

Which is better?

Alex and Morgan were asked to graph the equation  $y = 2x + 1$

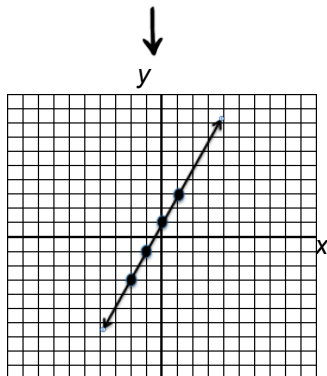
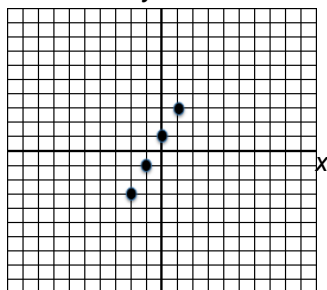
Alex's "make a table of values" way

First, I made a table. I chose some  $x$ -values, then plugged them into the original equation to find corresponding  $y$ -values.

Next, I plotted my points.

Finally, I connected my points and now I have my line.

$x$	$y$
-2	$2(-2)+1=-3$
-1	$2(-1)+1=-1$
0	$2(0)+1=1$
1	$2(1)+1=3$

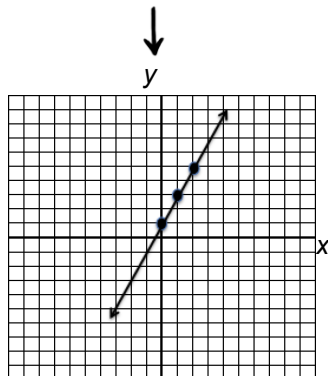
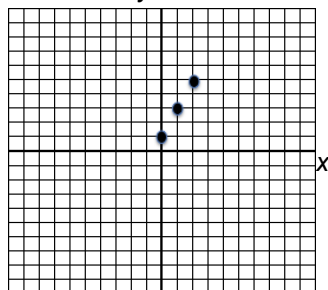


Morgan's "use the slope and y-intercept" way

$$y = 2x + 1$$

$$m = 2 = \frac{2}{1}$$

$$b = (0, 1)$$



I looked at the equation and saw that it was in slope-intercept form. So I could see that the slope,  $m$ , was 2 and the  $y$ -intercept,  $b$ , was at  $(0, 1)$ .

Next, I plotted the  $y$ -intercept. Then I found other points by using the slope. Since the slope is 2, this means that the rise is up 2 and the run is to the right 1.

Here is my final graph.



- \* Describe Alex's way to a new student in your class.
- \* Describe Morgan's way to a new student in your class.
- \* What are some similarities and differences between Alex's and Morgan's ways?\*
- \* Why did Alex choose the  $x$ -values he chose?
- \* Even though Alex and Morgan did different steps, why did they get the same answer?
- \* Which way is easier, Alex's way or Morgan's way? Why?

Which is better?

Alex and Morgan were asked to graph the equation  $y = 2x + 1$

Alex's "make a table of values" way

Morgan's "use the slope and y-intercept" way

First, I made a table. I chose some x-values, then plugged them into the original equation to find the corresponding y-values.

Next, I plotted the points.



Then, I connected my points to have my line.

$= 2$

I looked at the equation and saw that it was in slope-intercept form. So I knew that the slope,  $m$ , was 2 and the y-intercept,  $b$ , was 1).

I plotted the y-intercept and then used the slope to find the other points. The slope means is up 2 and the right 1.

When graphing a linear equation, making a table of values and plotting the slope and y-intercept both give you the same graph because both methods allow you to find several points that fall on the line.

There is more than one way to graph a line. Before you start graphing, you can look at the problem first and try to see which way will be easier.



- \* Describe Alex's way to a new student in your class.
- \* Describe Morgan's way to a new student in your class.
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Why did Alex choose the x-values he chose?
- \* Which way is easier, Alex's way or Morgan's way? Why?

1 Describe Alex's way to a new student in your class.

2 Describe Morgan's way to a new student in your class.

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

4 Why did Alex choose the  $x$ -values he chose?

5 Even though Alex and Morgan did different steps, why did they get the same answer?

6 Which way is easier, Alex's way or Morgan's way? Why?

Which is better?

Alex and Morgan were asked to graph the equation  $y = \frac{1}{3}x + 4$  using a table of values.

Alex's "choose typical x values" way

$$y = \frac{1}{3}x + 4$$

First I chose some x values. As I usually do when I make a table of values, I picked x to be 0, 1, 2, 3, and 4.

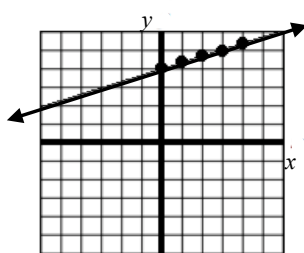
For each x value in the table, I plugged it into the equation to find the corresponding y value.

Then I plotted each ordered pair and connected the dots to give a graph of this line.



x	y
0	
1	
2	
3	
4	

x	y
0	4
1	13/3
2	14/3
3	5
4	16/3



Morgan's "choose x values more carefully" way

$$y = \frac{1}{3}x + 4$$

First I chose some x-values. I chose multiples of 3.

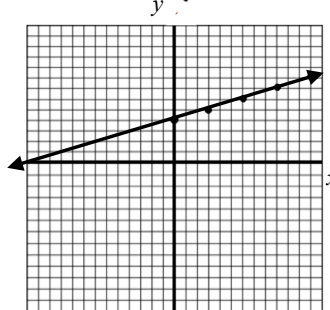
For each x value in the table, I plugged it into the equation to find the corresponding y value.

Then I plotted each ordered pair and connected the dots to give a graph of this line.



x	y
0	
3	
6	
9	
12	

x	y
0	4
3	5
6	6
9	7
12	8



\* How did Alex graph the equation? How did Morgan graph the equation?

\* What are some similarities and differences between Alex's and Morgan's ways? Why did Morgan choose to use only multiples of 3 for x?

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

Which is better?

Alex and Morgan were asked to graph the equation  $y = \frac{1}{3}x + 4$  using a table of values.

Alex's "choose typical x values" way

Morgan's "choose x values more carefully" way

$$\frac{1}{3}x + 4$$

$$y = \frac{1}{3}x$$

First I chose typical x values. As I do when I make a table of values, I picked x to be 2, 3, and 4.

For each x, I found the y value.



When creating a table of values to graph an equation, it is helpful to choose x values that will generate whole number values for y (rather than simply choosing x values without considering the specific equation to be graphed).

I chose some x-values that are multiples of 3.

These points are in the line.

There is more than one way to pick points for graphing a line. Before you start picking points, you can look at the problem first and try to pick points in the easiest way.



These points give a good picture of this line.

graph of this line.

\* How did Alex graph the equation? How did Morgan graph the equation?

\* What are some similarities and differences between Alex's and Morgan's ways? Why did Morgan choose to use only multiples of 3 for x?

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

1a How did Alex graph the equation?

1b How did Morgan graph the equation?

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

3 Why did Morgan choose to use only multiples of 3 for  $x$ ?

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

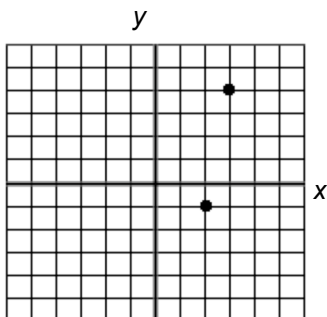
5 If the problem were changed to  $y = \frac{2}{7}x + 4$ , and you were trying to graph it using Morgan's way, then what  $x$  values would you choose?

Why does it work?

Alex and Morgan were asked to find the slope of the line passing through (3,4) and (2,-1)

Alex's "graph" way

First I drew a graph and plotted the two given points.



Starting from the bottom point, I counted the number of units up and to the right necessary to get to the other point. I went up 5 and to the right 1, so the slope is 5/1, which is 5.

$$m = \frac{5}{1} = 5$$



Morgan's "formula" way

First I wrote out the formula for slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Then I substituted in (3, 4) for  $(x_1, y_1)$  and (2, -1) for  $(x_2, y_2)$ .

$$m = \frac{-1 - 4}{2 - 3}$$

Then I simplified the numerator and denominator.

$$m = \frac{-5}{-1}$$

Then I divided to get the slope.

$$m = 5$$



- \* Describe Alex's way to a new student in your class.
- \* Describe Morgan's way to a new student in your class.
- \* Alex counted the spaces between the two points, beginning at the point (2, -1). Would Alex have gotten the same answer by starting from the other point, (3, 4)?
- \* How are Alex's and Morgan's ways similar?
- \* How are Alex's and Morgan's ways different?
- \* If the two points in the problem were changed to (-20, 6) and (14, 35), would Alex's way or Morgan's way be better?
- \* Even though Alex and Morgan did different first steps, why did they both get the same answer? **4.2.1**

Why does it work?

Alex and Morgan were asked to find the slope of the line passing through (3,4) and (2,-1)

Alex's "graph" way

Morgan's "formula" way

First I drew a graph and plotted the two given points.

First I wrote out the formula for slope.

To find the slope of a line passing through two given points, you can plot the points and get the slope from the graph or use the slope formula, and you will get the same answer.

There is more than one way to find the slope of a line; before you start, you can look at the problem first and try to see which way will be easier.

- \* Describe Alex's way to a new person.
- \* Describe Morgan's way to a new person.
- \* Alex counted the spaces between the two points. Would he have gotten the same answer by starting from the other point?
- \* How are Alex's and Morgan's ways similar?
- \* How are Alex's and Morgan's ways different?
- \* If the two points in the problem were changed to (-20, 6) and (14, 35), would Alex's way or Morgan's way be better?
- \* Even though Alex and Morgan did different first steps, why did they both get the same answer?



1 Describe Alex's way to a new student in your class.

2 Describe Morgan's way to a new student in your class.

3 Alex counted the spaces between the two points, beginning at the point  $(2, -1)$ . Would Alex have gotten the same answer by starting from the other point,  $(3, 4)$ ?

4 How are Alex's and Morgan's ways similar?

5 How are Alex's and Morgan's ways different?

6 If the two points in the problem were changed to  $(-20, 6)$  and  $(14, 35)$ , would Alex's way or Morgan's way be better?

7 Even though Alex and Morgan did different first steps, why did they both get the same answer?

Why does it work?

Alex and Morgan were asked to graph the equation  $4x - 3y = -12$  by plotting the x- and y-intercepts.

Alex's "find the intercepts by setting x and y equal to zero" way

Morgan's "find the intercepts by covering terms up" way

First I found the y-intercept. I found it by setting x equal to zero and solving the equation.

Then I found the x-intercept. I found it by setting y equal to zero and solving the equation.

