Curse Reverse
Teacher Guide
Curse Reverse is available at mathsnacks.org

General Information

Curse Reverse immerses players in imaginative worlds where they build skills with algebraic expressions and patterns. In the game, players explore imaginary archeological sites built from algebraic expressions. Blocks with defined and variable values form riddles that players solve to reach treasures. Understanding that variables can represent quantities is key to students' early-algebra learning. The game's narrative structure builds players' sense of accomplishment, and imaginative art motivates students to progress through the *Curse Reverse* sites.

Sessions:

Gameplay Introduction 20 to 30 minutes	Supporting Activity (*Curse Reverse* Keys) 30 to 45 minutes	Gameplay Enrichment 20 to 30 minutes	Reflection/Assessment Approx. 20 minutes

Supplies

• Computers/laptops • Whiteboard/markers • Pencils • 3 dice per small group • Snap cubes • Tape	• Printout of *Curse Reverse* poster and number locks sheet, one of each	• Printout of *Teacher Key Examples 1* and *2*, one of each to use for modeling	• Printout of *Curse Reverse Student Keys* handout, one per student

Common Core State Standards

Standard	Description
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.
5.OA.A.1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
5.OA.A.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.
6.EE.A.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for.

Common Core State Standards (continued)

Standard	Description
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
Mathematical Practices	MP1: Make sense of problems and persevere in solving them. MP4: Model with mathematics. MP6: Attend to precision. MP7: Look for and make use of structure.

Examples of Learning Targets: Tailor as needed, using the Common Core State Standards for your grade level.
- I can explain how a letter can represent a number.
- I can match an expression with a visual representation.

Preparing for the Lesson

1. Watch the "Teaching with" video.
2. View the Gameplay video and review the Overview.
3. Play the game yourself so that you understand the mechanics and math concepts.
4. Secure computers/laptops and make sure the game opens. Firefox is recommended.
5. Read the entire Teacher Guide and pay close attention to all Discussion Questions.
6. There is no need to teach variables and expressions before going to the computer lab. Allow students to explore and experience the game first.
7. Gather supplies needed for the Supporting Activity (see Supplies section).
8. Read and print the *Curse Reverse* Keys activity and instructions (page 7-10).
9. Students may silence their game and/or close their laptops for discussion time.
10. Student may skip through the different rooms or press the back button ⬅ top left to start over at the beginning of the room they are in.
11. Talking is allowed! Encourage your students to talk to each other and share strategies.
12. Turn the sound up on the game instead of having students use headphones.
13. Encourage students to keep playing *Curse Reverse* in and outside of school to complete all 7 sites.

Gameplay Introduction & Discussion Questions (20–30 minutes)

Allow students to play the game for 10 minutes, then ask them to silence their games and close their laptops.

Lead a discussion about gameplay for 10 minutes. You can scribe student responses if you would like.
1. What do you like about this game?
2. What are some things that make this game challenging?
3. How did you move the character around? (Talk about hand placement on the keyboard.)
4. What math do you see in this game so far?
5. What hints can you give your classmates to make the game easier?
6. Did you notice a variable box on the side of the screen? What does the letter mean? How does it help get the character through the door?
7. Which rooms did you get to explore?
8. How do you get the achievement stars?

Have a few students come up to the board and share a strategy.
After the discussion, allow students to continue playing the game for an additional 10 minutes.

# Curse Reverse Keys Supporting Activity & Discussion Questions (30–45 minutes)

Objective of the activity: Behind locks is a secret image; use the *Curse Reverse Student Keys* to uncover it. Each lock has a value that must be matched by modifying the expression on a key. Students will use coefficients, variables and constants to evaluate expressions.

