Why does it work?

Alex was asked to solve $2x^2+5x+1=0$, and Morgan was asked to solve $a^2+bx+c=0$

Alex's "complete the square" way

First I divided both sides of the equation by the coefficient of x^2. Then I subtracted the constant term from both sides.

$$2x^2+5x+1=0$$

$$x^2+\frac{5}{2}x+\frac{1}{2}=0$$

$$\downarrow$$

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

I completed the square by adding $\left(\frac{b}{2a}\right)^2$ to both sides of the equation.

$$\downarrow$$

$$x^2+\frac{5}{2}x+\left(\frac{5}{4}\right)^2=-\frac{1}{2}+\left(\frac{5}{4}\right)^2$$

$$\downarrow$$

$$\left(x+\frac{5}{4}\right)^2=-\frac{1}{2}+\frac{25}{16}$$

I simplified on both sides.

$$\downarrow$$

$$\left(x+\frac{5}{4}\right)^2=\frac{-8}{16}+\frac{25}{16}$$

I simplified further on the right-hand side. I found a common denominator for the two fractions on the right, then added them together.

$$\left(x+\frac{5}{4}\right)^2=\frac{17}{16}$$

$$\downarrow$$

$$\sqrt{\left(x+\frac{5}{4}\right)^2}=\sqrt{\frac{17}{16}}$$

I took the square root on either side..

$$\downarrow$$

$$x+\frac{5}{4}=\pm\sqrt{\frac{17}{16}}$$

I simplified and solved for x..

$$x+\frac{5}{4}=\pm\frac{\sqrt{17}}{\sqrt{16}}$$

$$x+\frac{5}{4}=\pm\frac{\sqrt{17}}{4}$$

$$x=\pm\frac{\sqrt{17}}{4}-\frac{5}{4}$$

$$x=\frac{-5\pm\sqrt{17}}{4}$$

Morgan's "complete the square and derive the quadratic formula" way

First I divided both sides of the equation by the coefficient of x^2. Then I subtracted the constant term from both sides.

$$ax^2+bx+c=0$$

$$x^2+\frac{b}{a}x+\frac{c}{a}=0$$

$$\downarrow$$

$$x^2+\frac{b}{a}x=-\frac{c}{a}$$

I completed the square by adding $\left(\frac{b}{2a}\right)^2$ to both sides of the equation.

$$\downarrow$$

$$x^2+\frac{b}{a}x+\left(\frac{b}{2a}\right)^2=-\frac{c}{a}+\left(\frac{b}{2a}\right)^2$$

$$\downarrow$$

$$\left(x+\frac{b}{2a}\right)^2=-\frac{c}{a}+\frac{b^2}{4a^2}$$

I simplified on both sides.

$$\downarrow$$

$$\left(x+\frac{b}{2a}\right)^2=\frac{-4ac}{4a^2}+\frac{b^2}{4a^2}$$

I simplified further on the right-hand side. I found a common denominator for the two fractions on the right, then added them together.

$$\left(x+\frac{b}{2a}\right)^2=\frac{-4ac+b^2}{4a^2}$$

$$\downarrow$$

$$\sqrt{\left(x+\frac{b}{2a}\right)^2}=\sqrt{\frac{-4ac+b^2}{4a^2}}$$

I took the square root on either side..

$$\downarrow$$

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

I simplified and solved for x..

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

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

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

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

- **How did Alex solve the equation? How did Morgan solve the equation?**
- **What does Morgan's answer look like to you?**
- **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?**
- **What happens when you substitute the values for *a*, *b*, and *c* from Alex's equation into Morgan's answer?**
- **Where does the quadratic formula come from?**

Why does it work?

Alex was asked to solve $2x^2+5x+1=0$, and Morgan was asked to solve $a^2+bx+c=0$

Alex's "complete the square" way	Morgan's "complete the square and derive the quadratic formula" way

First I divided both sides of the equation by the coefficient of x^2. Then I subtracted the constant term from both sides.

$$2x^2+5x+1=0 \qquad ax^2+bx+c=0$$

$$x^2+\frac{5}{2}x+\frac{1}{2}=0 \qquad x^2+\frac{b}{a}x+\frac{c}{a}=0$$

$$x^2+\frac{5}{2}x=-\frac{1}{2} \qquad \ldots+\frac{b}{a}x=-\frac{c}{a}$$

First I divided both sides of the equation by the coefficient of x^2. Then I subtracted the constant term from both sides.

I completed the square by adding $\left(\frac{b}{2a}\right)^2$ to both ... of the equation.

$$x^2+\frac{5}{2}x \ldots \qquad \ldots\left(\frac{b}{2a}\right)^2$$

I completed the square by adding $\left(\frac{b}{2a}\right)^2$ to both sides ...the equation.

I ... both ...

I simplifie... on the right... side. I f... co...

...ed further ...right-hand ...d a

... righ... them toge...

...e ...ed ...ether.

I took the ... root o...

...square ...r side.

solved for x.

...ved for x.

* How did Alex solve the equ...
* What does Morgan's answe... to you...
* What are some similarities a... ifferences be... x's and Mor... problems?
* What are some similarities a... differences betw... lex's and Morgan... ways?
* What happens when you substitute the values fo... b, and c from Alex's equation into Morgan's answer?
* Where does the quadratic formula come from?

Student Worksheet 8.1.1

1a How did Alex solve the equation?

1b How did Morgan solve the equation?

2 What does Morgan's answer look like to you?

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

4 What happens when you substitute the values for a, b, and c from Alex's equation into Morgan's answer?

5 Where does the quadratic formula come from?

Which is better?

Alex and Morgan were asked to find the *x*-intercepts of the graph given by the equation $y = x^2 - 2x - 3$

Alex's "use the quadratic formula" way

Since the *x*-intercepts occur when *y* is equal to zero, I substituted 0 for *y* in the equation.

$$y = x^2 - 2x - 3$$
$$0 = x^2 - 2x - 3$$

Then I wrote down the quadratic formula..

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

I plugged in the values for *a*, *b*, and *c* from the original equation, and solved for *x*.

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$$
$$x = \frac{2 \pm \sqrt{4+12}}{2}$$
$$x = \frac{2 \pm \sqrt{16}}{2}$$
$$x = \frac{2 \pm 4}{2}$$
$$x = \frac{6}{2} \text{ and } \frac{-2}{2}$$
$$x = 3 \text{ and } x = -1$$

Morgan's "factor" way

Since the *x*-intercepts occur when *y* is equal to zero, I substituted 0 for *y* in the equation.

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

Then I factored it.

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

I set each factor each to zero and solved. And here are my solutions.

$$x - 3 = 0$$
$$x = 3$$

$$x + 1 = 0$$
$$x = -1$$
$$x = 3 \text{ and } x = -1$$

- **How did Alex find the *x*-intercepts?**
- **How did Morgan find the *x*-intercepts?**
- **What are some similarities between Alex's and Morgan's ways?**
- **On a timed test, would you rather do Alex's way or Morgan's way?**
- **Can you state a general rule that suggests when it might be good to use Alex's way and when it might be good to use Morgan's way?**

Which is better?

