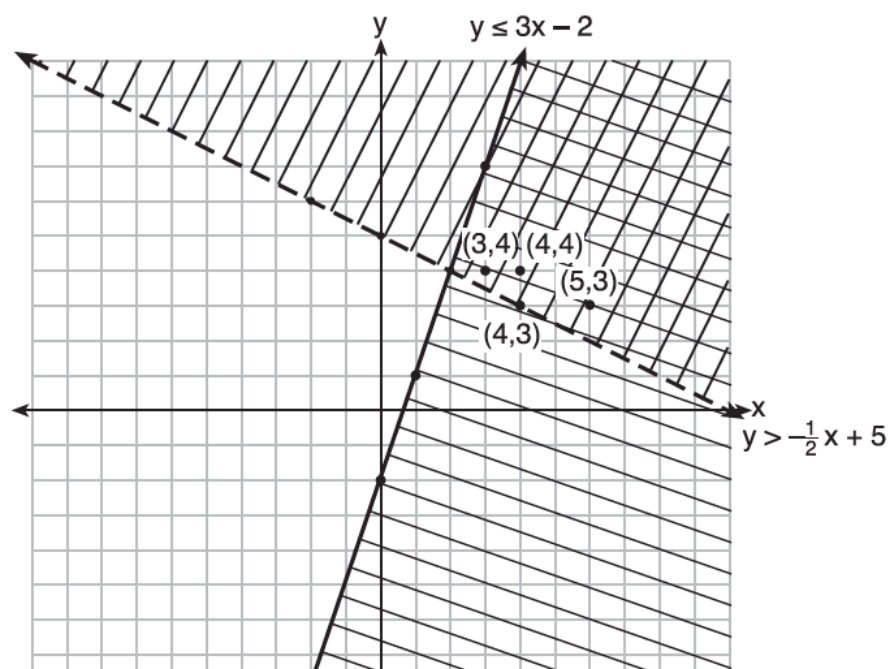


1 Which ordered pair is *not* in the solution set of $y > -\frac{1}{2}x + 5$

- (1) (5,3)
- (2) (4,3)
- (3) (3,4)
- (4) (4,4)



(4,3) is on the boundary of $y > -\frac{1}{2}x + 5$, therefore (4,3) is not a solution of the system of inequalities.

A student can also determine the answer to the question using substitution.

2 If the quadratic formula is used to find the roots of the equation $x^2 - 6x - 19 = 0$, the correct roots are

(1) $3 \pm 2\sqrt{7}$

(3) $3 \pm 4\sqrt{14}$

(2) $-3 \pm 2\sqrt{7}$

(4) $-3 \pm 4\sqrt{14}$

Rationale: Option 1 is correct.

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

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-19)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{36 + 76}}{2}$$

$$x = \frac{6 \pm \sqrt{112}}{2}$$

$$x = \frac{6 \pm \sqrt{16 \cdot 7}}{2}$$

$$x = \frac{6 \pm 4\sqrt{7}}{2}$$

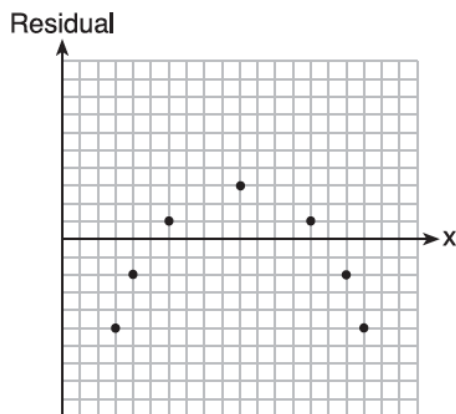
$$x = 3 \pm 2\sqrt{7}$$

3 Which statistic would indicate that a linear function would *not* be a good fit to model a data set?

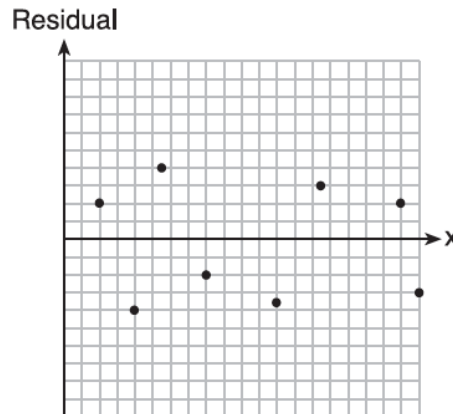
(1) $r = -0.93$

(2) $r = 1$

(3)



