

**Line Zapper #1**

$$3x + 4y = 3$$

$$-3x + 3y = 18$$

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**Line Zapper #2**

$$y = 2x - 4$$

$$y = 0.5x + 5$$

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**Line Zapper #3**

$$y = 3x + 6$$

$$2x + 2y = 20$$

$$x - y = 10$$

**Repeated Challenges**

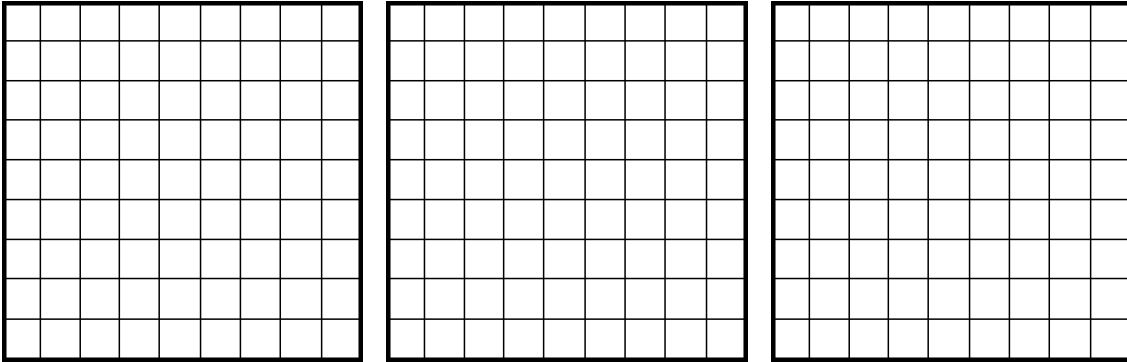
Use additional paper as needed.

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**Cool-Down**

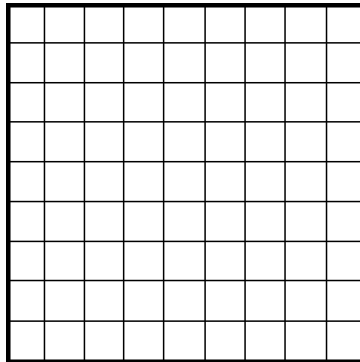
**Your Pattern: Part 1**

1. Draw your pattern in the space below.



2. Describe what about your pattern is changing and what is staying the same.

3. Draw the pattern for when  $s = 4$ .



4. How many tiles will there be when  $s = 10$ ? Draw a picture if it helps with your thinking.

**Your Pattern: Part 2**

1. Write an equation that represents your pattern.
2. Explain how you see each term of your equation represented in the pattern.
3. How many tiles will there be when  $s = 15$ ? Show or explain your thinking.

**Gallery Walk**

<p>1. What features of your classmates' work helped you understand their thinking?</p>	<p>2. Now that you've seen the work of other groups, what would you have done differently if you had more time?</p>
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## Tables

## Screens 4 and 5

[illegible]

## Screen 6

[illegible]

## Screen 9

[illegible]

## Screen 10

[illegible]

## Screen 11

[illegible]

### Activity 1: Coordinate Co-Op

As a group, make a graph of each function by following the instructions on the projection sheet. Use this worksheet to show all of your thinking.

1.  $f(x) = x^2 - 2x - 6$

$x$	$x^2$	$-2x$	$-6$	$x^2 - 2x - 6$

2.  $g(x) = (x + 4)(x - 2)$

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

3. **Reflection:** Describe a strategy that someone in your group used that you want to celebrate!

### Explore

Plot more points on the graph of each function. Try to plot points that no one else will!

### Activity 2: Fix It!

Three students were working on graphing parabolas. Part of their work is correct. Part is incorrect.

