2$



Is the point $(4, -2)$ in the solution set?

Explain your answer.   no its not in the shaded area.

---

**35** Solve the following system of inequalities graphically on the set of axes below.

$$Y > \frac{1}{3}X - 2$$

$$2x + 3y \geq -6 - 2x \quad \frac{3y}{3} \geq \frac{-6 - 2x}{3}$$

$$\frac{-6}{3} \frac{2}{x} \leq 3y \quad \frac{-6}{-3} \cancel{\text{6}}$$

$$Y \geq -2 \frac{-2}{3} X$$

Label the solution set $S$.



$$Y > \frac{1}{3}X - 2$$

$(4,-2)$
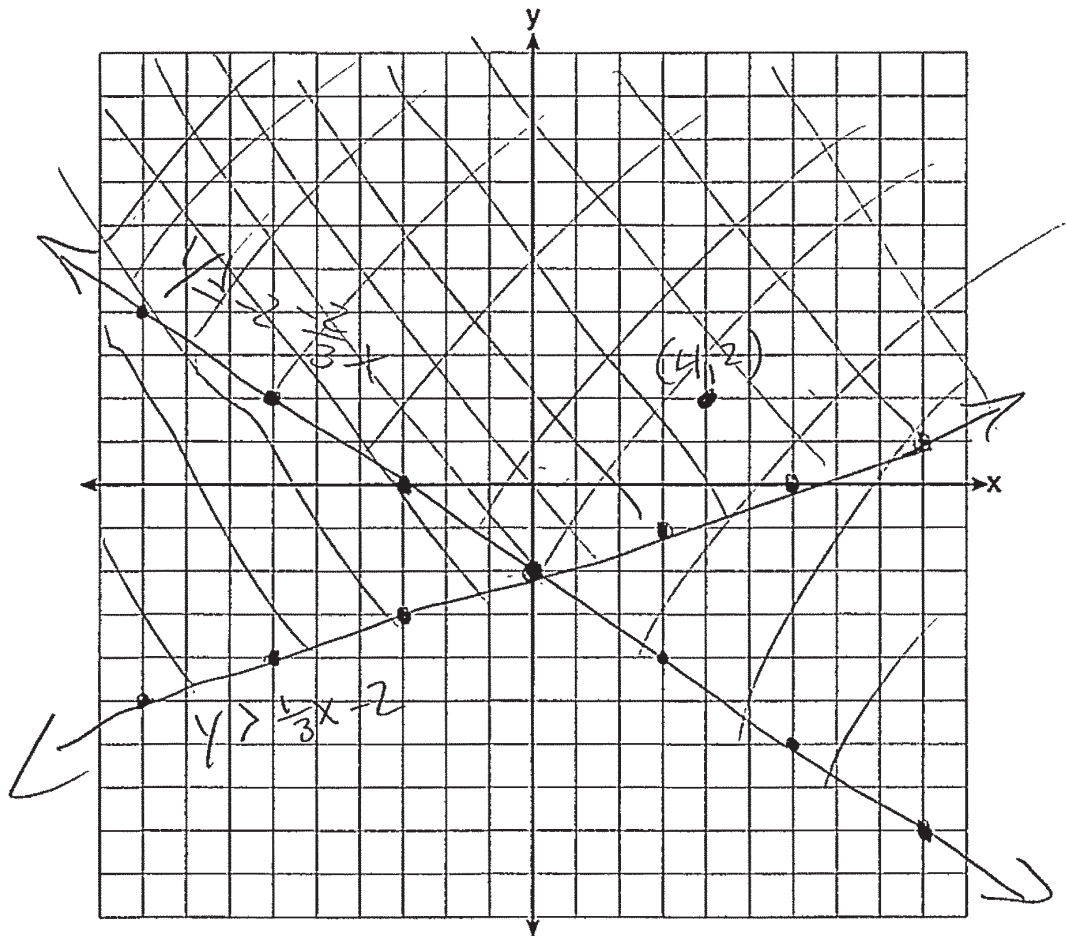
Is the point $(4,-2)$ in the solution set?