Then I plotted the x- and y-intercepts and connected the dots to give a graph of this line.



$$4x - 3y = -12$$

When  $x = 0$ :

$$4(0) - 3y = -12$$

$$y = 4$$

$$(0, 4)$$



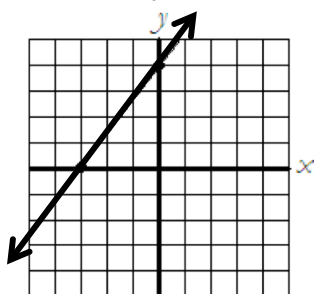
$$4x - 3y = -12$$

When  $y = 0$ :

$$4x - 3(0) = -12$$

$$x = -3$$

$$(-3, 0)$$



$$4x - 3y = -12$$



$$-3y = -12$$

$$y = 4$$

$$(0, 4)$$



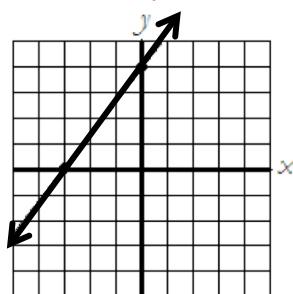
$$4x - 3y = -12$$



$$4x = -12$$

$$x = -3$$

$$(-3, 0)$$



First I found the y-intercept. I covered up the x term and solved the equation that was still showing, in my head, to get the y intercept of 4.

Then I found the x-intercept. I covered up the y term and solved the equation that was still showing, in my head, to get the x intercept of -3.

Then I plotted the x- and y-intercepts and connected the dots to give a graph of this line.



- \* How did Alex find the intercepts? How did Morgan find the intercepts?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Why did Alex and Morgan get the same intercepts, even though their ways are different?
- \* On a timed test, whose way would you use, Alex's or Morgan's?

Why does it work?

Alex and Morgan were asked to graph the equation  $4x - 3y = -12$  by plotting the x- and y-intercepts.

Alex's "find the intercepts by setting x and y equal to zero" way

Morgan's "find the intercepts by covering terms up" way

First I found the y-intercept. I found it by setting x to zero and solving the equation.

Then I found the x-intercept by setting y to zero and solving the equation.

Then I found the x- and y-intercepts and plotted them on the coordinate plane.



Hey Morgan, what did comparing these two examples help us to see?

First I found the y-intercept. I covered up the x term and solved the equation. I still got the y-intercept of 4.

Then I found the x-intercept by covering up the y term and solving the equation.

Then I found the x- and y-intercepts and plotted them on the coordinate plane.



When you are finding the intercepts of an equation in standard form, you can use the "shortcut" of covering up the terms rather than writing out the step where you substitute 0 in for x and y. Covering up a term is a shortcut for substituting 0 for the variable.

- \* How did Alex find the intercepts? How did Morgan find the intercepts?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Why did Alex and Morgan get the same intercepts, even though their ways are different?
- \* On a timed test, whose way would you use, Alex's or Morgan's?

1a How did Alex find the intercepts?

1b How did Morgan find the intercepts?

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

3 Why did Alex and Morgan get the same intercepts, even though their ways are different?

4 On a timed test, whose way would you use, Alex's or Morgan's? Why?

Why does it work?

Alex and Morgan were asked to write the equation of the line in point-slope form that passes through (3,7) and (8,22).

Alex's "use the first point" way

Morgan's "use the second point" way

First I wrote the point-slope form of a line.

Next, I found the slope using the slope formula. I used (3,7) as point #1 and (8,22) as point #2.

Then I plugged in the coordinates of point #1 to get my equation.

Finally, I wanted to check my answer with Morgan so I put it in slope-intercept form.

$$y - y_1 = m(x - x_1)$$



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{22 - 7}{8 - 3}$$

$$\frac{15}{5} = 3$$



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



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

$$y - 7 = 3x - 9$$

$$y = 3x - 2$$



$$y - y_1 = m(x - x_1)$$



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{22 - 7}{8 - 3}$$

$$\frac{15}{5} = 3$$



$$y - 22 = 3(x - 8)$$



$$y - 22 = 3(x - 8)$$

$$y - 22 = 3x - 24$$

$$y = 3x - 2$$



First I wrote the point-slope form of a line.

Next, I found the slope using the slope formula. I used (3,7) as point #1 and (8,22) as point #2.

Then I plugged in the coordinates of point #2 to get my equation.

Finally, I wanted to check my answer with Alex so I put it in slope-intercept form.

- \* Describe Alex's way to a new student in your class. Describe Morgan's way to a new student in your class.
- \* How do you know whether Alex's or Morgan's way is correct?
- \* Describe how Alex's and Morgan's ways are similar and different.
- \* Even though Alex and Morgan did different steps, why did they get the same answer?
- \* Would Alex and Morgan have gotten the same slope value if they had used (8,22) as point #1 and (3,7) as point #2?

Why does it work?

Alex and Morgan were asked to write the equation of the line in point-slope form that passes through (3,7) and (8,22).

Alex's "use the first point" way

Morgan's "use the second point" way

First I wrote the point-slope form of a line.

Next, I found the slope using the slope formula. I used (3,7) as point #1 and (8,22) as point #2.

Then I plugged in the coordinates of point #2 to get the equation.

I compared my answer with Morgan's answer in slope-intercept form.



$$y - y_1 = m(x - x_1)$$

$$y - y_1 = m(x - x_1)$$

First I wrote the point-slope form of a line.

Next, I found the slope using the slope formula. I used (3,7) as point #1 and (8,22) as point #2.

I plugged in the coordinates of point #2 to get the equation.

I compared my answer with Alex's answer in slope-intercept form.



When writing the equation of a line in point-slope form, you can choose to substitute in either of the given points for  $(x_1, y_1)$ . Either way, the equation will give you the same line.

There is more than one way to find the equation of a line. Before you start, you can look at the problem first and try to see which way will be easier.

- \* Describe Alex's way to a new student in your class.
- \* How do you know whether Alex's way is easier than Morgan's way?
- \* Describe how Alex's and Morgan's ways are similar and different.
- \* Even though Alex and Morgan used different steps, did they get the same answer?
- \* Would Alex and Morgan have gotten the same slope value if they had used (8,22) as point #1 and (3,7) as point #2?

1 Describe Alex's way to a new student in your class.

2 Describe Morgan's way to a new student in your class.

3 How do you know whether Alex's or Morgan's way is correct?

4 Describe how Alex's and Morgan's ways are similar and different.

5 Even though Alex and Morgan did different steps, why did they get the same answer?

6 Would Alex and Morgan have gotten the same slope value if they had used (8,22) as point #1 and (3,7) as point #2?

Which is better?

**Alex and Morgan were asked to graph  $y - 1 = 4(x - 2)$ .**

Alex's "convert to slope-intercept form" way

First, I noticed that this line is given in point-slope form. Before graphing, I wanted to convert it to slope-intercept form.

I added 1 on either side.

Then I distributed the 4.

I simplified my expression. Now the equation is in slope-intercept form.

To graph it, first I plotted the y-intercept, which is at (0, -7).

Then I looked at my equation and found the slope of the line, which is 4. I used the slope to plot several more points that fall on the line. I started at my point (0, -7) and counted up 4, right 1 to plot several more points.

Then I connected the dots to get the graph of my line.

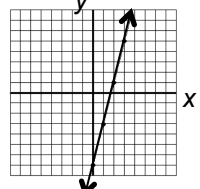
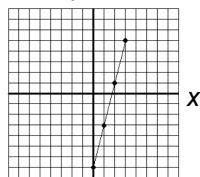
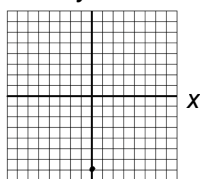


$$y - 1 = 4(x - 2)$$

$$y = 4(x - 2) + 1$$

$$y = 4x - 8 + 1$$

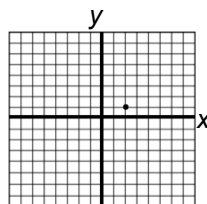
$$y = 4x - 7$$



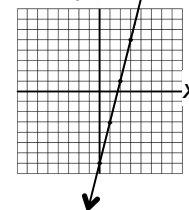
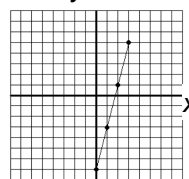
Morgan's "use point-slope form" way

$$y - y_1 = m(x - x_1)$$

$$y - 1 = 4(x - 2)$$



$$y - 1 = 4(x - 2)$$



First I wrote the general equation for a line in point-slope form. I compared that to the equation given in the problem.

By looking at my equation, I can find one ordered pair that falls on the line. It is (2, 1).

So I plotted this point.

Then I looked at my equation again, and I found the slope of the line, which is 4.

I used the slope to plot several more points that fall on the line. I started at my point (2, 1) and counted up 4, right 1, and also down 4, left 1 to plot several more points.

Then I connected the dots to make a line. This is my graph!



- \* How did Alex graph the equation?
- \* Why did Alex begin by solving for y?
- \* How did Morgan graph the equation?
- \* Describe some similarities and differences between Alex's and Morgan's ways.
- \* Did Alex and Morgan get the same answer? How do you know?
- \* Whose way is easier, Alex's or Morgan's?
- \* The slope-intercept form of an equation and the point-slope form of an equation both tell you the location of one point on the line. What part of the equation in slope-intercept form tells you the location of a point? What part of the equation in point-slope form tells you the location of a point?



Which is better?

Alex and Morgan were asked to graph  $y - 1 = 4(x - 2)$ .

Alex's "convert to slope-intercept form" way

Morgan's "use point-slope form" way

First, I noticed that this line is given in point-slope form. Before graphing, I wanted to convert it to slope-intercept form.

I added 1 on either side.

Then I distributed

I simplified  
Now I have  
slope-intercept

To graph it, I  
the y-intercept  
at (0, -7).

equation  
slope is 4. I used the  
several more points  
fall on the line.  
my points  
counted  
plot

Then I connected the  
to get the graph of  
line.



$$y - 1 = 4(x - 2)$$

2)

$$y - y_1 = m(x - x_1)$$

1 = 4

First I wrote the general equation for a line in point-slope form. I compared that to the equation given in the problem.

Looking at my equation, I can find one ordered pair that falls on the line. It is (2, 1).

So I plotted this point.

my equation, and I  
slope of the line  
is 4.

slope to plot  
points that  
started

1, 4, left 1  
several more

ated the  
line.



When you have to graph an equation given in point-slope form, you don't have to convert it to slope-intercept form. It may be easier to graph the line directly from the point-slope form  $y - y_1 = m(x - x_1)$ .

There is more than one way to graph a line. Before you start, you can look at the problem first and try to see which way will be easier.



- \* How did Alex graph the equation?
- \* Why did Alex begin by solving for y?
- \* How did Morgan graph the equation?
- \* Describe some similarities and differences between Alex's and Morgan's ways.
- \* Did Alex and Morgan get the same answer? How do you know?
- \* Whose way is easier, Alex's or Morgan's?
- \* The slope-intercept form of an equation and the point-slope form of an equation both tell you the location of one point on the line. What part of the equation in slope-intercept form tells you the location of a point? What part of the equation in point-slope form tells you the location of a point?

1a How did Alex graph the equation?

1b How did Morgan graph the equation?

2 Why did Alex begin by solving for  $y$ ?

3 Describe some similarities and differences between Alex's and Morgan's ways.

4 Did Alex and Morgan get the same answer? How do you know?

5 Whose way is easier, Alex's or Morgan's?

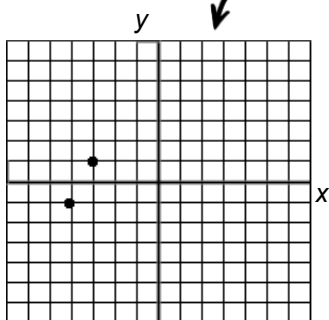
6 The slope-intercept form of an equation and the point-slope form of an equation both tell you the location of one point on the line. What part of the equation in slope-intercept form tells you the location of a point?

