The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

# ALGEBRA I

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

## MODEL RESPONSE SET

**Table of Contents**

## Question 25

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

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

State the zeros of the function.

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

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

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

## Question 25

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

-3 1 8

I plugged f(x) = (x+3)(x-1)(x-8) into my calculator into y=. Then I clicked 2nd Trace and hit zero

State the zeros of the function.

The zeros are -3, 1, 8

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

## Question 25

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

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

State the zeros of the function.

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

$x^2 + 2x - 3$

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

## Question 25

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

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

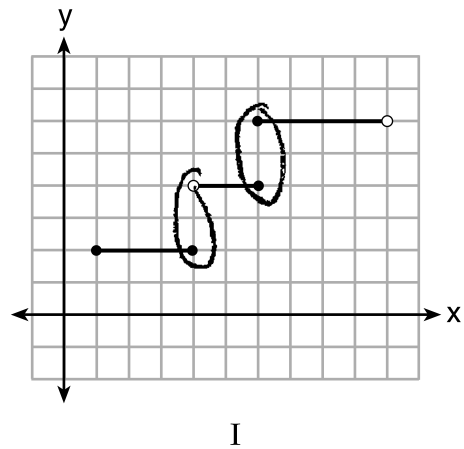
$(3, 0) \quad (-1, 0) \quad (-8, 0)$

State the zeros of the function.

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

## Question 26

**26** Four relations are shown below.



function

| x | y |
|---|---|
| −4 | 1 |
| 0 | 3 |
| 4 | 5 |
| 6 | 6 |

III

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

II

$y = x^2$ function

IV

State which relation(s) are functions.

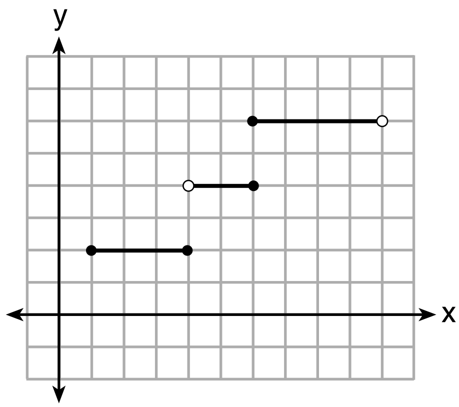
Explain why the other relation(s) are *not* functions.

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

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

## Question 26

**26** Four relations are shown below.



I

| x | y |
|---|---|
| −4 | 1 |
| 0 | 3 |
| 4 | 5 |
| 6 | 6 |

III

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

II

$y = x^2$

IV

State which relation(s) are functions.

III, and IV are functions

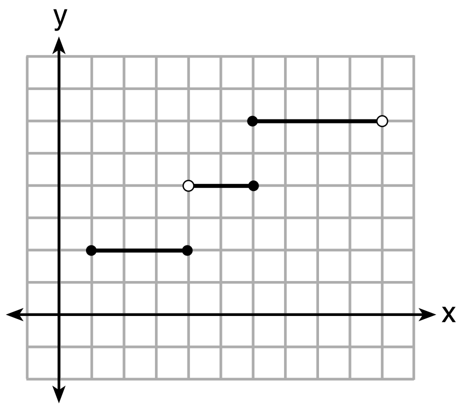
Explain why the other relation(s) are *not* functions.

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

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

## Question 26

**26** Four relations are shown below.




I

| x | y |
|---|---|
| −4 | 1 |
| 0 | 3 |
| 4 | 5 |
| 6 | 6 |

III

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

II

$y = x^2$

IV

State which relation(s) are functions.

I III IV are functions

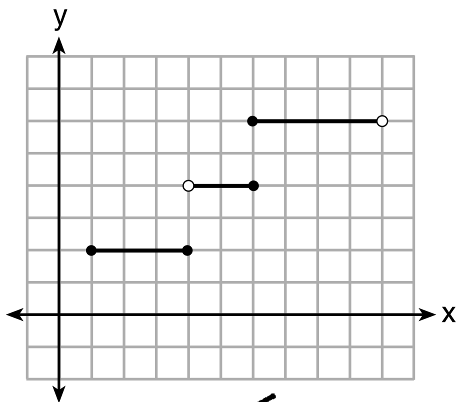
Explain why the other relation(s) are *not* functions.

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

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

## Question 26

**26** Four relations are shown below.




| x | y |
|---|---|
| −4 | 1 |
| 0 | 3 |
| 4 | 5 |
| 6 | 6 |

~~I~~ III

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

~~II~~

$y = x^2$

IV

State which relation(s) are functions. III and IV

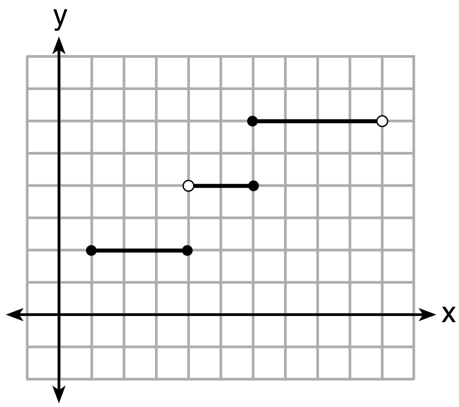
because the x-values do not repeat

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

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

## Question 26

**26** Four relations are shown below.




I

| x | y |
|---|---|
| –4 | 1 |
| 0 | 3 |
| 4 | 5 |
| 6 | 6 |

III

{(1,2), (2,5), (3,8), (2,–5), (1,–2)}

II

$y = x^2$

IV

State which relation(s) are functions.

3 = function

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

2=not A fuction
Domain repeat

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

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

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

6 2.85

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

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

3 6.26
9 3.41

$-6$ $\frac{2.85}{-6} = {}^{-}.475$

Answer: $^{-}.475$

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

## Question 27

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

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

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

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

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

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

## Question 27

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

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

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

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

47% change

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

## Question 28

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

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

$b^2-4ac$

$\overset{9}{\cancel{3^2}} - \overset{+80}{4(2)(-10)}$

$89$

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

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

## Question 28

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

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

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

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

$$-3 \pm \sqrt{9 + 80}$$

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

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

$1.608495283 \qquad -3.108495283$

Irrational

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

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

$$\overset{a}{}\quad\overset{b}{}\quad\overset{c}{}$$

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

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

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

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

$-.641504717$ $\quad$ $-5.358495283$

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

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

## Question 28

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

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

$0 = (2x+5)(x-2)$

$2x+5=0$ | $x-2=0$

$x = \frac{-5}{2}$ | $x = 2$

Rational

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

## Question 28

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

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

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

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

## Question 28

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

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

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

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

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

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

The solution is irrational because has a positive and negative number

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

## Question 29

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

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

Solve for $F$, in terms of $K$.