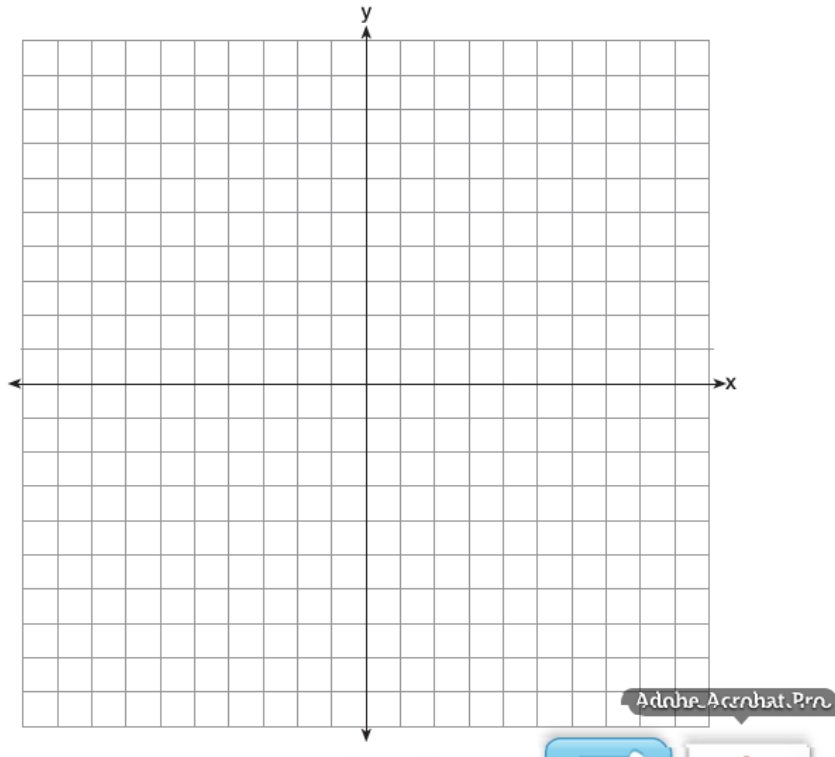
(4)



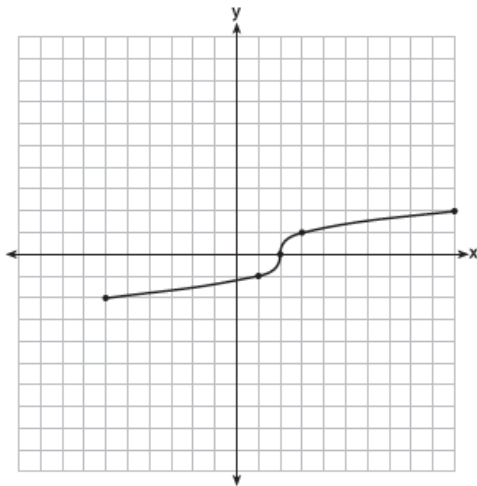
Notebook

Rationale: Option 3 is correct. A correlation coefficient close to -1 or 1 indicates a good fit. For a residual plot, there should be no observable pattern and a similar distribution of residuals above and below the x -axis.

- 4 On the set of axes below, graph the function represented by $y = \sqrt[3]{x-2}$ for the domain $-6 \leq x \leq 10$.



