Why does it work?

Alex and Morgan were asked to solve the linear system $\begin{cases} x+2y=11 \\ -3x+y=2 \end{cases}$

Alex's "substitute value of x into first equation" way

$\begin{cases} x+2y=11 \\ -3x+y=2 \end{cases}$

First I solved the second equation for *y*.

$y=3x+2$

I substituted this expression for *y* into the first equation.

$x+2y=11$

$x+2(3x+2)=11$

I then simplified to solve for *x*.

$x+6x+4=11$

$7x+4=11$

$7x=7$

$x=1$

I then substituted this value of *x* into the first equation. I solved this equation to find *y*.

$x+2y=11$

$(1)+2y=11$

$2y=10$

$y=5$

This gives me the solution to this linear system.

The solution is (1,5)

Morgan's "substitute value of x into second equation" way

$\begin{cases} x+2y=11 \\ -3x+y=2 \end{cases}$

First I solved the second equation for *y*.

$y=3x+2$

I substituted this expression for *y* into the first equation.

$x+2y=11$

$x+2(3x+2)=11$

I then simplified to solve for *x*.

$x+6x+4=11$

$7x+4=11$

$7x=7$

$x=1$

I then substituted this value of *x* into the second equation. I solved this equation to find *y*.

$-3x+y=2$

$-3(1)+y=2$

$-3+y=2$

$y=5$

This gives me the solution to this linear system.

The solution is (1,5)

- **How did Alex solve the problem?**
- **How did Morgan solve the problem?**
- **What are some similarities and differences between Alex's and Morgan's ways?**
- **Alex and Morgan used different ways, yet they got the same answer. Why?**

Why does it work?

Alex and Morgan were asked to solve the linear system $\begin{cases} x+2y=11 \\ -3x+y=2 \end{cases}$

Alex's "substitute value of x into first equation" way	Morgan's "substitute value of x into second equation" way
$\begin{cases} x+2y=11 \\ -3x+y=2 \end{cases}$	$\begin{cases} x+2y=11 \\ -3x+y=2 \end{cases}$
First I solved the second equation for *y*.	**First I solved the second equation for *y*.**
I substituted thi expression for *y* into the first equation.	**tituted this ession for *y* the first ation.**
I the to solv	
solve to find *y*.	**n to find**
This	

After you find the value of one of the variables, that value can be substituted into either of the original equations.

There is more than one way to solve a system of equations using substitution. Before you start, you can look at the problem first and try to see which way will be easier.

*** How did Alex solve m?**
*** How did Morgan so problem?**
*** What are some simil ies and differe ween Alex's an Morgan's ways?**
*** Alex and Morgan used different ways, y ey got the same answer. Why?**

Student Worksheet 6.1.1

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's *ways*?

3 Alex and Morgan used different ways, yet they got the same answer. Why?

Why does it work?

Alex and Morgan were asked to solve the linear system $\begin{cases} x+3y=2 \\ 5x+y=-4 \end{cases}$

Alex's "solve for *x*" way

$$\begin{cases} x+3y=2 \\ 5x+y=-4 \end{cases}$$

I solved the first equation for *x*.

$$x=2-3y$$

I substituted this expression for *x* into the second equation.

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

I then simplified to solve for *y*.

$$10-15y+y=-4$$
$$10-14y=-4$$
$$-14y=-14$$
$$y=1$$

I then substituted this value of *y* into the equation I previously solved for *x*. I solved this equation to find *x*.

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

This gives me the solution to this linear system.

The solution is (-1,1)

Morgan's "solve for *y*" way

$$\begin{cases} x+3y=2 \\ 5x+y=-4 \end{cases}$$

I solved the second equation for *y*.

$$y=-4-5x$$

I substituted this expression for *y* into the first equation.

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

I then simplified to solve for *x*.

$$x-12-15x=2$$
$$-14x-12=2$$
$$-14x=14$$
$$x=-1$$

I then substituted this value of *x* into the equation I previously solved for *y*. I solved this equation to find *y*.

$$y=-4-5x$$
$$y=-4-5(-1)$$
$$y=-4+5$$
$$y=1$$

This gives me the solution to this linear system.

The solution is (-1,1)

*** How did Alex solve the problem?**
*** How did Morgan solve the problem?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Alex and Morgan used different ways, yet they got the same answer. Why?**

Why does it work?

Alex and Morgan were asked to solve the linear system $\begin{cases} x+3y=2 \\ 5x+y=-4 \end{cases}$

Alex's "solve for *x*" way

Morgan's "solve for *y*" way

$\begin{cases} x+3y=2 \\ 5x+y=-4 \end{cases}$

$\begin{cases} x+3y=2 \\ 5x+y=-4 \end{cases}$

I solved the first equation for x.

I substituted t… expression for… into the second… equation.

I the… to solv…

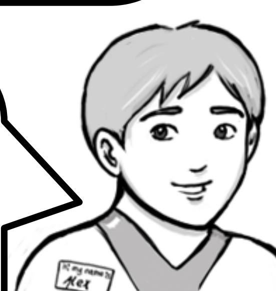
the… previo… for x. I s… equati…

I solved the second equation fo…

…stituted this …ession for y …the first …ation.

…lved for … this … find y.

The process of substitution allows you to eliminate one variable so that you can solve for the other. You can solve and substitute for either variable first; you'll get the same answer in the end.



There is more than one way to solve a system of equations using substitution. Before you start, you can look at the problem first and try to see which way will be easier.

*** How did Alex solv… …blem?**
*** How did Morgan s… …e problem?**
*** What are some simi…rities and differe… …etween Alex's an… Morgan's ways?**
*** Alex and Morgan used different ways, y… …hey got the same answer. Why?**

6.1.2

Student Worksheet 6.1.2

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's ways?

