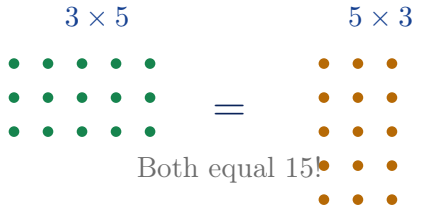
Properties of Multiplication

The properties of multiplication are little rules that let you rearrange and break apart problems to make them easier. You already use them without thinking — this lesson gives them names.

Property	Rule
Commutative	$a \times b = b \times a$
Associative	$(a \times b) \times c = a \times (b \times c)$
Identity	$a \times 1 = a$
Zero	$a \times 0 = 0$
Distributive	$a \times (b + c) = a \times b + a \times c$



Key Concepts

1. Commutative property: switching the order of two factors does not change the product. 4×7 and 7×4 both equal 28.

2. Associative property: when you multiply three numbers, the grouping does not matter. $(2 \times 3) \times 4 = 2 \times (3 \times 4)$. Both equal 24.

3. Distributive property: a hard fact can often be split into two easier ones. $6 \times 7 = 6 \times 5 + 6 \times 2 = 30 + 12 = 42$.

4. Identity: multiplying by 1 leaves the number alone. **Zero**: multiplying by 0 always gives 0.

Worked Examples

① Use the commutative property to find 8×3 if you know $3 \times 8 = 24$.

👉 The commutative property says you can swap the two numbers and the product stays the same. So 8×3 is the same as 3×8, which we already know equals 24. The answer is 24 without doing any new arithmetic.

Answer: 24

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② Use the distributive property: 7×6.

👉 Break the 6 into pieces that you know well. One easy way: $6 = 5 + 1$. Then $7 \times 6 = 7 \times 5 + 7 \times 1 = 35 + 7 = 42$. The distributive property turns one hard multiplication into two easier ones plus an addition.

Answer: 42

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③ Find $(2 \times 4) \times 5$ using the associative property.

👉 The associative property lets you re-group the multiplication. The original groups $(2 \times 4) \times 5$ would have you compute $8 \times 5 = 40$. But $4 \times 5 = 20$ is a friendly fact, so regroup: $2 \times (4 \times 5) = 2 \times 20 = 40$. Same answer, easier path.

Answer: 40

✎ Practice Problems

Fill in the blank or find the product. Name the property when asked.

1. $5 \times 9 = 9 \times$? _____

2. $0 \times 47 =$ _____

3. $1 \times 86 =$ _____

4. $(3 \times 2) \times 5 = 3 \times (2 \times$?$)$ _____

5. $4 \times 8 = 4 \times 5 + 4 \times$? _____

6. $6 \times 7 = 7 \times$? _____

7. $8 \times (3 + 2) = 8 \times 3 + 8 \times$? _____

8. $(5 \times 1) \times 9 = 5 \times$? _____

9. $3 \times 0 + 3 \times 4 = 3 \times (0 +$?$)$ _____

10. $9 \times 4 = 9 \times 2 + 9 \times 2 =$ _____

11. $7 \times 1 =$ _____

12. $(4 \times 5) \times 2 = 4 \times (5 \times 2) =$ _____

Study Tips

- ☞ The commutative property is your most-used shortcut: if you forget 7×8, try 8×7 — it might come to you faster.
- ☞ The distributive property is what teachers eventually call "break-apart strategy." Splitting one factor often turns a scary fact into two friendly ones.
- ☞ Multiplying by 0 wipes out the whole product. Don't get tricked: $0 \times 100 = 0$, not 100.

✍ Word Problems

1. Emma knows $5 \times 8 = 40$. Use a property to explain why 8×5 also equals 40.

Answer: _____

2. A baker makes 3 trays of cookies. Each tray has 2 rows of 5 cookies. How many cookies in all?

Answer: _____

Answer Key — with Friendly Explanations

Practice Problems

1. Commutative property — swap the factors, the missing number is 5.

Answer: 5

2. Zero property — any number times 0 is 0.

Answer: 0

3. Identity property — any number times 1 stays the same.

Answer: 86

4. Associative — regrouping does not change the answer. The missing factor is 5.

Answer: 5

5. Distributive — $4 \times 8 = 4 \times 5 + 4 \times 3 = 20 + 12 = 32$. Missing: 3.

Answer: 3

6. Commutative — the missing factor is 6.

Answer: 6

7. Distributive — $8 \times (3 + 2) = 8 \times 3 + 8 \times 2$. Missing: 2.

Answer: 2

8. Identity — $(5 \times 1) = 5$, so the expression is 5×9. Missing: 9.

Answer: 9

9. Distributive — both sides equal $3 \times 4 = 12$. Missing: 4.

Answer: 4

10. $9 \times 2 + 9 \times 2 = 18 + 18 = 36$. Same as 9×4.

Answer: 36

11. Identity — any number times 1 is itself.

Answer: 7

12. Associative — compute either side: $5 \times 2 = 10$, then $4 \times 10 = 40$.

Answer: 40

Word Problems

1. Commutative property — swapping factors leaves the product unchanged.

Answer: *Commutative property*

2. Each tray has $2 \times 5 = 10$ cookies; three trays = 30. Uses associative.

Answer: 30 *cookies*

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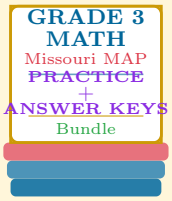

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