<b>Amir's First Draft</b>  <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <th style="padding: 5px;"><math>x</math></th> <th style="padding: 5px;"><math>2x^2</math></th> <th style="padding: 5px;"><math>x</math></th> <th style="padding: 5px;">1</th> <th style="padding: 5px;"><math>2x^2 + x + 1</math></th> </tr> <tr> <td style="text-align: center; padding: 5px;">5</td> <td style="text-align: center; padding: 5px;">100</td> <td style="text-align: center; padding: 5px;">5</td> <td style="text-align: center; padding: 5px;">1</td> <td style="text-align: center; padding: 5px;">106</td> </tr> </table> <p style="text-align: center; margin-top: 10px;">The point (5, 106) is on the graph!</p>	$x$	$2x^2$	$x$	1	$2x^2 + x + 1$	5	100	5	1	106	What they did correctly:  Their mistake:
$x$	$2x^2$	$x$	1	$2x^2 + x + 1$							
5	100	5	1	106							

<b>Second Draft</b>
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<b>Brielle's First Draft</b>  <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <th style="padding: 5px;"><math>x</math></th> <th style="padding: 5px;"><math>-x^2</math></th> <th style="padding: 5px;"><math>-5x</math></th> <th style="padding: 5px;">3</th> <th style="padding: 5px;"><math>-x^2 - 5x + 3</math></th> </tr> <tr> <td style="text-align: center; padding: 5px;">-2</td> <td style="text-align: center; padding: 5px;">4</td> <td style="text-align: center; padding: 5px;">10</td> <td style="text-align: center; padding: 5px;">3</td> <td style="text-align: center; padding: 5px;">17</td> </tr> </table> <p style="text-align: center; margin-top: 10px;">The point (-2, 17) is on the graph!</p>	$x$	$-x^2$	$-5x$	3	$-x^2 - 5x + 3$	-2	4	10	3	17	What they did correctly:  Their mistake:
$x$	$-x^2$	$-5x$	3	$-x^2 - 5x + 3$							
-2	4	10	3	17							

<b>Second Draft</b>
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<b>Juliana's First Draft</b>  <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <th style="padding: 5px;"><math>x</math></th> <th style="padding: 5px;"><math>(2x+6)</math></th> <th style="padding: 5px;"><math>(x+10)</math></th> <th style="padding: 5px;"><math>(2x+6)(x+10)</math></th> </tr> <tr> <td style="text-align: center; padding: 5px;">-3</td> <td style="text-align: center; padding: 5px;">0</td> <td style="text-align: center; padding: 5px;">7</td> <td style="text-align: center; padding: 5px;">7</td> </tr> </table> <p style="text-align: center; margin-top: 10px;">The point (-3, 7) is on the graph!</p>	$x$	$(2x+6)$	$(x+10)$	$(2x+6)(x+10)$	-3	0	7	7	What they did correctly:  Their mistake:
$x$	$(2x+6)$	$(x+10)$	$(2x+6)(x+10)$						
-3	0	7	7						

<b>Second Draft</b>
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**Reflection:** Which of these is your favorite mistake? Why?



## Lesson Synthesis

How can using a table help you graph quadratic functions?

$x$	$-x^2$	$-2x$	3	$-x^2 - 2x + 3$
-3	-9	6	3	0

$x$	$(2x+4)$	$(x-3)$	$(2x+4)(x-3)$
-3	-2	-6	12

## Cool-Down

Here are three statements about the graph of  $h(x) = (2x - 1)(x + 3)$ .

One of the statements is a lie. Which is it?

- A. The point  $(-2, -5)$  is on the graph.
- B. The point  $(0, -3)$  is on the graph.
- C. The point  $(2, 8)$  is on the graph.

Use the table if it helps with your thinking.

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

**Coordinate Co-Op Cards**

Distribute these cards so each person has  
at least two  $x$ -values.

$$x = -3$$

$$x = -2$$

$$x = -1$$

$$x = 0$$

$$x = 1$$

$$x = 2$$

$$x = 3$$

Distribute these cards so each person has  
at least two  $x$ -values.