3 Alex and Morgan used different ways, yet they got the same answer. Why?

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 4x+6y=4 \\ x-2y=-6 \end{cases}$

Alex's "solve for x" way

$$\begin{cases} 4x+6y=4 \\ x-2y=-6 \end{cases}$$

I solved the second equation for x.

$$x-2y=-6$$
$$x=2y-6$$

I substituted this expression for x into the first equation.

$$4(2y-6)+6y=4$$

I then simplified to solve for y.

$$8y-24+6y=4$$
$$14y-24=4$$
$$14y=28$$
$$y=2$$

I then substituted this value of y into the equation I previously solved for x. I solved this equation to find x.

$$x=2y-6$$
$$x=2(2)-6$$
$$x=4-6$$
$$x=-2$$

This gives me the solution to this linear system.

The solution is (-2,2)

Morgan's "solve for y" way

$$\begin{cases} 4x+6y=4 \\ x-2y=-6 \end{cases}$$

I solved the second equation for *y*.

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

I substituted this expression for y into the first equation.

$$4x+6(\frac{x}{2}+3)=4$$

I then simplified to solve for x.

$$4x+3x+18=4$$
$$7x+18=4$$
$$7x=-14$$
$$x=-2$$

I then substituted this value of x into the equation I previously solved for y. I solved this equation to find y.

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

This gives me the solution to this linear system.

The solution is (-2,2)

*** How did Alex solve the problem?**
*** How did Morgan solve the problem?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Alex and Morgan used different ways, yet they got the same answer. Why?**
*** Which way do you think is better, Alex's way or Morgan's way? Why?**

6.1.3

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases}4x+6y=4\\x-2y=-6\end{cases}$

Alex's "solve for x" way

Morgan's "solve for y" way

$\begin{cases}4x+6y=4\\x-2y=-6\end{cases}$

$\begin{cases}4x+6y=4\\x-2y=-6\end{cases}$

I solved the second equation for x.

I substituted th... expression for... into the first equation.

I then... to solve...

... the eq... previous... for x. I... equat...

... this line... system.

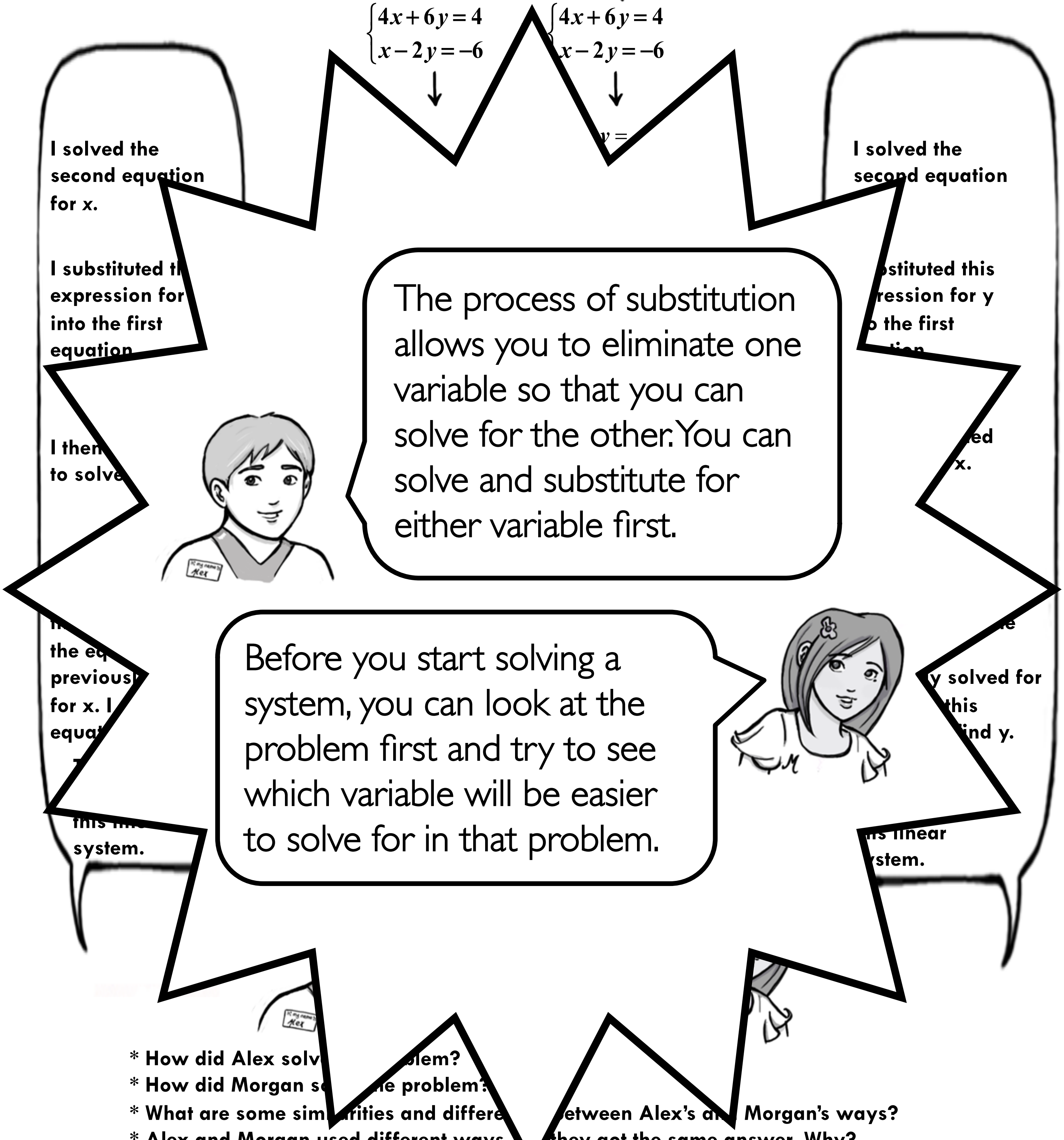
I solved the second equation

...bstituted this ...ression for y ...o the first ...ation

...ed ...x.