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

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

## Question 29

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

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

Solve for $F$, in terms of $K$.

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

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

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

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

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

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

Solve for $F$, in terms of $K$.

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

$$K = \frac{5}{9}F + 255.3722222$$

$$-255.372222 \quad -255.3722222$$

$$\frac{K - 255.3722222}{5/9} = \frac{\frac{5}{9}F}{5/9}$$

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

**Score 1:** The student rounded their answer.

## Question 29

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

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

Solve for $F$, in terms of $K$.

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

$$K = \frac{5}{9}F + 255.37\overline{2}$$

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

## Question 30

**30** Solve the following equation by completing the square:

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

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

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

$x+2=\sqrt{6}$

$-2 \qquad -2$

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

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

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

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

## Question 30

**30** Solve the following equation by completing the square:

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

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

**Score 1:** The student only completed the square correctly.

## Question 30

**30** Solve the following equation by completing the square:

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

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

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

$(x+2)^2 = 6$

$x + 2 = \sqrt{6}$

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

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

## Question 30

**30** Solve the following equation by completing the square:

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

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

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

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

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

## Question 30

**30** Solve the following equation by completing the square:

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

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

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

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

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

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

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

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

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

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

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

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

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

## Question 31

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

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

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

4th period has the largest spread because their $\sigma x$ is greater than 6th period.

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

## Question 31

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

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

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

$87.5 - 69 = 18.5$ 4th period

$88 - 71.5 = 16.5$

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

## Question 31

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

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

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

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

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

## Question 32

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

$$a_1 = 0$$
$$a_n = 2(a_{n-1})^2 - 1, \text{ for } n > 1$$

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

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

$a_2 = -1$

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

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

$a_3 = 1$

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

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

$a_4 = 1$

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

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

$a_5 = 1$

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

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

## Question 32

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

$$a_1 = 0$$
$$a_n = 2\left(a_{n-1}\right)^2 - 1, \text{ for } n > 1$$

0, -1, 1, 1, 1

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

## Question 32

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

$$a_1 = 0$$
$$a_n = 2\left(a_{n-1}\right)^2 - 1, \text{ for } n > 1$$

$a_1 = 0$

$a_2 = -1$

$a_3 = 3$

$a_4 = 35$

$a_5 = 4849$

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

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

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

$a_2 = -1$

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

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

$a_3 = 4 - 1$

$a_3 = 3$

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

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

$a_4 = 36 - 1$

$a_4 = 35$

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

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

$a_5 = (70)^2 - 1$

$a_5 = 4849$

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

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

$$a_1 = 0$$
$$a_n = 2\left(a_{n-1}\right)^2 - 1, \text{ for } n > 1$$

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

$a_1 = -1$

$a_1 = -1$

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

$a_2 = -7$

$a_2 = -1$

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

$a_3 = 7$

$a_3 = 7$

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

$a_4 = 17$

$a_4 = 17$

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

$a_5 = 31$

$a_5 = 31$

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

## Question 33

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

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

Let $x$ = the number of weeks

$96 \cdot 3/4 = 72$ $\quad\quad 135 + 72x \geq 580$

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

$$135 + 72x \geq 580$$
$$-135 \quad\quad\quad -135$$
$$\frac{72x}{72} \geq \frac{445}{72}$$
$$x \geq 6.2$$

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

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

## Question 33

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

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

$96 \cdot \frac{3}{4}$

$72$

$135 + 72x \geq 580$

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

$135 + 72x \geq 580$

$-135 \qquad -135$

$\frac{72x}{72} \geq \frac{445}{72}$

$x \geq 6.18\overline{05}$

~~6 weeks~~

6.1806 weeks

**Score 3:** The student made a rounding error

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

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

let w = weeks

$135 + 96w \geq 580$

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

$\cancel{135} + 96w \geq 580$

$-\cancel{135} \qquad -135$

$\frac{\cancel{96}w}{\cancel{96}} \geq \frac{445}{96}$

$\boxed{5 \text{ weeks}}$

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

## Question 33

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

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

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

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

$$72x + 135 = 580$$
$$72x = 445$$
$$x = 6.180\overline{5}$$

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

## Question 33

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

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

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

$\frac{3}{4}$

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

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

$135 + 96(6.5)\frac{3}{4} = 590$

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

**Score 1:** The student wrote an equation.

## Question 33

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

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

$$96 + 135x = 580$$

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

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

$x = 3.6$ week →

$\boxed{\text{3 weeks}}$

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

## Question 34

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

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

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

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

3 years $= 25000(1-.185)^3 = 13533.58438$

4 years $= 25000(1-.185)^4 = 11029.87127$

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

\$2503.71

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

## Question 34

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

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

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

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

$$13534 - 11030 = \$2504$$

**Score 3:** The student rounded incorrectly.

## Question 34

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

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

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

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

$$\begin{array}{r} {}^{4}\cancel{5}{}^{18}\cancel{8}.29 \\ -\ 29.28 \\ \hline \boxed{\$129.01} \end{array}$$