$$x = -3$$

$$x = -2$$

$$x = -1$$

$$x = 0$$

$$x = 1$$

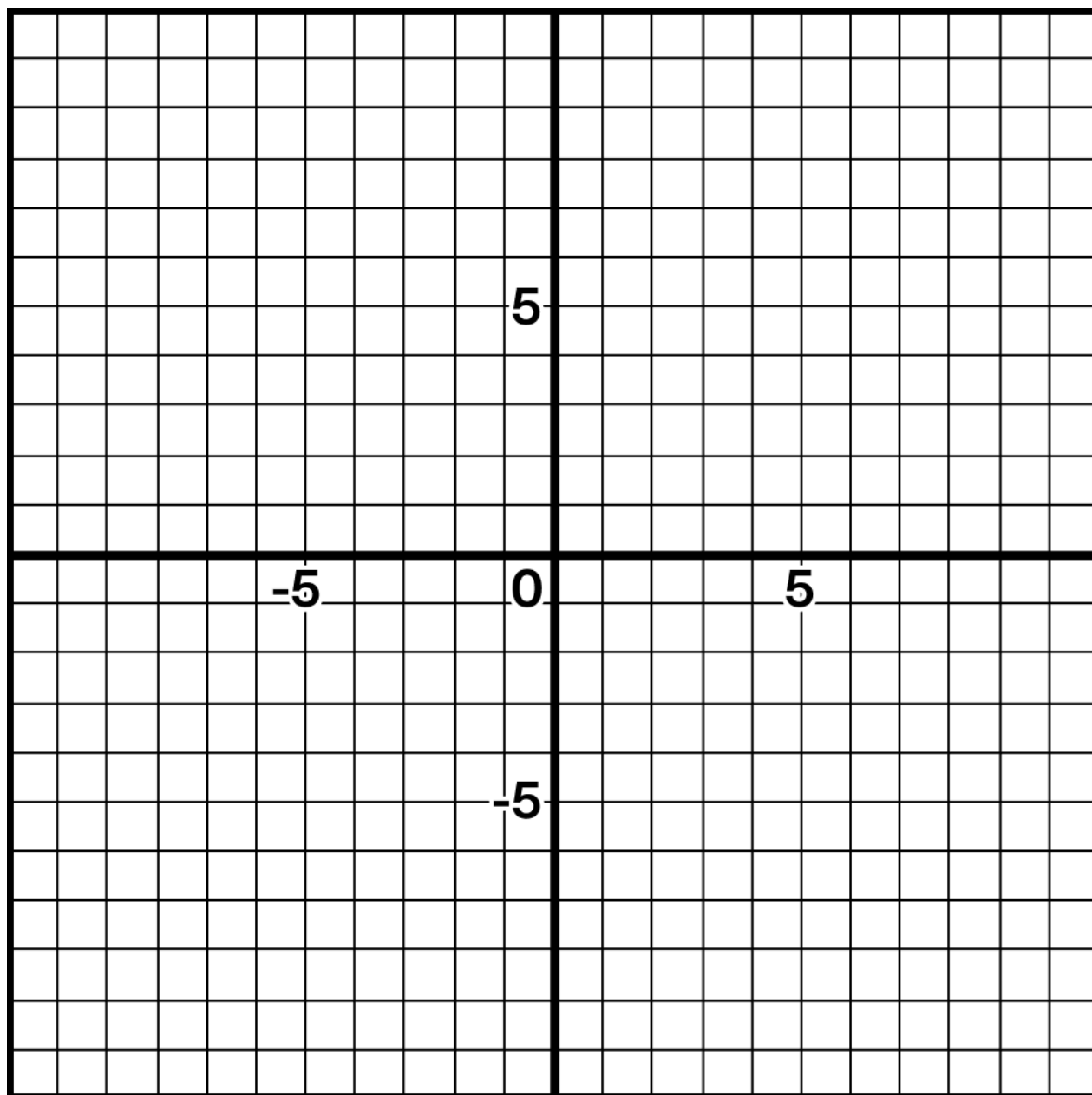
$$x = 2$$

$$x = 3$$

## Coordinate Co-Op

## Graph #1

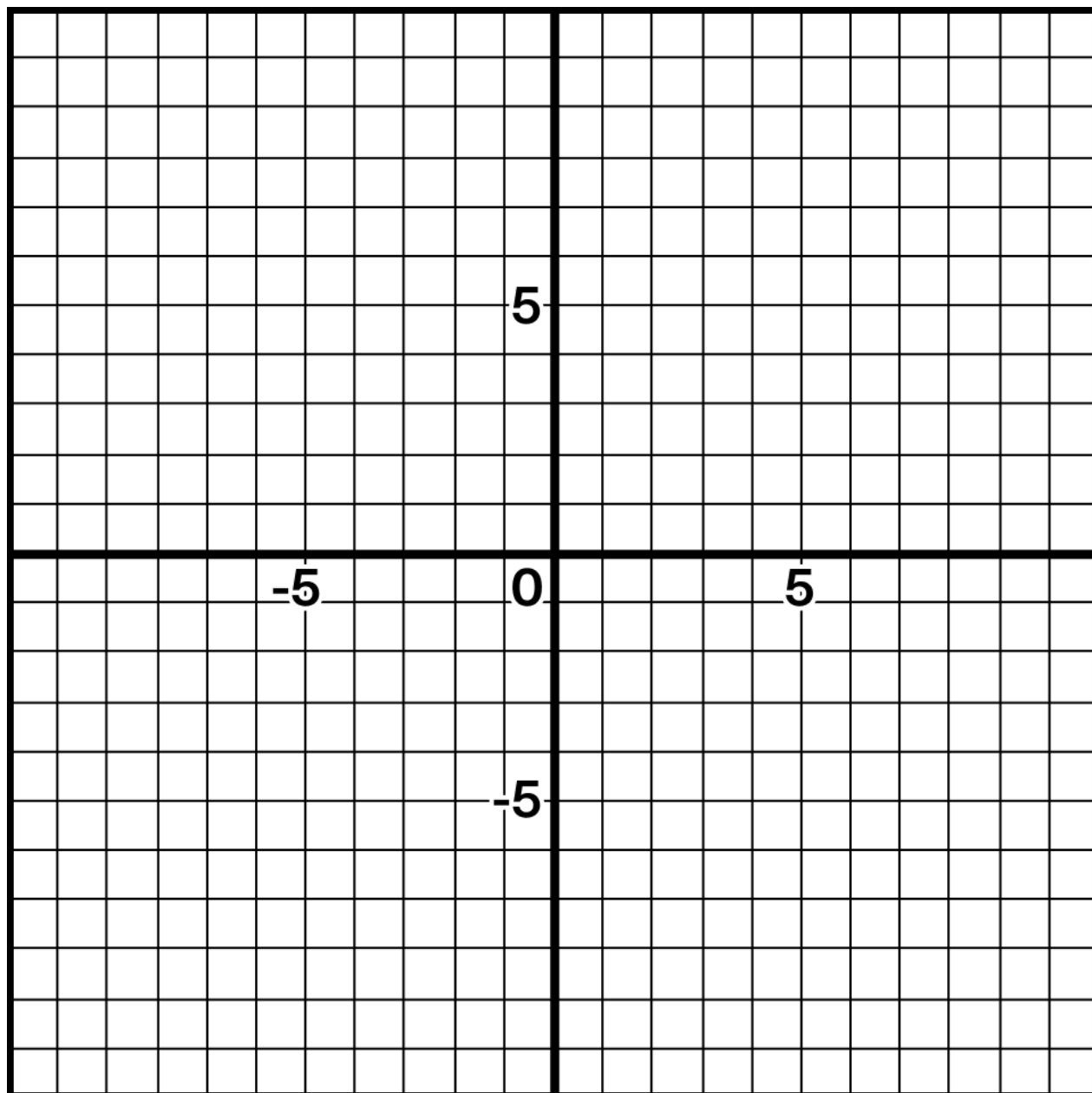
$$f(x) = x^2 - 2x - 6$$



## Coordinate Co-Op

**Graph #2**

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



### Warm-Up

Match each expression in factored form with its equivalent expression in standard form.

Factored Form	Standard Form
1. $(5x + 6)(x - 3)$ _____	A. $5x^2 + 43x - 18$
2. $(5x - 3)(x + 6)$ _____	B. $5x^2 - 9x - 18$
3. $(5x - 2)(x + 9)$ _____	C. $5x^2 - 43x - 18$
4. $(5x + 2)(x - 9)$ _____	D. $5x^2 + 27x - 18$

### Activity 1: Diagram Puzzles

Complete each diagram puzzle, standard-form expression, and factored-form expression.