Explain your answer. Yes because it is in the checkered area

---

**Score 1:** The student graphed $2x + 3y \geq -6$ correctly.

**35** Solve the following system of inequalities graphically on the set of axes below.
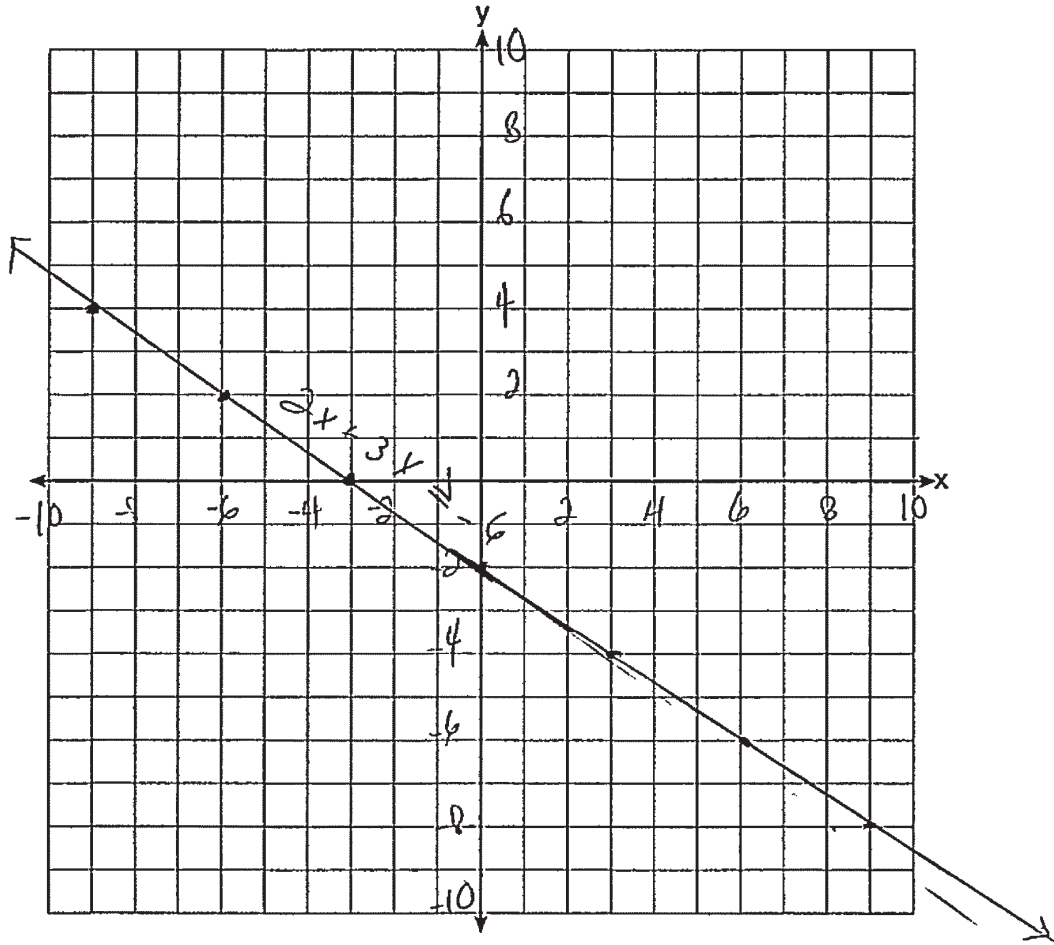
$$2x + 3y \geq -6$$
$$x < 3y + 6$$

$X < 3Y + 6$

Label the solution set $S$.