Alex and Morgan were asked to find the *x*-intercepts of the graph given by the equation $y = x^2 - 2x - 3$

Alex's "use the quadratic formula" way	Morgan's "factor" way
$y = x^2 - 2x - 3$	$0 = x^2 - 2x - 3$
$0 = \ \ \ -2x - 3$	

Since the *x*-intercepts occur when *y* is equal to zero, I substituted 0 for *y* in the equation.

Then I wrote down the quadratic formula..

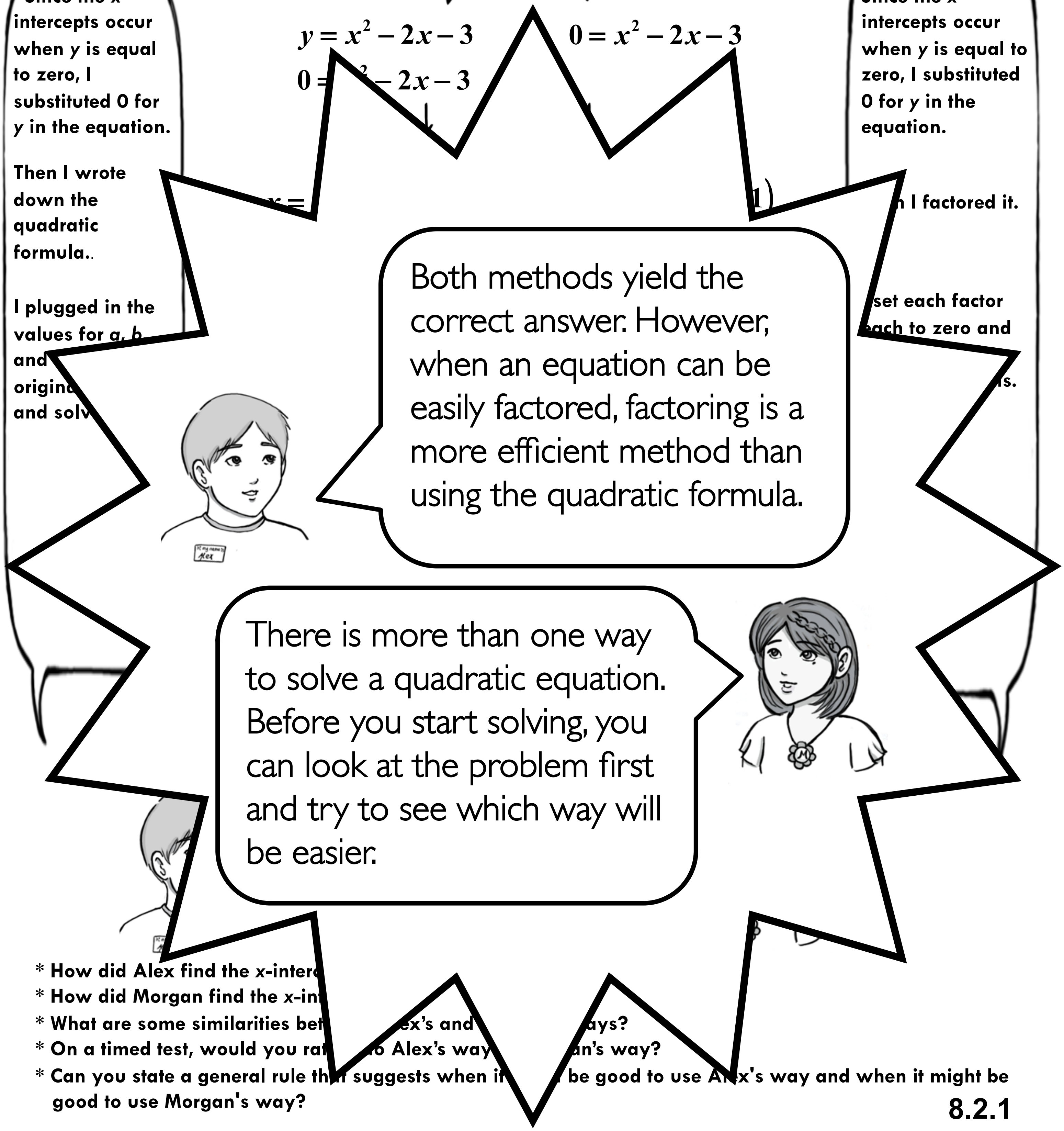
I plugged in the values for *a*, *b* and origin and solv

Since the *x*-intercepts occur when *y* is equal to zero, I substituted 0 for *y* in the equation.

n I factored it.

set each factor ach to zero and

s.



- *** How did Alex find the *x*-interc**
- *** How did Morgan find the *x*-in**
- *** What are some similarities bet ex's and ays?**
- *** On a timed test, would you rat o Alex's way an's way?**
- *** Can you state a general rule th suggests when i be good to use A x's way and when it might be good to use Morgan's way?**

Student Worksheet 8.2.1

1a How did Alex find the x-intercepts?

1b How did Morgan find the x-intercepts?

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

3 On a timed test, would you rather do Alex's way or Morgan's way?

4 Can you state a general rule that suggests when it might be good to use Alex's way and when it might be good to use Morgan's way?

Which is correct?

Alex and Morgan were asked to solve $8x^2 - 24x = 0$

Alex's "factor first" way

$$8x^2 - 24x = 0$$

$$\downarrow$$

$$8x(x-3) = 0$$

First I factored out an 8x term from the left side.

$$\downarrow$$

$$8x = 0 \quad \text{or} \quad (x-3) = 0$$
$$x = 0 \quad \text{or} \quad x = 3$$

Then I set 8x equal to zero and (x – 3) equal to zero. I solved both of the equations for x.

Morgan's "divide by x" way

$$8x^2 - 24x = 0$$

$$\downarrow$$

$$\begin{array}{r} 8x^2 - 24x = 0 \\ +24x + 24x \\ \hline 8x^2 = 24x \end{array}$$

First added 24x on both sides.

$$\downarrow$$

$$\frac{8x^2}{8x} = \frac{24x}{8x}$$
$$x = 3$$

Then I divided by 8x on both sides. I got my answer, x = 3.

*** How did Alex solve the equation?**
*** How did Morgan solve the equation?**
*** Whose answer is correct, Alex's or Morgan's? How do you know?**
*** What are some similarities between Alex's and Morgan's ways?**
*** One person did a step that led to the wrong answer. Who was it? What did they do?**
*** Why did doing that step lead to the wrong answer?**

Which is correct?

