Rectangle Expressions

Students are given equivalent expressions with rational coefficients and asked to explain what each expression represents within the context of the problem.

**Subject(s):** Mathematics  
**Grade Level(s):** 7  
**Intended Audience:** Educators  
**Freely Available:** Yes  
**Instructional Component Type(s):** Formative Assessment  
**Resource Collection:** MFAS Formative Assessments

**FORMATIVE ASSESSMENT TASK**

**Instructions for Implementing the Task**

1. The teacher asks the student to complete the problems on the Rectangle Expressions worksheet.
2. The teacher asks follow-up questions, as needed.

**TASK RUBRIC**

**Getting Started**

**Misconception/Error**

The student cannot relate the expressions to specific aspects of the context of the problem.

**Examples of Student Work at this Level**

The student is unable to explain how Brit’s expression relates to the perimeter of the rectangle. The student:

- Focuses on trying to find a value for x.
• Does not give a specific explanation.

• Does not indicate an understanding that \( x \) represents the width and \( 3x + 2 \) represents the length of the rectangle.

Additionally, the student does not recognize the equivalence of the two expressions and is unable to interpret \( 8x + 4 \) in the problem context.

Questions Eliciting Thinking

Why do you need to find the value of \( x \)? Do you have enough information to solve for \( x \)?

What does it mean to combine like terms? What terms can be combined in the first expression?

What do the variables represent in each expression? What do the numbers represent?

How is Abbey's expression different from Brit's? Can you explain the differences?

Instructional Implications

Make sure the student understands the terms expression and equivalent expression. Include an explanation of the rationale for writing expressions in equivalent form. Verify that the student understands the difference between mathematically equivalent and looks the same. Guide the student to give a justification for equivalence by referencing properties of operations (e.g., use the Distributive Property to justify combining like terms).

If needed, review how the perimeter of a rectangle is calculated. Then explain that \( x \) and \( 3x + 2 \) are expressions that represent the width and length of the rectangle. Guide the student to observe that Brit's expression shows the sum of the lengths of the sides of the rectangle and is a representation of the rectangle's perimeter. Assist the student in rewriting Brit's expression as \( 8x + 4 \). Explain the relationship between the two expressions using appropriate mathematical vocabulary. Ensure the student understands that the two expressions are equivalent.

Guide the student to interpret the expression \( 8x + 4 \) in terms of \( x \), the width of the rectangle. If needed, model explaining that the perimeter can be found by multiplying the width by eight and adding four because \( x \) represents the width of the rectangle.

Provide additional opportunities for the student to rewrite expressions in equivalent forms. Ask the student to explain the relationship between the quantities represented and how the different forms can reveal different information about the problem context.

Moving Forward

Misconception/Error

The student cannot identify equivalent expressions.

Examples of Student Work at this Level

The student can explain how Brit's expression represents the perimeter of the rectangle but does not recognize that this expression is equivalent to \( 8x + 4 \).
Questions Eliciting Thinking
What do the numbers and variables represent in the second expression? Where did the numbers come from?
Can you simplify the first expression by combining like terms? What is the result?

Instructional Implications
Assist the student in rewriting Brit’s expression as 8x + 4. Explain the relationship between the two expressions using appropriate mathematical vocabulary. Ensure the student understands that the two expressions are equivalent.

Guide the student to interpret the expression 8x + 4 in terms of x, the width of the rectangle. If needed, model explaining that the perimeter can be found by multiplying the width by eight and adding four because x represents the width of the rectangle.

Provide additional opportunities for the student to rewrite expressions in equivalent forms. Ask the student to explain the relationship between the quantities represented and how the different forms can reveal different information about the problem context.

Almost There
Misconception/Error
The student is unable to interpret 8x + 4 in the context of the problem.

Examples of Student Work at this Level
The student:

- Only says that 8x + 4 can be used to find the perimeter.
- Explains how to find the perimeter of a rectangle.

Questions Eliciting Thinking
What does x represent in this problem?
What operations are suggested by the expression 8x + 4? What is this expression telling you to do to the width of the rectangle?

Instructional Implications
Guide the student to interpret the expression 8x + 4 in terms of x, the width of the rectangle. Provide a value of x, and have the student use the expression 8x + 4 to calculate the perimeter of the rectangle. Ask the student to describe what the expression indicates about using the width to calculate the perimeter. Have the student compare 8x + 4 to x + (3x + 2) + x + (3x + 2). Ask the student what the latter expression conveys about the rectangle that 8x + 4 does not.

Ask the student to use the expression 3x + 2 to describe the length of the rectangle in terms of the width.

Got It
Misconception/Error
The student provides complete and correct responses to all components of the task.

Examples of Student Work at this Level
The student explains:

1. Since the expression shows the sum of the two widths (x) and two lengths (3x + 2), the expression represents the perimeter of the rectangle.
2. The two expressions are equivalent. By using the Commutative and Associative Properties of Addition, x + (3x + 2) + x + (3x + 2) = (x + 3x + x + 3x) + (2 + 2) = 8x + 4.
3. Abbey’s expression shows that an alternate way to find the perimeter is to multiply the width by 8 and add 4 since 8x + 4 is equivalent to x + (3x + 2) + x + (3x + 2).

Questions Eliciting Thinking
What is an advantage of using Abbey’s expression to find the perimeter?
Could you have found the perimeter of this rectangle if you only knew its width?

Why is x + 3x + x + 3x = 8x and not 6x or 9x? What are the coefficients and why are the coefficients added and not multiplied?

Instructional Implications
Provide a value for x, the width of the rectangle, and have the student determine the perimeter using Brit’s and Abbey’s expressions. Have the student explain which expression is preferred for this purpose and why. Then ask the student to find the length of the rectangle and explain his or her strategy.

Consider using the MFAS task Explain Equivalent Expressions (7.EE.1.2).
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>MAFS.7.EE.1.2:</td>
<td>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. For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”</td>
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**ACCOMMODATIONS & RECOMMENDATIONS**

- **Special Materials Needed:**
  - Rectangle Expressions worksheet

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