Rationale:



The graph must be drawn for the given domain *only*. The graph must *not* include any

Rubric:

- [2] A correct graph is drawn for the given interval.
- [1] One graphing error is made, such as the graph extending beyond the given interval
or
- [1] One conceptual error is made.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

5 Solve $8m^2 + 20m = 12$ for m by factoring.

Rationale:

$$\begin{aligned}8m^2 + 20m &= 12 \\8m^2 + 20m - 12 &= 0 \\4(2m^2 + 5m - 3) &= 0 \\4(m + 3)(2m - 1) &= 0 \\m + 3 = 0 &\quad 2m - 1 = 0 \\m = -3 &\quad 2m = 1 \\&\quad m = \frac{1}{2} \\m = -3 &\text{ and } \frac{1}{2}\end{aligned}$$

Rubric:

[2] -3 and $\frac{1}{2}$, 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] Appropriate work is shown, but only one solution is found.

or

[1] $(4m - 2)(2m + 6)$ or an equivalent factored expression is written, but no further correct work is shown.

or

[1] -3 and $\frac{1}{2}$, but a method other than factoring is used.

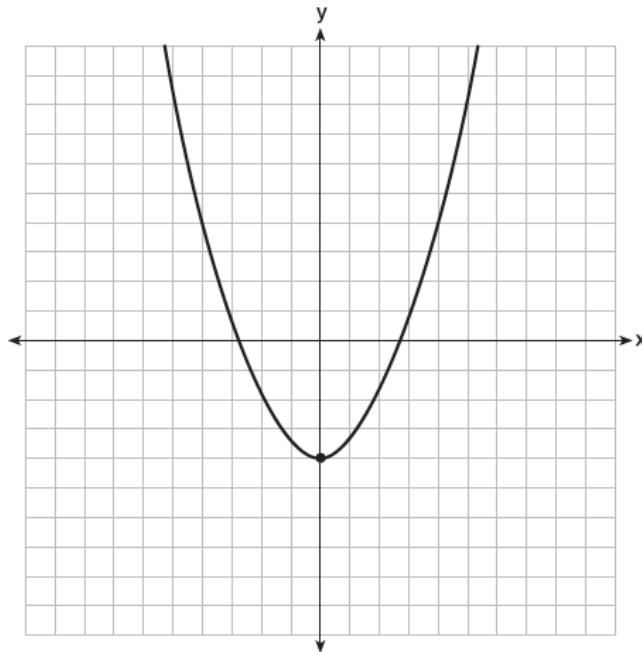
or

[1] -3 and $\frac{1}{2}$, but no work is shown.

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

Notebook

- 6 Ryker is given the graph of the function $y = \frac{1}{2}x^2 - 4$. He wants to find the zeros of the function, but is unable to read them exactly from the graph.



Find the zeros in simplest radical form.

Notebook

Rationale:

$$\begin{aligned} \frac{1}{2}x^2 - 4 &= 0 \\ 2\left(\frac{1}{2}x^2 - 4\right) &= (0)2 \\ x^2 - 8 &= 0 \\ x^2 &= 8 \\ x &= \pm\sqrt{8} \\ x &= \pm 2\sqrt{2} \end{aligned}$$

Rubric:

- [2] $\pm 2\sqrt{2}$, and correct work is shown.
- [1] Appropriate work is shown, but one computational or simplification error is made
or
- [1] Appropriate work is shown, but one conceptual error is made.
or
- [1] Appropriate work is shown, but the answer is written in decimal form.
or
- [1] $\pm 2\sqrt{2}$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- 7 Emma recently purchased a new car. She decided to keep track of how many gallons of gas she used on five of her business trips. The results are shown in the table below.

Miles Driven	Number of Gallons Used
150	7
200	10
400	19
600	29
1000	51

Write the linear regression equation for these data where miles driven is the independent variable. (Round all values to the *nearest hundredth*.)

Rationale: The linear regression equation, $y = 0.05x - 0.92$, was found using the regression capabilities of the calculator.

Rubric:

[2] The equation $y = 0.05x - 0.92$ or an equivalent equation is written.