Alex and Morgan were asked to solve $8x^2 - 24x = 0$

Alex's "factor first" way

Morgan's "divide by x" way

First I factored out an 8x term from the left

rst added 24x on

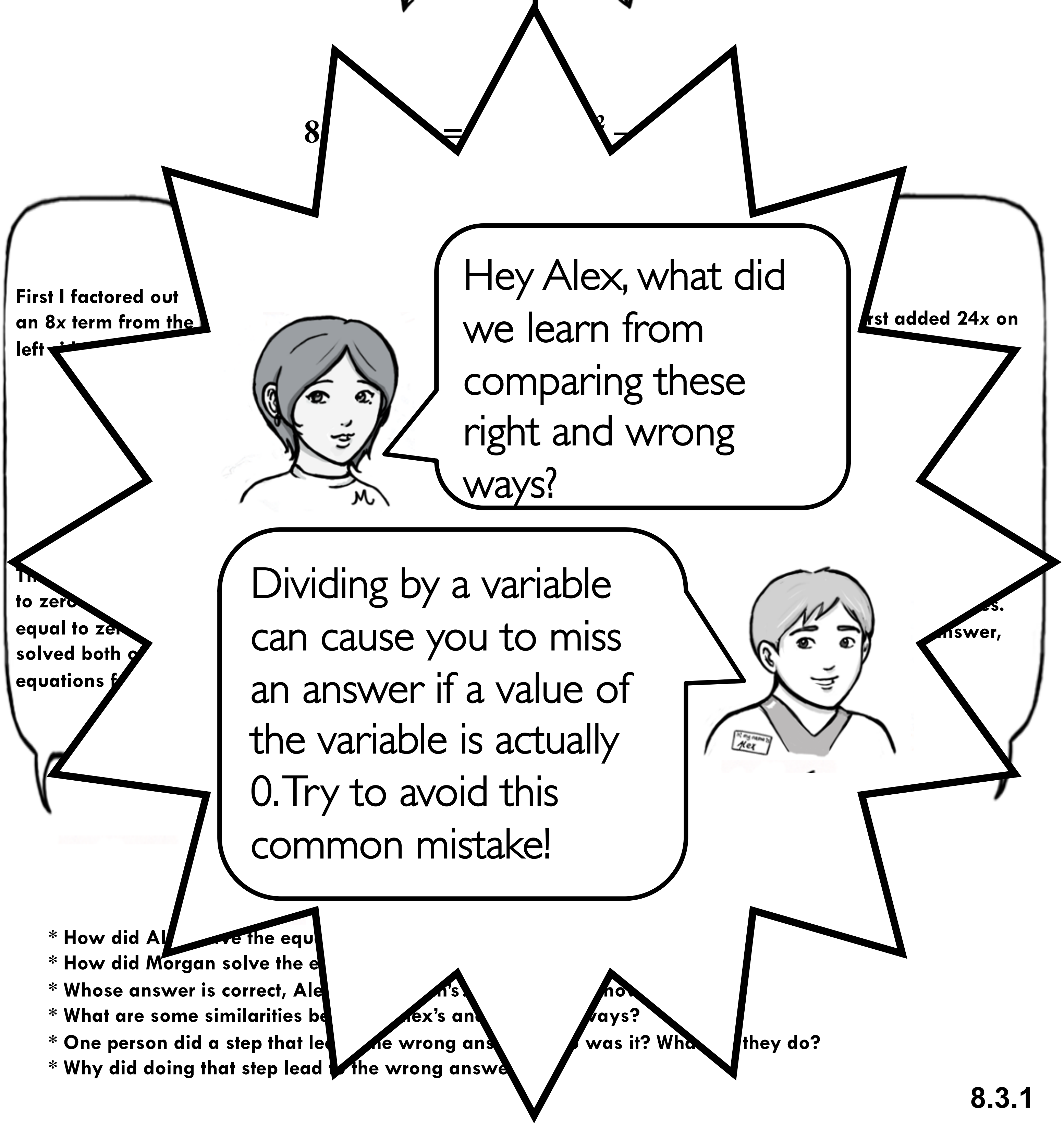
to zero

equal to ze

solved both

equations f

nswer,



* How did Al ve the equ
* How did Morgan solve the e
* Whose answer is correct, Ale n's no
* What are some similarities be lex's an ays?
* One person did a step that le he wrong ans was it? Wha they do?
* Why did doing that step lead t the wrong answe

Student Worksheet 8.3.1

1a How did Alex solve the equation?

1b How did Morgan solve the equation?

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

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

4 One person did a step that led to the wrong answer. Who was it? What did they do?

5 Why did doing that step lead to the wrong answer?

Which is correct?

Alex and Morgan were asked to solve $-x^2+5x+3=0$

Alex's "confuse the sign of *a*" way

First I wrote the quadratic formula.

$$-x^2+5x+3=0$$

$$\downarrow$$

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

$$\downarrow$$

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

$$x=\frac{-5\pm\sqrt{(5)^2-4(1)(3)}}{2(-1)}$$

$$\downarrow$$

I simplified.

$$x=\frac{-5\pm\sqrt{25-12}}{-2}$$

$$\downarrow$$

I subtracted the values inside the radical.

$$x=\frac{-5\pm\sqrt{13}}{-2}$$

Morgan's "substitute into the quadratic formula correctly" way

First I wrote the quadratic formula.

$$-x^2+5x+3=0$$

$$\downarrow$$

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

$$\downarrow$$

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

$$x=\frac{-5\pm\sqrt{(5)^2-4(-1)(3)}}{2(-1)}$$

$$\downarrow$$

I simplified.

$$x=\frac{-5\pm\sqrt{25+12}}{-2}$$

$$\downarrow$$

I subtracted the values inside the radical.

$$x=\frac{-5\pm\sqrt{37}}{-2}$$

*** Describe Alex's and Morgan's ways to a new student in your class.**
*** Why do you think Alex and Morgan used the quadratic formula for this problem? Could they have factored instead?**
*** 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?**
*** Based on what you have learned from comparing Alex's and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?**

Which is correct?

Alex and Morgan were asked to solve $-x^2+5x+3=0$

Alex's "confuse the sign of *a*" way

Morgan's "substitute into the quadratic formula correctly" way

$-x^2+5x+3=0$

$-x^2+5x+3=0$

$x =$ ... $4ac$

First I wrote the quadratic formula.

Then I substituted the values for a ... and ... origin... equatio... the formu...

I sim...