...e ...y solved for ...this ...find y.

...is linear ...ystem.



*** How did Alex solv... ...blem?**

*** How did Morgan s... ...e problem?**

*** What are some sim...rities and differe... ...etween Alex's a... Morgan's ways?**

*** Alex and Morgan used different ways, ... they got the same answer. Why?**

*** Which way do you think is better, Alex's way or Morgan's way? Why?**

Student Worksheet 6.1.3

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's *ways*?

3 Alex and Morgan used different ways, yet they got the same answer. Why?

4 Which way do you think is better, Alex's way or Morgan's way? Why?

Why does it work?

Alex and Morgan were asked to solve the linear system $\begin{cases} -9x+4y=-17 \\ 9x-6y=3 \end{cases}$

Alex's "substitute value of *y* into first equation" way

$$\begin{cases} -9x+4y=-17 \\ 9x-6y=3 \end{cases}$$

$\downarrow$

First I added the two equations together to solve for *y*.

$$\begin{array}{r} -9x+4y=-17 \\ 9x-6y=3 \\ \hline -2y=-14 \\ y=7 \end{array}$$

$\downarrow$

I substituted the value I got for *y* into the first equation.

$$-9x+4y=-17$$
$$-9x+4(7)=-17$$

$\downarrow$

I then simplified to solve for *x*.

$$\begin{array}{r} -9x+28=-17 \\ -28 \quad -28 \\ \hline -9x=-45 \\ x=5 \end{array}$$

$\downarrow$

This gives me the solution to this linear system.

The solution is (5,7)

Morgan's "substitute value of *y* into second equation" way

$$\begin{cases} -9x+4y=-17 \\ 9x-6y=3 \end{cases}$$

$\downarrow$

First I added the two equations together to solve for *y*.

$$\begin{array}{r} -9x+4y=-17 \\ 9x-6y=3 \\ \hline -2y=-14 \\ y=7 \end{array}$$

$\downarrow$

I substituted the value I got for *y* into the second equation.

$$9x-6y=3$$
$$9x-6(7)=3$$

$\downarrow$

I then simplified to solve for *x*.

$$\begin{array}{r} 9x-42=3 \\ +42 \quad +42 \\ \hline 9x=45 \\ x=5 \end{array}$$

$\downarrow$

This gives me the solution to this linear system.

The solution is (5,7)

*** How did Alex solve the problem?**
*** How did Morgan solve the problem?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Alex and Morgan used different ways, yet they got the same answer. Why?**

Why does it work?

Alex and Morgan were asked to solve the linear system $\begin{cases} -9x+4y=-17 \\ 9x-6y=3 \end{cases}$

Alex's "substitute value of *y* into first equation" way

Morgan's "substitute value of *y* into second equation" way

$-9x+4y=-17$
$-6y=3$

$-9x+4y=-17$
$-6y=3$

First I adde
two equatio
together to
solve for *y*.

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After you find the value of one of the variables, that value can be substituted into either of the original equations.

There is more than one way to solve a system of equations using substitution. Before you start, you can look at the problem first and try to see which way will be easier.

*** How did Alex solve blem?**
*** How did Morgan so he problem?**
*** What are some similarities and differen etween Alex's and Morgan's ways?**
*** Alex and Morgan used different ways, ye hey got the same answer. Why?**

Student Worksheet 6.2.1

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's *ways*?

3 Alex and Morgan used different ways, yet they got the same answer. Why?

How do they differ?

Alex and Morgan were asked to solve the linear system $\begin{cases} 4x+5y=-1 \\ 3x+2y=1 \end{cases}$

Alex's "multiply to eliminate the *x* terms" way

$$\begin{cases} 4x+5y=-1 \\ 3x+2y=1 \end{cases}$$

First, I multiplied the top equation by 3, and the bottom equation by -4, so that I could cancel out the *x* terms.

$$3\cdot\{4x+5y=-1\}$$
$$-4\cdot\{3x+2y=1\}$$

I simplified to get these equations, which I then added together.

$$12x+15y=-3$$
$$-12x-8y=-4$$

This gave me an equation with only *y* in it, which I solved to find the *y*-coordinate of the solution, which is -1.

$$7y=-7$$
$$y=-1$$

I plugged the *y*-value into the second equation, which I solved for *x*.

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

This gives me the solution to this linear system.

The solution is (1, -1)

Morgan's "multiply to eliminate the *y* terms" way

$$\begin{cases} 4x+5y=-1 \\ 3x+2y=1 \end{cases}$$

First, I multiplied the top equation by 2, and the bottom equation by -5, so that I could cancel out the *y* terms.

$$2\cdot\{4x+5y=-1\}$$
$$-5\cdot\{3x+2y=1\}$$

I simplified to get these equations, which I then added together.

$$8x+10y=-2$$
$$-15x-10y=-5$$

This gave me an equation with only *x* in it, which I solved to find the *x*-coordinate of the solution, which is 1.

$$-7x=-7$$
$$x=1$$

I plugged the *x*-value into the second equation, which I solved for *y*.

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

This gives me the solution to this linear system.

The solution is (1, -1)

*** How did Alex solve the problem?**
*** How did Morgan solve the problem?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Alex and Morgan used different ways, yet they got the same answer. Why?**

How do they differ?

Alex and Morgan were asked to solve the linear system $\begin{cases} 4x+5y=-1 \\ 3x+2y=1 \end{cases}$

Alex's "multiply to eliminate the *x* terms" way

Morgan's "multiply to eliminate the *y* terms" way

$\begin{cases} 4x+5y=-1 \\ 3x+2y=1 \end{cases}$ $\begin{cases} 4x+5y=-1 \\ 3x+2y=1 \end{cases}$

First, I multiplied the top equation by 3, and the bottom equation by -4, so that I c... cancel out the...