$2X + 3Y \geq -6$
$-2x \qquad -2x$
_____

$\dfrac{Y}{3} \geq \dfrac{-2x}{3} \dfrac{-6}{3}$

$\dfrac{-2}{3}X - 2$

| X | Y |
|----|----|
| -9 | 4 |
| 6 | 2 |
| 3 | 0 |
| 0 | -2 |
| | -4 |
| | -6 |
| | -8 |



Is the point $(4,-2)$ in the solution set?

Explain your answer.

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

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.    $y = ax + b$

$$y = 184.89x - 1706.07$$

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

correlation coefficient : 0.99

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

As the height of the horse increases the weight of the horse increases.

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

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.

$$y = 184.89x + -1706.07$$

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

0.99

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

the correlation coefficient indicates that it has a strong, positive correlation

**Score 3:** The student did not write an explanation in context.

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.

$$y = 184.89x + {\sim}1706.07$$

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

.9

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

The closer it is to 1 and -1 The closer it is to a line.

**Score 2:** The student only wrote a correct linear regression equation.

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.

$$y = 184.9x - 1706.1$$

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

$$0.99$$

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

It shows how much weight is left over.

**Score 2:** The student rounded the regression equation incorrectly and wrote an incorrect explanation.

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

$x_1$  $x_2$   $y_1$  $y_2$

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.

$$184.89 \div 1706.07$$

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

$$0.985 \rightarrow .99$$

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

Because it's a high positive #

**Score 1:** The student stated the correlation coefficient correctly.

**36** Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) x | Weight (lbs) y |
|---|---|
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the *nearest hundredth*.

$$\frac{\Delta y}{\Delta x} = \frac{638-264}{12-11} = \frac{374}{1}$$

$$y = mx+b$$

$$y = 2x+374$$

State the correlation coefficient for the linear regression. Round your answer to the *nearest hundredth*.

coefficient: 2

Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

This means that when you graph this, the graph will go up 2 over 1

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

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

$$\begin{cases} 3r + 2d = 31.88 \\ 2r + d = 18.92 \end{cases}$$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$\begin{cases} 3r + 2d = 31.88 \\ -2(2r + d = 18.92) \end{cases}$$

$$\begin{array}{rr} 3r & 31.88 \\ -4r & -37.84 \\ \hline -r = & -5.96 \\ \hline r = 5.96 \end{array}$$
rose

$2(5.96) + d = 18.92$

$11.92 + d = 18.92$

$\boxed{d = 7.}$
daisy

$\boxed{\begin{array}{l} 1 \text{ rose costs } \$5.96 \\ 1 \text{ daisy costs } \$7.00 \end{array}}$

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

---

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$$(31.88 + 18.92) - [5.(4.50) + 3(6.50)]$$

$$50.80 - [42]$$

She would have
Saved $8.80

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

$$3r + 2d = 31.88$$
$$2r + d = 18.92$$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$3r + 2d = 31.88$$
$$2r + d = 18.92 \rightarrow d = 18.92 - 2r$$

$$3r + 2(18.92 - 2r) = 31.88$$
$$3r + 37.84 - 4r = 31.88$$
$$37.84 - r = 31.88 \qquad d = 18.92 - 2(5.96)$$
$$-r = -5.96 \qquad \boxed{d = 7}$$
$$\boxed{r = 5.96}$$

**Score 5:** The student did not state the amount of money saved.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

Original   31.88 + 18.92 = 50.80

Sale   3(4.50) + 2(6.50) + 2(4.50) + 6.50 = 42

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

Let:

$r$ = cost rose

$d$ = cost of daisy

$\$31.88 = 3r + 2d$

$\$18.92 = 2r + 1d$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$-2(2d + 3r = 31.88) \longrightarrow -4d \cancel{-6r} \quad -63.76$$
$$+3(1d + 2r = 18.92) \longrightarrow 3d + \cancel{6r} = 56.76$$

$$\frac{-d}{-1} = \frac{-7}{-1} \qquad d = \$7$$

$18.92 = 2r + 1(7)$

$18.92 = 2r + 7$

$\phantom{18.92 =} -7 \phantom{= 2r} -7$

$$\frac{11.92}{2} = \frac{2r}{2} \qquad r = \$5.96$$

**Question 37 is continued on the next page.**

**Score 4:** The student did not correctly determine how much money would have been saved.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$$5.96\ R$$
$$+7.00\ D$$
$$\overline{12.96}$$

$$4.50\ R$$
$$+6.50\ D$$
$$\overline{11.00}$$

$$12.96$$
$$-11.00$$
$$\overline{1.96}$$

Dana would have saved $1.96 if buy all her flower during the sale.