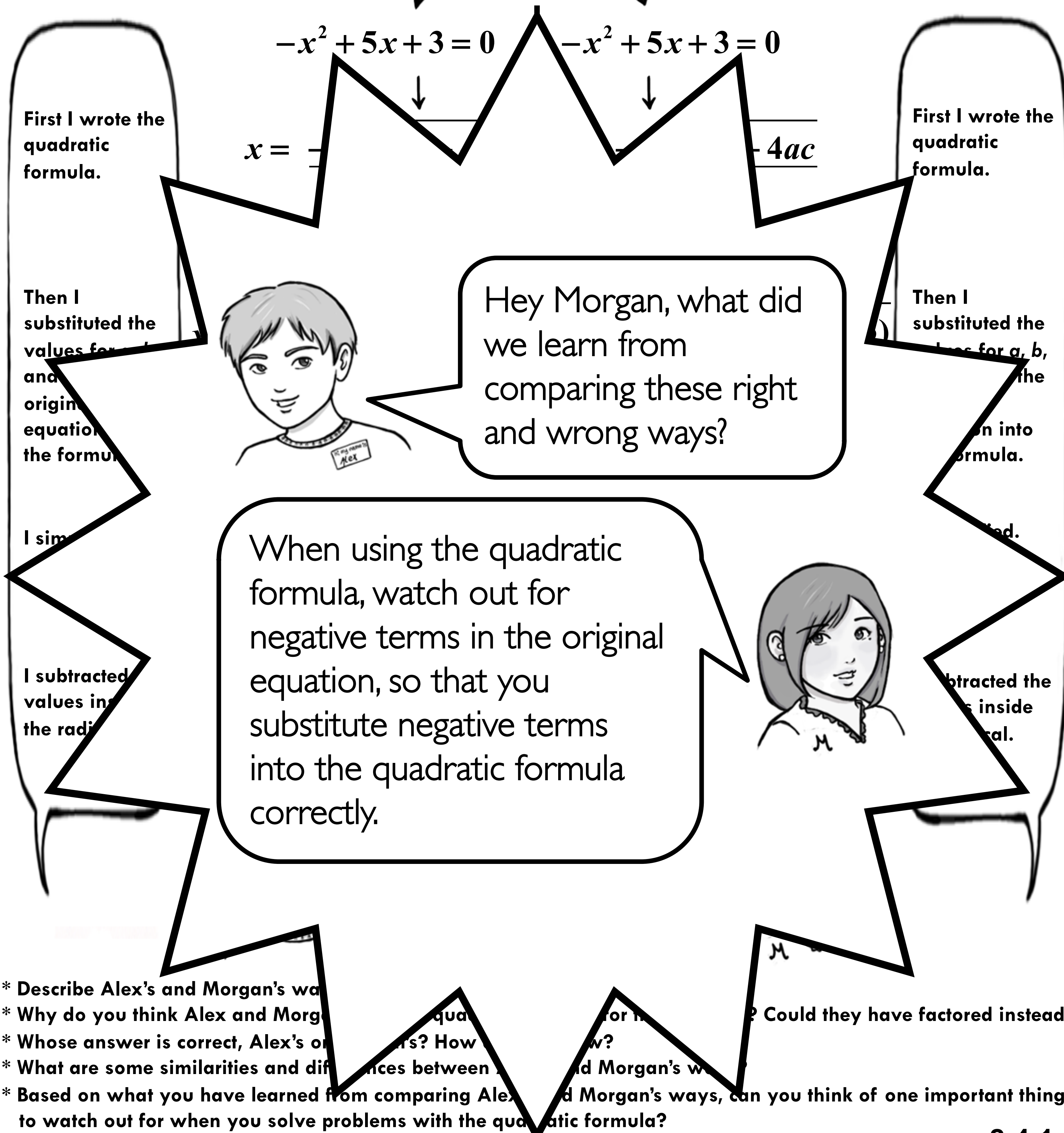
I subtracted ... values in... the radi...

First I wrote the quadratic formula.

Then I substituted the ... for *a*, *b*, ... the ... n into ... ormula.

...ed.

...btracted the ... inside ... cal.



*** Describe Alex's and Morgan's wa...**
*** Why do you think Alex and Morg... qua... for ... ? Could they have factored instead?**
*** Whose answer is correct, Alex's or ...n's? How ... w?**
*** What are some similarities and dif...nces between ... d Morgan's w...?**
*** Based on what you have learned from comparing Alex... d Morgan's ways, can you think of one important thing to watch out for when you solve problems with the qua...atic formula?**

Student Worksheet 8.4.1

1. Describe Alex's and Morgan's ways to a new student in your class.

2. Why do you think Alex and Morgan used the quadratic formula for this problem? Could they have factored instead?

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

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

5. Based on what you have learned from comparing Alex's and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?

Which is correct?

Alex and Morgan were asked to solve $4x^2 - 6x + 1 = 0$

Alex's "substitute into the quadratic formula correctly" way

$$4x^2 - 6x + 1 = 0$$

First I wrote the quadratic formula.

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

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

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

I simplified.

$$x = \frac{6 \pm \sqrt{36 - 16}}{8}$$

I subtracted the values inside the radical.

$$x = \frac{6 \pm \sqrt{20}}{8}$$

I rewrote 20 as the product of prime factors.

$$x = \frac{6 \pm \sqrt{2 \cdot 2 \cdot 5}}{8}$$

I simplified the expression inside the radical.

$$x = \frac{6 \pm 2\sqrt{5}}{8}$$

Then I simplified the fraction. Here is my answer.

$$x = \frac{3 \pm \sqrt{5}}{4}$$

Morgan's "confuse the sign of *b*" way

$$4x^2 - 6x + 1 = 0$$

First I wrote the quadratic formula.

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

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

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

I simplified.

$$x = \frac{-6 \pm \sqrt{36 - 16}}{8}$$

I subtracted the values inside the radical.

$$x = \frac{-6 \pm \sqrt{20}}{8}$$

I rewrote 20 as the product of prime factors.

$$x = \frac{-6 \pm \sqrt{2 \cdot 2 \cdot 5}}{8}$$

I simplified the expression inside the radical.

$$x = \frac{-6 \pm 2\sqrt{5}}{8}$$

Then I simplified the fraction. Here is my answer.

$$x = \frac{-3 \pm \sqrt{5}}{4}$$

*** Describe Alex's and Morgan's ways to a new student in your class.**

*** Why do you think Alex and Morgan used the quadratic formula for this problem? Could they have factored instead?**

*** 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?**

*** Based on what you have learned from comparing Alex's and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?**

Which is correct?

Alex and Morgan were asked to solve $4x^2 - 6x + 1 = 0$

Alex's "substitute into the quadratic formula correctly" way	Morgan's "confuse the sign of *b*" way
$4x^2 - 6x + 1 = 0$	$4x^2 - 6x + 1 = 0$
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$x = -(-6)$ ...	... $^2 - 4(4)(1)$

First I wrote the quadratic formula.

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

I simplified.

I subtrac... values insi... radical.

I ... prim...

I simplified... expressi... the rad...

Then I simplified the fraction. Here is my answer.

First I wrote the quadratic formula.

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

I simplified.

...d the ...nside the ...l.

...ied the ... inside

Then I simplified the fraction. Here is my answer.

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

When using the quadratic formula, watch out for negative terms in the original equation, so that you substitute negative terms into the quadratic formula correctly.

*** Describe Alex's and Morgan's w... stu... ...ass.**
*** Why do you think Alex and Morg... the qua... ...a for thi... ...n? Could they have factored instead?**
*** Whose answer is correct, Alex's o... ...rgan's? How ... ...now?**
*** What are some similarities and di...erences between ... and Morgan's wa...s?**
*** Based on what you have learned from comparing Ale... and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?**

Student Worksheet 8.4.2

1 Describe Alex's and Morgan's ways to a new student in your class.

2 Why do you think Alex and Morgan used the quadratic formula for this problem? Could they have factored instead?

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

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

5 Based on what you have learned from comparing Alex's and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?

Which is correct?

Alex and Morgan were asked to solve $x^2 + 5x - 3 = 0$

Alex's "substitute into the quadratic formula correctly" way

$$x^2 + 5x - 3 = 0$$

First I wrote the quadratic formula.

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

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

$$x = \frac{-5 \pm \sqrt{(5)^2 - 4(1)(-3)}}{2(1)}$$

I simplified.

$$x = \frac{-5 \pm \sqrt{25 + 12}}{2}$$

I added the values inside the radical.

$$x = \frac{-5 \pm \sqrt{37}}{2}$$

Morgan's "confuse the sign of *c*" way

$$x^2 + 5x - 3 = 0$$

First I wrote the quadratic formula.

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

Then I substituted the values for *a*, *b*, and *c* from the original equation into the formula.

$$x = \frac{-5 \pm \sqrt{(5)^2 - 4(1)(3)}}{2(1)}$$

I simplified.

$$x = \frac{-5 \pm \sqrt{25 - 12}}{2}$$

I subtracted the values inside the radical.

$$x = \frac{-5 \pm \sqrt{13}}{2}$$

*** Describe Alex's and Morgan's ways to a new student in your class.**
*** Why do you think Alex and Morgan used the quadratic formula for this problem? Could they have factored instead?**
*** 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?**
*** Based on what you have learned from comparing Alex's and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?**

Which is correct?

