Lesson 8

DETERMINE EQUIVALENT EXPRESSIONS

3.PAR.3.4

WORDS TO KNOW

equation
equal sign
equivalent
expression
compare
balanced

INTRODUCTION

Real-World Connection

Louanne wrote an equation multiplying the number of rows by the number of columns to determine the total number of bottles of perfume on these shelves. Ron wrote an equation multiplying the columns by the rows to find his answer. Are the expressions in their equations equivalent? Is the equation balanced? Let's practice the skills in the **Guided Instruction** and **Independent Practice** and, at the end of the lesson, see if Louanne and Ron both wrote balanced equations!

What I Am Going to Learn

- How to identify if an equation is balanced
- How to explain if two different expressions are equivalent
- How to compare the values of different expressions

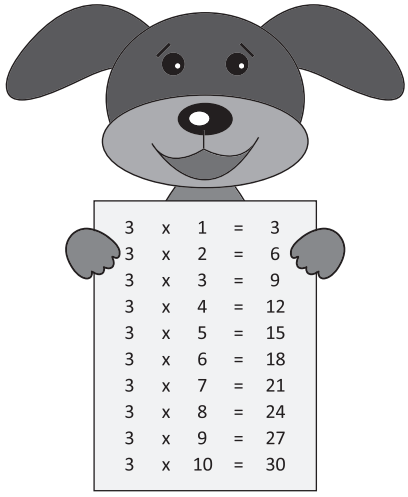
What I May Already Know

- I know how to add, subtract, multiply, and divide.
- I know that multiplication and division are related.
- I know how to compare numbers.

Vocabulary in Action

Equations are mathematical statements that contain an **equal sign**.

- Multiplication facts are examples of equations.
- The left side of an equation should be **equivalent** to the right side. Each side of an equation is an **expression**.
- To check if an equation is true or false, find the value of each side and then **compare** them to see if they are the same.



SAMPLE

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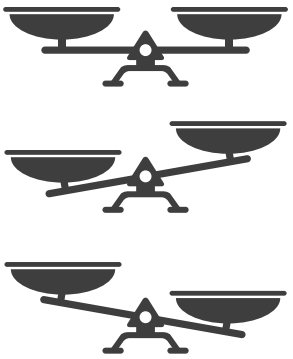

A **balanced** equation means that the expressions on both sides of the equation have the same value.

- A balanced scale is like an equation with both sides the same.
- An unbalanced scale lets you know that something is not correct with the equation.

TIPS AND HINTS

Double-check your math to make sure you are right when you say that the sides of an equation are equivalent.

EXAMPLE

Are the expressions in this equation equivalent? $3 \times 4 = 12 \div 2$

You need to simplify each side of the equation by finding the value of each side.

Step One Simplify the expression on the left side of the equation.

- Multiply 3 times 4.
- The left side equals 12.

Step Two Simplify the expression on the right side of the equation.

- Divide 12 by 2.
- The right side equals 6.

Step Three Compare the two values to determine if the equation is true or false.

- $12 = 6$. Since 12 does not equal 6, the sides of this equation are not equivalent.

EXAMPLE

Are the expressions in this equation equivalent? $6 \times 6 = 4 \times 9$

Simplify both sides of the equation.

Step One Simplify the expression on the left side of the equation.

- Multiply 6 times 6.
- The left side equals 36.

Step Two Simplify the expression on the right side of the equation.

- Multiply 4 times 9.
- The right side equals 36.

Step Three Compare the two values to determine if the sides are equivalent.

- $36 = 36$. Since 36 does equal 36, the expressions 6 x 6 and 4 x 9 are equivalent.

SAMPLE

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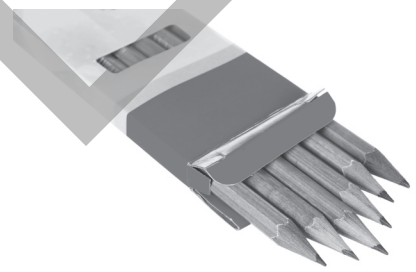
GUIDED INSTRUCTION

Identifying the expressions on the two sides of an equation as equivalent or not can be used to solve real-life problems. Work both problems and determine if they are equal.

TIPS AND HINTS

Keep in mind that the packs of pencils are different sizes.

1. Jackie has 3 packs of pencils with 6 pencils in each pack. Sue has 4 packs of pencils with 4 pencils in each pack. Jackie and Sue want to know if they have the same number of pencils.



Write the two problems with an equal sign between them.

The first problem is 3 packs of pencils with 6 pencils each. This would be written as 3×6.

The second problem is 4 packs of pencils with 4 pencils each. This would be written as 4×4.

Step One The equation would look like this.

$3 \times$ [ ] $=$ [ ] $\times 4$

Step Two Now, simplify the expressions on each side of the equation.

$3 \times 6 =$ [ ]

$4 \times 4 =$ [ ]

Step Three Does $12 =$ [ ]?

[ ], it does not.

Step Four The equation is (Circle: equivalent not equivalent).

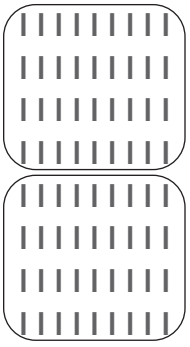
Step Five Answer the question.