[1] The expression $0.05x - 0.92$ is written.

or

[1] One rounding error is made.

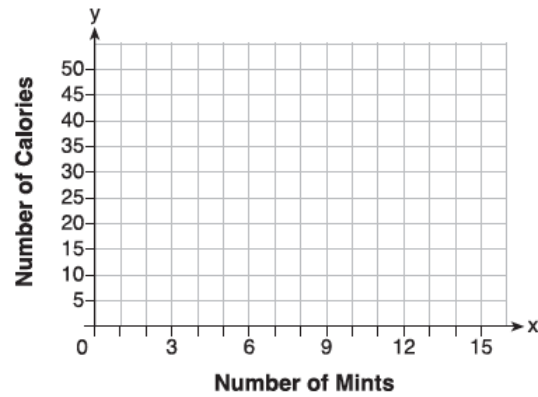
or

[1] One conceptual error is made, such as using a regression equation other than linear.

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

- 8 Max purchased a box of green tea mints. The nutrition label on the box stated that a serving of three mints contains a total of 10 Calories.

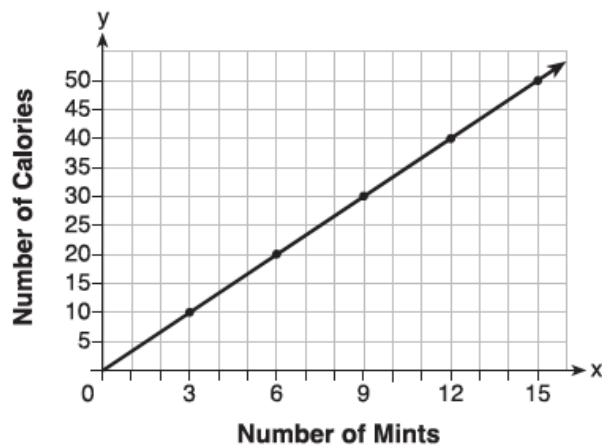
On the axes below, graph the function, C , where $C(x)$ represents the number of Calories in x mints.



Write an equation that represents $C(x)$.

A full box of mints contains 180 Calories. Use the equation to determine the total number mints in the box.

Rationale:



The slope of the given line is $\frac{10}{3}$, therefore the equation representing $C(x)$ is

$$C(x) = \frac{10}{3}x$$

$$180 = \frac{10}{3}x$$

$$540 = 10x$$

$$54 = x$$

There are 54 mints in the box.

- 9 David has two jobs. He earns \$8 per hour babysitting his neighbor's children and he earns \$11 per hour working at the coffee shop.

Write an inequality to represent the number of hours, x , babysitting and the number of hours, working at the coffee shop that David will need to work to earn a minimum of \$200.

David worked 15 hours at the coffee shop. Use the inequality to find the number of full hours must babysit to reach his goal of \$200.

Rationale: $8x + 11y \geq 200$

$$8x + 11(15) \geq 200$$

$$8x + 165 \geq 200$$

$$8x \geq 35$$

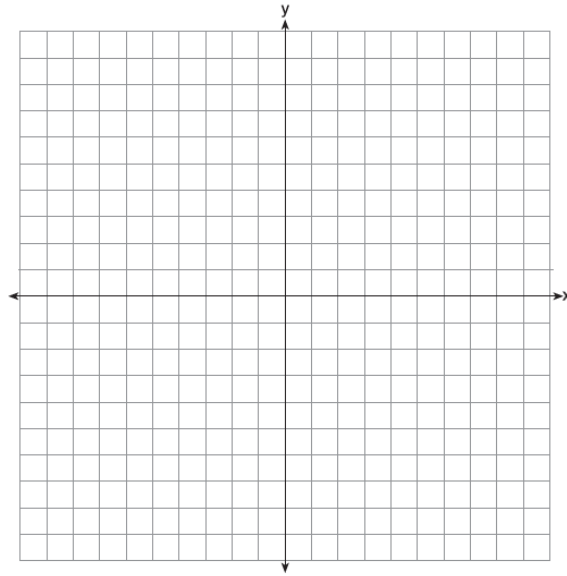
$$x \geq 4.375$$

5 hours

Rubric:

- [4] $8x + 11y \geq 200$ or equivalent, 5 and correct work is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made.
or
- [3] An incorrect inequality is written, but solved appropriately for the number of full hours of babysitting.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
or
- [2] Appropriate work is shown, but one conceptual error is made.
or
- [2] $8x + 11y \geq 200$ and 5 are stated, but no work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or
- [1] $8x + 11y \geq 200$ is written, but no further correct work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

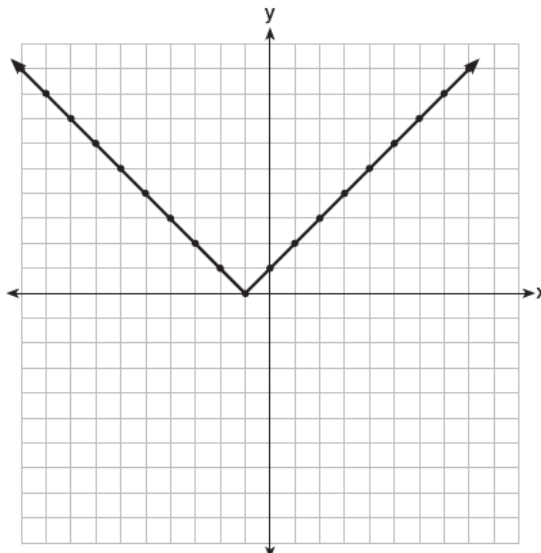
10 On the set of axes below, graph the function $y = |x + 1|$.



State the range of the function.

State the domain over which the function is increasing

Rationale:



The graph should be drawn to include the decreasing and increasing portions of the graph. Since domain is *not* stated, arrows *must* be included on the graph of the function.

The range of the function is $y \geq 0$, $[0, \infty)$, $\{y \mid y \geq 0, \text{ where } y \text{ is a rational number}\}$, or all real numbers ≥ 0 .

The function is increasing for $x > -1$, $(-1, \infty)$, $\{x \mid x > -1, \text{ where } x \text{ is a real number}\}$, or all real numbers > -1 .

- 11 The table below lists the total cost for parking for a period of time on a street in Albany, N.Y. The total cost is for any length of time up to and including the hours parked. For example, parking for up to and including 1 hour would cost \$1.25; parking for 3.5 hours would cost \$5.75.

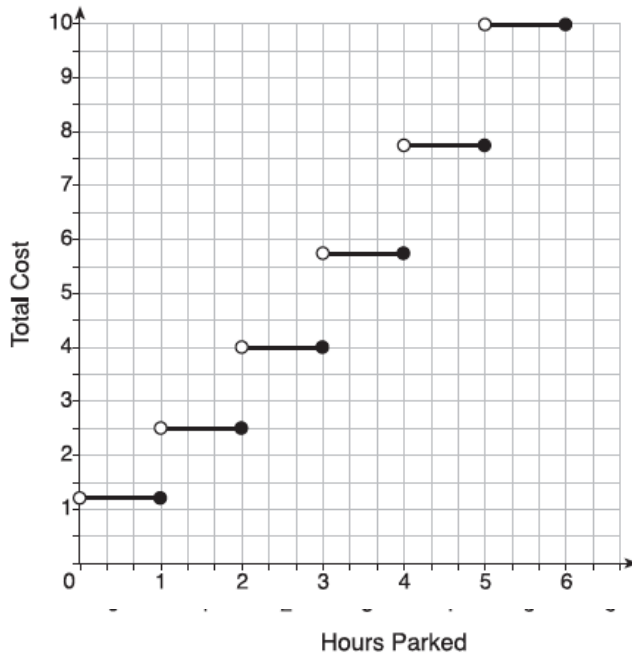
Hours Parked	Total Cost
1	1.25
2	2.50
3	4.00
4	5.75
5	7.75
6	10.00

Graph the step function that represents the cost for the number of hours parked.