Which is better?

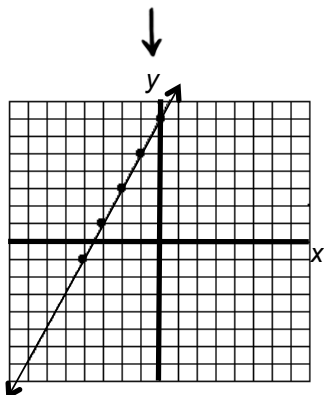
Alex and Morgan were asked to find the y-intercept of the line connecting the two points  $(-3, 1)$  and  $(-4, -1)$ .

Alex's "graphing" way

First I drew a graph and plotted the two given points.



Then I looked at the points and found the slope of the line. To get from one point to the next, I went up two and to the right one. I repeated this pattern to draw more points on the line until it crossed the y-axis to get the y-intercept, which is  $(0, 7)$ .



Morgan's "algebraic" way

$$y = mx + b$$

$$m = \frac{-1 - 1}{-4 - (-3)}$$

$$\frac{-2}{-1} = 2$$

$$y = 2x + b$$

$$-1 = 2(-4) + b$$

$$-1 = -8 + b$$

$$7 = b$$

First I wrote out the slope-intercept form of the equation of a line. In this equation,  $b$  is the y-intercept.

Then I used the slope formula to find the slope. It is 2.

Then I substituted the slope for  $m$  in the equation.

Then I substituted in one of the given points,  $(-4, -1)$ , for  $x$  and  $y$  in the equation.

Then I eliminated the parentheses.

Then I solved for  $b$  to get the answer, which means that the y-intercept is at  $(0, 7)$ .



- \* Why did Alex plot the two points as a first step?
- \* Why did Morgan write the equation for a line in slope-intercept form as a first step?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Even though Alex and Morgan did different steps, why did they both get the same answer?
- \* If the points given were changed to  $(520, 657)$  and  $(-3000, -25)$ , would Alex's way or Morgan's way be better?
- \* If the points given were changed to  $(0.56, 29)$  and  $(-2/3, 65.733)$ , would Alex's way or Morgan's way be better?

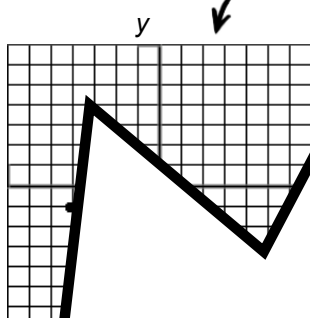
Which is better?

Alex and Morgan were asked to find the y-intercept of the line connecting the two points  $(-3, 1)$  and  $(-4, -1)$ .

Alex's "graphing" way

Morgan's "algebraic" way

First I drew a graph and plotted the two given points.



$$y = mx + b$$

First I wrote out the slope-intercept form of the equation of a line. In this equation,  $b$  is the y-intercept.

Then I used the slope formula to find the slope. It is 2.

Then I substituted the slope into the equation.

I substituted in the given point  $(-4, -1)$ , for  $x$  and  $y$  in the equation.

I solved for  $b$  and the answer,  $b = 5$ , means that the y-intercept is at  $(0, 5)$ .

Then I looked at the points and found the slope of the line. To get the slope, I found the change in  $y$  over the change in  $x$ . From the two points, I saw a repeated pattern to find the slope.

When I graphed the line, I saw that the y-intercept was at  $(0, 5)$ .



When you are given two points, you can determine the y-intercept of the line that passes through both points either (1) graphically or (2) algebraically. For some problems, the algebraic method may be easier than the graphing method, such as when the numbers given in the problem are large or messy.

Before you start, you can look at the problem first and try to see which way will be easier.



What was Morgan's first step? What was Alex's first step? Did they get the same answer? Which way was easier? Alex's way or Morgan's way?

- \* Why did Alex use the graphing method?
- \* Why did Morgan write the slope-intercept form?
- \* What are some similarities between the two methods?
- \* Even though Alex and Morgan used different methods, they did not get the same answer. Why?
- \* If the points given were changed to  $(520, 6)$  and  $(3000, -25)$ , which way would be better?
- \* If the points given were changed to  $(0.56, 29)$  and  $(-2/3, 65.733)$ , would Alex's way or Morgan's way be better?

1a Why did Alex plot the two points as a first step?

1b Why did Morgan write the equation for a line in slope-intercept form as a first step?

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

3 Even though Alex and Morgan did different steps, why did they both get the same answer?

4 If the points given were changed to  $(520, 657)$  and  $(-3000, -25)$ , would Alex's way or Morgan's way be better?

5 If the points given were changed to  $(0.56, 29)$  and  $(-2/3, 65.733)$ , would Alex's way or Morgan's way be better?

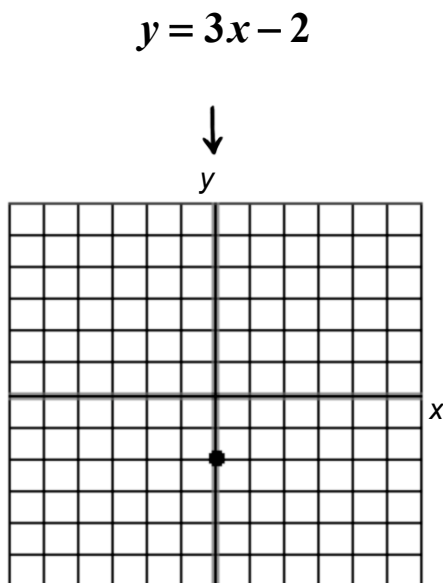
Which is correct?

Alex and Morgan were asked to graph the equation  $y = 3x - 2$

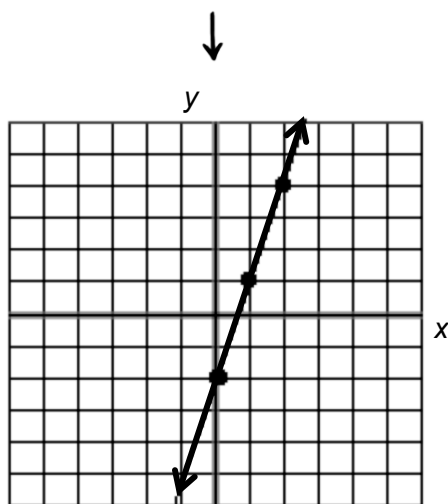
Alex's "slope and y-intercept" way

Morgan's "slope and y-intercept" way

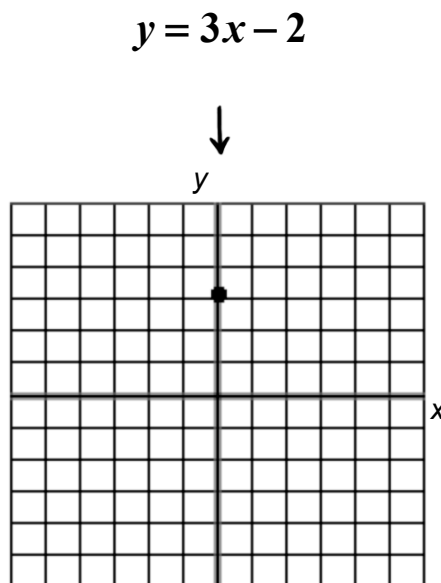
First I graphed the -2, which is the y-intercept.



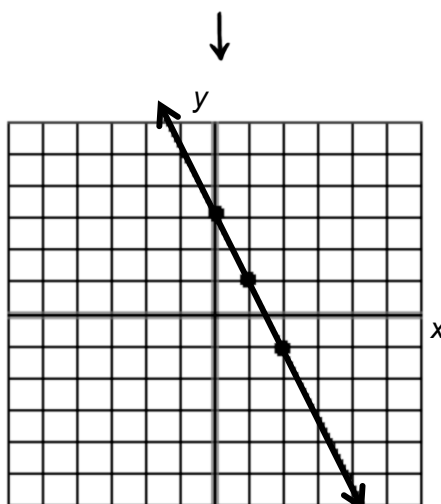
Then I used the slope to find more points. Since the slope is 3, I went up three units and to the right 1 unit to get two more points, then connected them to get the line.



First I graphed the 3, which is the y-intercept.



Then I used the slope to find more points. Since the slope is -2, I went down two units and to the right 1 unit to get two more points, then connected them to get the line.



- \* Describe Alex's way to a new student in your class.
- \* Describe two ways that Alex's and Morgan's ways are similar.
- \* Describe two ways that Alex's and Morgan's ways are different.
- \* Which answer is correct, Alex's or Morgan's? How do you know?
- \* Can you give a general rule that describes what you have learned from comparing Alex's and Morgan's ways of solving this type of problem?

Which is correct?

Alex and Morgan were asked to graph the equation  $y = 3x - 2$

Alex's "slope and y-intercept" way

Morgan's "slope and y-intercept" way

$$y = 3x - 2$$

$$y = 3x - 2$$

First I graphed the -2, which is the y-intercept.

First I graphed 3, which is the y-intercept.

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

In the slope-intercept form of the equation  $y = mx + b$ ,  $m$  represents the slope and  $b$  represents the y-intercept. Be careful that you don't confuse these!

Then I graphed the 3, which is the slope. Since the slope is 3, I went up 3 units and to the right 1 unit. Then I graphed two more points and connected them to form the line.

the slope is 3, I went down 3 units and to the right 1 unit to graph the line.

- \* Describe Alex's way to a new friend in your own words.
- \* Describe two ways that Alex's and Morgan's ways are similar.
- \* Describe two ways that Alex's and Morgan's ways are different.
- \* Which answer is correct, Alex's or Morgan's? How do you know?
- \* Can you give a general rule that describes what you have learned from comparing Alex's and Morgan's ways of solving this type of problem?

1 Describe Alex's way to a new student in your class.

2 Describe two ways that Alex's and Morgan's ways are similar.

3 Describe two ways that Alex's and Morgan's ways are different.

4 Which answer is correct, Alex's or Morgan's? How do you know?

5 Can you give a general rule that describes what you have learned from comparing Alex's and Morgan's ways of solving this type of problem?



Which is correct?

Alex and Morgan were asked to graph the equation  $y = -\frac{2}{5}x + 1$

Alex's "plot 'run over rise'" way

Morgan's "plot 'rise over run'" way

First I plotted the y-intercept, which is at (0,1).

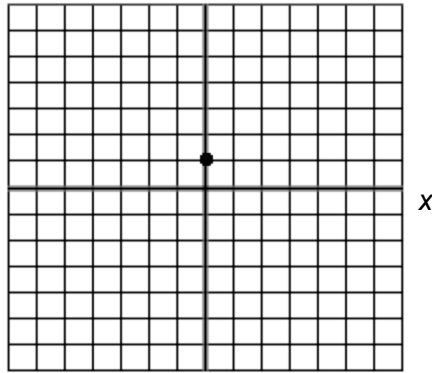
Then I plotted two points using the slope of the equation. The slope is  $-\frac{2}{5}$ , so I went down five and to the right two, to get to the next point. To find another point, I went up five and left two.