I simplified to ge... equations, which...

Thi... equa... it, whic... find the y... the soluti... -1.

... equati... solved for...

this linear system.

First, I multiplied the top equation by 2, and the bottom equation by ...hat I could ... out the *y* terms.

...mplified to get these ...uations, which I then

...only *x* in ...lved to ...coordinate of ... which is

...ls linear ...stem.

When using the elimination method, you can eliminate either the *x*-variable or the *y*-variable. In either case, you are merely changing the form of the equation to make it easier to find a point that solves both equations.

There is more than one way to solve a system of equations using elimination. Before you start, you can look at the problem first and try to see which way will be easier.

*** How did Alex solv... ...oblem?**
*** How did Morgan s... ...e the problem?**
*** What are some similarities and differe... ...between Alex's and Morgan's ways?**
*** Alex and Morgan used different ways, y... they got the same answer. Why?**

6.2.2

Student Worksheet 6.2.2

1 How did Alex solve the problem?

2 How did Morgan solve the problem?

3 What are some similarities and differences between Alex's and Morgan's *ways*?

4 Even though Morgan and Alex used different ways, they arrived at the same answer. Why?

Which is correct?

Alex and Morgan were asked to solve the linear system $\begin{cases} 4x + y = 12 \\ 3x + y = 10 \end{cases}$

Alex's "elimination" way

$$\begin{cases} 4x + y = 12 \\ 3x + y = 10 \end{cases}$$

$\downarrow$

First, I eliminated the y's. Then I solved for x.

$$\begin{array}{r} 4x \cancel{+y} = 12 \\ 3x \cancel{+y} = 10 \\ \hline 7x = 22 \end{array}$$

$$x = \frac{22}{7}$$

$\downarrow$

Then I substituted what I found for x into the second equation, to solve for y.

$$3x + y = 10$$

$$3\left(\frac{22}{7}\right) + y = 10$$

$$\frac{66}{7} + y = 10$$

$$7\left(\frac{66}{7} + y\right) = (10)7$$

$$66 + 7y = 70$$

$$7y = 4$$

$$y = \frac{4}{7}$$

$\downarrow$

Here is my solution.

$$\left(\frac{22}{7}, \frac{4}{7}\right)$$

Morgan's "elimination" way

$$\begin{cases} 4x + y = 12 \\ 3x + y = 10 \end{cases}$$

$\downarrow$

First, I multiplied the second equation by -1 on both sides.

$$4x + y = 12$$

$$-1(3x + y) = 10(-1)$$

$\downarrow$

Then I added the two equations together to eliminate the y's. I got $x = 2$.

$$\begin{array}{r} 4x + y = 12 \\ -3x - y = -10 \\ \hline x = 2 \end{array}$$

$\downarrow$

Then I plugged my answer for x back into the first equation and solved for y. I got $y = 4$.

$$4x + y = 12$$

$$4(2) + y = 12$$

$$8 + y = 12$$

$$y = 4$$

$\downarrow$

Here is my solution.

$$(2, 4)$$

- **How did Alex solve the problem?**
- **How did Morgan solve the problem?**
- **Whose answer is correct, Alex's or Morgan's? How do you know?**
- **What are some similarities and differences between Alex's and Morgan's ways?**
- **Can you explain Alex's error to a new student in your class? How and when is elimination used to solve systems of linear equations?**

Which is correct?

Alex and Morgan were asked to solve the linear system $\begin{cases} 4x + y = 12 \\ 3x + y = 10 \end{cases}$

Alex's "elimination" way	Morgan's "elimination" way
$\begin{cases} 4x + y = 12 \\ 3x + y = 10 \end{cases}$	$\begin{cases} 4x + y = 12 \\ 3x + y = 10 \end{cases}$
$4x + \cancel{y} = 12$	$4x + y = 12$
$x + \cancel{y} =$	$(3x + y) =$

First, I eliminated the *y*'s.
Then I solved for *x*.

Then I substitute
I found for *x* into
so

First, I multiplied the second equation by -1 on both sides.

n I added the two
ations together to
got *x*

my
to

n.

Hey Alex, what did we learn from comparing these right and wrong ways?

When using the elimination method for solving systems of equations, remember that coefficients of terms to be eliminated should be additive inverses and not equal, so that when the equations are added together, the terms are eliminated. Try to avoid this common mistake!

* **How did Alex sol**
* **How did Morgan s oblem**
* **Whose answer is c Alex's or M ow do you ?**
* **What are some sim ities and differe etween Alex's a Morgan's ways?**
* **Can you explain Alex's error to a new s ent in your class? How and when is elimination used to solve systems of line r equations?**

Student Worksheet 6.2.3

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 Whose answer is correct, Alex's or Morgan's? How do you know?

3 What are some similarities and differences between Alex's and Morgan's *ways*?

4 Can you explain Alex's error to a new student in your class? How and when is elimination used to solve systems of linear equations?

Why does it work?

Alex and Morgan were asked to solve $\begin{aligned} 2x+3y&=12 \\ 5x-3y&=9 \end{aligned}$

Alex's "elimination" way

First I added the two equations together.

$$\begin{aligned} 2x+3y&=12 \\ \underline{5x-3y}&\underline{=9} \\ 7x&=21 \end{aligned}$$

$$\downarrow$$

Then I solved for *x*.

$$\frac{7x}{7}=\frac{21}{7}$$

$$x=3$$

$$\downarrow$$

I substituted the value of *x* into the first equation to find the value of *y*.

$$\begin{aligned} 2x+3y&=12 \\ 2(3)+3y&=12 \\ 6+3y&=12 \\ \underline{-6\qquad}&\underline{\;\;-6} \\ 3y&=6 \end{aligned}$$

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

$$y=2$$

$$\downarrow$$

Here is my answer.

$$(3,2)$$

Morgan's "use the equal sign" way

The equal sign means that the quantities on either side have the same value. So 5*x* – 3*y* has the same value as 9.