Explain how the cost per hour to park changes over the six-hour period.

Rationale:



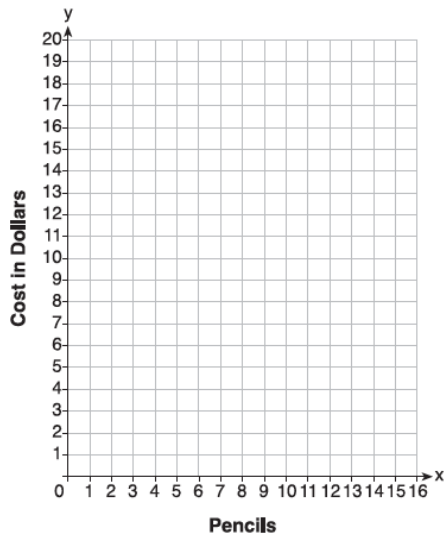
The cost for each additional hour increases after the first 2 hours. This can be determined by viewing the increasing gaps between the steps or by calculating the cost for each additional hour after two hours.

- 12 At an office supply store, if a customer purchases fewer than 10 pencils, the cost of each pencil is \$1.75. If a customer purchases 10 or more pencils, the cost of each pencil is \$1.25.

Let c be a function for which $c(x)$ is the cost of purchasing x pencils, where x is a whole number.

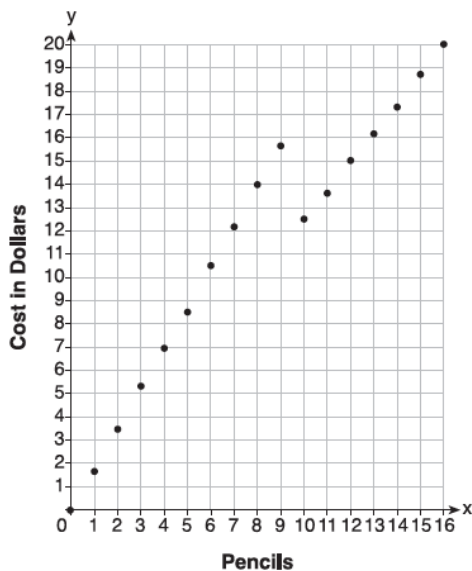
$$c(x) = \begin{cases} 1.75x, & \text{if } 0 \leq x \leq 9 \\ 1.25x, & \text{if } x \geq 10 \end{cases}$$

Create a graph of c on the axes below.



A customer brings 8 pencils to the cashier. The cashier suggests that the total cost to purchase 10 pencils would be less expensive. State whether the cashier is correct or incorrect. Justify your answer.

Rationale:



The data points are not connected because the points represent discrete data and the values for the data can be included on the axes.

Data points *can* be connected or drawn as a straight line if plotting each individual data point would represent a line.

Since 8 pencils cost \$14 and 10 pencils cost \$12.50, the cashier is correct. The student can calculate the cost of pencils or use the graph to identify that 10 pencils are cheaper than 8 pencils.

- 13 About a year ago, Joey watched an online video of a band and noticed that it had been viewed only 843 times. One month later, Joey noticed that the band's video had 1708 views. Joey made the table below to keep track of the cumulative number of views the video was getting online.

Months Since First Viewing	Total Views
0	843
1	1708
2	forgot to record
3	7124
4	14,684
5	29,787
6	62,381

- a) Write a regression equation that best models these data. Round all values to the *nearest hundredth*. Justify your choice of regression equation.
- b) As shown in the table, Joey forgot to record the number of views after the second month. Use the equation from part *a* to estimate the number of full views of the online video that Joey forgot to record.

Rationale: The exponential regression equation, $y = (836.47)(2.05)^x$, was found using the regression capabilities of the calculator.