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

## Question 34

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

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

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

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

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

$V(t) = 24944.50$

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

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

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

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

## Question 34

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

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

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

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

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

$V(t) = 25000 \div 74$

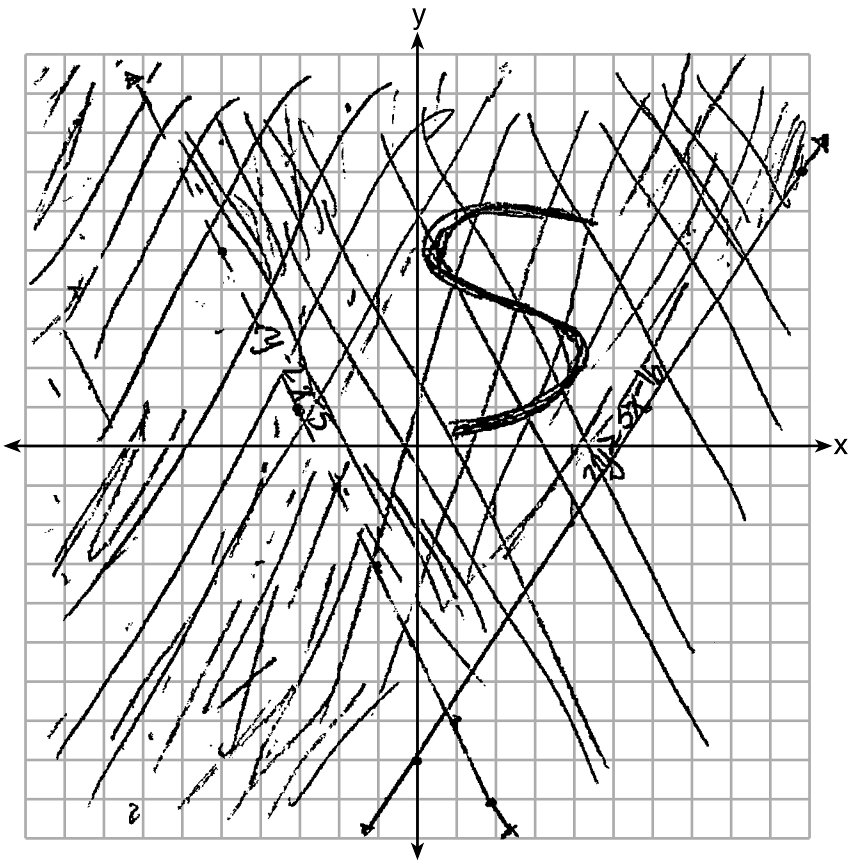
$V(t) = 5405.41$

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

## Question 35

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

$$2y \geq 3x - 16 \quad y \geq \frac{3}{2}x - 8$$
$$y + 2x > -5 \quad y > -2x - 5$$



