Expressions and Equivalence

Lesson 12 Proving or Disproving Equivalence

Standards 6.EE.A.4

Learning target I can justify whether expressions are equivalent.

Materials Algebra tiles or rectangle models, pencils, expression cards.

Lesson Flow 50 Minutes

0–5 Activate prior knowledge. Read the learning target. Ask students what they already know about proving or disproving equivalence. Use a quick model or estimate to make their starting ideas visible.

5–17 Teach and model. Use operation properties to rewrite an expression. Matching values at one input do not prove equivalence for all inputs. A single counterexample is enough to show two expressions are not equivalent. Work through the two examples on the attached instruction page. Have students name the first step before showing it.

17–22 Guided practice. Revisit worked Example 2 with its solution covered. Students propose the next step and explain why it is valid; uncover and compare with the worked solution.

22–45 Independent classwork. Assign the attached 10 questions in order. Check items 1–3 for entry-level understanding, 4–6 for connected procedures, 7–8 for representation and explanation, and 9–10 for application or justification. Ask students to use the instruction-page notes area or extra grids for longer work.

45–50 Check understanding. Use classwork question 10 as an exit discussion: Are 2(x + 4) and 2x + 8 equivalent for every x? Use a property or a counterexample. Compare the result with the answer key and ask a student to defend the method.

Support and Extension

Support Model item 1 together with the listed tools, then have students attempt item 2 independently. Watch exponents versus multiplication, operation order, and distributing to every term.

Extension Ask students to solve a final item another way, draw a second representation, or create a related problem with a checked answer.

Next step Record which students can explain the target independently. Begin the next teaching session with a brief correction for any recurring error.

Name _____ Date _____

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Learn and Discuss

Use operation properties to rewrite an expression. Matching values at one input do not prove equivalence for all inputs. A single counterexample is enough to show two expressions are not equivalent.

Example 1 Are 7(x + 3) and 7x + 21 equivalent for every x? Use a property or a counterexample.
Solution Yes; distribution gives 7x + 21. 7(x + 3) = 7x + 21. This matches.
Example 2 Are 2(x + 5) and 2x + 10 equivalent for every x? Use a property or a counterexample.
Solution Yes; distribution gives 2x + 10. 2(x + 5) = 2x + 10. This matches.

Classwork Show Your Work

Complete the 10 problems on the following page. Refer to the examples, draw models, and check your results.

My Notes or Second Method

Lesson 12 Proving or Disproving Equivalence

Name _____ Show calculations, models, and units.

1. Are 8(x + 5) and 8x + 5 equivalent for every x? Use a property or a counterexample.

2. Are 4(x + 4) and 4x + 16 equivalent for every x? Use a property or a counterexample.

3. Are 8(x + 2) and 8x + 2 equivalent for every x? Use a property or a counterexample.

4. Are 5(x + 3) and 5x + 15 equivalent for every x? Use a property or a counterexample.

5. Are 7(x + 5) and 7x + 5 equivalent for every x? Use a property or a counterexample.

6. Are 7(x + 2) and 7x + 14 equivalent for every x? Use a property or a counterexample.

7. Are 4(x + 3) and 4x + 3 equivalent for every x? Use a property or a counterexample.

8. Are 6(x + 5) and 6x + 30 equivalent for every x? Use a property or a counterexample.

9. Are 5(x + 7) and 5x + 7 equivalent for every x? Use a property or a counterexample.

10. Are 2(x + 4) and 2x + 8 equivalent for every x? Use a property or a counterexample.

Proving or Disproving Equivalence

Expressions and Equivalence

1. No; at x = 0, values are 40 and 5
Reasoning 8(x + 5) = 8x + 40. The constants 40 and 5 differ.

2. Yes; distribution gives 4x + 16
Reasoning 4(x + 4) = 4x + 16. This matches.

3. No; at x = 0, values are 16 and 2
Reasoning 8(x + 2) = 8x + 16. The constants 16 and 2 differ.

4. Yes; distribution gives 5x + 15
Reasoning 5(x + 3) = 5x + 15. This matches.

5. No; at x = 0, values are 35 and 5
Reasoning 7(x + 5) = 7x + 35. The constants 35 and 5 differ.

6. Yes; distribution gives 7x + 14
Reasoning 7(x + 2) = 7x + 14. This matches.

7. No; at x = 0, values are 12 and 3
Reasoning 4(x + 3) = 4x + 12. The constants 12 and 3 differ.

8. Yes; distribution gives 6x + 30
Reasoning 6(x + 5) = 6x + 30. This matches.

9. No; at x = 0, values are 35 and 7
Reasoning 5(x + 7) = 5x + 35. The constants 35 and 7 differ.

10. Yes; distribution gives 2x + 8
Reasoning 2(x + 4) = 2x + 8. This matches.