	Diagram	Standard Form	Factored Form
1	<div><div><div>3x</div><div>-5</div></div><div><div>4x</div><div><div></div><div></div></div></div><div><div>-9x</div><div>15</div></div></div>	<div><div>_____</div><div>_____</div><div>+ 15</div></div>	<div><div>(3x - 5)(4x _____)</div></div>
2	<div><div><div>2x</div><div>3</div></div><div><div>4x<sup>2</sup></div><div>6x</div></div></div> <div><div></div><div>-9</div></div>	<div><div>4x<sup>2</sup></div><div>_____</div></div>	<div><div>(2x + 3)(_____)</div></div>
3	<div><div><div></div><div>-3</div></div><div><div>2x<sup>2</sup></div><div>-3x</div></div></div> <div><div>8x</div><div></div></div>	<div><div>2x<sup>2</sup> + 5x</div><div>_____</div></div>	

	Diagram	Standard Form	Factored Form				
4	<table><tr><td><math>3x^2</math></td><td><math>4x</math></td></tr><tr><td><math>15x</math></td><td><math>20</math></td></tr></table>	$3x^2$	$4x$	$15x$	$20$		
$3x^2$	$4x$						
$15x$	$20$						
5	<div><div><math>x</math></div><table><tr><td><math>x^2</math></td><td></td></tr><tr><td></td><td><math>-10</math></td></tr></table></div>	$x^2$			$-10$	$x^2 - 3x - 10$	
$x^2$							
	$-10$						
6	<table><tr><td><math>3x^2</math></td><td></td></tr><tr><td></td><td><math>1</math></td></tr></table>	$3x^2$			$1$	$3x^2 + 4x + 1$	
$3x^2$							
	$1$						
7	<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>					$x^2 + 9x + 20$	
8	<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>					$6x^2 + 7x + 2$	

## Activity 2: Next Steps

Tameeka is trying to factor  $2x^2 + 9x + 7$ .

1. Discuss with a partner:

- How can you tell Tameeka's work is incorrect?
- What did Tameeka do well?
- What could she try next?

	$2x$	$1$
$x$	$2x^2$	$x$
$7$	$14x$	$7$

Sneha is trying to factor  $2x^2 + 23x - 12$ . She started by creating this diagram.

2.1 List pairs of constants Sneha could try in order to complete the outside of the diagram.

	$2x$	$-$
$x$	$2x^2$	
$-$		$-12$

Sneha tried the numbers  $-6$  and  $2$ .

2.2 Discuss with a partner:

- How can you tell Sneha's work is incorrect?
- What did Sneha do well?
- What could she try next?

	$2x$	$(2)$
$x$	$2x^2$	$2x$
$(-6)$	$-12x$	$-12$

2.3 Rewrite  $2x^2 + 23x - 12$  in factored form.

Use the diagram supplement if it helps with your thinking.

Ariana is trying to factor  $10x^2 - 7x - 12$ . She starts by creating this diagram.

3.1 Ariana says: *I have to use factors of 10. I also need to use factors of -12.*

What do you think she means?

$10x^2$	
	$-12$

3.2 Rewrite  $10x^2 - 7x - 12$  in factored form.

Here are three other expressions with a  $c$ -value of  $-12$ . Rewrite each expression in factored form.

4.1  $x^2 + x - 12$

4.2  $3x^2 - 16x - 12$

4.3  $6x^2 - 1x - 12$





## Unit A1.8, Lesson 3: X-Factor

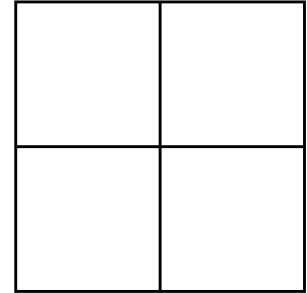
Name \_\_\_\_\_

### Lesson Synthesis

Describe how to rewrite a standard-form expression in factored form.

Use the example if it helps with your thinking.

$$5x^2 - 31x - 28$$

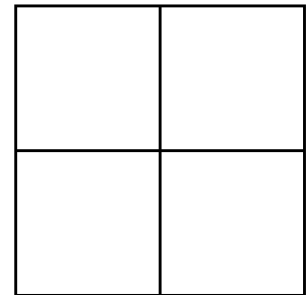


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### Cool-Down

Rewrite  $x^2 + 3x - 28$  in factored form.

Use the diagram if it helps with your thinking.