Alex and Morgan were asked to solve $x^2 + 5x - 3 = 0$

Alex's "substitute into the quadratic formula correctly" way	Morgan's "confuse the sign of *c*" way
$x^2 + 5x - 3 = 0$	$x^2 + 5x - 3 = 0$
$x = \ldots$	$\ldots - 4ac$

First I wrote the quadratic formula.

Then I substituted the values for *a*, *b* an… origi… equati… the form…

I simp…

I added the values in… the rad…

First I wrote the quadratic formula.

Then I substituted the values for *a*, *b*, …he …n into …rmula.

…ified.

…btracted the …s inside …ical.

* **Describe Alex's … Morgan's w…**
* **Why do you think Alex and Mor… …? Could they have factored instead?**
* **Whose answer is correct, Alex's … ? Ho… …w?**
* **What are some similarities and d…es betwee… …d Morgan… …?**
* **Based on what you have learned …m comparing A… …d Morgan's wa… can you think of one important thing to watch out for when you solve problems with the q…atic formula?**

Student Worksheet 8.4.3

1 Describe Alex's and Morgan's ways to a new student in your class.

2 Why do you think Alex and Morgan used the quadratic formula for this problem? Could they have factored instead?

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

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

5 Based on what you have learned from comparing Alex's and Morgan's ways, can you think of one important thing to watch out for when you solve problems with the quadratic formula?

How do they differ?

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

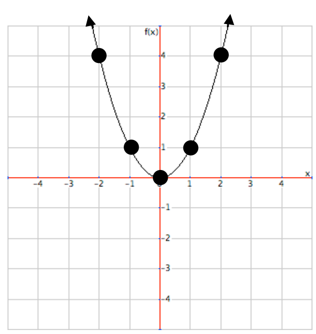
Alex's way

I created a table of values.

$$y = x^2$$

x	y
-2	4
-1	1
0	0
1	1
2	4

I graphed the points and connected them to draw my parabola.



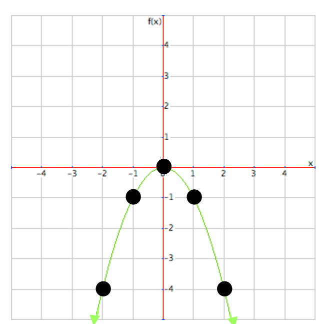
Morgan's way

I created a table of values.

$$y = -x^2$$

x	y
-2	-4
-1	-1
0	0
1	-1
2	-4

I graphed the points and connected them to draw my parabola.



*** How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?**
*** 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 the coefficient of x^2 affect the graph of a quadratic function?**

How do they differ?

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

Alex's way

Morgan's way

I created a table o values.

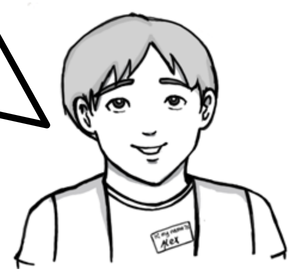
I graphed th and conne to dra p

ed a table of s.

e points them

For the graph of the quadratic equation $y=x^2$, changing the sign of coefficient of x^2 changes the concavity of the parabola.

In general, if the coefficient of x^2 is positive, the parabola is concave up, and if the coefficient of x^2 is negative, the parabola is concave down.



*** How did Alex graph the p given on? H organ graph the parabola given by her equation?**

*** What are some similarities nd differences b n Alex's and M an's problems?**

*** What are some similarities and differences be en Alex's and Morgan's graphs?**

*** How does changing the sign of the coefficient x^2 affect the graph of a quadratic function?**

Student Worksheet 8.5.1

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

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

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

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

4 How does changing the sign of the coefficient of x^2 affect the graph of a quadratic function?

How do they differ?

Alex was asked to graph the equation $y = x^2$,

and Morgan was asked to graph the equation $y = \frac{1}{2}x^2$.

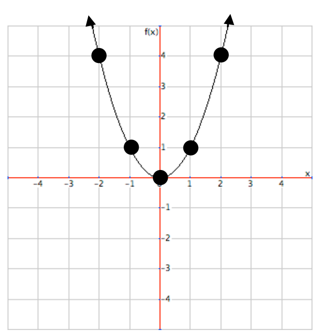
Alex's way	Morgan's way

I created a table of values.

I graphed the points and connected them to draw my parabola.

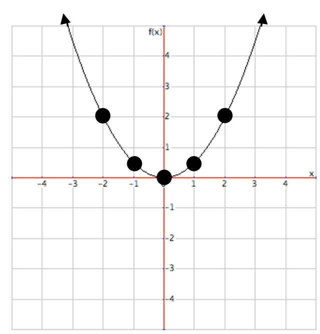
$$y = x^2$$

x	y
-2	4
-1	1
0	0
1	1
2	4



$$y = \frac{1}{2}x^2$$

x	y
-2	2
-1	1/2
0	0
1	1/2
2	2



I created a table of values.

I graphed the points and connected them to draw my parabola.

*** How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?**
*** 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 the coefficient of x^2 affect the graph of a quadratic function?**

How do they differ?

Alex was asked to graph the equation $y = x^2$,

and Morgan was asked to graph the equation $y = \frac{1}{2}x^2$.

Alex's way

Morgan's way

I created a table
values.

I graphed
and connect
to draw my
parabo

a table of

points
ed them

For the graph of the quadratic equation $y=ax^2$, the absolute value of a determines whether the parabola is relatively 'wide' or 'narrow.'

As the absolute value of a increases, the parabola becomes more narrow, and as the absolute value of a decreases, the parabola becomes wider.

*** How did Alex graph the**
rgan graph the parabola
given by her equation?
*** What are some similaritie**
ifference
Alex's an
an's problems?
*** What are some similarities**
d differences
Alex's and M
an's graphs?
*** How does changing the va**
ue of the coefficie
x affect the grap
of a quadratic function?

Student Worksheet 8.5.2

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

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

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

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

4 How does changing the value of the coefficient of x^2 affect the graph of a quadratic function?

How do they differ?

Alex was asked to graph the equation $y = x^2$,

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

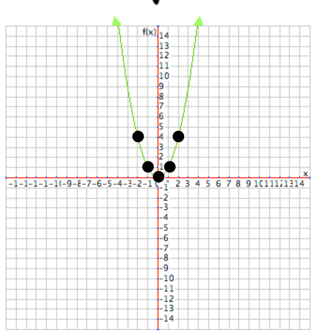
Alex's way

$$y = x^2$$

I created a table of values.

x	y
-2	4
-1	1
0	0
1	1
2	4

I graphed the points and connected them to draw my parabola.



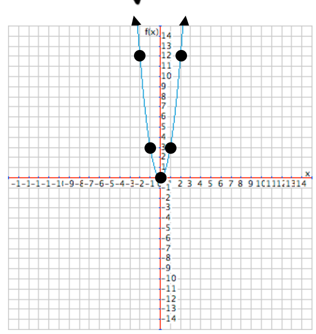
Morgan's way

$$y = 3x^2$$

I created a table of values.

x	y
-2	12
-1	3
0	0
1	3
2	12

I graphed the points and connected them to draw my parabola.