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

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

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

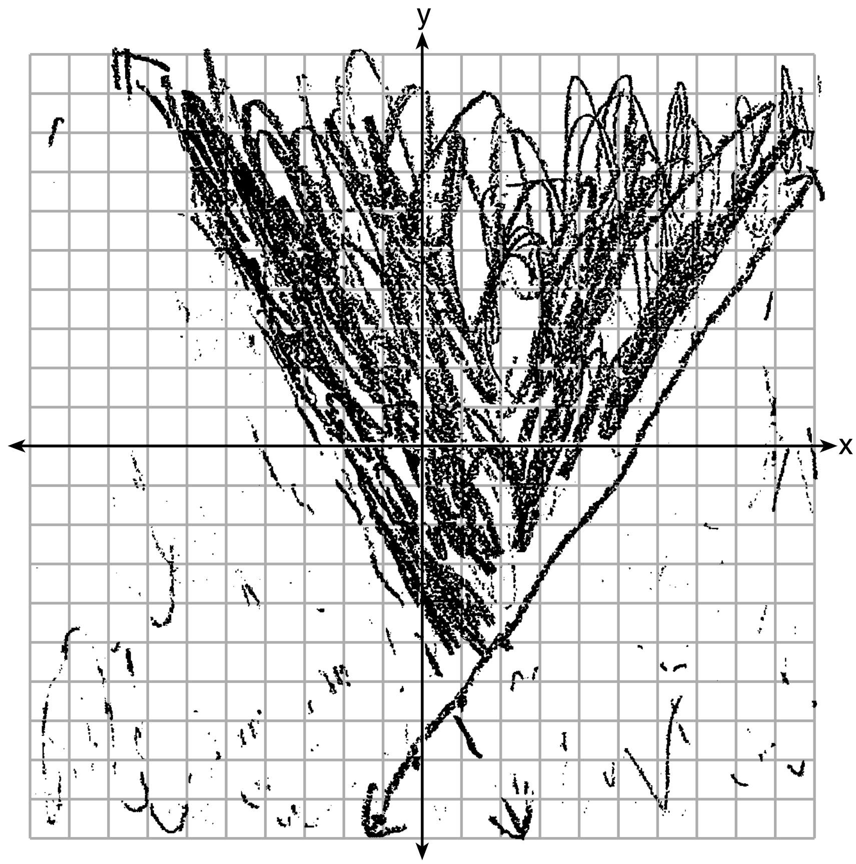
## Question 35

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

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

$$2y \geq 3x - 16$$
$$y + 2x > -5$$

$\frac{2y \geq 3x-16}{2}$
$y \geq 1.5x-8$




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

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

**Score 3:** The student did not label either inequality.

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

$2y \geq 3x - 16$

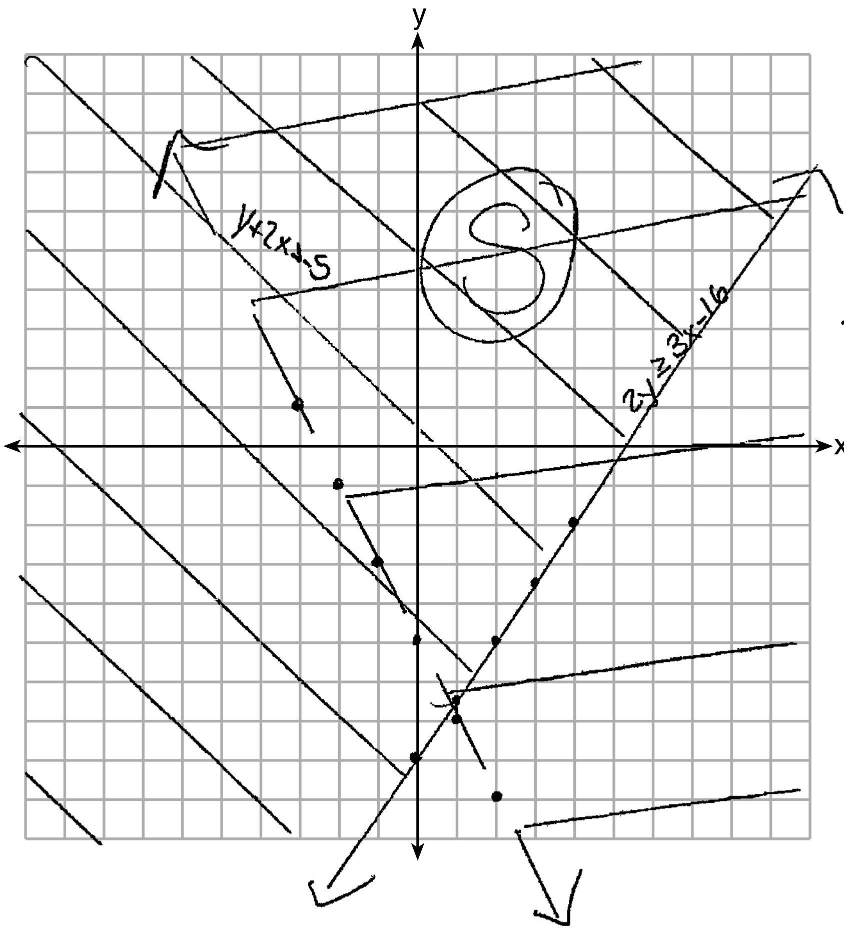
$y + 2x > -5$

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

$m=-2$
$b=-5$

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

$y \geq 1.5x-8$
$m=1.5$
$b=-8$




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

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

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

(6,1) is in the solution
and (-6,7) isnt

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

## Question 35

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

$$2y \geq 3x - 16$$
$$y + 2x > -5$$

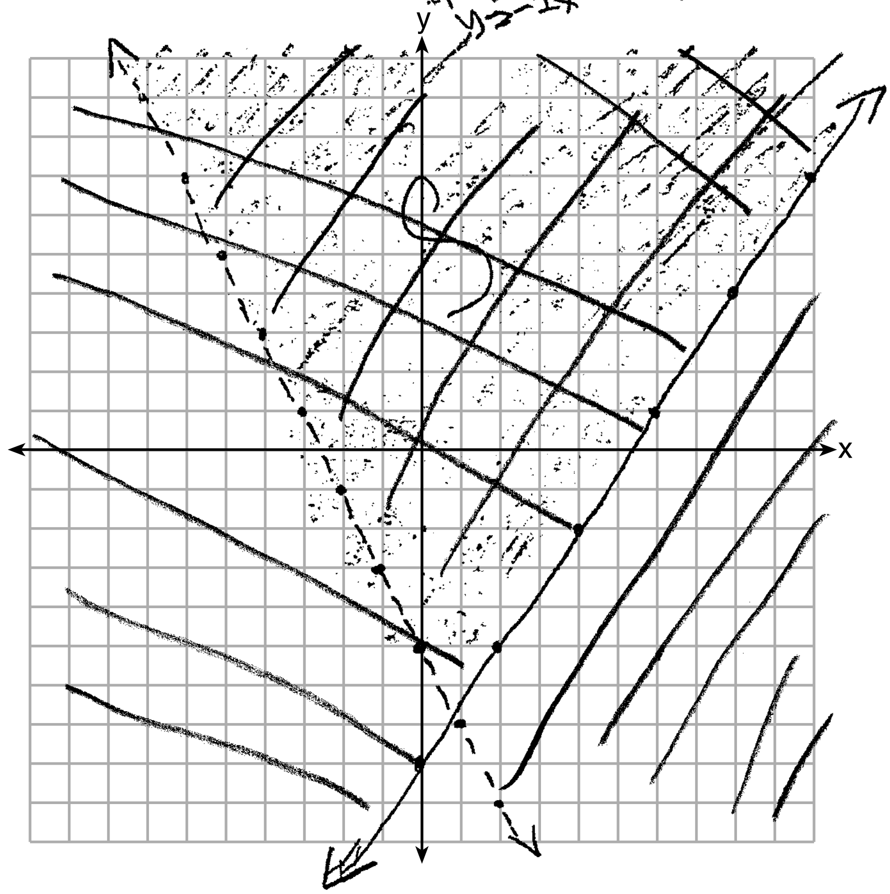
$\frac{2y}{2} \geq \frac{3x}{2} - \frac{16}{2}$

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

$-2x \quad -2x$

$y > -2x - 5$

$y > -2x - 5$



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

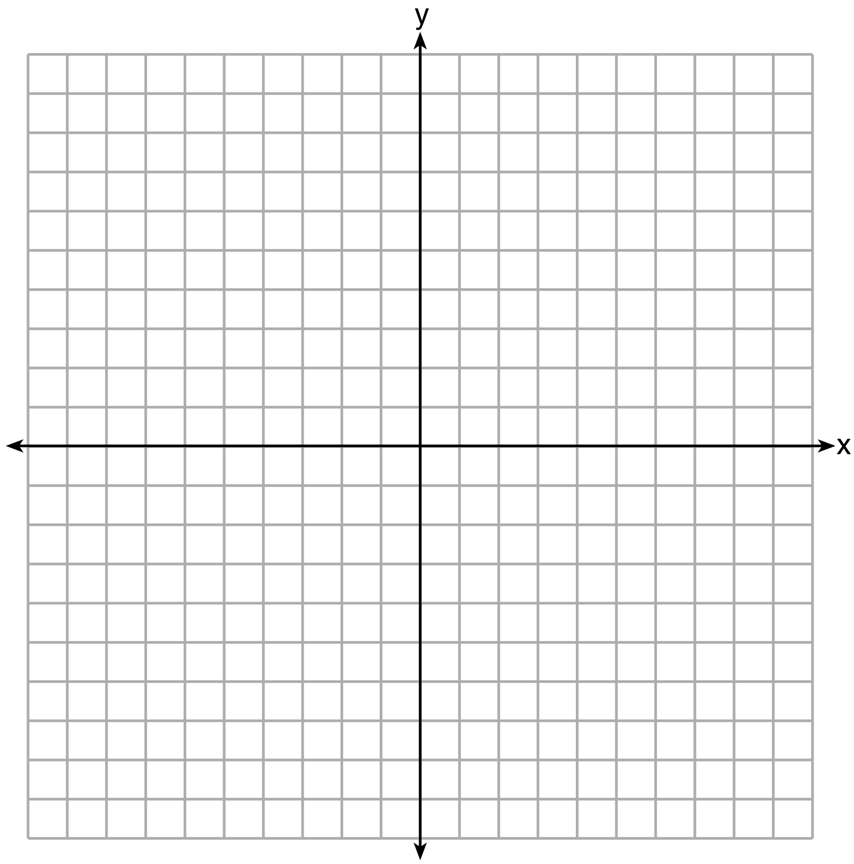
= NO ~~~~(6,1) a not a solution ~~~~ it has to inside of shaded line. ~~~~ (-6,7) is not a solution because it not.

**Score 1:** The student did not label either inequality.

## Question 35

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

$$2y \geq 3x - 16$$
$$y + 2x > -5$$



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

$2y \geq 3x - 16$
$2 \cdot 1 \geq 3 \cdot 6 - 16$
$2 \geq 18 - 16$
$2 \geq 2$ yes

$y + 2x > -5$
$1 + 2 \cdot 6 > -5$
$1 + 12 > -5$
$13 > -5$ yes

(6,1) works in both inequalites so its a solution.

$2y \geq 3x - 16$
$2 \cdot 7 \geq 3 \cdot -6 - 16$
$14 \geq -18 - 16$
$14 \geq -34$ yes

$y + 2x > -5$
$7 + 2 \cdot -6 > -5$
$7 + -12 > -5$
$-5 > -5$ no

(−6,7) doesn't work in both so its not a solution.

