

Multiplying and Dividing Fractions

Multiply straight across. To divide, flip the second fraction and multiply, and here is why that works.

× Multiplying

$$2/3 \times 4/5 = 8/15$$

Multiply across

Numerator × numerator, denominator × denominator: $2 \times 4 = 8$ and $3 \times 5 = 15$. No common denominator needed.

$$3/4 \text{ of } 20 = 15$$

'Of' means ×

$3/4 \times 20/1 = 60/4 = 15$. In your head: divide by the denominator ($20 \div 4 = 5$), then multiply by the numerator ($5 \times 3 = 15$).

$$3/8 \times 4/9 = 1/6$$

Cancel first

Divide 3 and 9 by 3, and 4 and 8 by 4, before multiplying: $1/2 \times 1/3 = 1/6$. Smaller numbers, fewer slips.

$$2 \frac{1}{2} \times 1 \frac{1}{3} = 3 \frac{1}{3}$$

Mixed numbers: go improper

Convert first: $5/2 \times 4/3 = 20/6 = 10/3 = 3 \frac{1}{3}$.

$$6 \times 1/2 = 3$$

Multiplying can shrink

Multiplying a positive number by a proper fraction makes it smaller: you are taking part of it.

÷ Dividing

$$3/4 \div 2/5 = 3/4 \times 5/2$$

Keep, change, flip

Keep the first fraction, change ÷ to ×, flip the second: $3/4 \times 5/2 = 15/8 = 1 \frac{7}{8}$. Only the second fraction flips.

$$2/5 \times 5/2 = 1$$

The reciprocal

Flipping a fraction gives its reciprocal. A number times its reciprocal always makes 1. Zero has no reciprocal.

$$3 \div 1/2 = 6$$

Why: how many fit?

Division asks how many fit. Each whole holds 2 halves, so 3 holds 6. Dividing by $1/2$ is the same as multiplying by 2.

$$2/3 \div 4/9 = 3/2$$

Why: make the divisor 1

Multiply both numbers by $9/4$ (like $12 \div 4 = 24 \div 8$). $4/9$ becomes 1, leaving $2/3 \times 9/4 = 18/12 = 3/2$. That is keep-change-flip.

$$6 \div 3/4 = 8$$

Whole numbers over 1

Write 6 as $6/1$, then flip and multiply: $6/1 \times 4/3 = 24/3 = 8$. Check: $3/4$ fits into 6 eight times.

$$4 \div 1/4 = 16$$

Dividing can grow

Dividing a positive number by a proper fraction makes it bigger: there are 16 quarters in 4.



Sense-check the size

$3/4 \div 2/5$: does $2/5$ fit into $3/4$ about twice? Just under, as $2 \times 2/5 = 4/5$ is a bit more than $3/4$. So an answer just under 2, like $1 \frac{7}{8}$, makes sense.

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5. Fractions, Decimals and Percentages