*** How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?**
*** 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 the coefficient of x^2 affect the graph of a quadratic function?**

How do they differ?

Alex was asked to graph the equation $y = x^2$,

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

Alex's way

Morgan's way

I created a table
values.

a table of

I graphed
and connec
to draw my
parabo

points
ed them

For the graph of the quadratic equation $y=ax^2$, the absolute value of *a* determines whether the parabola is relatively 'wide' or 'narrow.'

As the absolute value of *a* increases, the parabola becomes more narrow, and as the absolute value of *a* decreases, the parabola becomes wider.

*** How did Alex graph the p** **rgan graph the parabola**
given by her equation?
*** What are some similaritie** **ifference** **Alex's an** **an's problems?**
*** What are some similarities** **d differences** **Alex's and M** **an's ways?**
*** How does changing the va** **ue of the coefficie** x^2 **affect the grap** **h of a quadratic function?**

Student Worksheet 8.5.3

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

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

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

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

4 How does changing the value of the coefficient of x^2 affect the graph of a quadratic function?

How do they differ?

Alex was asked to graph the equation $y = x^2$,

and Morgan was asked to graph the equation $y = x^2 + 1$.

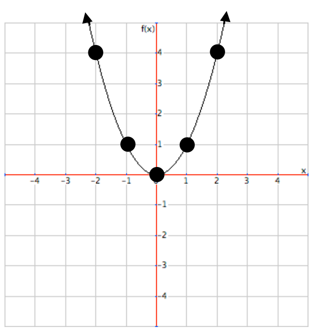
Alex's way

$y = x^2$

I created a table of values.

x	y
-2	4
-1	1
0	0
1	1
2	4

I graphed the points and connected them to draw my parabola.



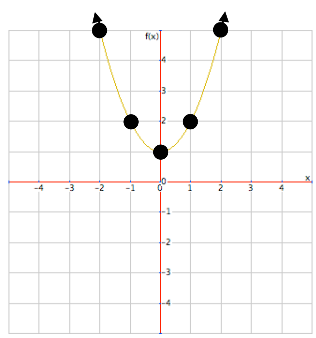
Morgan's way

$y = x^2 + 1$

I created a table of values.

x	y
-2	5
-1	2
0	1
1	2
2	5

I graphed the points and connected them to draw my parabola.



*** How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?**
*** 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 adding a constant to the equation affect the graph of a quadratic function?**
*** If the equation were changed to $y = x^2 - 3$, what do you think the graph would look like?**

How do they differ?

Alex was asked to graph the equation $y = x^2$,

and Morgan was asked to graph the equation $y = x^2 + 1$.

Alex's way

Morgan's way

I created a table
values.

a table of

I graphed
and connec
to draw my
parabola

oints
d them

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

The effect of the constant term c on the graph of $y = x^2 + c$ is to shift (or translate) the parabola up or down c units. If c is positive, the parabola will shift up; if c is negative, the parabola will shift down.

*** How did Alex graph the ... rgan graph the parabola given by her equation?**
*** What are some similaritie ... erenc ... lex's ... an's problems?**
*** What are some similaritie ... ifferences ... Alex's an ... an's ways?**
*** How does adding a consta ... o the equation ... ct the graph o ... quadratic function?**
*** If the equation were changed to $y = x^2 - 3$, w ... do you think the graph would look like?**

Student Worksheet 8.5.4

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

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

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

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

4 How does adding a constant to the equation affect the graph of a quadratic function?

5 If the equation were changed to $y = x^2 - 3$, what do you think the graph would look like?

How do they differ?

Alex was asked to graph the equation $y = x^2 + 1$,

and Morgan was asked to graph the equation $y = x^2 - 1$.

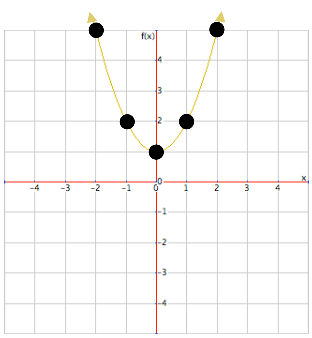
Alex's way

$$y = x^2 + 1$$

I created a table of values.

x	y
-2	5
-1	2
0	1
1	2
2	5

I graphed the points and connected them to draw my parabola.



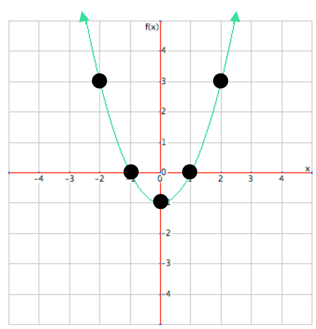
Morgan's way

$$y = x^2 - 1$$

I created a table of values.

x	y
-2	3
-1	0
0	-1
1	0
2	3

I graphed the points and connected them to draw my parabola.



*** How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?**
*** 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 adding or subtracting a constant to the equation affect the graph of a quadratic function?**
*** If the equation were changed to $y = x^2$, what do you think the graph would look like?**

How do they differ?

Alex was asked to graph the equation $y = x^2 + 1$,

and Morgan was asked to graph the equation $y = x^2 - 1$.