## Launch (Teacher's turn to model with student input)

1. Introduce students to the *Curse Reverse* poster covered by the number locks sheet. Refer to printing and set up instructions at end of guide, page 7.
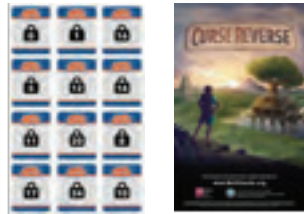
   Tell the students the goal is to remove each lock to reveal the secret image. A lock may only be opened by a key with matching value.
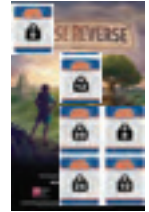
2. Display the *Teacher Key Examples 1* and *2* printouts on the board.
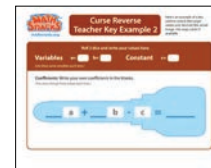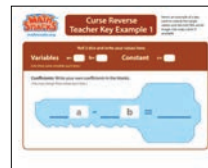
3. Roll 3 dice at the same time. Use the *Teacher Key* printouts to fill in the blanks for the values of the variables *a* and *b*, and the constant *c*. These values will stay the same for every key. For example:
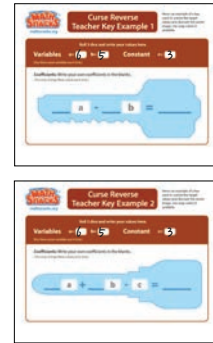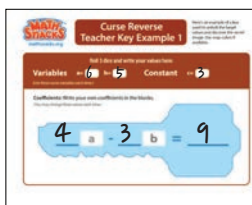
   a=6   b=5   c=3

4. Use snap cubes to represent the variables and constant. You may use this example:

   a=6   2a=12

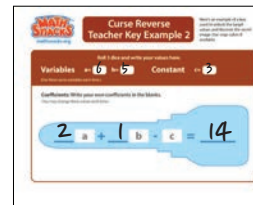   b=5   2b=10

   Constant: c=3

5. Go back to the *Teacher Key* printout to model how to fill out the keys using student input. Below are two examples provided. The handouts for printing are found on pages 8–9 of this guide.

   $(4 \times 6) - (3 \times 5)$
   24 - 15
   9

   $(2 \times 6) + (1 \times 5) - 3$
   12 + 5 - 3
   17 - 3
   14

6. Show students that lock number 9 is not in the secret image poster. Remove lock number 14 from the secret image poster.

7. Ask these questions after modeling:
   a. Why did I write a *3* in front of *b* (point to the coefficient *3* in the term *3b)*?; What does that mean? (Tell a partner.)
   b. Why did I write a *5* to replace *b*?
   c. What happens when you have a coefficient in front of a variable? (Student might respond, "You multiply.") What operation is being done when you have *3b*? (*3* times *b*, or multiplication of *3* and *b*.)
   d. What would *3a* look like mathematically if *a=6*? (Draw student answer on board or have them do it on a piece of paper/whiteboard and show *3* groups of *6*, or *3* times *6*, or $3 \times 6 = 18$.)

Explore (Students' turn)

1. Divide the students into small groups, pass out 3 dice to each group and *Student Keys* to each student.
2. Ask them to use the *Student Keys* handout to uncover the rest of the secret image.
3. When students find a result that is equal to a value of a lock, they may uncover that part of the image.
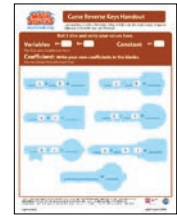
Assessment tip for teachers as students explore:
- Are students using variables correctly? (dice numbers)
- Are students using the constant correctly? (The value of *c* is the same in all expressions.)
- Encourage students to use coefficients greater than 1, or fractions; for example, ask what will happen if you use ½.
- Encourage students to use the number *0*.
- Select one or two interesting expressions for students to present during share out.
- It is ok if the image is not fully uncovered by the end of the 15 minutes – students can come back to it later.

Summarize (Students' turn to discuss and share)

Ask students to share some of the expressions used in the different keys.
1. Why were some of the lock numbers hard to get?
2. Did you get a number that was not on one of the locks?
3. How will the Keys activity help you with playing *Curse Reverse*?
4. If anyone wrote "(variable × coefficient)" instead of "(coefficient × variable)" have a discussion about it. For example, is *a3* the same as or different than *3a*?

Gameplay Enrichment & Discussion Questions (20–30 minutes)

Allow students to play the game for 10 minutes.