Then I drew a line through the three points to finish graphing the line.

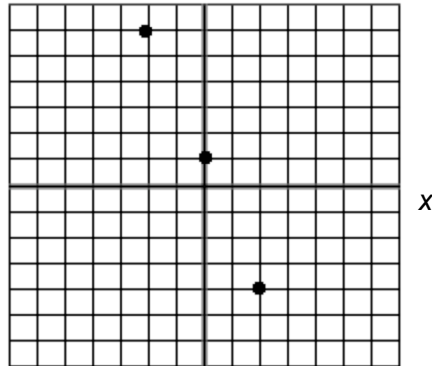


$$y = -\frac{2}{5}x + 1$$

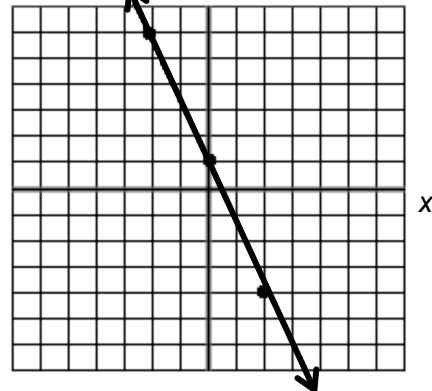
y ↓



y ↓

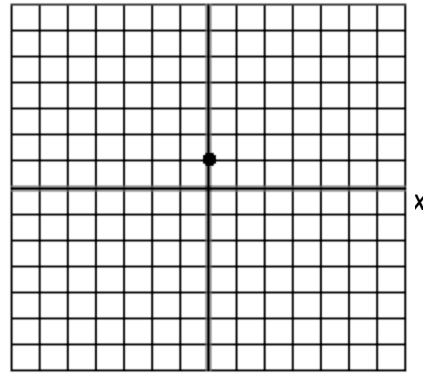


y ↓

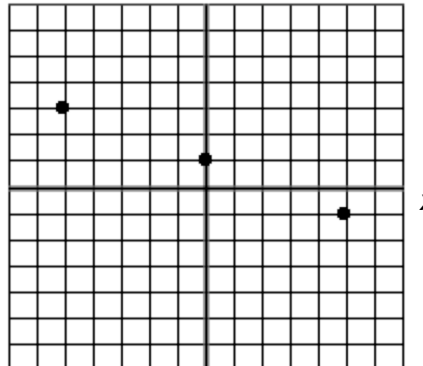


$$y = -\frac{2}{5}x + 1$$

y ↓



y ↓



y ↓



First I plotted the y-intercept, which is at (0,1).

Then I plotted two points using the slope of the equation. The slope is  $-\frac{2}{5}$ , so I went down two and right five, to get to the next point. To find another point, I went up two and left five.

Then I drew a line through the three points to finish graphing the line.



- \* How did Alex graph this line? How did Morgan graph this line?
- \* Describe two ways that Alex's and Morgan's ways are similar.
- \* Describe two ways that Alex's and Morgan's ways are different.
- \* Which line is correctly graphed, Alex's or Morgan's? How do you know?
- \* In thinking about the similarities and differences between Alex's and Morgan's ways, what conclusions can you draw about how to solve this type of problem?

Which is correct?

Alex and Morgan were asked to graph the equation  $y = -\frac{2}{5}x + 1$

Alex's "plot 'run over rise'" way

Morgan's "plot 'rise over run'" way

$$y = -\frac{2}{5}x + 1$$

$$y = -\frac{2}{5}x + 1$$

First I plotted the y-intercept, which is at (0,1).

First I plotted the y-intercept, which is at (0,1).

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

The slope is ratio of the vertical distance between any two points on a line, to the horizontal distance between those two points. It is the change in y divided by the change in x. When we say that slope means "rise over run," the "rise" is the change in y and can be found in the numerator of the slope, and the "run" is the change in x and can be found in the denominator of the slope.

Then I plotted two points using the slope of the equation. The slope is -2/5, so I went down two and right five.

Then I found another point, I went up five and left two.

Then I drew a line through the points to graph the line.



I plotted two points using the slope of the equation. The slope is -2/5, so I went down two and right five.

Then I found another point, I went up two and right five.

Then I drew a line through the points to graph the line.



- \* How did Alex graph this line? How did Morgan graph this line?
- \* Describe two ways that Alex's and Morgan's ways are similar.
- \* Describe two ways that Alex's and Morgan's ways are different.
- \* Which line is correctly graphed, Alex's or Morgan's? How do you know?
- \* In thinking about the similarities and differences between Alex's and Morgan's ways, what conclusions can you draw about how to solve this type of problem?

**1a** How did Alex graph this line?

**1b** How did Morgan graph this line?

**2** Describe two ways that Alex's and Morgan's ways are similar.

**3** Describe two ways that Alex's and Morgan's ways are different.

**4** Which line is correctly graphed, Alex's or Morgan's? How do you know?

**5** In thinking about the similarities and differences between Alex's and Morgan's ways, what conclusions can you draw about how to solve this type of problem?

How do they differ?

Alex was asked to graph the equation  $y = x$ ,  
and Morgan was asked to graph the equation  $y = 3x$ .

Alex's "graph  $y = x$ " way

Morgan's "graph  $y = 3x$ " way

$$y = x$$

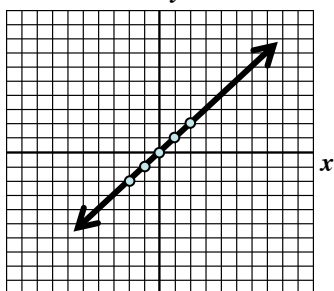


$$y = mx + b$$

$$y = 1x + 0$$



y



$$y = 3x$$

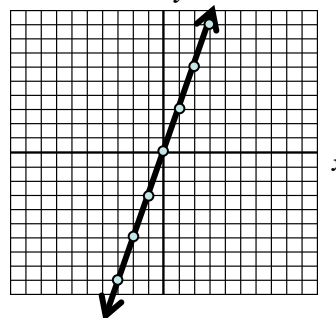


$$y = mx + b$$

$$y = 3x + 0$$



y



I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, (0,0) and counted up 1, right 1 and down 1, left 1 to plot other points on the line. I connected the points to draw the graph of the line.



I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, (0,0) and counted up 3, right 1 and down 3, left 1 to plot other points on the line. I connected the points to draw the graph of the line.



- \* How did Alex graph the line given by his equation? How did Morgan graph the line given by her equation?
- \* Can you think of another way that Alex and Morgan could have used to find the graphs of their lines?
- \* What are some similarities and differences between Alex's and Morgan's problems?
- \* What are some similarities and differences between Alex's and Morgan's graphs?
- \* If  $m$  were changed to  $-3$ , how would this affect the graph of the line? What about if  $m$  were changed to  $\frac{1}{3}$ ?
- \* How does changing the value of  $m$  affect the graph of a line?

How do they differ?

Alex was asked to graph the equation  $y = x$ ,  
and Morgan was asked to graph the equation  $y = 3x$ .

Alex's "graph  $y = x$ " way

Morgan's "graph  $y = 3x$ " way

I rewrote the equation in  $y = mx + b$  form.



Hey Morgan, what did we learn from comparing these two ways?

I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, counted up 1 and down 1 to plot points, and graphed the line.

and, right 3, left 3.

In the slope-intercept form of a line ( $y = mx + b$ ), the coefficient of  $x$ , which is  $m$ , indicates the slope. Changing the value of  $m$  changes the slope, or the steepness, of the line.



\* How did Alex graph his equation?

\* Can you think of another way to graph a line?

\* What are some similarities between Alex's and Morgan's problems?

\* What are some similarities between Alex's and Morgan's graphs?

\* If  $m$  were changed to  $-3$ , how would this affect the graph of the line? What about if  $m$  were changed to  $\frac{1}{3}$ ?

\* How does changing the value of  $m$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

\* How does changing the value of  $b$  affect the graph of a line?

given by

to find the graphs of their

an's problems?

an's graphs?

What about if  $m$  were

What about if  $m$  were

What about if  $m$  were

What about if  $m$  were

What about if  $m$  were

What about if  $m$  were

What about if  $m$  were

What about if  $m$  were

**1a** How did Alex graph the line given by his equation?

**1b** How did Morgan graph the line given by her equation?

**2** Can you think of another way that Alex and Morgan could have used to find the graphs of their lines?

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

**4** What are some similarities and differences between Alex's and Morgan's graphs?

**5** If  $m$  were changed to  $-3$ , how would this affect the graph of the line? What about if  $m$  were changed to  $\frac{1}{3}$ ?

**6** How does changing the value of  $m$  affect the graph of a line?

How do they differ?

Alex was asked to graph the equation  $y = 2x$   
and Morgan was asked to graph the equation  $y = -2x$ .

Alex's "graph  $y = 2x$ " way

Morgan's "graph  $y = -2x$ " way

$$y = 2x$$

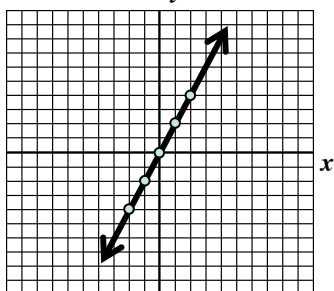


$$y = mx + b$$

$$y = 2x + 0$$



y



$$y = -2x$$

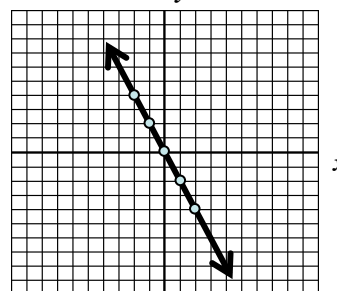


$$y = mx + b$$

$$y = -2x + 0$$



y



I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, (0,0) and counted up 2, right 1 and down 2, left 1 to plot other points on the line. I connected the points to draw the graph of the line.



I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, (0,0) and counted down 2, right 1 and up 2, left 1 to plot other points on the line. I connected the points to draw the graph of the line.



- \* How did Alex graph the line given by his equation? How did Morgan graph the line given by her equation?
- \* Can you think of another way that Alex and Morgan could have used to find the graphs of their lines?
- \* What are some similarities and differences between Alex's and Morgan's problems?
- \* What are some similarities and differences between Alex's and Morgan's graphs?
- \* How does changing the sign of  $m$  affect the graph of a line?

How do they differ?

Alex was asked to graph the equation  $y = 2x$   
and Morgan was asked to graph the equation  $y = -2x$ .

Alex's "graph  $y = 2x$ " way

Morgan's "graph  $y = -2x$ " way

I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, counted up 1 and down 1 to plot points, and then graphed the line.



In the slope-intercept form of a line ( $y = mx + b$ ), the coefficient of  $x$ , which is  $m$ , indicates the slope.