Alex's way

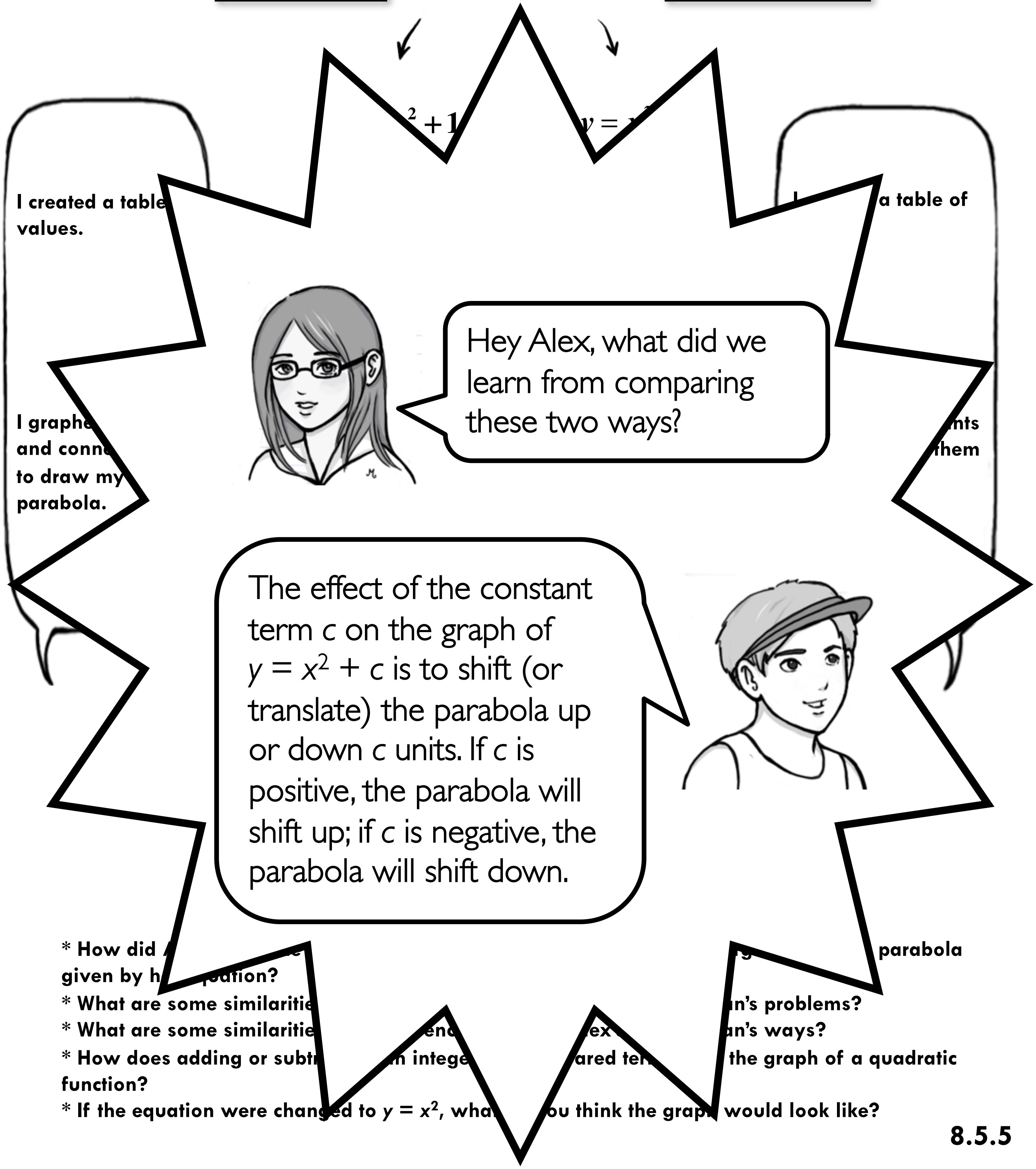
Morgan's way

I created a table values.

I graphe and conn to draw my parabola.

a table of

nts them



*** How did parabola given by h uation?**
*** What are some similaritie n's problems?**
*** What are some similaritie ex an's ways?**
*** How does adding or subtr n intege ared te the graph of a quadratic function?**
*** If the equation were changed to $y = x^2$, wha ou think the graph would look like?**

Student Worksheet 8.5.5

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

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

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

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

4 How does adding or subtracting a constant to the equation affect the graph of a quadratic function?

5 If the equation were changed to $y = x^2$, what do you think the graph would look like?

How do they differ?

Alex was asked to graph the equation $y = x^2$,

and Morgan was asked to graph the equation $y = (x+1)^2$.

Alex's way	Morgan's way

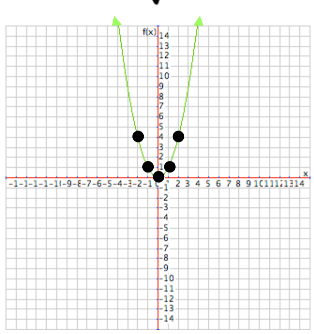
Alex:

I created a table of values.

$y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4

I graphed the points and connected them to draw my parabola.



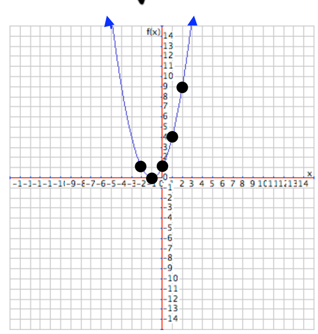
Morgan:

I created a table of values.

$y = (x+1)^2$

x	y
-2	1
-1	0
0	1
1	4
2	9

I graphed the points and connected them to draw my parabola.



*** How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?**
*** 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 adding a constant to x^2 affect the graph of a quadratic function?**
*** If the equation were changed to $y = (x-1)^2$, what do you think the graph would look like?**

How do they differ?

Alex was asked to graph the equation $y = x^2$,

and Morgan was asked to graph the equation $y = (x+1)^2$.

Alex's way

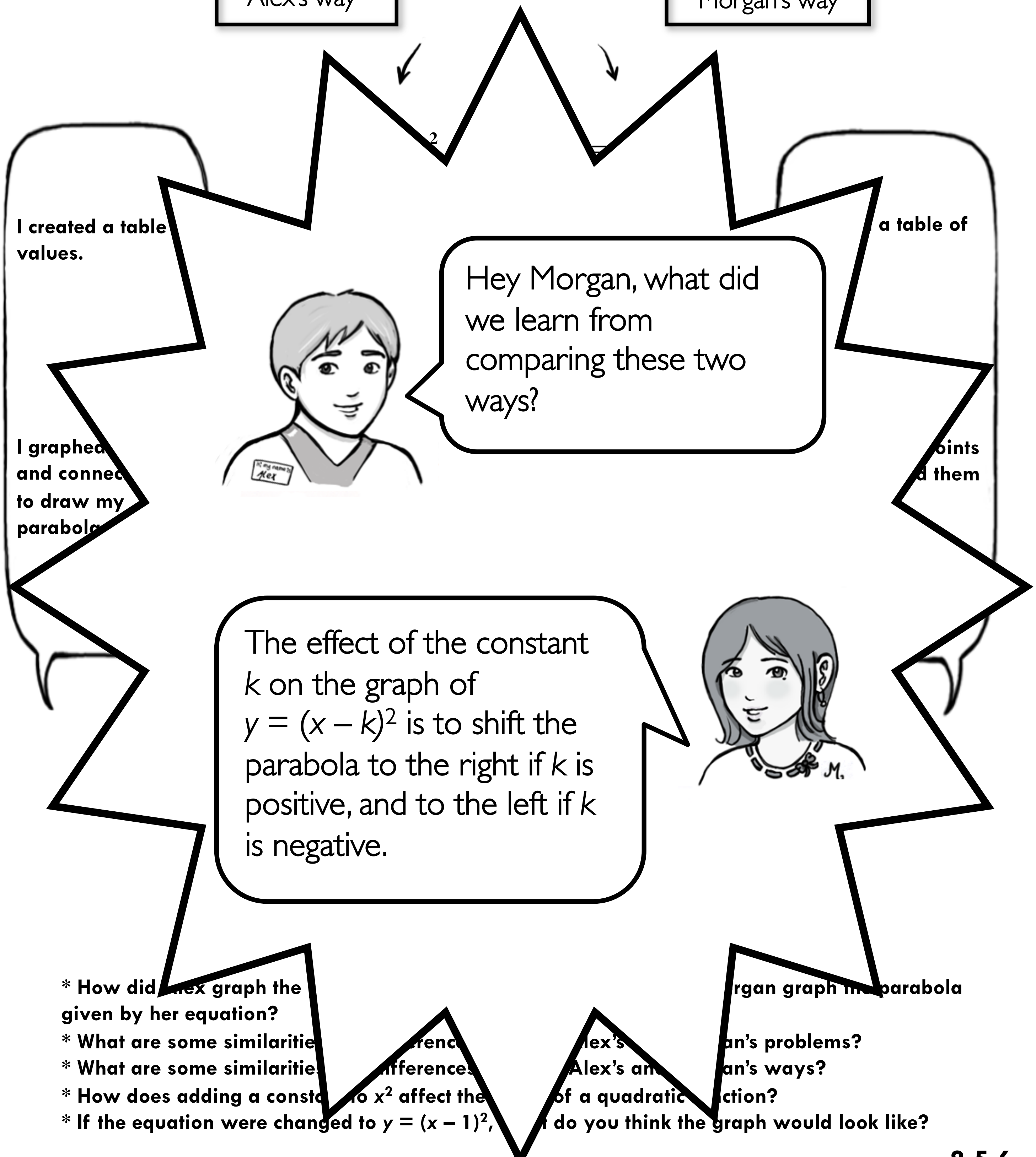
Morgan's way

I created a table ... values.