I can add the same value on both sides of an equation while maintaining the equality, so I added 5*x* – 3*y* to one side of the first equation and 9 to the other side of the first equation.

$$\begin{aligned} 2x+3y&=12 \\ 5x-3y&=9 \end{aligned}$$

$$\downarrow$$

$$5x-3y+2x+3y=12+9$$

$$\downarrow$$

Next I combined like terms to get 7*x* = 21. Then I solved for *x*.

$$7x=21$$

$$\downarrow$$

$$\frac{7x}{7}=\frac{21}{7}$$

$$x=3$$

$$\downarrow$$

I substituted the value of *x* into the first equation to find the value of *y*.

$$\begin{aligned} 2x+3y&=12 \\ 2(3)+3y&=12 \\ 6+3y&=12 \\ \underline{-6\qquad}&\underline{\;\;-6} \\ 3y&=6 \end{aligned}$$

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

$$y=2$$

$$\downarrow$$

Here is my answer.

$$(3,2)$$

*** How did Alex solve the system of equations?**
*** How did Morgan solve the system of equations?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Why does Alex's way work? Why can you "add" two equations together?**

Why does it work?

Alex and Morgan were asked to solve $\begin{aligned} 2x+3y&=12 \\ 5x-3y&=9 \end{aligned}$

Alex's "elimination" way	Morgan's "use the equal sign" way

First I added the two equations together.

$2x$ … $=12$

$5x$ …

Then I solved f…

I substituted t… value of x into… first equatio… find the va…

Here is my answer.

(…, 2)

$2x+3$…

The equal sign means that the quantities on either side have the same value. So … 3y has the same …ue as 9.

…an add the same …lue on both sides of …n equation while …aintaining the …lded … side of …tion and 9 …r side of the …tion.

…bined like …x = 21.

…ed the …f x into the …tion to …lue of y.

Here is my answer.

(3, 2…

The equal sign indicates that the quantities on either side have the same value.

Since you can add the same value to both sides of an equation while maintaining the equality, you can add the values on either side of an equal sign to either side of another equation and you will maintain the equality of that equation.

*** How did Alex solve the system of equations?**
*** How did Morgan solve the system of equations?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Why does Alex's way work? Why can you "add" two equations together?**

Student Worksheet 6.2.4

1a How did Alex solve the system of equations?

1b How did Morgan solve the system of equations?

2 What are some similarities and differences between Alex's and Morgan's ways?

3 Why does Alex's way work? Why can you "add" two equations together?

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 3x+2y=8 \\ x-3y=10 \end{cases}$

Alex's "substitution" way

First, I solved the second equation for x.

$$x-3y=10$$
$$x=3y+10$$

Then I substituted the resulting expression into the first equation.

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

I simplified the equation by distributing and combining like terms.

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

I subtracted 30 from both sides of the equation and solved for *y*. This means that the *y*-coordinate of the solution is -2.

$$11y=-22$$
$$y=-2$$

To find the *x*-coordinate, I plugged the *y*-value into the original second equation.

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

I simplified and solved this equation for *x*. This means that the *x*-coordinate of the solution is 4.

$$x+6=10$$
$$x=4$$

This gives me the coordinates of the solution to this system.

The solution is (4, -2)

Morgan's "elimination" way

First I multiplied both sides of the second equation by -3, because this will help me to cancel out the 3*x* term.

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

Next I added the two equations.

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

I found the *y*-value by dividing both sides of the equation by 11. This means that the y-coordinate of the solution is -2.

$$y=-2$$

To find the *x*-coordinate, I plugged the *y*-value into the original second equation.

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

I simplified and solved this equation for *x*. This means that the *x*-coordinate of the solution is 4.

$$x+6=10$$
$$x=4$$

This gives me the coordinates of the solution to this system.

The solution is (4,-2)

* **How did Alex solve the problem?**
* **How did Morgan solve the problem?**
* **What are some similarities and differences between Alex's and Morgan's ways?**
* **What are some advantages of Alex's way? Of Morgan's way?**

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 3x+2y=8 \\ x-3y=10 \end{cases}$

Alex's "substitution" way	Morgan's "elimination" way
$x-3y=10$	$3x+2y=8$
$x=3y+10$	$-3(x-3y=10)$

First, I solved the second equation for x.

Then I substituted the resulting ex… into the first …

I simplified the… equation by distributing and…

I s… both… equati… for *y*. Th… that the… of t…

the… equatio…

I sim… thi…

is 4.

This gives me… coordinates … solution to t…

First I multiplied both sides of the second equation by -3, because this will help me to cancel out the 3x term.

Next I added the two …ons.