Lead a discussion about gameplay for 10 minutes. You can scribe student responses if you would like.
1. How does building the towers get more challenging from room to room?
2. How can you get the minimum number of moves required for a room to get a star? (By changing the variable instead of trying to move the platform one step at a time. For example, if we want to get to a height of *6* and the platform is *2d*, assign *d* a value of *3* in one step because *2(3)* equals *6*, instead of changing *d* values by +1, +1, +1.)
3. How did you use math to achieve the next level?
4. How did you use math to place the treasures?
5. How did you use math to achieve a third star?
6. What do letters represent in the game?
7. How are *2a* and *3a* different?
8. What is the difference between *2a* and *3a*?
9. How else can you represent *x + x + 3? (2x +3)*
10. What other temples and rooms did you explore?
11. What happens when you turn off the grid? (You see only the height of the blocks.)
12. How does *Curse Reverse* relate to the Keys activity?

Students continue to play for an additional 10 minutes.

Reflection & Assessment (approx. 20 minutes)

Use any of these questions for oral discussion, journal entries or exit tickets. Encourage the use of vocabulary words.
1. Revisit the poster. Come up with your own expression to find the match for the keys and locks.
2. If you have a tower that is *3a*, what must *a* equal to make a platform of *9*?
3. What happens when you have a number before a variable?
4. Represent *3a + 4,* if *a=2*. Students may say *3(2) + 4* or draw the following representations:
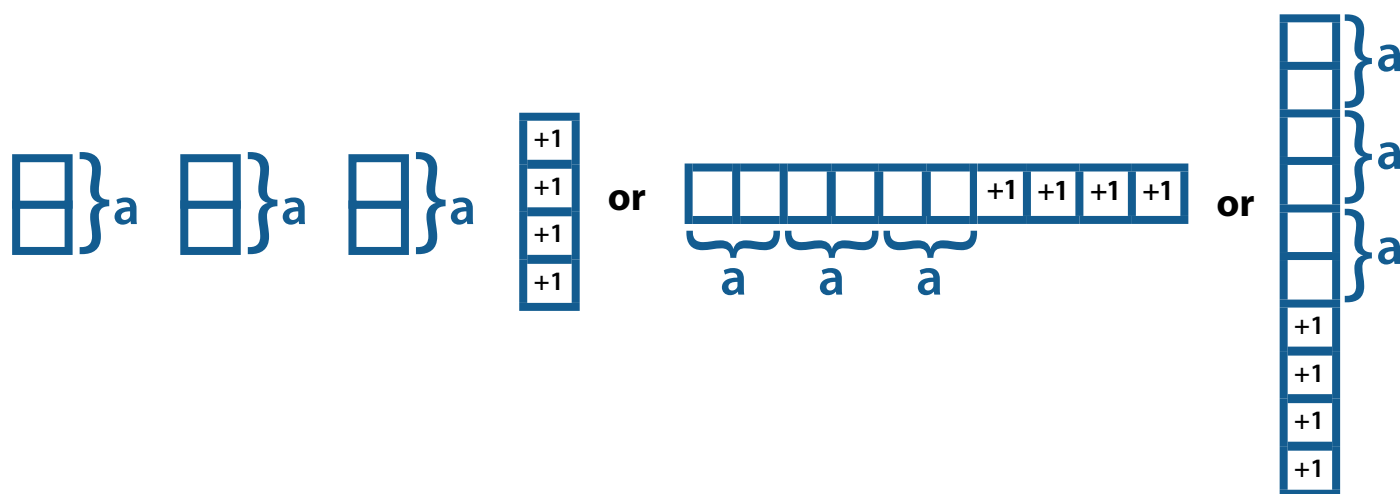
Vocabulary

Do not explicitly pre-teach vocabulary.
Students will develop vocabulary through modeling, gameplay and discussion.