I rewrote the equation in  $y = mx + b$  form.

and then 2, 2, then 4, 4, then 6, 6, then 8, 8, then 10, 10, then 12, 12, then 14, 14, then 16, 16, then 18, 18, then 20, 20, then 22, 22, then 24, 24, then 26, 26, then 28, 28, then 30, 30, then 32, 32, then 34, 34, then 36, 36, then 38, 38, then 40, 40, then 42, 42, then 44, 44, then 46, 46, then 48, 48, then 50, 50, then 52, 52, then 54, 54, then 56, 56, then 58, 58, then 60, 60, then 62, 62, then 64, 64, then 66, 66, then 68, 68, then 70, 70, then 72, 72, then 74, 74, then 76, 76, then 78, 78, then 80, 80, then 82, 82, then 84, 84, then 86, 86, then 88, 88, then 90, 90, then 92, 92, then 94, 94, then 96, 96, then 98, 98, then 100, 100, then 102, 102, then 104, 104, then 106, 106, then 108, 108, then 110, 110, then 112, 112, then 114, 114, then 116, 116, then 118, 118, then 120, 120, then 122, 122, then 124, 124, then 126, 126, then 128, 128, then 130, 130, then 132, 132, then 134, 134, then 136, 136, then 138, 138, then 140, 140, then 142, 142, then 144, 144, then 146, 146, then 148, 148, then 150, 150, then 152, 152, then 154, 154, then 156, 156, then 158, 158, then 160, 160, then 162, 162, then 164, 164, then 166, 166, then 168, 168, then 170, 170, then 172, 172, then 174, 174, then 176, 176, then 178, 178, then 180, 180, then 182, 182, then 184, 184, then 186, 186, then 188, 188, then 190, 190, then 192, 192, then 194, 194, then 196, 196, then 198, 198, then 200, 200, then 202, 202, then 204, 204, then 206, 206, then 208, 208, then 210, 210, then 212, 212, then 214, 214, then 216, 216, then 218, 218, then 220, 220, then 222, 222, then 224, 224, then 226, 226, then 228, 228, then 230, 230, then 232, 232, then 234, 234, then 236, 236, then 238, 238, then 240, 240, then 242, 242, then 244, 244, then 246, 246, then 248, 248, then 250, 250, then 252, 252, then 254, 254, then 256, 256, then 258, 258, then 260, 260, then 262, 262, then 264, 264, then 266, 266, then 268, 268, then 270, 270, then 272, 272, then 274, 274, then 276, 276, then 278, 278, then 280, 280, then 282, 282, then 284, 284, then 286, 286, then 288, 288, then 290, 290, then 292, 292, then 294, 294, then 296, 296, then 298, 298, then 300, 300, then 302, 302, then 304, 304, then 306, 306, then 308, 308, then 310, 310, then 312, 312, then 314, 314, then 316, 316, then 318, 318, then 320, 320, then 322, 322, then 324, 324, then 326, 326, then 328, 328, then 330, 330, then 332, 332, then 334, 334, then 336, 336, then 338, 338, then 340, 340, then 342, 342, then 344, 344, then 346, 346, then 348, 348, then 350, 350, then 352, 352, then 354, 354, then 356, 356, then 358, 358, then 360, 360, then 362, 362, then 364, 364, then 366, 366, then 368, 368, then 370, 370, then 372, 372, then 374, 374, then 376, 376, then 378, 378, then 380, 380, then 382, 382, then 384, 384, then 386, 386, then 388, 388, then 390, 390, then 392, 392, then 394, 394, then 396, 396, then 398, 398, then 400, 400, then 402, 402, then 404, 404, then 406, 406, then 408, 408, then 410, 410, then 412, 412, then 414, 414, then 416, 416, then 418, 418, then 420, 420, then 422, 422, then 424, 424, then 426, 426, then 428, 428, then 430, 430, then 432, 432, then 434, 434, then 436, 436, then 438, 438, then 440, 440, then 442, 442, then 444, 444, then 446, 446, then 448, 448, then 450, 450, then 452, 452, then 454, 454, then 456, 456, then 458, 458, then 460, 460, then 462, 462, then 464, 464, then 466, 466, then 468, 468, then 470, 470, then 472, 472, then 474, 474, then 476, 476, then 478, 478, then 480, 480, then 482, 482, then 484, 484, then 486, 486, then 488, 488, then 490, 490, then 492, 492, then 494, 494, then 496, 496, then 498, 498, then 500, 500, then 502, 502, then 504, 504, then 506, 506, then 508, 508, then 510, 510, then 512, 512, then 514, 514, then 516, 516, then 518, 518, then 520, 520, then 522, 522, then 524, 524, then 526, 526, then 528, 528, then 530, 530, then 532, 532, then 534, 534, then 536, 536, then 538, 538, then 540, 540, then 542, 542, then 544, 544, then 546, 546, then 548, 548, then 550, 550, then 552, 552, then 554, 554, then 556, 556, then 558, 558, then 560, 560, then 562, 562, then 564, 564, then 566, 566, then 568, 568, then 570, 570, then 572, 572, then 574, 574, then 576, 576, then 578, 578, then 580, 580, then 582, 582, then 584, 584, then 586, 586, then 588, 588, then 590, 590, then 592, 592, then 594, 594, then 596, 596, then 598, 598, then 600, 600, then 602, 602, then 604, 604, then 606, 606, then 608, 608, then 610, 610, then 612, 612, then 614, 614, then 616, 616, then 618, 618, then 620, 620, then 622, 622, then 624, 624, then 626, 626, then 628, 628, then 630, 630, then 632, 632, then 634, 634, then 636, 636, then 638, 638, then 640, 640, then 642, 642, then 644, 644, then 646, 646, then 648, 648, then 650, 650, then 652, 652, then 654, 654, then 656, 656, then 658, 658, then 660, 660, then 662, 662, then 664, 664, then 666, 666, then 668, 668, then 670, 670, then 672, 672, then 674, 674, then 676, 676, then 678, 678, then 680, 680, then 682, 682, then 684, 684, then 686, 686, then 688, 688, then 690, 690, then 692, 692, then 694, 694, then 696, 696, then 698, 698, then 700, 700, then 702, 702, then 704, 704, then 706, 706, then 708, 708, then 710, 710, then 712, 712, then 714, 714, then 716, 716, then 718, 718, then 720, 720, then 722, 722, then 724, 724, then 726, 726, then 728, 728, then 730, 730, then 732, 732, then 734, 734, then 736, 736, then 738, 738, then 740, 740, then 742, 742, then 744, 744, then 746, 746, then 748, 748, then 750, 750, then 752, 752, then 754, 754, then 756, 756, then 758, 758, then 760, 760, then 762, 762, then 764, 764, then 766, 766, then 768, 768, then 770, 770, then 772, 772, then 774, 774, then 776, 776, then 778, 778, then 780, 780, then 782, 782, then 784, 784, then 786, 786, then 788, 788, then 790, 790, then 792, 792, then 794, 794, then 796, 796, then 798, 798, then 800, 800, then 802, 802, then 804, 804, then 806, 806, then 808, 808, then 810, 810, then 812, 812, then 814, 814, then 816, 816, then 818, 818, then 820, 820, then 822, 822, then 824, 824, then 826, 826, then 828, 828, then 830, 830, then 832, 832, then 834, 834, then 836, 836, then 838, 838, then 840, 840, then 842, 842, then 844, 844, then 846, 846, then 848, 848, then 850, 850, then 852, 852, then 854, 854, then 856, 856, then 858, 858, then 860, 860, then 862, 862, then 864, 864, then 866, 866, then 868, 868, then 870, 870, then 872, 872, then 874, 874, then 876, 876, then 878, 878, then 880, 880, then 882, 882, then 884, 884, then 886, 886, then 888, 888, then 890, 890, then 892, 892, then 894, 894, then 896, 896, then 898, 898, then 900, 900, then 902, 902, then 904, 904, then 906, 906, then 908, 908, then 910, 910, then 912, 912, then 914, 914, then 916, 916, then 918, 918, then 920, 920, then 922, 922, then 924, 924, then 926, 926, then 928, 928, then 930, 930, then 932, 932, then 934, 934, then 936, 936, then 938, 938, then 940, 940, then 942, 942, then 944, 944, then 946, 946, then 948, 948, then 950, 950, then 952, 952, then 954, 954, then 956, 956, then 958, 958, then 960, 960, then 962, 962, then 964, 964, then 966, 966, then 968, 968, then 970, 970, then 972, 972, then 974, 974, then 976, 976, then 978, 978, then 980, 980, then 982, 982, then 984, 984, then 986, 986, then 988, 988, then 990, 990, then 992, 992, then 994, 994, then 996, 996, then 998, 998, then 1000, 1000, then 1002, 1002, then 1004, 1004, then 1006, 1006, then 1008, 1008, then 1010, 1010, then 1012, 1012, then 1014, 1014, then 1016, 1016, then 1018, 1018, then 1020, 1020, then 1022, 1022, then 1024, 1024, then 1026, 1026, then 1028, 1028, then 1030, 1030, then 1032, 1032, then 1034, 1034, then 1036, 1036, then 1038, 1038, then 1040, 1040, then 1042, 1042, then 1044, 1044, then 1046, 1046, then 1048, 1048, then 1050, 1050, then 1052, 1052, then 1054, 1054, then 1056, 1056, then 1058, 1058, then 1060, 1060, then 1062, 1062, then 1064, 1064, then 1066, 1066, then 1068, 1068, then 1070, 1070, then 1072, 1072, then 1074, 1074, then 1076, 1076, then 1078, 1078, then 1080, 1080, then 1082, 1082, then 1084, 1084, then 1086, 1086, then 1088, 1088, then 1090, 1090, then 1092, 1092, then 1094, 1094, then 1096, 1096, then 1098, 1098, then 1100, 1100, then 1102, 1102, then 1104, 1104, then 1106, 1106, then 1108, 1108, then 1110, 1110, then 1112, 1112, then 1114, 1114, then 1116, 1116, then 1118, 1118, then 1120, 1120, then 1122, 1122, then 1124, 1124, then 1126, 1126, then 1128, 1128, then 1130, 1130, then 1132, 1132, then 1134, 1134, then 1136, 1136, then 1138, 1138, then 1140, 1140, then 1142, 1142, then 1144, 1144, then 1146, 1146, then 1148, 1148, then 1150, 1150, then 1152, 1152, then 1154, 1154, then 1156, 1156, then 1158, 1158, then 1160, 1160, then 1162, 1162, then 1164, 1164, then 1166, 1166, then 1168, 1168, then 1170, 1170, then 1172, 1172, then 1174, 1174, then 1176, 1176, then 1178, 1178, then 1180, 1180, then 1182, 1182, then 1184, 1184, then 1186, 1186, then 1188, 1188, then 1190, 1190, then 1192, 1192, then 1194, 1194, then 1196, 1196, then 1198, 1198, then 1200, 1200, then 1202, 1202, then 1204, 1204, then 1206, 1206, then 1208, 1208, then 1210, 1210, then 1212, 1212, then 1214, 1214, then 1216, 1216, then 1218, 1218, then 1220, 1220, then 1222, 1222, then 1224, 1224, then 1226, 1226, then 1228, 1228, then 1230, 1230, then 1232, 1232, then 1234, 1234, then 1236, 1236, then 1238, 1238, then 1240, 1240, then 1242, 1242, then 1244, 1244, then 1246, 1246, then 1248, 1248, then 1250, 1250, then 1252, 1252, then 1254, 1254, then 1256, 1256, then 1258, 1258, then 1260, 1260, then 1262, 1262, then 1264, 1264, then 1266, 1266, then 1268, 1268, then 1270, 1270, then 1272, 1272, then 1274, 1274, then 1276, 1276, then 1278, 1278, then 1280, 1280, then 1282, 1282, then 1284, 1284, then 1286, 1286, then 1288, 1288, then 1290, 1290, then 1292, 1292, then 1294, 1294, then 1296, 1296, then 1298, 1298, then 1300, 1300, then 1302, 1302, then 1304, 1304, then 1306, 1306, then 1308, 1308, then 1310, 1310, then 1312, 1312, then 1314, 1314, then 1316, 1316, then 1318, 1318, then 1320, 1320, then 1322, 1322, then 1324, 1324, then 1326, 1326, then 1328, 1328, then 1330, 1330, then 1332, 1332, then 1334, 1334, then 1336, 1336, then 1338, 1338, then 1340, 1340, then 1342, 1342, then 1344, 1344, then 1346, 1346, then 1348, 1348, then 1350, 1350, then 1352, 1352, then 1354, 1354, then 1356, 1356, then 1358, 1358, then 1360, 1360, then 1362, 1362, then 1364, 1364, then 1366, 1366, then 1368, 1368, then 1370, 1370, then 1372, 1372, then 1374, 1374, then 1376, 1376, then 1378, 1378, then 1380, 1380, then 1382, 1382, then 1384, 1384, then 1386, 1386, then 1388, 1388, then 1390, 1390, then 1392, 1392, then 1394, 1394, then 1396, 1396, then 1398, 1398, then 1400, 1400, then 1402, 1402, then 1404, 1404, then 1406, 1406, then 1408, 1408, then 1410, 1410, then 1412, 1412, then 1414, 1414, then 1416, 1416, then 1418, 1418, then 1420, 1420, then 1422, 1422, then 1424, 1424, then 1426, 1426, then 1428, 1428, then 1430, 1430, then 1432, 1432, then 1434, 1434, then 1436, 1436, then 1438, 1438, then 1440, 1440, then 1442, 1442, then 1444, 1444, then 1446, 1446, then 1448, 1448, then 1450, 1450, then 1452, 1452, then 1454, 1454, then 1456, 1456, then 1458, 1458, then 1460, 1460, then 1462, 1462, then 1464, 1464, then 1466, 1466, then 1468, 1468, then 1470, 1470, then 1472, 1472, then 1474, 1474, then 1476, 1476, then 1478, 1478, then 1480, 1480, then 1482, 1482, then 1484, 1484, then 1486, 1486, then 1488, 1488, then 1490, 1490, then 1492, 1492, then 1494, 1494, then 1496, 1496, then 1498, 1498, then 1500, 1500, then 1502, 1502, then 1504, 1504, then 1506, 1506, then 1508, 1508, then 1510, 1510, then 1512, 1512, then 1514, 1514, then 1516, 1516, then 1518, 1518, then 1520, 1520, then 1522, 1522, then 1524, 1524, then 1526, 1526, then 1528, 1528, then 1530, 1530, then 1532, 1532, then 1534, 1534, then 1536, 1536, then 1538, 1538, then 1540, 1540, then 1542, 1542, then 1544, 1544, then 1546, 1546, then 1548, 1548, then 1550, 1550, then 1552, 1552, then 1554, 1554, then 1556, 1556, then 1558, 1558, then 1560, 1560, then 1562, 1562, then 1564, 1564, then 1566, 1566, then 1568, 1568, then 1570, 1570, then 1572, 1572, then 1574, 1574, then 1576, 1576, then 1578, 1578, then 1580, 1580, then 1582, 1582, then 1584, 1584, then 1586, 1586, then 1588, 1588, then 1590, 1590, then 1592, 1592, then 1594, 1594, then 1596, 1596, then 1598, 1598, then 1600, 1600, then 1602, 1602, then 1604, 1604, then 1606, 1606, then 1608, 1608, then 1610, 1610, then 1612, 1612, then 1614, 1614, then 1616, 1616, then 1618, 1618, then 1620, 1620, then 1622, 1622, then 1624, 1624, then 1626, 1626, then 1628, 1628, then 1630, 1630, then 1632, 1632, then 1634, 1634, then 1636, 1636, then 1638, 1638, then 1640, 1640, then 1642, 1642, then 1644, 1644, then 1646, 1646, then 1648, 1648, then 1650, 1650, then 1652, 1652, then 1654, 1654, then 1656, 1656, then 1658, 1658, then 1660, 1660, then 1662, 1662, then 1664, 1664, then 1666, 1666, then 1668, 1668, then 1670, 1670, then 1672, 1672, then 1674, 1674, then 1676, 1676, then 1678, 1678, then 1680, 1680, then 1682, 1682, then 1684, 1684, then 1686, 1686, then 1688, 1688, then 1690, 1690, then 1692, 1692, then 1694, 1694, then 1696, 1696, then 1698, 1698, then 1700, 1700, then 1702, 1702, then 1704, 1704, then 1706, 1706, then 1708, 1708, then 1710, 1710, then 1712, 1712, then 1714, 1714, then 1716, 1716, then 1718, 1718, then 1720, 1720, then 1722, 1722, then 1724, 1724, then 1726, 1726, then 1728, 1728, then 1730, 1730, then 1732, 1732, then 1734, 1734, then 1736, 1736, then 1738, 1738, then 1740, 1740, then 1742, 1742, then 1744, 1744, then 1746, 1746, then 1748, 1748, then 1750, 1750, then 1752, 1752, then 1754, 1754, then 1756, 1756, then 1758, 1758, then 1760, 1760, then 1762, 1762, then 1764, 1764, then 1766, 1766, then 1768, 1768, then 1770, 1770, then 1772, 1772, then 1774, 1774, then 1776, 1776, then 1778, 1778, then 1780, 1780, then 1782, 1782, then 1784, 1784, then 1786, 1786, then 1788, 1788, then 1790, 1790, then 1792, 1792, then 1794, 1794, then 1796, 1796, then 1798, 1798, then 1800, 1800, then 1802, 1802, then 1804, 1804, then 1806, 1806, then 1808, 1808, then 1810, 1810, then 1812, 1812, then 1814, 1814, then 1816, 1816, then 1818, 1818, then 1820, 1820, then 1822, 1822, then 1824, 1824, then 1826, 1826, then 1828, 1828, then 1830, 1830, then 1832, 1832, then 1834, 1834, then 1836, 1836, then 1838, 1838, then 1840, 1840, then 1842, 1842, then 1844, 1844, then 1846, 1846, then 1848, 1848, then 1850, 1850, then 1852, 1852, then 1854, 1854, then 1856, 1856, then 1858, 1858, then 1860, 1860, then 1862, 1862, then 1864, 1864, then 1866, 1866, then 1868, 1868, then 1870, 1870, then 1872, 1872, then 1874, 1874, then 1876, 1876, then 1878, 1878, then 1880, 1880, then 1882, 1882, then 1884, 1884, then 1886, 1886, then 1888, 1888, then 1890, 1890, then 1892, 1892, then 1894, 1894, then 1896, 1896, then 1898, 1898, then 1900, 1900, then 1902, 1902, then 1904, 1904, then 1906, 1906, then 1908, 1908, then 1910, 1910, then 1912, 1912, then 1914, 1914, then 1916, 1916, then 1918, 1918, then 1920, 1920, then 1922, 1922, then 1924, 1924, then 1926, 1926, then 1928, 1928, then 1930, 1930, then 1932, 1932, then 1934, 1934, then 1936, 1936, then 1938, 1938, then 1940, 1940, then 1942, 1942, then 1944, 1944, then 1946, 1946, then 1948, 1948, then 1950, 1950, then 1952, 1952, then 1954, 1954, then 1956, 1956, then 1958, 1958, then 1960, 1960, then 1962, 1962, then 1964, 1964, then 1966, 1966, then 1968, 1968, then 1970, 1970, then 1972, 1972, then 1974, 1974, then 1976, 1976, then 1978, 1978, then 1980, 1980, then 1982, 1982, then 1984, 1984, then 1986, 1986, then 1988, 1988, then 1990, 1990, then 1992, 1992, then 1994, 1994, then 1996, 1996, then 1998, 1998