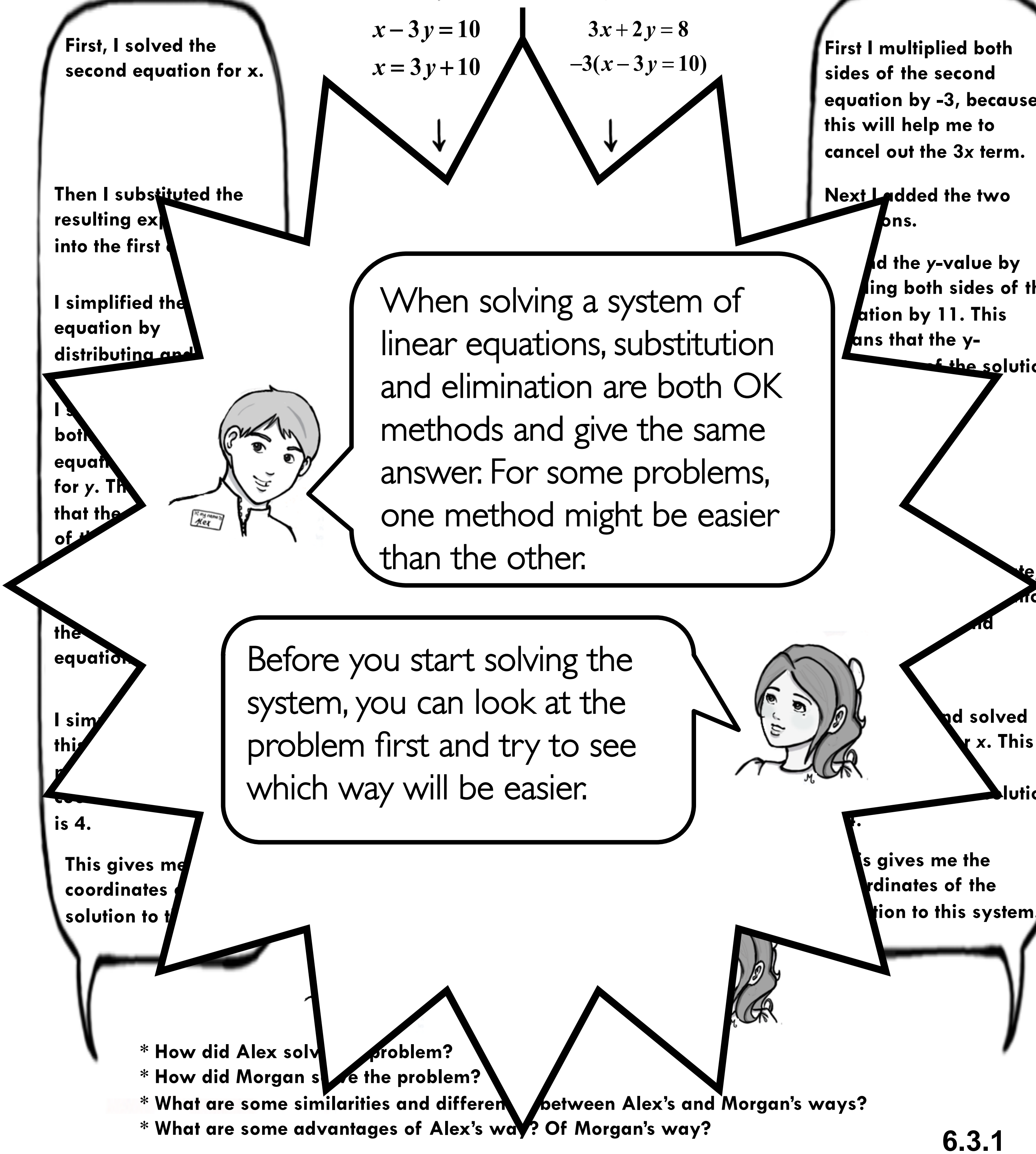
…d the *y*-value by …ing both sides of the …ation by 11. This …ans that the y- …f the solution

…te, I …o …nd

…d solved …r *x*. This

…olution

…s gives me the …rdinates of the …tion to this system.



* **How did Alex solv… problem?**
* **How did Morgan s…e the problem?**
* **What are some similarities and differen… between Alex's and Morgan's ways?**
* **What are some advantages of Alex's wa…? Of Morgan's way?**

Student Worksheet 6.3.1

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's *ways*?

3 What are some advantages of Alex's way? Of Morgan's way?

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 3x+4y=2 \\ y=-3x-4 \end{cases}$

Alex's "elimination" way

$$3x+4y=2$$
$$y=-3x-4$$

First, I rewrote the second equation in standard form.

$$y=-3x-4$$
$$3x+y=-4$$

Then I multiplied the second equation by (-1) so that I could eliminate the *x* terms.

$$-1(3x+y=-4)$$
$$-3x-y=4$$

I then used the elimination method by adding the two equations together. This gave me an equation with only *y*. I solved to get the *y*-coordinate of the solution.

$$\begin{array}{r} 3x+4y=2 \\ \underline{-3x-y=4} \\ 3y=6 \\ y=2 \end{array}$$

I substituted this value for *y* into the first equation so I could solve for *x*.

$$3x+4(2)=2$$
$$3x+8=2$$
$$3x=-6$$
$$x=-2$$

I got the solution.

The solution is (-2,2)

Morgan's "substitution" way

$$3x+4y=2$$
$$y=-3x-4$$

I substituted the expression for *y* in the second equation for *y* in the first equation.

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

I solved the resulting equation, which gave me the *x*-coordinate of the solution.

$$3x-12x-16=2$$
$$-9x-16=2$$
$$-9x=18$$
$$x=-2$$

I substituted this value of *x* into the second equation to solve for *y*.

$$y=-3x-4$$
$$y=-3(-2)-4$$
$$y=6-4$$
$$y=2$$

I got the solution.

The solution is (-2,2)

*** How did Alex solve the problem?**
*** How did Morgan solve the problem?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Whose way is easier, Alex's or Morgan's? Why?**
*** Complete the statements: "I think it's better to use substitution when __________." "I think it's better to use elimination when __________."**

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 3x + 4y = 2 \\ y = -3x - 4 \end{cases}$

Alex's "elimination" way | Morgan's "substitution" way

$3x + 4y = 2$
$y = -3x - 4$

$y = -3x - 4$ ...

$3x + 4y = 2$
$y = -3x - 4$

$3x + 4(-3x$ ...

First, I rewrote the second equation in standard form.

Then I multip... the second equat... (-1) so that I c... eliminate the x...

I then used the eli... ad... equ... This g... equatio... y. I solved... y-coord... so...

