

Ratio Reasoning

A GUIDE

How two amounts can grow together without ever falling out of step — the secret behind doubling recipes, mixing paint, and sharing fairly.

A recipe that keeps its promise

Imagine a cookie recipe that says: 2 cups of flour for every 1 cup of sugar. That "for every" is the whole secret. It is a promise between the two amounts.

Want more cookies? Double both: 4 cups of flour, 2 cups of sugar. Triple both: 6 and 3. The amounts grow, but the promise — 2 to 1 — never changes. That promise is called a ratio, and you can write it as 2 : 1.

Watch what happens when you build a table of the recipe. Every row is different, but every row keeps the same 2-to-1 deal. That is what "the same ratio" means.

Flour (cups)	Sugar (cups)
2	1
4	2
6	3
8	4

Shrinking a ratio down to its smallest self

Sometimes a ratio shows up wearing a disguise. 12 : 8 and 3 : 2 look different, but they are the exact same promise — one is just a scaled-up version of the other.

To unmask it, divide both numbers by the same thing. Keep dividing until nothing bigger than 1 divides into both. What is left is the ratio in simplest form: the smallest, clearest way to say the deal.

The rule that makes this legal is the golden rule of ratios: whatever you do to one side, do exactly the same to the other. Multiply both, or divide both — never just one.

Red paint (drops)	White paint (drops)
3	2
6	4
12	8

Worked example Simplify the ratio 12 : 8.

1. Find the biggest number that divides into both 12 and 8 — that is 4.
2. Divide the first side: $12 \div 4 = 3$.
3. Divide the second side: $8 \div 4 = 2$.

Answer: 3 : 2

Finding the missing amount

Here is where ratios get useful. If you know the ratio and one amount, you can figure out the other amount — even if nobody told you.

The move is called scaling. Ask: what did the known number get multiplied by? Then multiply the other side by the very same thing. The golden rule does the rest.

Worked example A smoothie uses 3 bananas for every 2 oranges. You have 9 bananas. How many oranges do you need?

1. Compare the bananas: $9 \div 3 = 3$, so the recipe was scaled up by 3.
2. Do the same to the oranges: $2 \times 3 = 6$.
3. Check the promise: $9 : 6$ divides back down to $3 : 2$. It holds.

Answer: 6 oranges

Sharing a total in a ratio

Now the level-up: sometimes you know the total and the ratio, and you have to split things fairly. Say you and a friend share 30 coins in the ratio $2 : 3$. That does not mean 2 coins and 3 coins — it means 2 parts and 3 parts.

So think in parts. First add the ratio numbers to count the parts: $2 + 3 = 5$ parts in all. Then divide the total by the number of parts to find the size of one part. Finally, hand out the parts.

This one trick — $\text{total} \div \text{parts} = \text{one part}$ — unlocks every sharing problem. And you can always check yourself: the two shares should add back up to the total.

Worked example Share 30 coins between two friends in the ratio $2 : 3$.

1. Add the ratio numbers: $2 + 3 = 5$ parts.
2. Find one part: $30 \div 5 = 6$ coins per part.
3. First friend gets 2 parts: $2 \times 6 = 12$ coins.
4. Second friend gets 3 parts: $3 \times 6 = 18$ coins.
5. Check: $12 + 18 = 30$. It all adds back.

Answer: 12 coins and 18 coins

Remember

- ★ The golden rule: whatever you multiply or divide on one side of a ratio, do exactly the same on the other side.
- ★ A ratio table is just skip-counting two columns at once — if one column jumps, the other jumps with it.
- ★ To simplify, hunt for the biggest number that divides into both sides, then divide both.
- ★ Sharing a total? Add the ratio numbers first — that tells you how many equal parts to cut the total into.

Now you try

1) A recipe uses 2 cups of flour for every 1 cup of sugar. If you use 6 cups of flour, how many cups of sugar do you need?

Answer: _____

2) Simplify the ratio $10 : 5$.

Answer: _____

3) Simplify the ratio $12 : 18$.

Answer: _____

4) A paint mix uses 3 spoonfuls of blue for every 4 spoonfuls of yellow. You put in 12 spoonfuls of blue. How many spoonfuls of yellow do you need?

Answer: _____

5) 5 fair tickets cost 20 coins. At the same rate, how many coins do 8 tickets cost?

Answer: _____

6) Share 35 marbles between two friends in the ratio $4 : 3$. How many marbles does the friend with the bigger share get?

Answer: _____

7) At a shelter, the ratio of cats to dogs is $5 : 2$. There are 14 dogs. How many animals are there in total?

Answer: _____

8) Two numbers are in the ratio $3 : 5$, and the bigger one is 12 more than the smaller one. What is the bigger number?

Answer: _____

Answers — check yourself

1. 3
2. 2 : 1
3. 2 : 3
4. 16
5. 32
6. 20
7. 49
8. 30