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

## Question 35

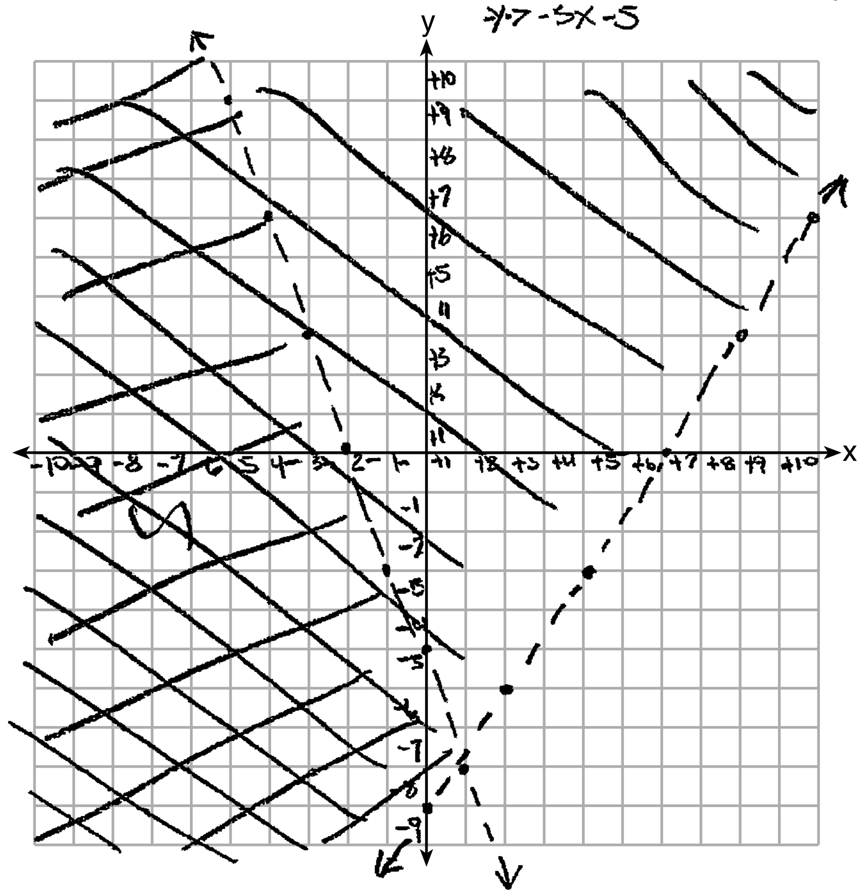
**35** Graph the following system of inequalities on the set of axes below:

$$2y \geq 3x - 16$$
$$y + 2x > -5$$

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

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

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



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

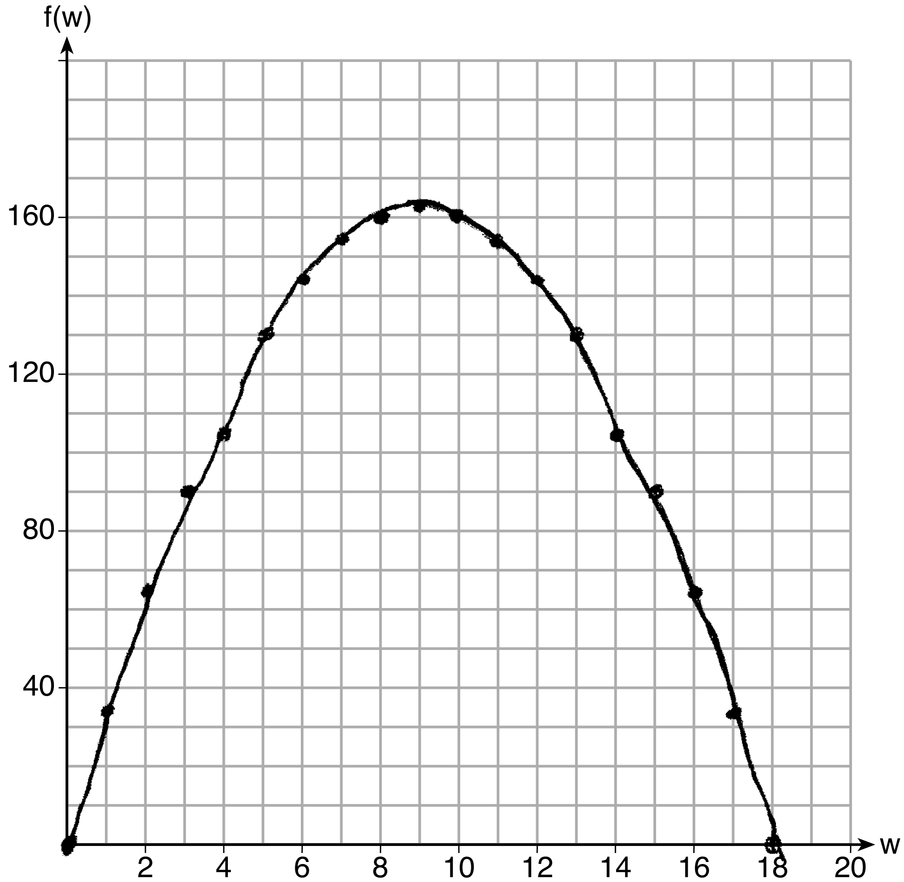
It is in striped line and that means it is a solution

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

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

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

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




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

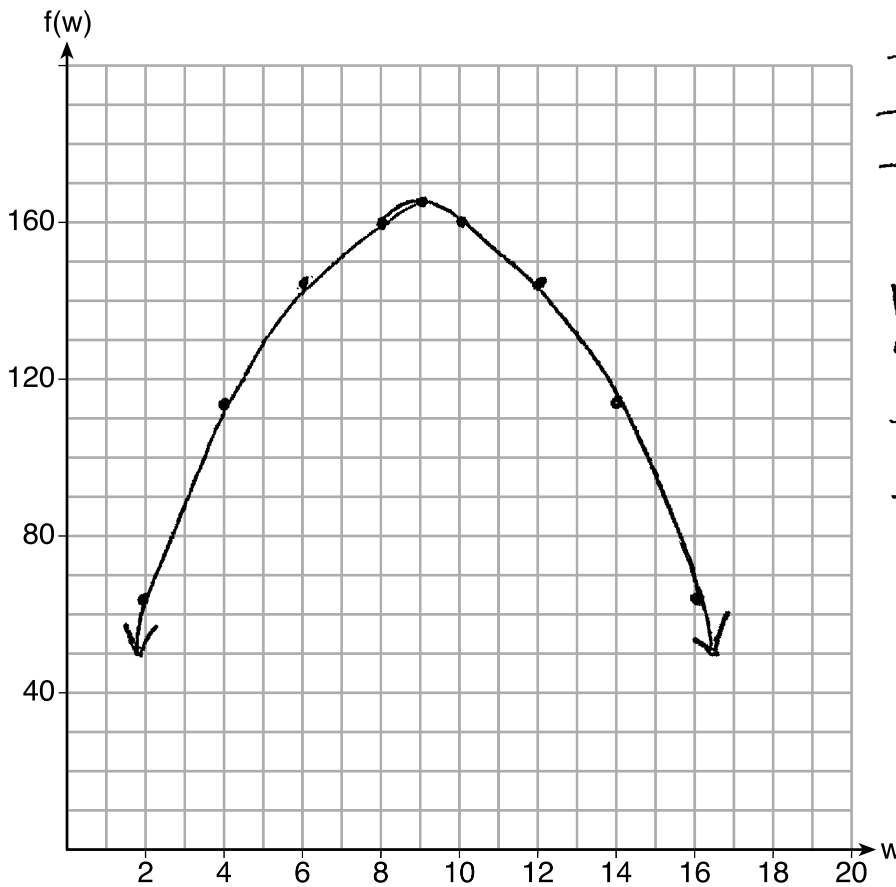
When the width of the garden was 9 the area was 162in squareft.