The student chose the exponential regression because the data appear to increase at an exponential rate. A scatter plot of the data supports an exponential model.

For the second month:

$$y = (836.47)(2.05)^2$$

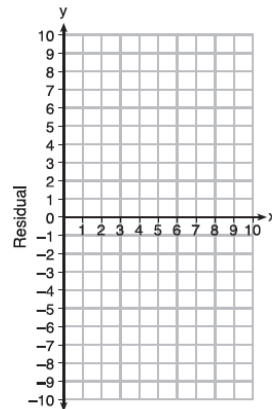
$$y = 3515$$

- 14 Use the data below to write the regression equation ($y = ax + b$) for the raw test score based on the hours tutored. Round all values to the nearest hundredth.

Tutor Hours, x	Raw Test Score	Residual (Actual - Predicted)
1	30	1.3
2	37	1.9
3	35	-6.4
4	47	-0.7
5	56	2.0
6	67	6.6
7	62	-4.7

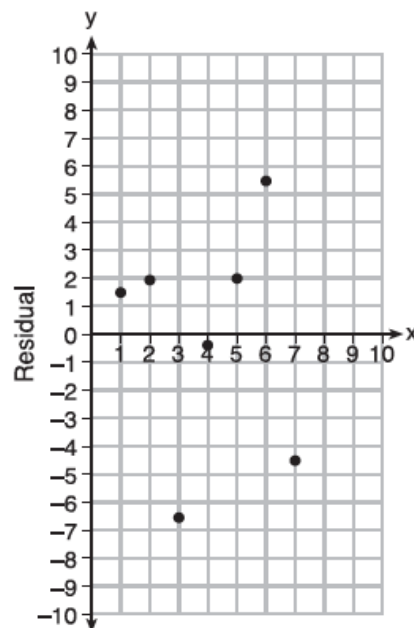
Equation: _____

Create a residual plot on the axes below, using the residual scores in the table above.



Based on the residual plot, state whether the equation is a good fit for the data. Justify your answer.

Rationale: The regression equation $y = 6.32x + 22.43$ was found using the regression capabilities of the calculator.



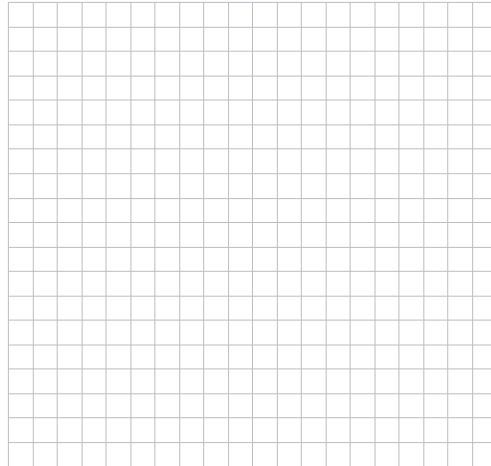
Based on the residual plot, the equation is a good fit for the data because the residual values are scattered without a pattern and are fairly evenly distributed above and below the x -axis.

- 15 A local business was looking to hire a landscaper to work on their property. They narrowed their choices to two companies. Flourish Landscaping Company charges a flat rate of \$120 per hour. Green Thumb Landscapers charges \$70 per hour plus a \$1600 equipment fee.

Write a system of equations representing how much each company charges.

Determine and state the number of hours that must be worked for the cost of each company to be the same. [The use of the grid below is optional.]

If it is estimated to take at least 35 hours to complete the job, which company will be less expensive? Justify your answer.



Rationale : Flourish Landscaping Company
 $y = 120x$

Green Thumb Landscapers
 $y = 70x + 1600$

$$120x = 70x + 1600$$

$$-70x \quad -70x$$

$$\frac{50x}{50} = \frac{1600}{50}$$

$$x = 32 \text{ hours}$$

$$y = 120(35) = \$4200$$

$$y = 70(35) + 1600 = \$4050$$

Green Thumb Landscapers would be less expensive.