## Science Mom Lesson 76

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Unit A1.8, Lesson 4: Form Up

**A**

$$x^2 + 5x - 6$$

**I**

$$x^2 - 15x + 56$$

**Q**

$$x^2 - 6x - 40$$

**B**

$$x^2 + 3x - 10$$

**J**

$$x^2 + 18x + 80$$

**R**

$$x^2 + 11x + 18$$

**C**

$$4x^2 - 8x - 5$$

**K**

$$4x^2 + 13x + 10$$

**S**

$$3x^2 + 13x + 12$$

**D**

$$2x^2 - 13x - 24$$

**L**

$$3x^2 + 8x - 16$$

**T**

$$2x^2 + 15x + 18$$

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Unit A1.8, Lesson 4: Form Up

**E**

$$100x^2 - 9$$

**M**

$$25x^2 - 64$$

**U**

$$x^2 - 36$$

**F**

$$9x^2 - 1$$

**N**

$$x^2 - 16$$

**V**

$$x^2 - 4$$

**G**

$$-2x^2 + 2x + 4$$

**O**

$$-6x^2 + 21x$$

**W**

$$15x^2 - 5x - 20$$

**H**

$$6x^2 - 6x - 36$$

**P**

$$5x^2 - 15x - 20$$

**X**

$$10x^2 - 60x + 80$$

### Activity 1: Spotting Similarities

Here are three groups of expressions.

Group 1	Group 2	Group 3
$4x^2 - 25$	$8x^2 + 32x + 24$	$x^2 - 6x - 27$
$x^2 - 36$	$4x^2 - 8x - 32$	$x^2 + 2x - 80$
$x^2 - 100$	$10x^2 + 20x + 10$	$x^2 - 13x + 30$
$25x^2 - 49$	$2x^2 - 22x + 60$	$x^2 + 2x - 63$

1. Explain how the expressions in each group are alike.

Group 1:

Group 2:

Group 3:

2. Factor one expression from each group.

Group 1: \_\_\_\_\_

Group 2: \_\_\_\_\_

Group 3: \_\_\_\_\_

Deiondre factored the expression  $7x^2 + 28x + 21$ .

3.1 Discuss with a classmate:

- Are  $7x^2 + 28x + 21$  and  $7(x^2 + 4x + 3)$  equivalent? How do you know?
- Why might Deiondre have written  $7(x^2 + 4x + 3)$  as a first step?

Deiondre's Work

$$\begin{aligned} 7x^2 + 28x + 21 \\ 7(x^2 + 4x + 3) \\ 7(x + 3)(x + 1) \end{aligned}$$

3.2 Does Deiondre's expression belong in group 1, 2, or 3? Explain your thinking.

Yasmine factored the expression  $9x^2 - 49$ .

4.1 Discuss with a classmate: Does Yasmine's expression belong in group 1, 2, or 3? Explain your thinking.

4.2 Write a new expression in standard form that belongs in the same group as Yasmine's.

Yasmine's Work

$$\begin{aligned} 9x^2 - 49 \\ 9x^2 + 0x - 49 \\ (3x - 7)(3x + 7) \end{aligned}$$

4.3 Factor the expression you wrote in problem 4.2.

Factor each expression.

5.  $3x^2 - 6x - 105$

6.  $16x^2 - 49$

7.  $4x^2 + 52x + 120$

1. Your teacher will give you a card. Factor the expression on your card.
2. Find a partner and swap cards. Factor your new expression and check with your partner.
3. Find a new partner and repeat step 2.

[illegible]



## Unit A1.8, Lesson 4: Form Up

Name \_\_\_\_\_

### Lesson Synthesis

What do you think is important to remember when factoring an expression in standard form?

Use the expressions if they help with your thinking.

$$5x^2 - 18x - 8$$

$$9x^2 - 16$$

$$6x^2 - 24x - 30$$

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### Cool-Down

Factor the expression  $2x^2 - 8x - 10$ .

## Science Mom Lesson 81

STudent worksheet



## Activity 2: Solution Search

Use screen 8 to guide your exploration of solutions to quadratic equations.

1.1 Here is an equation that has **two integer solutions**. Find two more equations.

<b>Equation:</b> $1x^2 - 5x + 6 = 0$  <b>Solutions:</b> $x = \frac{5 \pm \sqrt{1}}{2}$	<b>Equation:</b>   <b>Solutions:</b>	<b>Equation:</b>   <b>Solutions:</b>
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1.2 Find three equations that have **one solution**.

<b>Equation:</b>   <b>Solutions:</b>	<b>Equation:</b>   <b>Solutions:</b>	<b>Equation:</b>   <b>Solutions:</b>
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1.3 Find three equations that have **no solutions**.