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

## Question 36

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

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




| x | y |
|---|---|
| 0 | 0 |
| 2 | 64 |
| 4 | 112 |
| 6 | 144 |
| 8 | 160 |
| 10 | 160 |

vertex

$\boxed{9, 162}$

| | |
|---|---|
| 12 | 144 |
| 14 | 112 |
| 16 | 64 |
| 18 | 0 |

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

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

$w(36 - 2w) = 0$

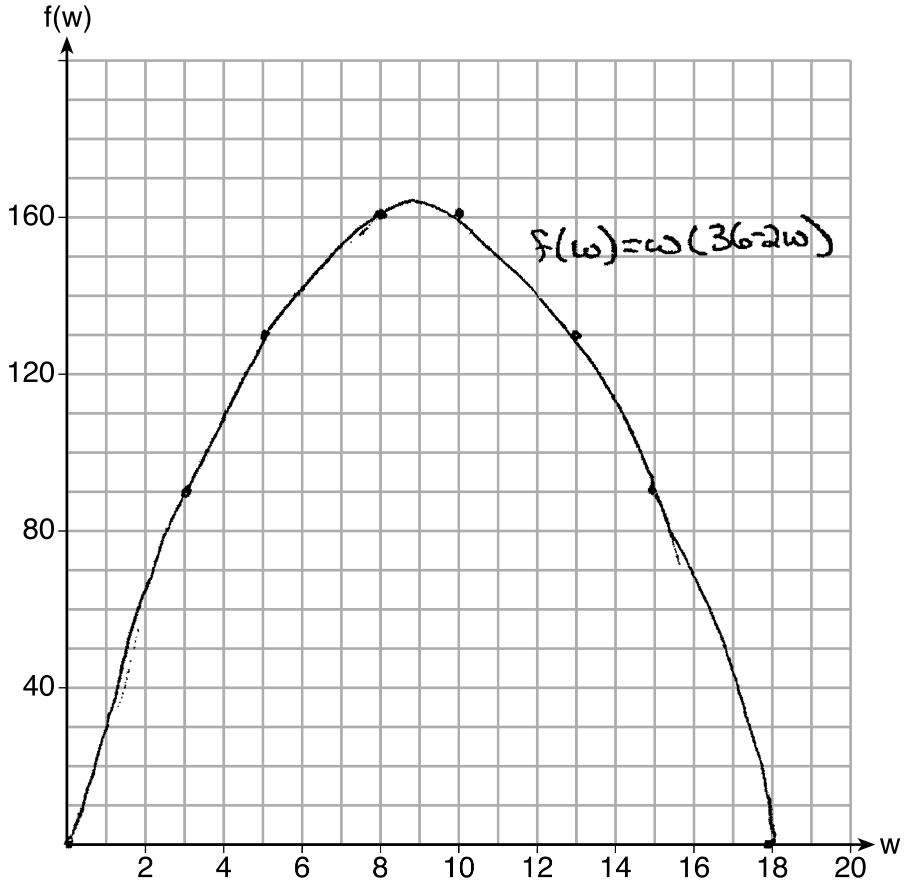
$36w - 2w^2 = 0$

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

## Question 36

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

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




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

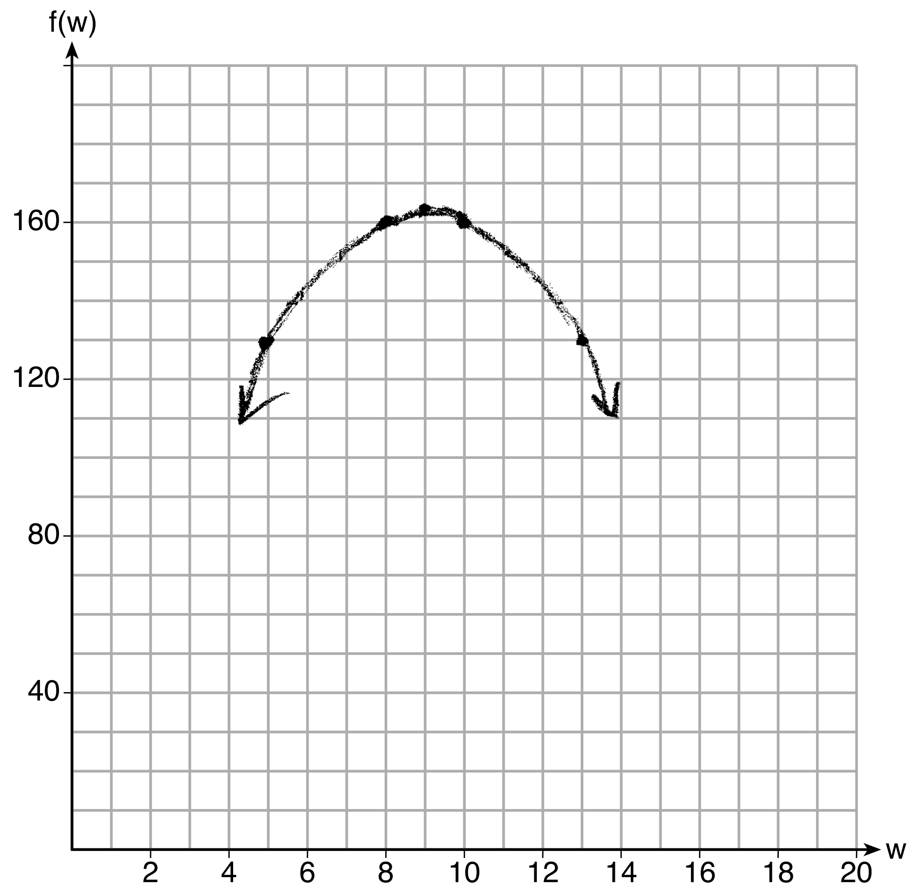
In this situation, the vertex of 162 means that the area of the garden cannot be greater than 162 square feet in total if Paul only uses 36 feet of fence

