Tim and Emma were asked to solve the linear system

$$\begin{cases} 3x + 2y = 8 \\ x - 3y = 10 \end{cases}$$

Tim's "substitution" way	Emma's "elimination" way

Tim's "substitution" way

$$\begin{cases} 3x + 2y = 8 \\ x - 3y = 10 \end{cases}$$

↓

$x = 3y + 10$

I solved the second equation for x.

↓

$3(3y + 10) + 2y = 8$

I plugged this into the first equation.

↓

$9y + 30 + 2y = 8$
$11y + 30 = 8$
$11y = -22$
$y = -2$

I then solved for y.

↓

$x - 3(-2) = 10$
$x + 6 = 10$
$x = 4$

I plugged y into the second equation to find x.

↓

The solution is (4, -2)

Emma's "elimination" way

$$\begin{cases} 3x + 2y = 8 \\ x - 3y = 10 \end{cases}$$

↓

$3x + 2y = 8$
$-3(x - 3y = 10)$

I multiplied the bottom equation by -3.

↓

$3x + 2y = 8$
$\underline{-3x + 9y = -30}$
$11y = -22$
$y = -2$

I then used elimination and solved for y.

↓

$x - 3(-2) = 10$
$x + 6 = 10$
$x = 4$

I plugged y into the second equation to find x.

↓

The solution is (4, -2)

Why did Tim choose to plug y = –2 into the second equation to find x instead of the first equation?

Which method is better? What are some advantages of Tim's "substitution" way? Of Emma's "elimination" way?

Discuss Connections

Is there a situation where substitution would be better than elimination, or vice versa?

Think, Pair. First, think about the question(s) above independently. Then, get with a partner and discuss your answers. After talking with your partner, what is your answer?

Think	Pair

Share. After reviewing the worksheet as a class, summarize the answer(s) your class agrees on. Was this different from your original response?

Big Idea. When your teacher tells you to do so, write what you think is the big idea of this example, in your own words.

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T... "substitution ... ...a's "eliminati... way

Why did Tim choose to plug y = –2 into the second equation to find x instead of the first equation?

Which method is better? What are some advantages of Tim's "substitution" way? Of Emma's "elimination" way?

Riley and Gloria were asked to solve $5(n + 6) = 2(n + 6) + 6$.

Riley's "distribute first" way

$5(n + 6) = 2(n + 6) + 6$

First, I distributed.

$5n + 30 = 2n + 12 + 6$

Then I moved the variable to one side of the equation.

$5n + 30 = 2n + 18$
$-2n \quad -2n$

I subtracted from both sides.

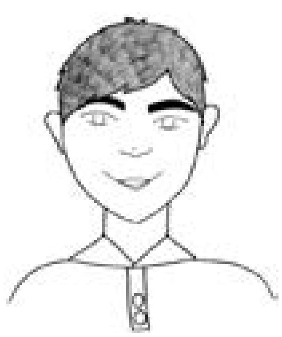
$3n + 30 = 18$
$-30 \quad -30$

I divided by 3.

$\frac{3n}{3} = \frac{-12}{3}$

Here's my answer.

$n = -4$



Gloria's "composite variable" way

$5(n + 6) = 2(n + 6) + 6$

First, I subtracted the quantity 2(n + 6) from both sides.

$5(n + 6) = 2(n + 6) + 6$
$-2(n + 6) \quad -2(n + 6)$

Then I divided by 3.

$\frac{3(n + 6)}{3} = \frac{6}{3}$

I subtracted from both sides.

$n + 6 = 2$
$-6 \quad -6$

Here's my answer.

$n = -4$

How did Riley and Gloria solve the equation?

Which method is better? What are some important differences between Riley's"distribute first" method and Gloria's "composite variable" method?

Come up with another problem where the composite variable method will work. Then solve it using the distributive property. Which method is better?

Riley and Gloria were given the set of ordered pairs

{(–3, 6), (2, 5), (3, 1), (2, 4), (5, 1)},

and asked to determine if the relation is a function.

Riley's "make a table" way

I made a table.

x (domain)	y (range)
-3	6
2	5
2	4
3	1
5	1

I saw that 2 in the domain is paired with both a 5 and a 4 in the range.

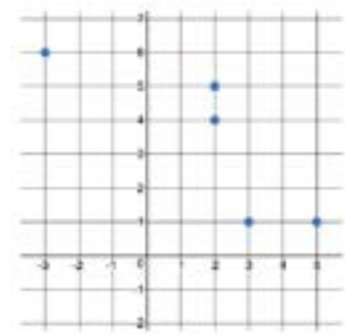
x (domain)	y (range)
-3	6
2 →	5
2 →	4
3	1
5	1

This means the relation is not a function.

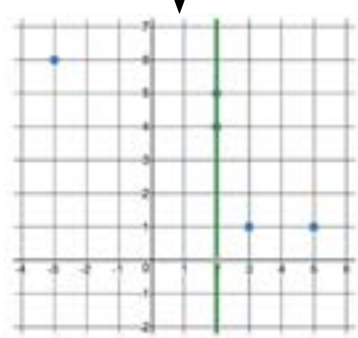
Not a function

Gloria's "graph and vertical line test" way

I graphed the ordered pairs.



I found a vertical line that intersected two of the points.



This means the relation is not a function.

Not a function

How did Riley determine if the relation was a function? How did Gloria determine if the relation was a function?

Why do both methods work? Why does the vertical line test tell us the same thing as the table of values?

Why does the vertical line test work?

Layla and Riley were asked to use factoring to solve the equation $a^2 + 5a - 6 = -12$.

Layla's "set equal to 0" way

First, I set the equation equal to zero by adding 12 to both sides. Then, I factored.

I solved the equations to get my answers.

$a^2 + 5a - 6 = -12$

$a^2 + 5a + 6 = 0$

↓

$(a + 2)(a + 3) = 0$

↓

$a + 2 = 0$ or $a + 3 = 0$

↓

$a = -2$ or $a = -3$

Riley's "factor first" way

$a^2 + 5a - 6 = -12$

$(a + 6)(a - 1) = -12$

↓

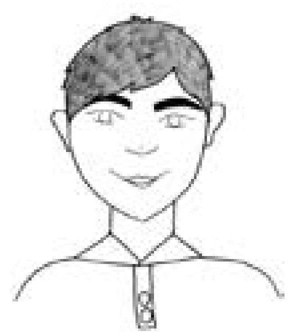
$a + 6 = 6$ or $a - 1 = -2$

↓

$a = 0$ or $a = -1$

First, I factored.

Since 6 times -2 is -12, I set the first part equal to 6 and the second part equal to -2. Then I solved the equations to get my answers.



How could you check to see if Layla or Riley's solutions are correct?

Which method is correct, Layla's "set equal to 0" method or Riley's "factor first" method?

Will Riley's "factor first" method ever get the right answer? Why or why not?