REACHING ALL LEARNERS

Extension

Have students create their own sets of expressions like those in *Explore* and challenge another student to find the expressions that balance.

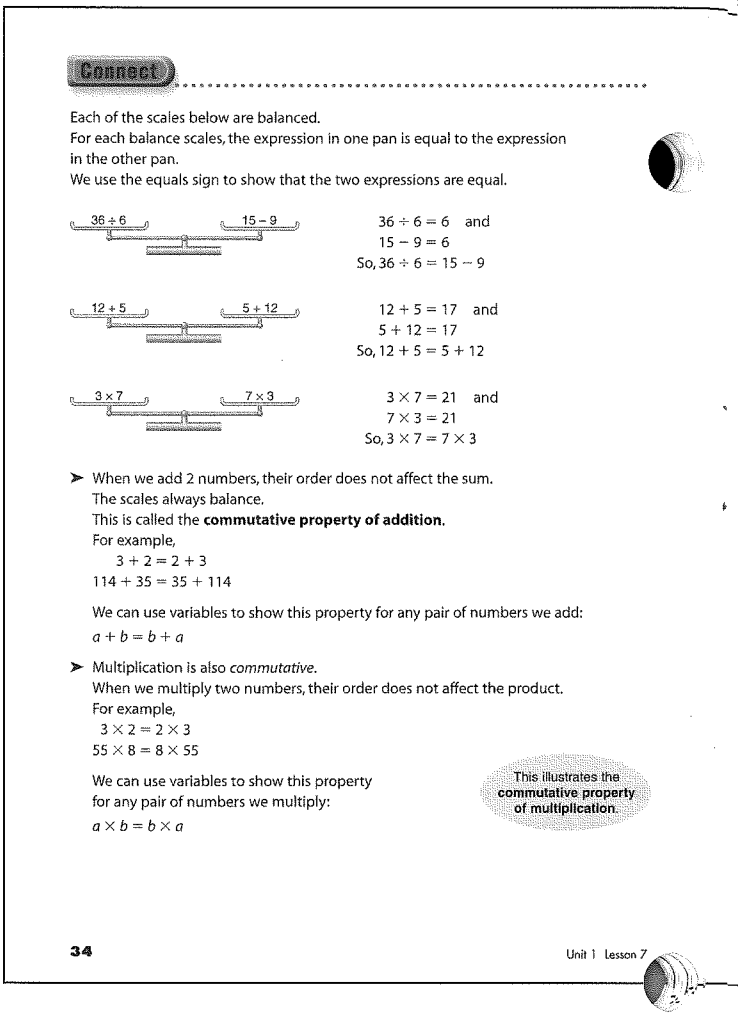
Common Misconception

➤ In previous grades, students may have learned that 2×3 is "2 groups of 3" while 3×2 is "3 groups of 2."

How to Help: Ensure students understand that the commutative property does not contradict this model of multiplication as it refers only to the product of the two numbers.

Sample Solutions

1. a) $72 \div 9 = 8$ and $13 - 5 = 8$, so $72 \div 9 = 13 - 5$
   b) Multiplication is commutative; the order of the 2 numbers does not affect the product. So, $12 \times 6 = 6 \times 12$
   c) $19 - 9 = 10$ and $9 + 19 = 28$; the scales will tilt to the right.
2. a) $7 + 5$
   b) $5 + 7$; $6 + 6$; $4 + 8$; $20 - 8$; 3×4
   I thought of different expressions that equalled 12.
   c) The scales would balance because all the expressions equal 12. So, there would be $3 \times 12 = 36$ counters in each pan.



Connect

Each of the scales below are balanced.
For each balance scales, the expression in one pan is equal to the expression in the other pan.
We use the equals sign to show that the two expressions are equal.

$36 \div 6 = 6$ and
$15 - 9 = 6$
So, $36 \div 6 = 15 - 9$

$12 + 5 = 17$ and
$5 + 12 = 17$
So, $12 + 5 = 5 + 12$

$3 \times 7 = 21$ and
$7 \times 3 = 21$
So, $3 \times 7 = 7 \times 3$

➤ When we add 2 numbers, their order does not affect the sum.
The scales always balance.
This is called the **commutative property of addition.**
For example,
$3 + 2 = 2 + 3$
$114 + 35 = 35 + 114$

We can use variables to show this property for any pair of numbers we add:
$a + b = b + a$

➤ Multiplication is also *commutative.*
When we multiply two numbers, their order does not affect the product.
For example,
$3 \times 2 = 2 \times 3$
$55 \times 8 = 8 \times 55$

We can use variables to show this property for any pair of numbers we multiply:
$a \times b = b \times a$

This illustrates the **commutative property of multiplication.**

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AFTER Connect

Invite students to share their strategies. Ask:

- What did you notice about the expressions $4 + 5$ and $5 + 4$?
  (They both have a sum of 9. The order in which we add does not matter.) The expressions 2×4 and 4×2? *(They both have a product of 8. The order in which we multiply does not matter.)*
- What does it mean when the scales balance?
  (The expression or the number of counters in one pan equals the expression or the number of counters in the other pan.)