**1a** How did Alex graph the line given by his equation?

**1b** How did Morgan graph the line given by her equation?

**2** Can you think of another way that Alex and Morgan could have used to find the graphs of their lines?

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

**4** What are some similarities and differences between Alex's and Morgan's graphs?

**5** How does changing the sign of  $m$  affect the graph of a line?

How do they differ?

Alex was asked to graph the equation  $y = 2x$   
and Morgan was asked to graph the equation  $y = 2x + 3$ .

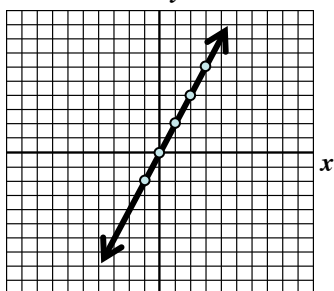
Alex's "graph  $y = 2x$ " way

$$y = 2x$$

x	y
-1	-2
0	0
1	2
2	4
3	6

First I made a table of values.

I graphed the y-intercept, (0,0) and counted up 2, right 1 and down 2, left 1 to plot other points on the line. I connected the points to draw the graph of the line.



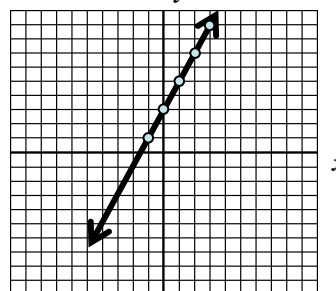
Morgan's "graph  $y = 2x + 3$ " way

$$y = 2x + 3$$

x	y
-1	1
0	3
1	5
2	7
3	9

First I made a table of values.

I graphed the y-intercept, (0,3) and counted up 2, right 1 and down 2, left 1 to plot other points on the line. I connected the points to draw the graph of the line.



- \* How did Alex graph the line given by his equation? How did Morgan graph the line given by her equation?
- \* Can you think of another way that Alex and Morgan could have used to find the graphs of their lines?
- \* What are some similarities and differences between Alex's and Morgan's problems?
- \* What are some similarities and differences between Alex's and Morgan's graphs?
- \* How does changing the value of  $b$  affect the graph of a line?

How do they differ?

Alex was asked to graph the equation  $y = 2x$   
and Morgan was asked to graph the equation  $y = 2x + 3$ .

Alex's "graph  $y = 2x$ " way

Morgan's "graph  $y = 2x + 3$ " way

I rewrote the equation in  $y = mx + b$  form.

I graphed the y-intercept, counted up 1 and down 1 to plot points, and then graphed the line.



In the slope-intercept form of a line ( $y = mx + b$ ),  $b$  is the y-coordinate of the point where the line intersects the y-axis.

I rewrote the equation in  $y = mx + b$  form.

and then counted up 2, left 1, and right 2, left 1 to plot points.

Changing the value of  $b$  in the equation of a line shifts (or translates) the graph up or down vertically  $b$  units.



\* How did Alex graph the line given by her equation?

\* Can you think of another way to graph the line?

\* What are some similarities and differences between Alex's and Morgan's problems?