Student Friendly Term	Developing Vocabulary	Definition	Example
Operation	Operation	Addition, subtraction, multiplication and division.	For example, 2y + 1 has two operations. This expression means "multiply 2 times y, then add 1." The two operations are **multiplication** and **addition**.
Multiplier	Coefficient	A number written directly before a variable in an algebraic expression, indicating multiplication.	For example, 2 is the coefficient of y in the expression **2**y + 1
A known or fixed number	Constant	A number in an expression that is not attached to a variable.	For example, 1 is a constant in the expression 2y + **1**.
An unknown or changing number	Variable	A symbol for a number, which may be unknown. It is usually a letter like x or y.	For example, y is a variable in the expression 2**y** + 1.

Curse Reverse Keys Activity Printout Instructions

1. Included in this package are three activity components:
   a. *Teacher Key* examples (2 pages) for modeling the activity.
   b. *Student Keys* handout.
   c. Poster and number locks sheet.
2. Print pages 8–11. (When printing, select the "fit" or "fit to page" option so no artwork gets cut off.)
   a. Print *Teacher Key* examples (pages 7–8).
   b. Print one *Student Keys* handout (page 9) per student.
   c. Print the poster and number locks sheet (pages 10–11).

3. Cut out the lock sections.
   a. Cut the page with locks along the faint dotted lines, making approximately 2.75- by 2.75-in squares.
4. Set up the poster.
   a. Place the cut locks on top of the poster.
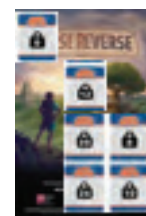
* Alternatively, you can cut out squares from different colors of construction paper and label them with their corresponding number (shown to the right). You will have 12 of these rectangles, and they will be approximately 2.75 by 2.75 in.

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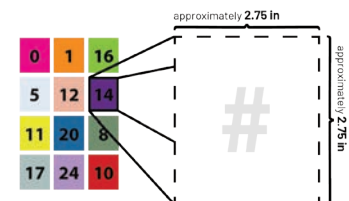
Curse Reverse
Teacher Key Example 1