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

## Question 36

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

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

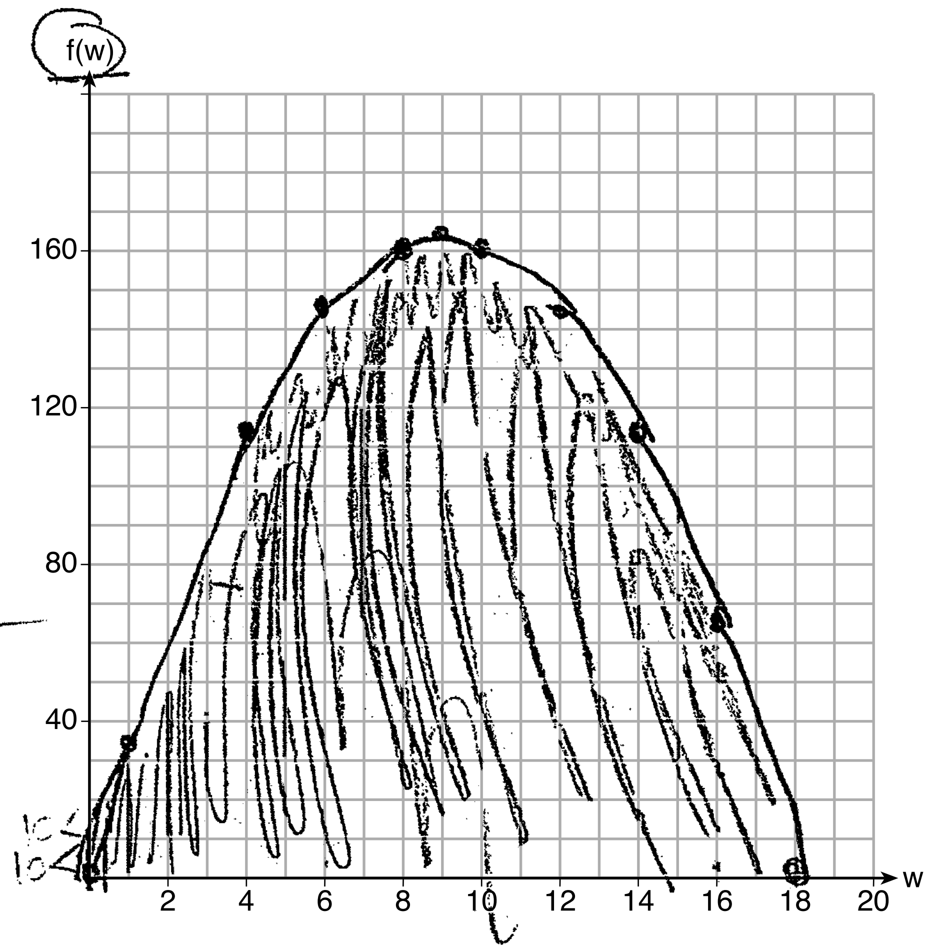



Explain the meaning of the vertex in the context of the problem.

**Score 2:** The student made a correct sketch.

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

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




10(36-20)
10(16)
160

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

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

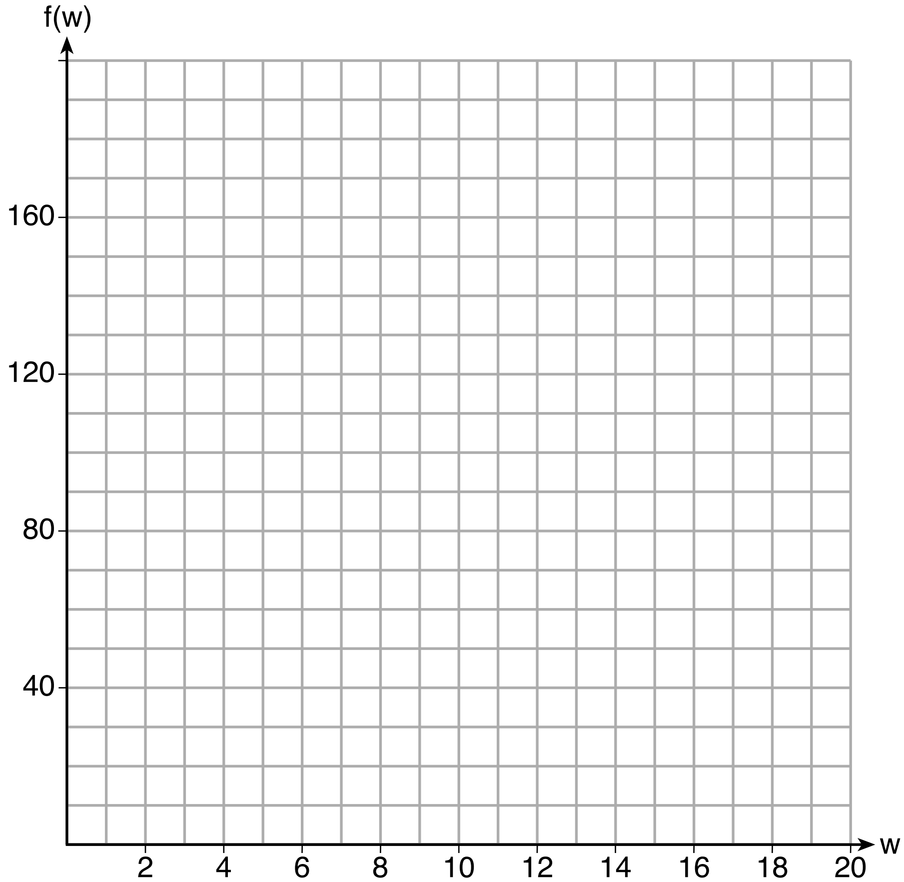
**Score 1:** The student made a graphing error by shading in the area under the parabola.