\* What are some similarities and differences between Alex's and Morgan's graphs?

\* How does changing the value of  $b$  affect the graph of a line?

**1a** How did Alex graph the line given by his equation?

**1b** How did Morgan graph the line given by her equation?

**2** Can you think of another way that Alex and Morgan could have used to find the graphs of their lines?

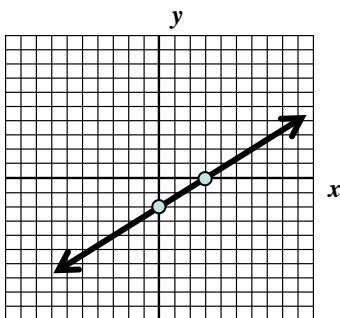
**3** What are some similarities and differences between Alex's and Morgan's problems?

**4** What are some similarities and differences between Alex's and Morgan's graphs?

**5** How does changing the value of  $b$  affect the graph of a line?

*How do they differ?*

**Alex was asked to find the x-intercept of the line in the graph below, and Morgan was asked to find the y-intercept of the line in the graph below.**

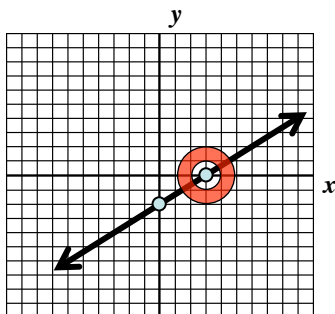


Alex's "find the x-intercept" way

Morgan's "find the y-intercept" way

The x-intercept is the point where the line intersects the x-axis.

It is at (3,0).

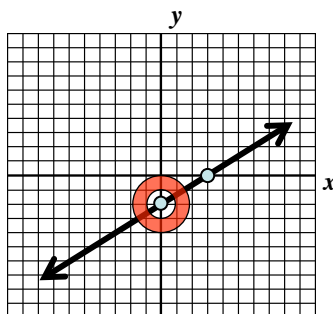


(3, 0)



The y-intercept is the point where the line intersects the y-axis.

It is at (0,-2).



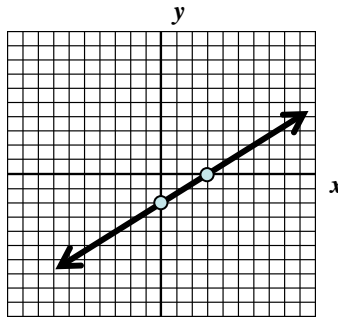
(0, -2)



- \* How did Alex find the x-intercept of the line? How did Morgan find the y-intercept of the line?
- \* What are some similarities and differences between Alex's and Morgan's problems?
- \* What are some similarities and differences between the ordered pairs that Alex and Morgan generated?
- \* What is an x-intercept? What is a y-intercept?

How do they differ?

Alex was asked to find the x-intercept of the line in the graph below, and Morgan was asked to find the y-intercept of the line in the graph below.



Alex's "find the x-intercept" way

Morgan's "find the y-intercept" way

The x-intercept is the point where the line intersects the x-axis.



Hey Alex, what did we learn from comparing these two ways?

The y-intercept is the point where the line intersects the y-axis.

The x-intercept is the point where the line intersects the x-axis. The y-intercept is the point where the line intersects the y-axis.



- \* How did Alex find the x-intercept?
- \* What are some similarities between the two ways?
- \* What are some similarities between the two ways generated?

- \* What is an x-intercept? What is a y-intercept?

What are the problems that Alex and Morgan generated?

1a How did Alex find the  $x$ -intercept of the line?

1b How did Morgan find the  $y$ -intercept of the line?

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

3 What are some similarities and differences between the ordered pairs that Alex and Morgan generated?

4 What is an  $x$ -intercept?

5 What is a  $y$ -intercept?

Which is better?

Alex and Morgan were asked to graph the equation  $3x - 2y = 6$

Alex's "x- and y-intercepts" way

Morgan's "slope-intercept" way

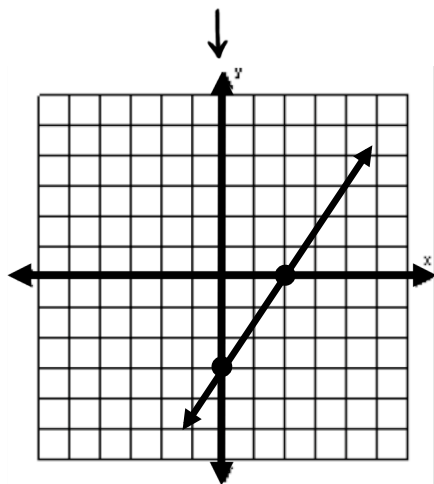
First I found the x-intercept, by plugging in 0 for y in the equation and solving for x.

$$\begin{aligned} 3x - 2y &= 6 \\ 3x - 2(0) &= 6 \\ 3x &= 6 \\ x &= 2 \\ \text{x-intercept is } (2, 0) \end{aligned}$$

Then I found the y-intercept, by plugging in 0 for x in the equation and solving for y.

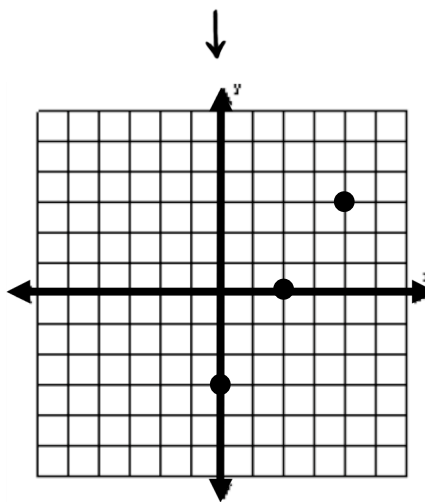
$$\begin{aligned} 3(0) - 2y &= 6 \\ -2y &= 6 \\ y &= -3 \\ \text{y-intercept is } (0, -3) \end{aligned}$$

Then I plotted the two intercepts and connected them to get the line.



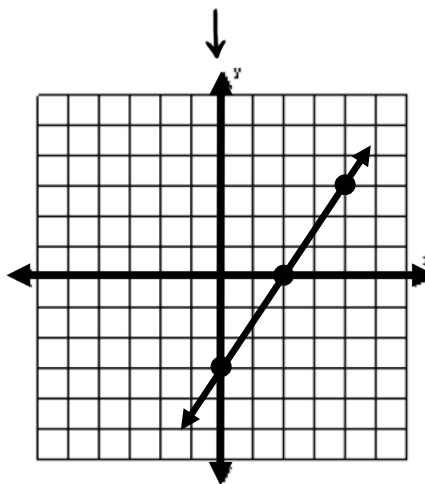
$$\begin{aligned} 3x - 2y &= 6 \\ -2y &= -3x + 6 \\ y &= \frac{3}{2}x - 3 \end{aligned}$$

First I put the equation in slope-intercept form by solving for y.



Then I graphed the equation using the intercept (0, -3) and the slope of 3/2.

Then I connected the points to get the line.



- \* How did Alex graph the line?
- \* Why did Morgan solve the equation for y as a first step?
- \* Name a step that Morgan did that Alex did not. Why did Alex not do that step?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* If the original problem were  $y = \frac{3}{2}x - 3$ , would Alex's way or Morgan's way be better?



Which is better?

Alex and Morgan were asked to graph the equation  $3x - 2y = 6$

Alex's "x- and y-intercepts" way

Morgan's "slope-intercept" way

$$3x - 2y = 6$$

$$3x - 2y = 6$$

First I found the x-intercept, by plugging in 0 for y in the equation and solving for x.

$$\begin{aligned} 3x - 2(0) &= 6 \\ 3x &= 6 \\ x &= 2 \end{aligned}$$

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

First I put the equation in slope-intercept form by solving for y.

Then I found the y-intercept by plugging in 0 for x in the equation and solving for y.

When you have to graph an equation given in standard form, you don't have to automatically convert it to slope-intercept form. It may be easier to graph the line directly from the standard form, by substituting 0 for x and for y to find the intercepts.

I graphed the line by plotting the points (0, -3) and (2, 0). The slope is  $3/2$ .

Then I plotted the two intercepts and connected them to graph the line.

There is more than one way to graph a line. Before you start, you can look at the problem first and try to see which way will be easier.

I used the slope and y-intercept to graph the line.

- \* How did Alex graph the line?
- \* Why did Morgan solve for y?
- \* Name a step that Morgan did that Alex did not.
- \* What are some similarities and differences between Alex's and Morgan's ways?

\* If the original problem were  $y = \frac{3}{2}x - 3$ , would Alex's way or Morgan's way be better?

1 How did Alex graph the line?

2 Why did Morgan solve the equation for  $y$  as a first step?

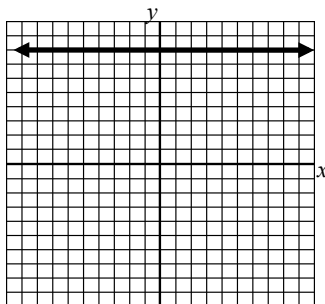
3 Name a step that Morgan did that Alex did not. Why did Alex not do that step?

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

5 If the original problem were  $y = \frac{3}{2}x - 3$  would Alex's way or Morgan's way be better?

Why does it work?

Alex and Morgan were asked to determine the slope of the horizontal line below from its graph.



Alex's "use the slope formula" way

Morgan's "inspect the patterns in a T-table" way

First, I read any two points off the line.

$(-5, 8)$  and  $(3, 8)$

Then I substituted these two ordered pairs into the slope formula, which is

$$m = \frac{y_2 - y_1}{x_2 - x_1} .$$

I simplified, to get that the slope of this line is zero.

$$m = \frac{8 - 8}{-5 - 3}$$

$$m = \frac{0}{-8} = 0$$



x	y
-9	8
-6	8
0	8
5	8
7	8

x	y
-9	8
-6	8
0	8
5	8
7	8

The slope is 0.



First, I read several points off the line and put them into a T - table.

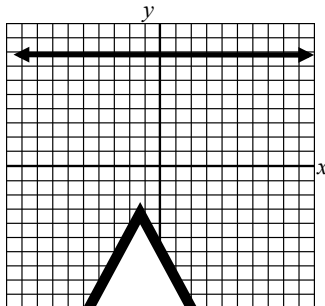
I looked at the table and noticed that the y values never change, even when the x values change.

Since slope measures the change in y values for each change in x values, I know that the slope is zero.

- \* How did Alex find the slope? How did Morgan find the slope?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Which way is easier, Alex's way or Morgan's way? Why?
- \* What are some advantages of Alex's way? Of Morgan's way?

Why does it work?

Alex and Morgan were asked to determine the slope of the horizontal line below from its graph.



Alex's "use the slope formula" way

Morgan's "select the patterns in a T-table" way

First, I read any two points off the line.



Hey Morgan, what did comparing these two examples help us to see?

First, I read several points off the line and put them into a T-table.

Then I substituted these two points into the slope formula.

I simplified the equation and found that the slope is zero.

I simplified the equation and found that the slope is zero.

These examples helped us see why the slope of a horizontal line is 0. For a horizontal line, all of the points on the line have the same value for the y coordinate, so the difference between the y coordinates of any two points on the line will be 0 and thus the slope will be 0.

