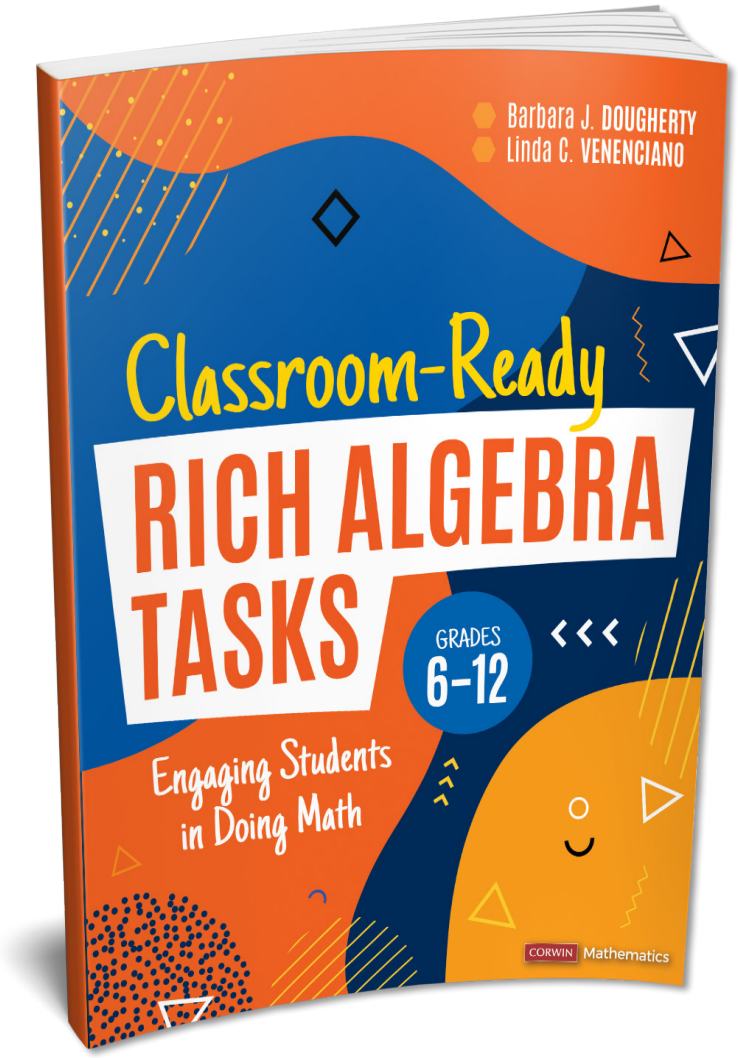

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Task 7.3
Riddle Me This!

TASK

Riddle Me This!

1. a. Follow the steps in the riddle.

   Think of a number between 1 and 30.

   Multiply the number by 3.

   Add 8 more than the original number.

   Divide by 4.

   Subtract the original number.

   b. How could you change the final step so you end up with your original number?

2. a. Follow the steps in the riddle.

   Enter the first three digits of your phone number (not your area code).

   Multiply by 80.

   Add 1.

   Multiply by 250.

   Add the last four digits of your phone number.

   Add the last four digits of your phone number again.

   Subtract 250.

   Divide by 2.

   b. Describe the number that you got as your result.

3. a. Follow the steps in the riddle.

   Think of a number.

   Subtract 7.

   Add 3 more than the original number.

   Add 4.

   Multiply by 3.

   Divide by 6.

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Mathematics Focus

- Students use properties of operations to modify algebraic riddles.

Mathematics Content Standard(s)

- 7.EE.1: Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 7.EE.2: Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
- 7.EE.4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- A-SSE.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- A-CED.1: Create equations and inequalities in one variable and use them to solve problems.

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Mathematical Practice(s)

- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Attend to precision.
- Look for and make use of structure.

Vocabulary

- opposite
- commutative property of multiplication
- commutative property of addition

Materials

- 1 Riddle Me This! task per student
- 1 calculator per student or pair of students

Task Type

X	Conceptual
X	Procedural
	Problem-Solving Application
X	Problem-Solving Critical Thinking

X	Reversibility
X	Flexibility
X	Generalization

b. Describe the number that you got as your result.

c. Look at the steps in the riddle. Which steps can you reverse without changing the result?

4. a. This riddle is missing the last step.

Think of a number.

Take its opposite.

Multiply by 2.

Subtract 2.

Divide by 2.

b. Create a final step so that the result is one more than the original number.

c. Create a final step so that the result is the opposite of the original number.

d. Create a final step so that the result is always 0.

e. Create a final step so that the result is always –1.

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TASK PREPARATION CONSIDERATIONS

- Have students had experience with number riddles and generalizing them?
- Are students familiar with the properties of operations?

SCAFFOLDING OR DIFFERENTIATING THE TASK

- Have students try more than one number in the riddles to better detect patterns.
- Provide algebra tiles or other manipulatives to assist students in understanding why each riddle gets a particular result.
- Suggest that students organize their results from the riddles' steps in a table so they can more easily see the results.
- Provide a calculator for students so that their results are accurate.

WATCH-FORS!

- Students may consider only whole number values and not realize that the riddles work for any numbers.

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EXTEND THE TASK

- Have students create their own riddles and share them with the class.

LAUNCH

1. Place students in pairs.
2. Do an example riddle with the class.

   Think of a number between 1 and 30.

   Multiply the number by 3.

   Add 8 more than the original number.

   Divide by 4.

   Subtract the original number.
3. Have students share their results.
   a. Students should notice that the result is 2 no matter what number they start with.
   b. To extend the problem as time allows, you can ask students to try it with other numbers, such as a fraction, a decimal, 0, or a negative number.
   c. You may want to work through a generalization with the class if they have not had experience in doing one.

      Let x = starting number.

      First step: $3x$

      Second step: $3x + x + 8$

      Third step: $\frac{4x+8}{4} = x + 2$

      Final step: $x + 2 - x = 2$
4. Tell the students that they are going to be working with riddles like this as they try to determine why they get the results they do or how to change the riddle for a different or the same result.
5. Allow about 30 minutes for students to work.

FACILITATE

1. Monitor the pairs as they work.
2. Have pairs share their solutions by selecting a different pair for each riddle.

EXPECTED SOLUTIONS

1. b. Subtract 2 for the final step.
2. b. The result should be the student's phone number.
3. b. The result should be the original number.
   c. Steps 2 and 3; steps 3 and 4; and steps 2 and 4 can be reversed.

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4. b. Add 2 more than twice the original number.

   c. Add 1.

   d. Add 1 more than the original number.

   e. Add the original number.

CLOSE AND GENERALIZATIONS

1. Select a riddle and work through the algebraic expressions to create a generalization. Be sure to identify the variable.

POST-TASK NOTES: REFLECTIONS AND NEXT STEPS

- How did the task contribute to students' understanding of the concept of variable?
- What riddles could I incorporate in future lessons that would build on this experience?
- What properties of operations did students explicitly discuss as part of their solution process?

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