Introduce *Connect.* Ask:

- What do you notice about the expressions on the second and third scales? *(The numbers and operations in each pair of expressions are the same. The only difference is the order of the numbers. The expressions balance because the order does not affect the sum or product.)*

Use *Connect* to review the commutative properties of addition and multiplication. Ask:

- How are the meanings of "commutative" and "commuter" similar? *(A commuter goes from one place to another. The commutative property relates to numbers that change position.)*

Practice

Students may need drawings of balance scales (Master 1.18) for question 2.

Assessment Focus: Question 2

Since all 6 expressions are equal, students should recognize that placing counters to represent 3 of the expressions in the left pan and 3 in the right pan would result in the scales being balanced.

Students can complete the Additional Activity *Concentrating on Equality* (Master 1.10).

Practice

1. Suppose you were using real balance scales.
Which scales below would balance?
How did you find out?

a) $72 \div 9$ and $13 - 5$ — Balanced

b) 12×6 and 6×12 — Balanced

c) $19 - 9$ and $9 + 19$ — Not balanced

2. a) Write an expression with 2 numbers and one operation.
b) Write 5 different expressions that equal your expression in part a.
What strategy did you use to find the expressions?
c) Suppose you used real balance scales.
You put counters to represent 3 of the expressions in the left pan and 3 in the right pan. What would happen? How do you know? The scales would balance.

3. Rewrite each expression using a commutative property.
a) $5 + 8$ $8 + 5$ b) 6×9 9×6 c) 11×7 7×11
d) $12 + 21$ $21 + 12$ e) $134 + 72$ $72 + 134$ f) 36×9 9×36

4. a) Are these scales balanced? No

$36 + 27 - 50$ and 4×3

b) If your answer is yes, why do you think so?
If your answer is no, what could you do to balance the scales?
Why would this work?

5. a) Addition and subtraction are inverse operations.
Addition is commutative. Is subtraction commutative? No
Use an example to show your answer.
b) Multiplication and division are inverse operations.
Multiplication is commutative. Is division commutative? No
Use an example to show your answer.

Reflect

Are subtractions and division commutative operations?
Explain why or why not.

4. b) $36 + 27 - 50 = 13$ and $4 \times 3 = 12$. The expressions do not balance. I could add 1 to the right pan to make the scales balance. Then, each side would have value 13.

5. a) Subtraction is not commutative. Suppose I have 17 counters and take 10 counters away. I am left with 7 counters. But, I cannot take 17 counters away from 10 counters. So, $17 - 10$ is not the same as $10 - 17$.
b) Division is not commutative. For example, $24 \div 3 = 8$, but $3 \div 24$ will be less than 1. So, $24 \div 3$ is not the same as $3 \div 24$.

REFLECT: Subtraction is not a commutative operation because the order in which 2 numbers are subtracted affects the difference. For example, $9 - 6 = 3$, but I cannot subtract 9 from 6. Division is not a commutative operation because the order in which 2 numbers are divided affects the quotient. For example, $4 \div 2 = 2$, but $2 \div 4 = \frac{1}{2}$.

ASSESSMENT FOR LEARNING

What to Look For

Conceptual Understanding

✔ Students can explain that an equals sign shows that two expressions are equal.

✔ Students can explain the commutative properties of addition and multiplication.

Procedural Knowledge

✔ Students can decide whether scales are balanced and justify their answers.

✔ Students can use the commutative property to explain that expressions are equal.

What to Do If You Don't See It

Check Further

As students work, ask:

- What does the equals sign tell us?
- How is an equation like a set of balance scales?
- Are these expressions balanced? How do you know?
- Does the order affect the sum of two numbers? The product? The difference? The quotient?

Adjust Instruction

Many students see the equals sign as a signal to "do something" rather than a symbol of equality. To check for understanding, write this equation on the board and ask students to complete it:
$6 + 7 = \_\_ + 9$

If students offer 13 as the missing number rather than 4, work with them to clarify the meaning of the equals sign.