I looked at the y values and noticed they were all the same.

Since the y values are the same in the T-table, I know that the slope is zero.



- \* How did Alex find the slope? How did Morgan find the slope?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Which way is easier, Alex's way or Morgan's way? Why?
- \* What are some advantages of Alex's way? Of Morgan's way?

1a How did Alex find the slope?

1b How did Morgan find the slope?

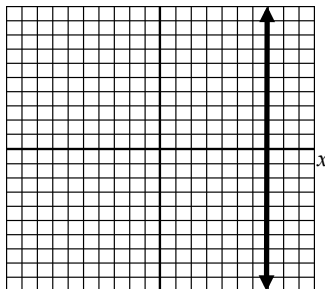
2 What are some similarities and differences between Alex's and Morgan's *ways*?

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

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

Why does it work?

Alex and Morgan were asked to determine the slope of the line below from its graph.



Alex's "use the slope formula" way

Morgan's "inspect the patterns in a T-table" way

First, I read any two points off the line.

$(7, 4)$  and  $(7, -1)$

Then I substituted these two ordered pairs into the slope formula, which is

$$m = \frac{y_2 - y_1}{x_2 - x_1} .$$

I simplified. Since any number divided by zero is undefined, I found that this line has no slope.

$$m = \frac{4 - (-1)}{7 - 7}$$

$$m = \frac{5}{0}$$



x	y
7	-6
7	-1
7	0
7	-2
7	-5

First, I read several points off the line and put them into a T-table.

x	y
7	-6
7	-1
7	0
7	-2
7	-5

I looked at the table and noticed that the x values never change, even when the y values change.

This line has no slope.

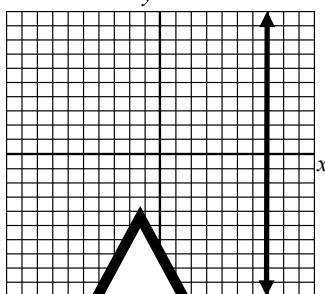


Since slope measures the change in y values for each change in x values, and since the x values don't change, I know that this line has no slope.

- \* How did Alex find the slope? How did Morgan find the slope?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Which way is easier, Alex's way or Morgan's way? Why?
- \* What are some advantages of Alex's way? Of Morgan's way?

Why does it work?

Alex and Morgan were asked to determine the slope of the line below from its graph.



Alex's "use the slope formula" way

Morgan's "select the patterns in a T-table" way

First, I read any two points off the line.



What did comparing these two examples help us to see?

First, I read several points off the line and put them into a T-table.

Then I substituted these two points into the slope formula.

These examples help us see why the slope of a vertical line is undefined. For a vertical line, all of the points on the line have the same value for the x coordinate, so the difference between the x coordinates of any two points on the line will be 0. Division by 0 is undefined, so thus the slope of any vertical line will be undefined.



At the end, I noticed the x values were the same.

I simplified any numbers and divided up to find that this line has no slope.

The slope measures the change in y values over the change in x values.

Since the x values don't change, I know that this line has no slope.

- \* How did Alex find the slope of the vertical line? How did Morgan find the slope?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Which way is easier, Alex's way or Morgan's way?
- \* What are some advantages of Alex's way? Of Morgan's way?

1a How did Alex find the slope?

1b How did Morgan find the slope?

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

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

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



How do they differ?

Alex and Morgan were given the set of ordered pairs  $\{(-3, 6), (2, 5), (3, 1), (2, 4)\}$ , and asked to determine if the relation is a function.

Alex's "make a table of values" way

Morgan's "graph and use the vertical line test" way

I made a table of values.

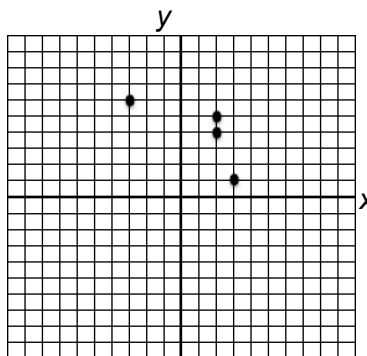
$x$ (domain)	$y$ (range)
-3	6
2	5
2	4
3	1

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

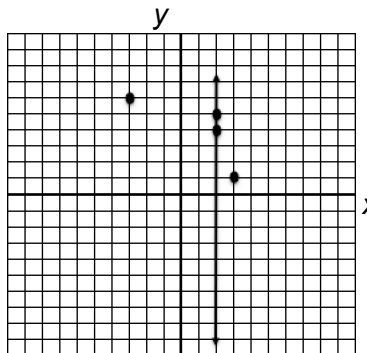
$x$ (domain)	$y$ (range)
-3	6
2	5
2	4
3	1

Because of this, I believe that this relation is not a function.

Not a function



I graphed the ordered pairs on a coordinate plane.



Then I tried using the vertical line test. I found that I could draw a vertical line that intersected my graphed points more than once.

Because of this, I believe that this relation is not a function.

Not a function



- \* How did Alex complete the problem?
- \* How did Morgan complete the problem?
- \* Describe a way in which Alex's and Morgan's ways are similar.
- \* Describe a way in which Alex's and Morgan's ways are different.
- \* Why does the vertical line test tell us the same thing as the table of values?
- \* Can you think of another way of determining whether this relation is a function, besides Alex's way and Morgan's way?
- \* If the problem were changed so you were instead asked to determine whether  $y = 2x + 6$  was a function, would you use Alex's way or Morgan's way? Why?

How do they differ?

Alex and Morgan were given the set of ordered pairs  $\{(-3, 6), (2, 5), (3, 1), (2, 4)\}$ , and asked to determine if the relation is a function.

Alex's "make a table of values" way

Morgan's "graph and use the vertical line test" way

I made a table of values.

$x$ (domain)	$y$ (range)
-3	
2	
2	
3	

I graphed the ordered pairs on a coordinate plane.

I saw that the ordered pairs both a 2 in the x-value.



Hey Morgan, what did comparing these two examples help us to see?

The graph could fail the vertical line test.

Because I believe this relation is not a function.

These examples help us see why the vertical line test works. If you can draw a vertical line through the graph that intersects the graph more than once, this shows that there are two points on the graph that have the same  $x$  value but different  $y$  values, so the graph is not a function.



Because of this, that relation is not a function.

- \* How did Alex determine if the relation was a function?
- \* How did Morgan complete the task?
- \* Describe a way in which Alex's method is more efficient than Morgan's.
- \* Describe a way in which Morgan's method is more efficient than Alex's.
- \* Why does the vertical line test work? Use the set of ordered pairs from the table to explain.
- \* Can you think of another way of determining whether this relation is a function, besides Alex's way and Morgan's way?
- \* If the problem were changed so you were instead asked to determine whether  $y = 2x + 6$  was a function, would you use Alex's way or Morgan's way? Why?

1a How did Alex complete the problem?

1b How did Morgan complete the problem?

2 Describe a way in which Alex's and Morgan's ways are similar.

3 Describe a way in which Alex's and Morgan's ways are different.

4 Why does the vertical line test tell us the same thing as the table of values?

5 Can you think of another way of determining whether this relation is a function, besides Alex's way and Morgan's way?

6 If the problem were changed so you were instead asked to determine whether  $y = 2x + 6$  was a function, would you use Alex's way or Morgan's way? Why?

How do they differ?

Alex was asked to determine whether average rainfall is a function of the month, and Morgan was asked to determine whether the month is a function of the average rainfall.

Month	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average Rainfall in inches	3.9	3.3	3.9	3.6	3.2	3.2	3.1	3.4	3.5	3.8	4.0	3.7

Alex’s “month is the domain” way

Morgan’s “month is the range” way

I need to figure out whether average rainfall is a function of the month.

I rewrote the expression in function notation with month in the domain and average rainfall in the range.

For each month, there is only 1 average rainfall.

So yes, average rainfall is a function of the month.

$$\text{Is } y = f(x) \text{ ?}$$

$$\text{Is average rainfall} = f(\text{month}) \text{ ?}$$

Month	x	Jan.	Feb.	March	...	Sept	Oct	Nov	Dec
Av. Rainfall in in	y	3.9	3.3	3.9	...	3.5	3.8	4.0	3.7

$$\text{average rainfall} = f(\text{month})$$



$$\text{Is } y = f(x) \text{ ?}$$

$$\text{Is month} = f(\text{average rainfall}) \text{ ?}$$

Month	x	Jan.	Feb.	March	...	Sept	Oct	Nov	Dec
Av. Rainfall in in	y	3.9	3.3	3.9	...	3.5	3.8	4.0	3.7

Not a function



I need to figure out whether the month is a function of average rainfall.

I rewrote the expression in function notation with average rainfall in the domain and month in the range.

I noticed that an average rainfall of 3.9 inches happened in both January and March. So no, the month is not a function of average rainfall.

- \* Describe what Alex did to a new student in your class. How did Alex decide whether or not the relation was a function?
- \* Describe what Morgan did to a new student in your class. How did Morgan decide whether or not the relation was a function?
- \* What are some similarities and differences between Alex’s and Morgan’s problems?
- \* What are some similarities and differences between Alex’s and Morgan’s ways?
- \* Why did Alex consider month as the domain, while Morgan considered average rainfall as the domain?
- \* In thinking about the similarities and differences between Alex’s and Morgan’s ways, what conclusions can you draw about how to solve this type of problem?

How do they differ?

Alex was asked to determine whether average rainfall is a function of the month, and Morgan was asked to determine whether the month is a function of the average rainfall.

Month	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average Rainfall in inches	3.9	3.3	3.9	3.6	3.2	3.2	3.1	3.4	3.5	3.8	4.0	3.7

Alex's "month is the domain" way

Morgan's "month is the range" way

I need to figure out whether average rainfall is a function of the month.

I reviewed the definition of a function and expressed the relation with month in the domain and average rainfall in the range.

For each month, there is only 1 average rainfall.

So yes, average rainfall is a function of the month.



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

I need to figure out whether the month is a function of average rainfall.

I looked at the data in the table and saw that the same average rainfall can happen in different months.

For example, an average rainfall of 3.9 inches happened in January and March.

Therefore, the month is not a function of average rainfall.



It is easy to confuse the domain and range of a relation, but this really matters if you are trying to figure out whether a relation is a function!

- \* Describe what Alex did to a relation and how he decided whether or not the relation was a function?
- \* Describe what Morgan did to a relation and how he decided whether or not the relation was a function?
- \* What are some similarities and differences between Alex's and Morgan's problems?
- \* What are some similarities and differences between Alex's and Morgan's ways?
- \* Why did Alex consider month as the domain, while Morgan considered average rainfall as the domain?
- \* In thinking about the similarities and differences between Alex's and Morgan's ways, what conclusions can you draw about how to solve this type of problem?

- 1 Describe what Alex did to a new student in your class. How did Alex decide whether or not the relation was a function?

- 2 Describe what Morgan did to a new student in your class. How did Morgan decide whether or not the relation was a function?

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

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

- 4 Why did Alex consider month as the domain, while Morgan considered average rainfall as the domain?

- 5 In thinking about the similarities and differences between Alex's and Morgan's ways, what conclusions can you draw about how to solve this type of problem?