I graphed ... and conne... to draw my parabola

... a table of

...oints ...d them



*** How did ...lex graph the ... rgan graph ... parabola given by her equation?**
*** What are some similaritie... ... erenc... ...lex's ... an's problems?**
*** What are some similaritie... ...ifferences ... Alex's an... ...an's ways?**
*** How does adding a consta... ...o x^2 affect the ... of a quadratic ...ction?**
*** If the equation were changed to $y = (x - 1)^2$, ... do you think the graph would look like?**

Student Worksheet 8.5.6

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

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

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

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

4 How does adding a constant to x^2 affect the graph of a quadratic function?

5 If the equation were changed to $y = (x - 1)^2$, what do you think the graph would look like?

How do they differ?

Alex was asked to graph the equation $y = (x+1)^2$,

and Morgan was asked to graph the equation $y = (x-1)^2$.

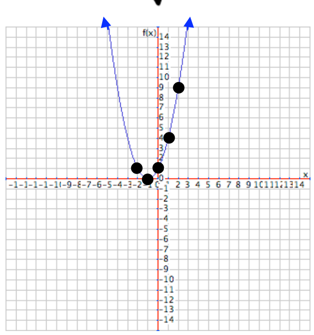
Alex's way

I created a table of values.

$$y = (x+1)^2$$

x	y
-2	1
-1	0
0	1
1	4
2	9

I graphed the points and connected them to draw my parabola.



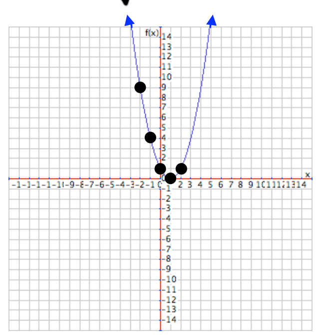
Morgan's way

I created a table of values.

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

x	y
-2	9
-1	4
0	1
1	0
2	1

I graphed the points and connected them to draw my parabola.



* How did Alex graph the parabola given by his equation? How did Morgan graph the parabola given by her equation?
* 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 adding or subtracting a constant to x^2 affect the graph of a quadratic function?
* If the equation were changed to $y = (x-6)^2$, what do you think the graph would look like?

How do they differ?

Alex was asked to graph the equation $y=(x+1)^2$,

and Morgan was asked to graph the equation $y=(x-1)^2$.

Alex's way

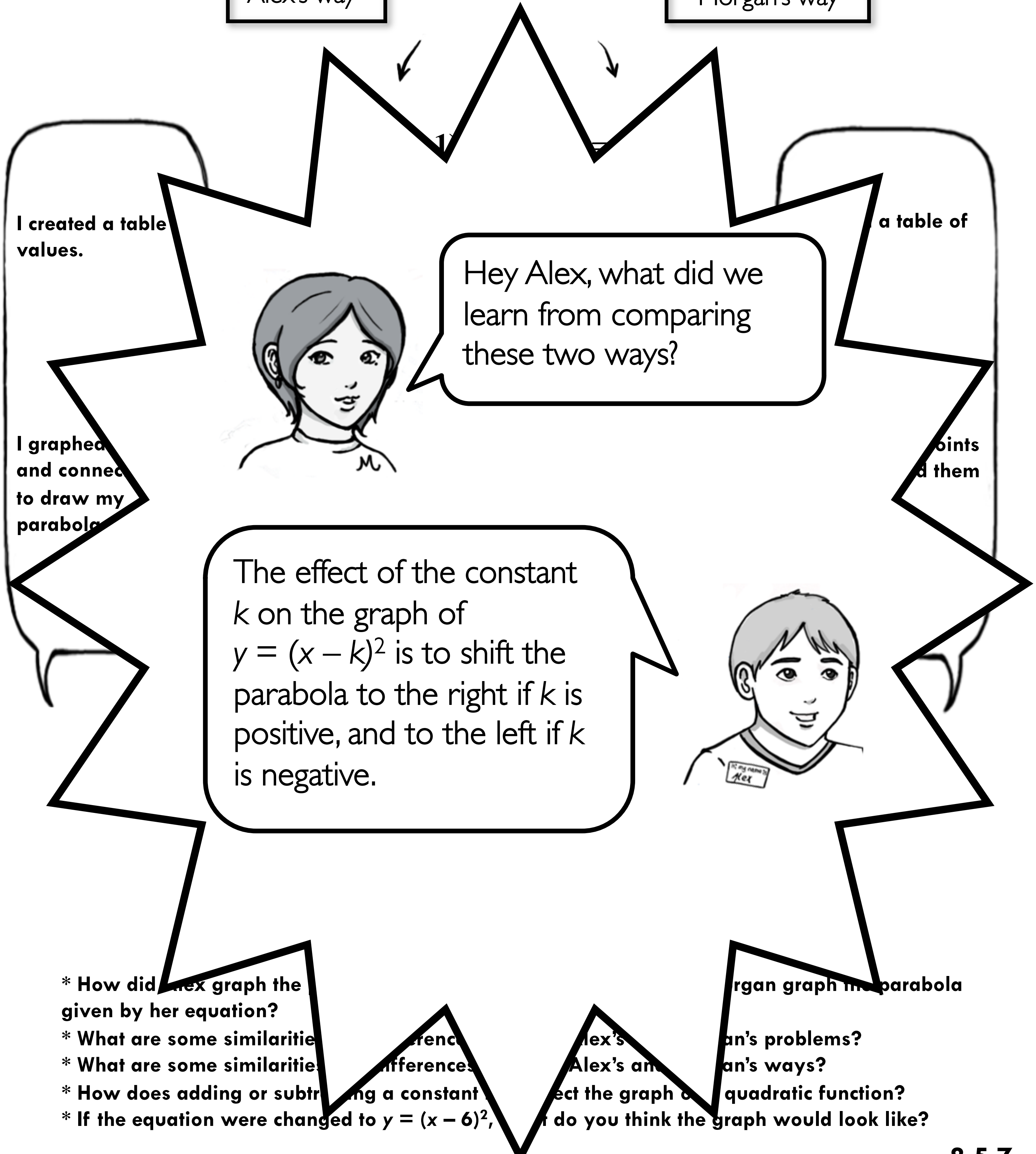
Morgan's way

I created a table
values.

a table of

I graphed
and connec
to draw my
parabola

oints
d them



*** How did lex graph the**
rgan graph parabola
given by her equation?
*** What are some similaritie erenc lex's an's problems?**
*** What are some similaritie ifferences Alex's an an's ways?**
*** How does adding or subtr ng a constant ect the graph quadratic function?**
*** If the equation were changed to $y=(x-6)^2$, do you think the graph would look like?**

Student Worksheet 8.5.7

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

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

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

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

4 How does adding or subtracting a constant to x^2 affect the graph of a quadratic function?

5 If the equation were changed to $y = (x - 6)^2$, what do you think the graph would look like?