Jackie and Sue (Circle: do do not) have the same number of pencils.

SAMPLE

SKETCH IT

You could use tally marks to compare the two expressions.



2. Look at this equation.

$9 \times 8 = 36 + 36$

Are the two expressions in this equation equivalent?

Step One Simplify each side.

$9 \times 8 =$ ☐

$36 + 36 =$ ☐

Step Two Compare the two answers.

☐ = ☐

Step Three Are the expressions equivalent?

The expressions are equivalent because

☐ = ☐.

TIPS AND HINTS

Remember to solve both sides of the equation and compare the two answers.

3. Which statements describe the equation $40 - 5 = 8 \times 5$? Select the TWO correct answers.

Ⓐ This equation is balanced because the expressions on each side of the equation equal 40.

Ⓑ This equation is balanced because the expressions on each side of the equation add to 35.

Ⓒ This equation is not balanced because the expression on the left side of the equation is not equal to the expression on the right side of the equation.

Ⓓ This equation is not balanced because subtraction cannot equal multiplication.

Ⓔ The equation would be balanced if 8×5 were replaced with 7×5.

SAMPLE

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How Am I Doing?

What questions do you have?

Why is it important to work each side of the equation separately?

Write a balanced equation. Explain why it is balanced. Then, write an equation that is not balanced and explain why it is not balanced.

TURN AND TALK

Discuss with a partner why an incorrect answer to a multiplication problem is the same as an unbalanced equation.

Color in the traffic signal that shows how you are doing with the skill.

SAMPLE

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INDEPENDENT PRACTICE

Answer the questions.

TIPS AND HINTS

Simplify the equation on each side to determine if it is true or false.

1. Which expression would make a balanced equation?

$$3 \times 10 = \square$$

Ⓐ 6×5
Ⓑ 4×9
Ⓒ 6×6
Ⓓ 2×12

2. Which equations have equivalent expressions? Select the TWO correct answers.

Ⓐ $12 - 5 = 1 \times 7$
Ⓑ $3 + 2 = 60 \div 12$
Ⓒ $3 \times 12 = 30 + 12$
Ⓓ $6 \times 3 = 18 - 9$
Ⓔ $5 \times 9 = 54 - 5$

3. Select the number that would make this equation balanced.

$$16 - \square = 4 + 8$$

Ⓐ 4
Ⓑ 3
Ⓒ 8
Ⓓ 2

SAMPLE

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4. Which equation has sides that are NOT equivalent?

Ⓐ $2 \times 3 = 1 \times 6$

Ⓑ $3 \times 10 = 4 \times 6$

Ⓒ $5 \times 2 = 20 - 10$

Ⓓ $18 \div 1 = 12 + 6$

5. Which equations have equivalent expressions? Select the TWO correct answers.

Ⓐ $5 \times 5 = 20 - 5$

Ⓑ $25 - 20 = 1 \times 5$

Ⓒ $4 \times 4 = 8 + 4$

Ⓓ $6 \times 7 = 7 \times 6$

Ⓔ $6 \times 4 = 8 \times 2$

TIPS AND HINTS

Solve each expression on each side and then compare.

6. Select the expression that would make this an unbalanced equation.

$$2 \times 9 = \square$$

Ⓐ $14 + 4$

Ⓑ 3×4

Ⓒ 9×2

Ⓓ $18 - 9$

7. Use the numbers in the box to complete the expression. Not all numbers will be used. Write each number in the appropriate box.

8	9	72	80

$9 \times 8 =$ ☐ $-$ ☐

SAMPLE

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8. Write a value into the box to complete the expression to make a balanced equation.

$3 \times 4 = 4 \times$ ☐

9. Use the numbers in the box to make a balanced equation.

Write ONLY the numbers that complete the expressions and make a balanced equation into the boxes.

2	4	6	8	12	24

☐ − ☐ = **6** × ☐

TIPS AND HINTS

Remember that you do not have to use all the numbers in the top box.

SKETCH IT

It might help to make a simple drawing to represent the bowls of light bulbs.

10. Lisa and Fonda are painting the school logo on light bulbs for their class fundraiser. They started with 7 bowls each with 9 light bulbs. One of the bowls fell on the floor and all the light bulbs broke. How many light bulbs can they paint?

Circle the option in the drop-down menu to complete the equivalent expressions.

(6 / 7 / 8 / 9 − 1) × 9 = 6 / 7 / 8 / 9 × 9

SAMPLE

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11. Part A

Write a multiplication expression in the box on the left side of the equation that will make this a balanced equation.

$$\square = 60 - 18$$

Part B

Explain how you know your answer to Part A is correct.

TIPS AND HINTS

In this question, you are writing your answer on lines. In questions like these, there can be more than one correct answer.

SAMPLE

EXIT TICKET

3.PAR.3.4

Now that you have mastered determining if two expressions are equivalent, let's solve the problem in the Real-World Connection.

Louanne said she could use the equation $11 \times 3 = 33$ to show the total number of bottles of perfume on the shelves. Ron said he would use the equation $3 \times 11 = 14$. Are the expressions in their equations equivalent? Whose equation represents the total number of bottles and is true?

SAMPLE

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