## Question 36

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

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

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




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

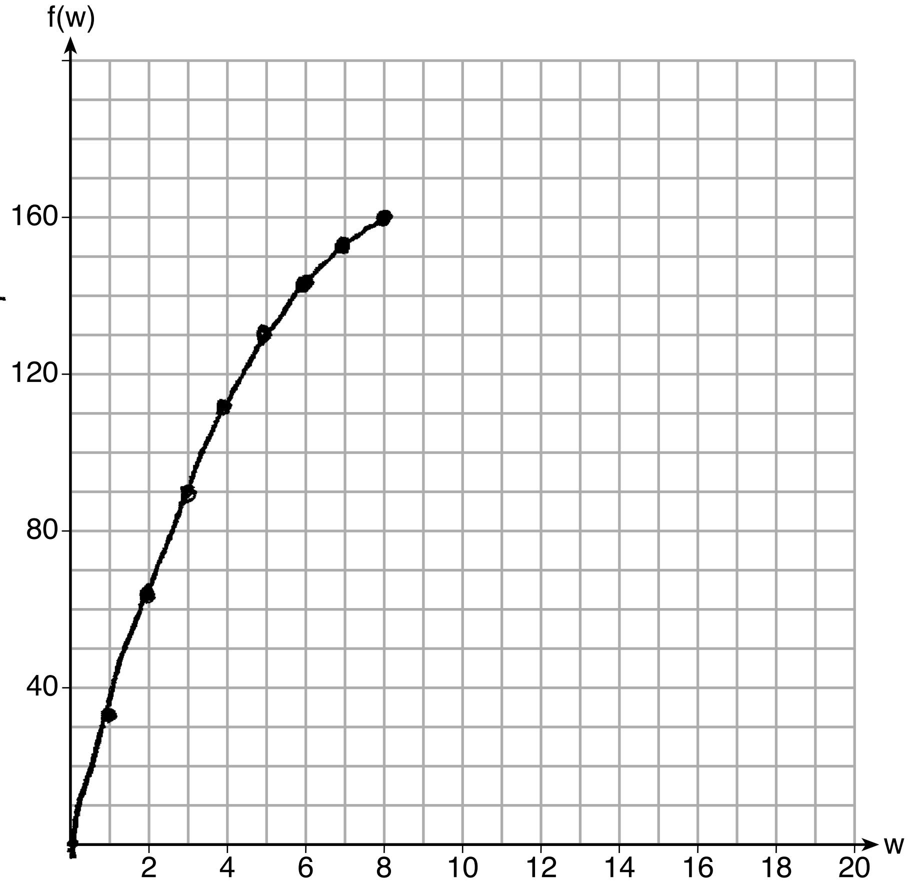
$f(x) = -2(w^2 - 18w)$
$f(x) = -2(w^2 - 18w + 81)$
$f(x) - 162 = -2(w - 9)^2$
$f(x) = -2(w - 9)^2 + 162$
Vertex $(9, 162)$

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

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

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

| X | Y |
|---|---|
| 0 | 0 |
| 1 | 34 |
| 2 | 64 |
| 3 | 90 |
| 4 | 112 |
| 5 | 130 |
| 6 | 144 |
| 7 | 154 |
| 8 | 160 |




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

the vertex is the turning point

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

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

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

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

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

$b = 6 + 4s$

$b - 3 = 7(s-3)$
$b - 3 = 7s - 21$
$+3 \quad +3$
$b = 7s - 18$

$6 + 4s = 7s - 18$
$-4s \quad -4s$
$6 = 3s - 18$
$+18 \quad +18$
$\frac{24}{3} = \frac{3s}{3}$
$\boxed{8 = s}$

$b = 6 + 4s$
$b = 6 + 4(8)$
$b = 38$

Mrs. Bee is 38 and her son is 8.

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

Let $x$ = years

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

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

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

## Question 37

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

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

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

and

$4s+6 = b$

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

Mrs Bee's age = 38 years old

Sons age = 8 years old

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

Check

$4 \cdot 8+6 = 38$

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

$35 = 35$

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

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

$4s+6 = 7s-18$

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

$-3s+24 = 0$

$3s-24 = 0$

$3s-24 = 0$

$+24 \quad +24$

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

$s = 8$

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

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

$3b = s$

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

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

## Question 37

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

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

$b = 4s + 6$

$b = 7s$

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

$b = 4s + 6$

$b = 7s$

$7s = 4s + 6$

$-4s \quad -4s$

$\frac{3s}{3} = \frac{6}{3}$

$s = 2$

$b = 7s$

$b = 7(2)$

$b = 14$

Mrs. Bee = 14 yrs
Her son = 2 yrs

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

| Age now | 1 year | 2 years | 3 years |
|---|---|---|---|
| Mrs. Bee = 14, son = 2 | Mrs. Bee = 15, son = 3 | Mrs. Bee = 16, son = 4 | Mrs. Bee = 17, son = 5 |

$18 \div 6 = 3$

4 years
Mrs. Bee = 18
son = 6

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

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

## Question 37

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

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

B
S

B $4s+6=B$

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

$7(s-3)+3=B$

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

son=8
Mrs. Bee=38

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

$7s-18$

$6+4s=7s-18$

$6=3s-18$

$24=3s$

$s=8$

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

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

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

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

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

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

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

$b - 3 = 7(s - 3)$
$(4s + 6) - 3 = 7(s - 3)$
$4s + 6 - 3 = 7s - 21$
$4s + 3 = 7s - 21$
$-4s \quad -4s$
$3 = 3s - 21$
$+21 \quad +21$
$24 = 3s$
$8 = s$

$b = 4s + 6$
$b = 4(8) + 6$
$b = 32 + 6$
$b = 38$

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

Check
$8(4) = 32$
$+6$
$38$

$38 - 3 = 35$
$8 - 3 = 5$
$\frac{35}{5} = 7$

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

Let $x$ = years

$3(38) = 8x$
$\frac{114}{8} = \frac{8x}{8}$
$14.25 = x$

about 14 years.

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

## Question 37

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

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

$4s+6=b$

$7s-3=b$

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

$4s+6=7s-3$
$-4s \quad -4s$
$6=3s-3$
$+3 \quad +3$
$\frac{9}{3}=\frac{3s}{3}$
$\boxed{3=s}$

$4s+6=b$
$12+6=b$
$\boxed{18=b}$

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

2 years

| Years | b | s |
|---|---|---|
| 1 | 19 | 4 |
| | 20 | 5 |
| | 21 | 6 |
| | 22 | 7 |
| | 23 | 8 |
| | 24 | 9 |
| | 25 | 10 |
| | 26 | 11 |
| | 27 | 12 |
| | 28 | 13 |
| | 29 | 14 |
| | 30 | 15 |

| | |
|---|---|
| 31 | 16 |
| 32 | 17 |
| 33 | 18 |
| 34 | 19 |
| 35 | 20 |
| 36 | 21 |
| 37 | 22 |
| 38 | 23 |

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

## Question 37

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

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

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

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

$$b = 6s + 4$$
$$\underline{b - 3 = 7s - 3}$$
$$6s + 4 - 3 = 7s - 3$$

$$s = 4$$
$$b = 28$$

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

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

## Question 37

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

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

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

$B = 4s + 6$

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

4 years

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

## Question 37

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

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

Present: $4s+6b$

3 years ago: $7b+s$

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

$4s+6b=7b+s$
$-s \qquad\qquad -s$
$3s+6b=7b$
$-6b \quad -6b$
$\frac{3s}{3}=\frac{1b}{3}$
$\boxed{s=\frac{1}{3}b}$

$4s+6=7b+s$
$-s \qquad\qquad -s$
$3s+6=7b$
$-3s \qquad -3s$
$6=4b+s$

mrs. Bee: 46

Her son: 10

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

7 years.

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