Here's an example of a key used to unlock the target values and discover the secret image. Use snap cubes if available.
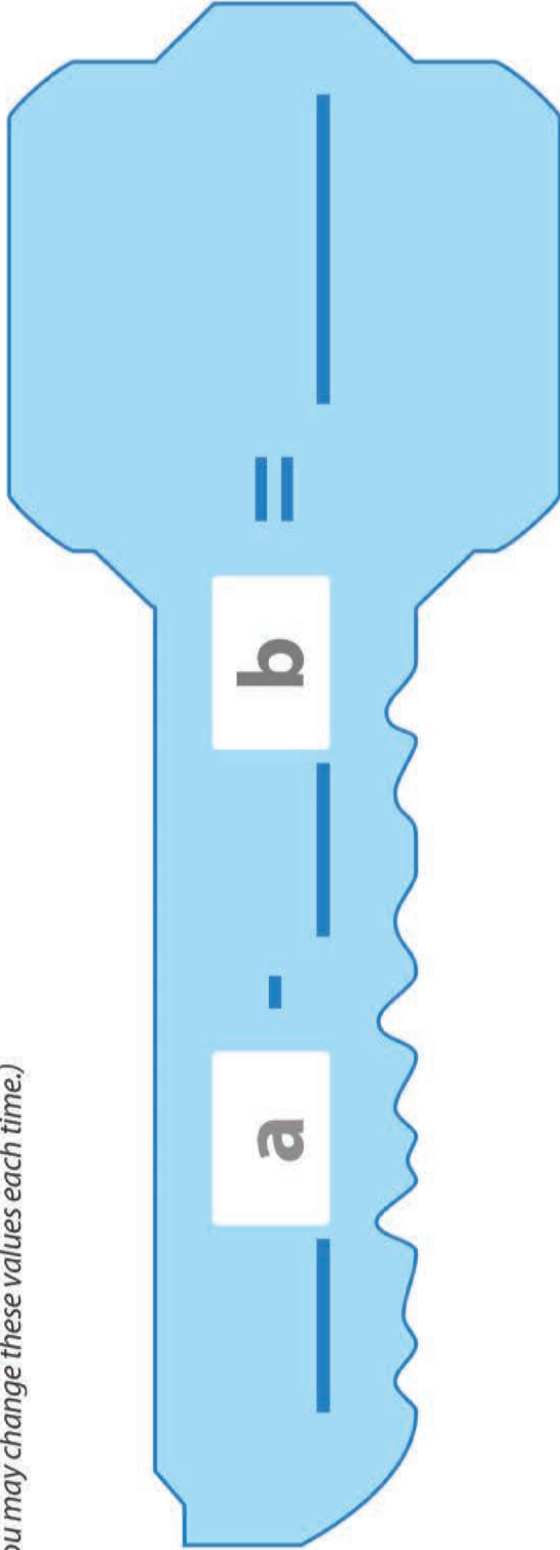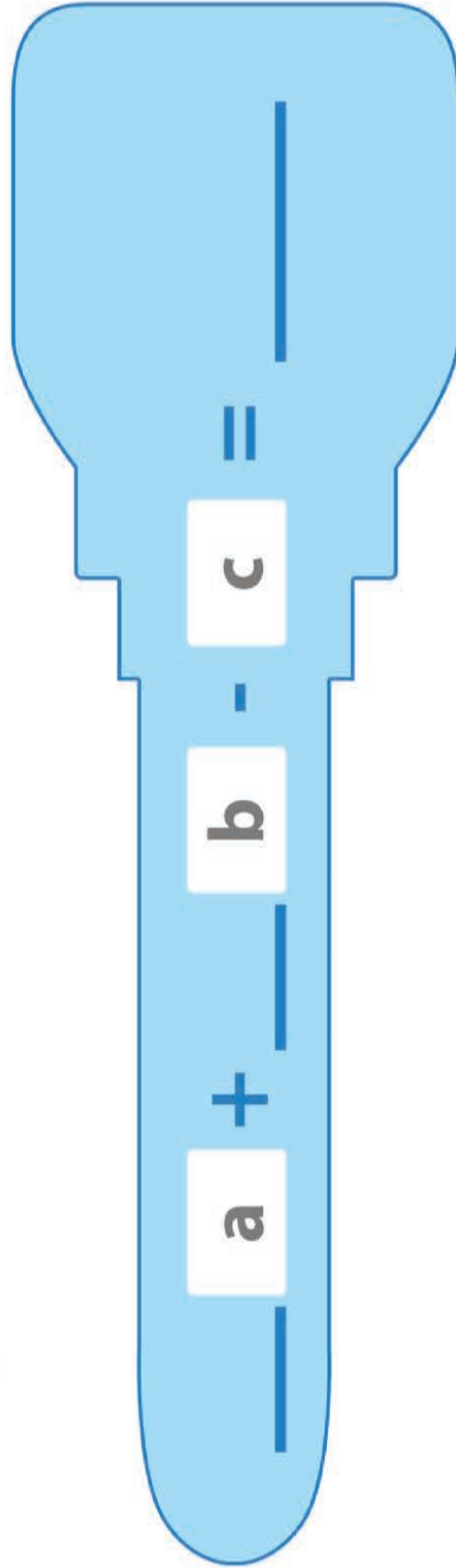
Variables $a=$ ☐ $b=$ ☐ **Constant** $c=$ ☐

Roll 3 dice and write your values here.

(Use these same variables each time.)

Coefficients: Write your own coefficients in the blanks.

(You may change these values each time.)

$$ \_\_ a - \_\_ b = \_\_ $$

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Curse Reverse
Teacher Key Example 2

Here's an example of a key used to unlock the target values and discover the secret image. Use snap cubes if available.