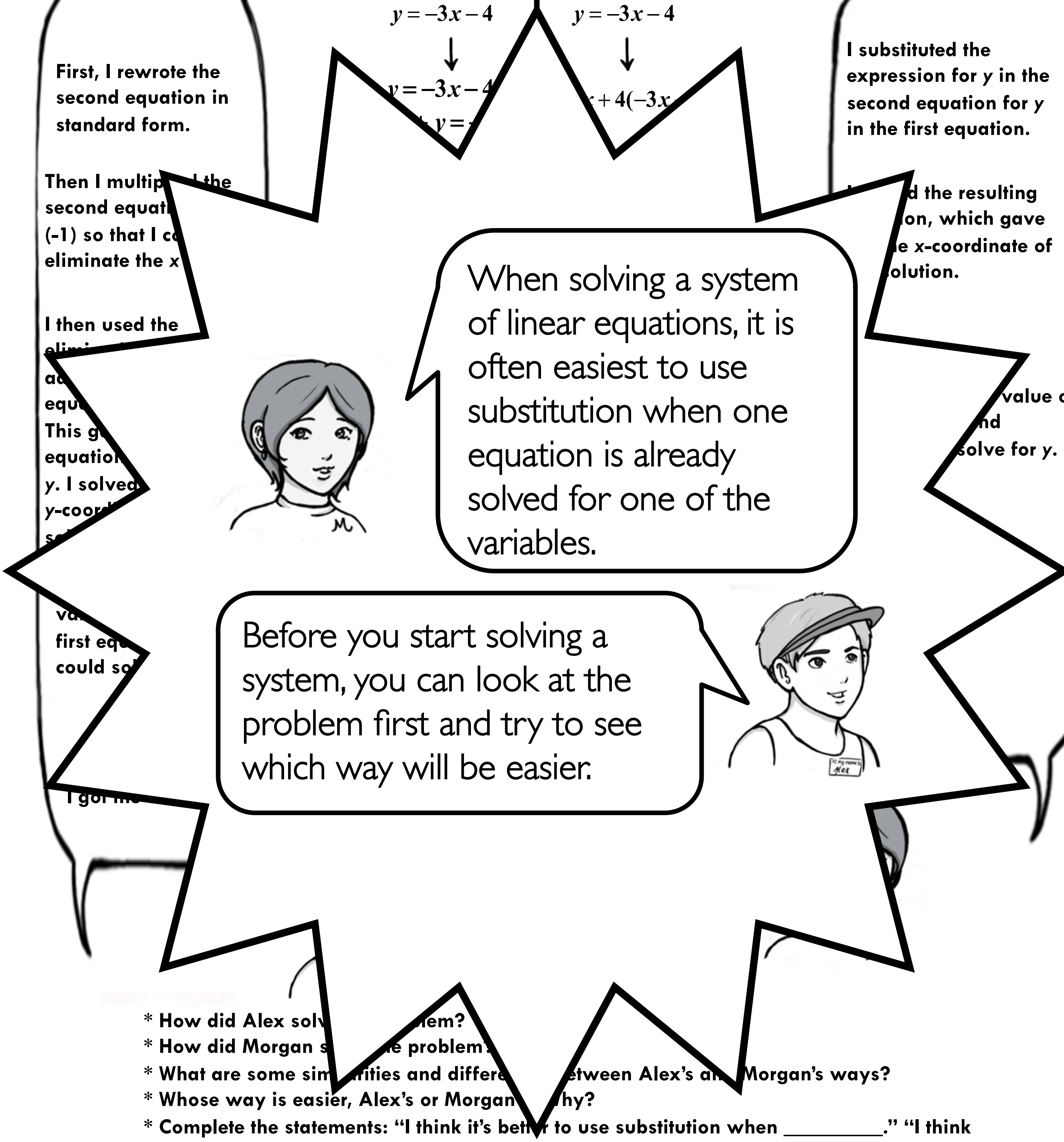
va... first eq... could so...

I got the...

I substituted the expression for y in the second equation for y in the first equation.

I ...d the resulting ...on, which gave ...e x-coordinate of ...olution.

...value of ...nd ...solve for y.



*** How did Alex solv... ...lem?**
*** How did Morgan s... ...e problem?**
*** What are some sim...ities and differe... ...etween Alex's a... Morgan's ways?**
*** Whose way is easier, Alex's or Morgan... ...hy?**
*** Complete the statements: "I think it's bett... to use substitution when _________." "I think it's better to use elimination when _________."**

Student Worksheet 6.3.2

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's *ways*?

3 Whose way is easier, Alex's or Morgan's? Why?

4 Complete the statements: "I think it's better to use substitution when ____________________________."
"I think it's better to use elimination when ___________________________________."

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 2x + 4y = 3 \\ -6x + 4y = 7 \end{cases}$

Alex's "substitution" way

$$2x + 4y = 3$$
$$-6x + 4y = 7$$

First, I solved the first equation for *x*.

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

Then I substituted this expression for *x* into the second equation and then solved for *y*. I got *y* = 1.

$$-6\left(\frac{3-4y}{2}\right) + 4y = 7$$
$$\frac{-6(3-4y)}{2} + 4y = 7$$
$$\frac{-18+24y}{2} + 4y = 7$$
$$-9 + 12y + 4y = 7$$
$$-9 + 16y = 7$$
$$16y = 16$$
$$y = 1$$

I substituted this value of *y* into the first equation to solve for *x*.

$$2x + 4y = 3$$
$$2x + 4(1) = 3$$
$$2x + 4 = 3$$
$$2x = -1$$
$$x = -\frac{1}{2}$$

Here is my answer.

$$\left(-\frac{1}{2}, 1\right)$$

Morgan's "elimination" way

$$2x + 4y = 3$$
$$-6x + 4y = 7$$

First I multiplied the second equation by -1.

$$2x + 4y = 3$$
$$-1(-6x + 4y) = 7(-1)$$

$$2x + 4y = 3$$
$$6x - 4y = -7$$

Then I added this new equation to the first equation, to eliminate the *y* variables.