<b>Equation:</b>   <b>Solutions:</b>	<b>Equation:</b>   <b>Solutions:</b>	<b>Equation:</b>   <b>Solutions:</b>
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2. Examine the equations and solutions you found.  
 Discuss with your partner: *What patterns do you notice?*

### Activity 1: Form Over Function

Here are four quadratic equations and their solutions.

Use the quadratic formula to show that the solutions are correct.

#### The Quadratic Formula

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

1.1  $x^2 - 8x + 15 = 0$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(15)}}{2(1)}$$

Solutions:  $x = 5$  and  $x = 3$

1.2  $x^2 + 10x + 18 = 0$

$$\text{Solutions: } x = -5 \pm \frac{\sqrt{28}}{2}$$

1.3  $9x^2 - 6x = -1$

$$\text{Solution: } x = \frac{1}{3}$$

1.4  $2x^2 + 6x + 5 = 0$

No solutions

- Discuss with a partner: *Do you think that the quadratic formula is the best strategy for solving each of these equations? Explain your thinking.*

**Activity 2: Error Analysis**

Your teacher will give you a supplement with the same equations from the previous activity. Each attempt to solve the equation contains an error.

1. With a partner:
  - Identify the error in each attempt. Then discuss or show how to correct the error.
  - Discuss why someone might make this error.
- 2.1 Solve the following equation using the quadratic formula, **but include an error that you think would be common.**

$$3x^2 - 6x - 1 = 0$$

- 2.2 Swap equations with a classmate. Identify and describe the error in each other's work.

- 3.1 Reflect: *What kinds of errors do you think you are most likely to make when using the quadratic formula?*
- 3.2 Write two pieces of advice that will help your future self correctly use the quadratic formula. Include examples if they help with your thinking.
  - 
  -

**Lesson Synthesis**

What are some advantages of using the quadratic formula to solve quadratic equations?

What are some disadvantages?

Use the examples if they help with your thinking.

$$x^2 - 6x + 8 = 0$$

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

$$2x^2 + 7x - 10 = 0$$

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**Cool-Down****The Quadratic Formula**

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

Use the quadratic formula to solve the equation  $2x^2 + 5x - 12 = 0$ .

## Science Mom Lesson 84

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Unit A1.8, Lesson 14: Supplement

Name(s) \_\_\_\_\_

### Error Analysis

**1.1**

$$x^2 - 8x + 15 = 0$$

$$a = 1, b = -8, c = 15$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(15)}}{2(1)}$$

$$x = \frac{8 \pm \sqrt{-64 - 60}}{2}$$

$$x = \frac{8 \pm \sqrt{-124}}{2}$$

No solutions

**1.2**

$$x^2 + 10x + 18 = 0$$

$$a = 1, b = 10, c = 18$$

$$x = \frac{-10 \pm \sqrt{10^2 - 4(1)(18)}}{2(1)}$$

$$x = \frac{-10 \pm \sqrt{100 - 72}}{2}$$

$$x = \frac{-10 \pm \sqrt{28}}{2}$$

$$x = -5 \pm \sqrt{14}$$



Unit A1.8, Lesson 14: Supplement

Name(s) \_\_\_\_\_

Error Analysis

**1.3**

$$9x^2 - 6x = -1$$

$$a = 9, b = -6, c = -1$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(9)(-1)}}{2(9)}$$

$$x = \frac{6 \pm \sqrt{36 + 36}}{18}$$

$$x = \frac{6 \pm \sqrt{72}}{18}$$

**1.4**

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

$$a = 2, b = 6, c = 5$$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(2)(5)}}{2(2)}$$

$$x = \frac{-6 \pm \sqrt{36 - 40}}{4}$$

$$x = \frac{-6 \pm \sqrt{-4}}{4}$$

$$x = \frac{-6 \pm 2}{4}$$

$$x = -2 \text{ and } x = -1$$

**Shooting Stars #1**

$$y = x^2 - 11$$

$$y = 5$$

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**Shooting Stars #2**

$$y = x^2$$

$$y = -4x + 12$$

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**Shooting Stars #3**

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

$$y = x$$

**Repeated Challenges**

Use additional paper as needed.

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**Cool-Down**