Properties of Operations

Apply the skill to decisions and designs

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

You may switch multiplication factors: $3 \times 4 = 4 \times 3 = 12$ (commutative). You may regroup three factors: $(2 \times 3) \times 4 = 2 \times (3 \times 4) = 24$ (associative). You may split a factor: $3 \times 7 = 3 \times 5 + 3 \times 2 = 21$ (distributive). Division does not allow switching the two numbers.

Worked example

Use $6 = 4 + 2$ to find 3×6. Show two smaller products.

1. $3 \times 4 = 12$ and $3 \times 2 = 6$.

2. Add the parts: $12 + 6 = 18$, so $3 \times (4 + 2) = 18$.

Answer: 18.

Practice Problems

Show your thinking.

1. Each of 5 tables needs 7 red cups and 2 blue cups. Find all cups using two products.

2. Use $8 = 6 + 2$ to find 6×8. Show two smaller products.

3. Compute $(4 \times 2) \times 3$ and $4 \times (2 \times 3)$. What changes?

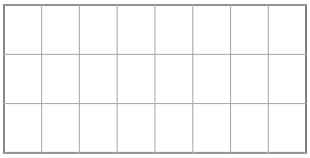
4. A helper groups $24 \div (2 \times 3)$ as $(24 \div 2) \times 3$. Compute both and decide if this regrouping preserves the value.

5. Five trays each hold 2 rows of 3 cakes. Group the factors in two ways to find the total cakes.

6. Design two different splits of 7 to find 4×7. Neither split may contain zero. Write and check both area sums.

7. A shop needs 8 sets of 6 cups. It has 8 sets of 5 cups ready. Use the difference between the set sizes to find how many cups to add.

8. A tile display is 3 rows of 8 tiles. Without adding or removing tiles, it is turned so rows become columns. State both dimensions and the area, and name the property.



Answer Key

1. 45 cups.
2. 48.
3. Both are 24; only the grouping changes.
4. No; the values are 4 and 36.
5. 30 cakes.
6. For example $4 \times (5 + 2) = 20 + 8 = 28$ and $4 \times (4 + 3) = 16 + 12 = 28$.
7. 8 cups to add; 48 cups needed altogether.
8. $3 \times 8 = 8 \times 3 = 24$ tiles; commutative property.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Red cups: $5 \times 7 = 35$. Blue cups: $5 \times 2 = 10$.

2. Total: $35 + 10 = 45$ cups, the same as 5×9.

Problem 2

1. $6 \times 6 = 36$ and $6 \times 2 = 12$.

2. Add the parts: $36 + 12 = 48$, so $6 \times (6 + 2) = 48$.

Problem 3

1. Left grouping: $(4 \times 2) \times 3 = 8 \times 3 = 24$.

2. Right grouping: $4 \times (2 \times 3) = 4 \times 6 = 24$; the factors stay in the same order.

Problem 4

1. In the first expression, $2 \times 3 = 6$, so $24 \div 6 = 4$.

2. In the second, $24 \div 2 = 12$, then $12 \times 3 = 36$. The multiplication regrouping rule cannot be applied across this division.

Problem 5

1. Find cakes per tray first: $5 \times (2 \times 3) = 5 \times 6 = 30$.

2. Or count rows first: $(5 \times 2) \times 3 = 10 \times 3 = 30$. Regrouping preserves all three factors.

Problem 6

1. Choose $7 = 5 + 2$: $4 \times 5 + 4 \times 2 = 20 + 8 = 28$.

2. Choose $7 = 4 + 3$: $4 \times 4 + 4 \times 3 = 16 + 12 = 28$. Both split the same total width 7.

Problem 7

1. The ready sets have $8 \times 5 = 40$ cups. Each set needs $6 - 5 = 1$ extra cup.

2. Add $8 \times 1 = 8$ cups: $40 + 8 = 48 = 8 \times 6$. This is $8 \times (5 + 1)$.

Problem 8

1. The first view is 3 rows of 8: $3 \times 8 = 24$.

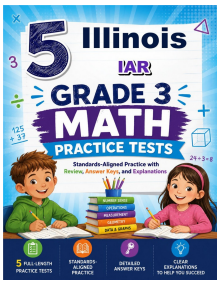
2. Turning gives 8 rows of 3: $8 \times 3 = 24$. The two factors switch order, not values.

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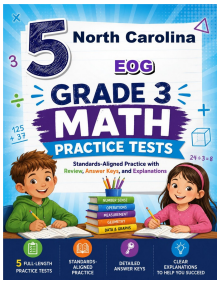
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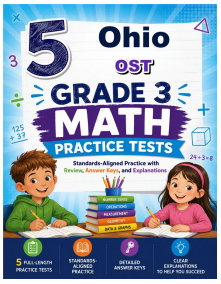
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