When I added the equations together, I got a new equation that only had *x*'s in it. I solved this new equation for *x*.

$$2x + 4y = 3$$
$$\underline{6x - 4y = -7}$$
$$8x = -4$$
$$x = -\frac{1}{2}$$

I substituted this value of *x* into the first equation to solve for *y*.

$$2x + 4y = 3$$
$$2\left(-\frac{1}{2}\right) + 4y = 3$$
$$-1 + 4y = 3$$
$$4y = 4$$
$$y = 1$$

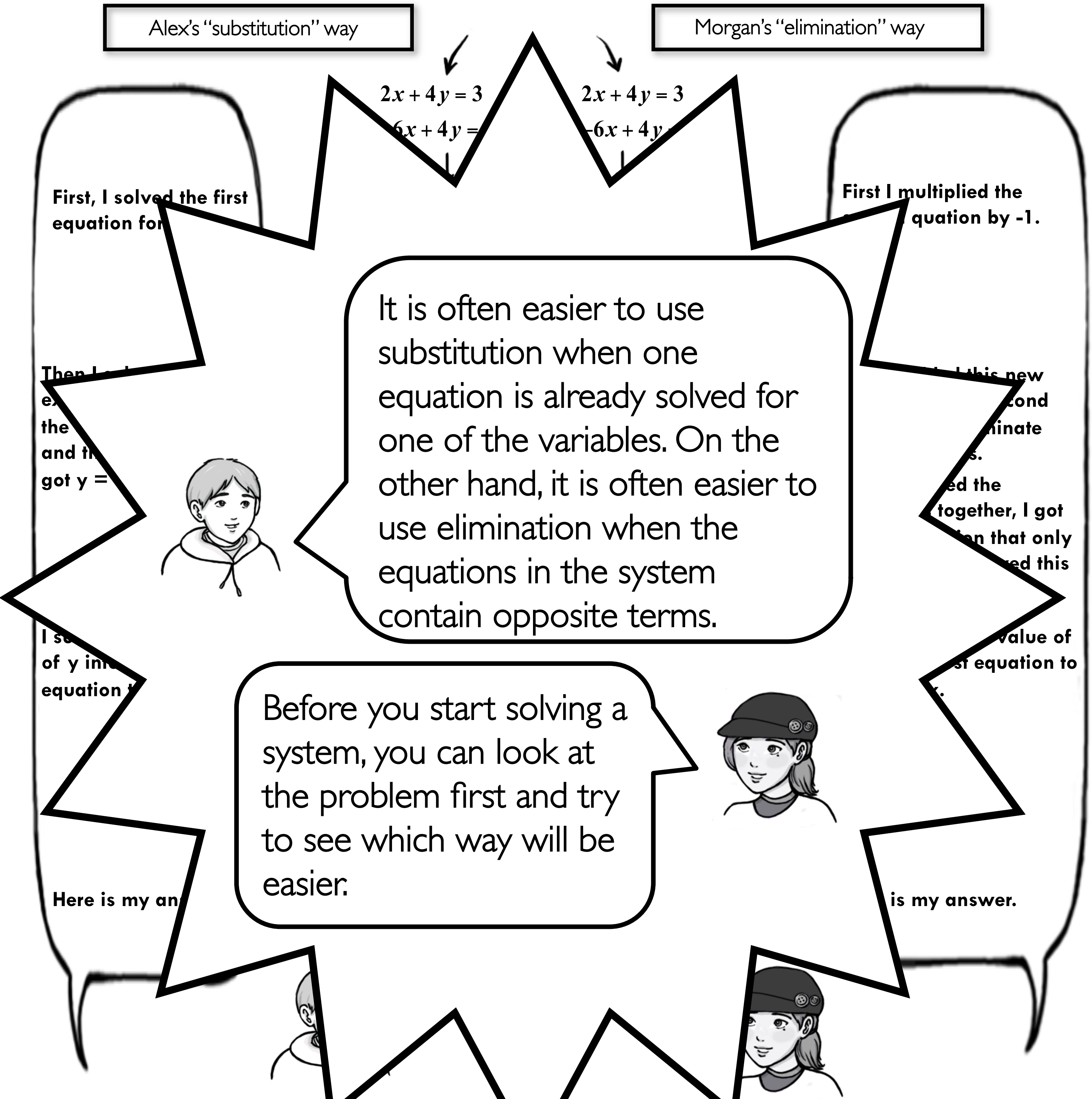
Here is my answer.

$$\left(-\frac{1}{2}, 1\right)$$

*** How did Alex solve the problem?**
*** How did Morgan solve the problem?**
*** What are some similarities and differences between Alex's and Morgan's ways?**
*** Whose way is easier, Alex's or Morgan's? Why?**
*** Complete the statements: "I think it's better to use substitution when _________." "I think it's better to use elimination when _________."**

Which is better?

Alex and Morgan were asked to solve the linear system $\begin{cases} 2x+4y=3 \\ -6x+4y=7 \end{cases}$



* How did Alex solve the problem?
* How did Morgan solve the problem?
* What are some similarities and differences between Alex's and Morgan's ways?
* Whose way is easier, Alex's or Morgan's? Why?
* Complete the statements: "I think it's better to use substitution when ________." "I think it's better to use elimination when ________."

Student Worksheet 6.3.3

1a How did Alex solve the problem?

1b How did Morgan solve the problem?

2 What are some similarities and differences between Alex's and Morgan's *ways*?

3 Whose way is easier, Alex's or Morgan's? Why?

4 Complete the statements: "I think it's better to use substitution when ___________________________."
"I think it's better to use elimination when __________________________________."