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

$$3r + 2d = 31.88$$
$$2r + 1d = 18.92$$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$3r + 2d = 31.84 \qquad 3(1.49) + 2d = 31.88$$
$$-2(2r + 1d = 18.92) \qquad 4.47 + 2d = 31.88$$
$$3r + 2d = 31.88 \qquad -4.47 \qquad -4.47$$
$$-4r - 2d = -37.84 \qquad \frac{2d}{2} = \frac{27.41}{2}$$
$$\frac{-4r}{-4} = \frac{-5.99}{-4}$$

doesn't add up?

$$\boxed{r = \$1.49}$$

$$\boxed{d = \$13.71}$$

**Score 4:** The student solved their system of equations incorrectly.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$$5(4.50) + 3(6.50) = \cancel{\$42}$$
Original was $50.80
so you saved $8.80

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

$$3r + 2d = 31.88$$
$$2r + 1d = 18.92$$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$3r + 2d = 31.88 \qquad 3r + 2d = 31.88$$
$$-2(2r + 1d = 18.92) \quad -4r - 2d = -37.84$$
$$\overline{\qquad\qquad} \quad \overline{-1r = 5.96}$$
$$\overline{\qquad -1}$$

$$3(5.96) + 1d = 18.92 \qquad \boxed{r = 5.96}$$
$$17.88 + 1d = 18.92$$
$$-17.88 \qquad -17.88$$
$$1d = 1.04 \quad d = 1.04$$

**Score 3:** The student only wrote a correct system of equations and the correct cost of the rose.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$$3(4.50) + 2(6.50) = 31.80$$
$$13.50 + 13.00 = 31.80$$
$$26.50 = 31.80$$
$$5.30 \text{ saved}$$

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for \$31.88. Later that day, she went back and bought two roses and one daisy for \$18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

**Score 2:** The student correctly determined how much money was saved.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$$r = 5.96$$

$$\text{Sale} = 4.50$$
$$\overline{\phantom{Sale =4.50}}$$
$$1.46$$

$$d = 7$$

$$\text{Sale} = 6.50$$
$$\overline{\phantom{Sale = 6.50}}$$
$$0.50$$

$$5(1.46) + 3(0.50) = 8.80$$

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

$$3x + 2y = 31.88$$
$$2x + y = 18.92$$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$\frac{-1y}{-1} = \frac{25.92}{-1}$$

$$-2(3x + 2y = 31.88)$$
$$3(2x + y = 18.92)$$

$$-6x - 4y = -63.76$$
$$6x + 3y = 3784$$

**Score 1:** The student did not use the indicated variables in their system of equations.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

**Score 1:** The student only found the amount of money saved for one day.

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$$3r + 2d = 31.88$$

$$3(4.50) + 2(6.50) = 26.50$$

$$\begin{array}{r} 31.88 \\ -\ 26.50 \\ \hline \$5.38 \end{array}$$

**37** Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $31.88. Later that day, she went back and bought two roses and one daisy for $18.92.

If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation.

$$3r = + 31.88x + 18.92$$

Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy.

$$18.92$$
$$31.88$$

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

**Question 37 continued**

If Dana had waited until the plants were on sale, she would have paid $4.50 for each rose and $6.50 for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

$3

The State Education Department / The University of the State of New York

# Regents Examination in Algebra I – June 2023

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

(Use for the June 2023 exam only.)

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

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

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

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