Roll 3 dice and write your values here.
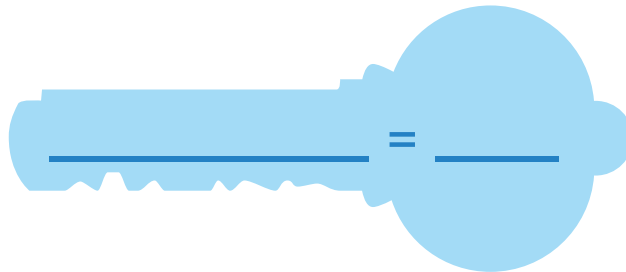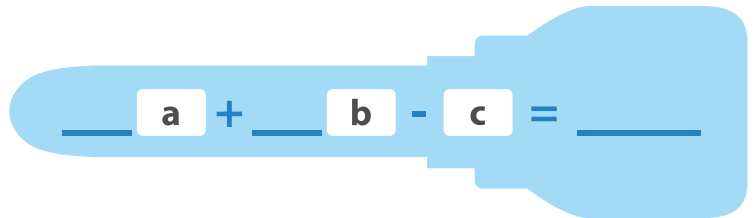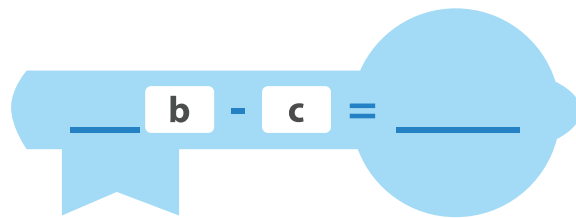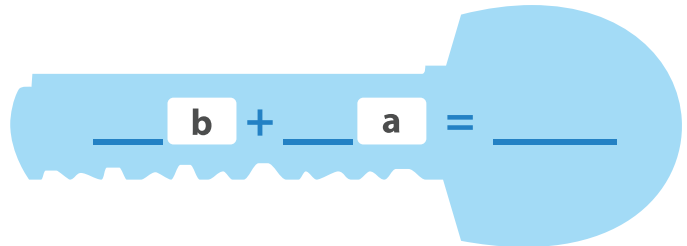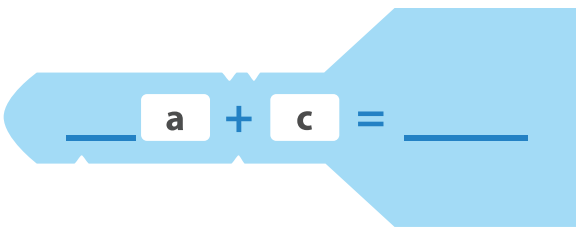
Variables   a= ☐   b= ☐   **Constant** c= ☐

(Use these same variables each time.)

Coefficients: Write your own coefficients in the blanks.

(You may change these values each time.)

$$\_\_\ a\ +\ \_\_\ b\ -\ c\ =\ \_\_$$

Curse Reverse Student Keys Handout

Use these keys to unlock the target values and discover the secret image. Use snap cubes if available.

Roll 3 dice and write your values here.
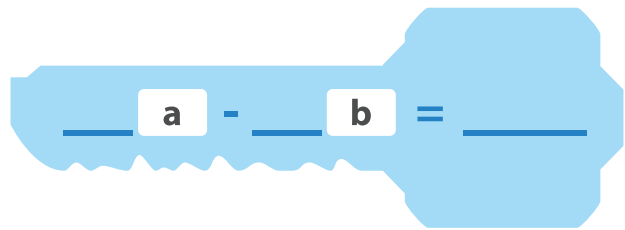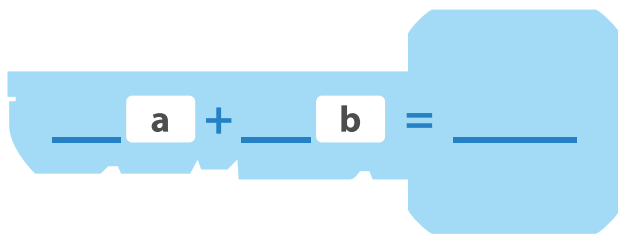
Variables a= [ ] b= [ ]   **Constant** c= [ ]

(Use these same variables each time.)

Coefficient: Write your own coefficients in the blanks.

(You may change these values each time.)

___ **a** + ___ **b** = _____

___ **a** - ___ **b** = _____

___ **a** + **c** = _____

___ **b** + ___ **a** = _____

___ **b** - **c** = _____

___ **a** + ___ **b** - **c** = _____

_____ = _____

Play the game and access teacher support materials at:

www.Math Snacks.org

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MATH Snacks™ 🔒12

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MATH Snacks™ 🔒8

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