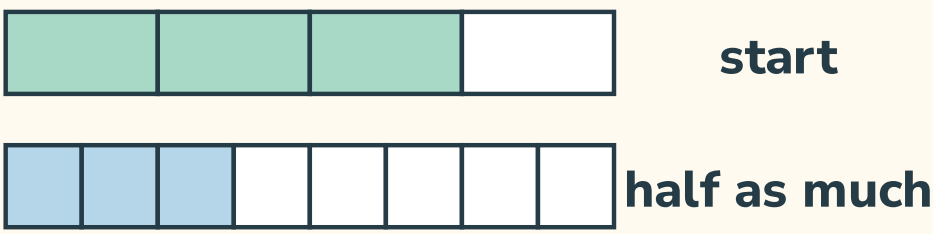
MATHS FIELD GUIDE · GRADE 5

A fraction of a fraction

OPENING PROBLEM

What is half of three quarters?



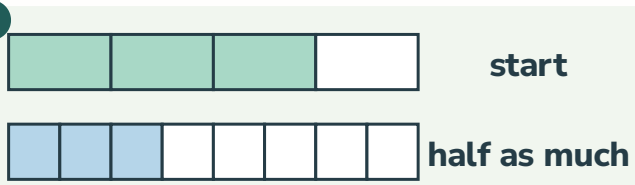
02 Predict what multiplication will do
03 Rules and worked cases
04 Resize a recipe
05 Compare the models
06 Name the fraction by its whole and its unit
07 Check your reasoning

ILLUSTRATED PROBLEM SHEET

Predict what multiplication will do

For a positive starting amount, a factor below one shrinks it. A factor above one enlarges it.

1



What is half of three quarters?

Split each quarter into two eighths. Taking half leaves three eighths.

2

⅔ of ¾
↓
2 × 3 over 3 × 4
↓
½

Why is the product smaller than three quarters?

Only two of three equal shares of the starting amount are kept.

3

1½ × 8
↓
8 + 4
↓
12

What does the extra half add?

Half of eight is four. One full eight plus four is twelve.

4

¾ × 4/3
↓
12/12
↓
1

Which factor undoes multiplication by ¾?

Its reciprocal, 4/3. The product is exactly one.

¾ of 20
15.

20 is ¾ of the whole
whole = 26⅔.

CHAPTER PROBLEM

Find 3/4 × 2/5.

6/20 = 3/10.

MATHS REFERENCE · GRADE 5

A fraction of a fraction

Multiplying two fractions can mean taking a fraction of a fractional amount.

Keep one reference whole. The selected part is measured against that same whole.

Cases to recognise

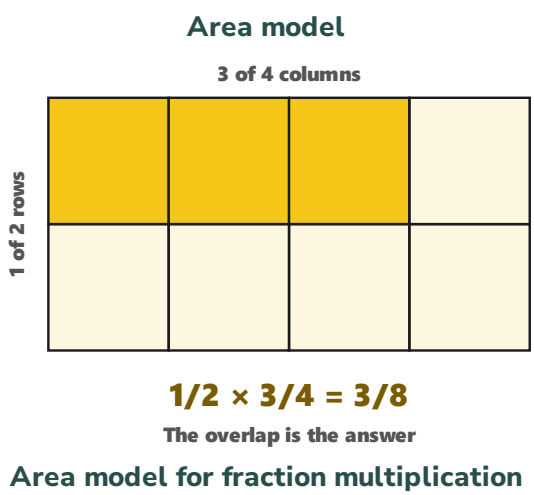
Situation	What to do and why
2/3 of 3/4	Split each quarter into thirds. Six of twelve equal parts make 1/2.
Scale 8 by 5/4	A quarter of eight is two. Five quarters give ten.

Read the model

Take half of three quarters

Three quarters of a rectangle is selected. Split each quarter into two equal pieces.

Half of the selected six eighths is three eighths: 1/2 × 3/4 = 3/8.



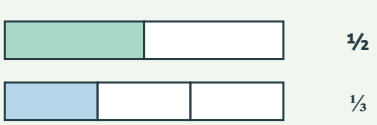
Area model for fraction multiplication

Read the overlap

One direction splits the whole into halves; the other splits it into quarters.

The grid has eight equal cells. Three cells lie in the selected overlap.

scaling Multiplying to change an amount's size.
overlap The region selected in both directions.
reference whole The complete region used to measure the product.



Add the shaded amounts. What common piece works?

Sixths: 3/6 + 2/6 = 5/6.

WORKED INVESTIGATION

Resize a recipe

A recipe uses 3/4 cup of oats. For half a batch, take half of each of its three quarters. Each half-quarter is an eighth.

Look at this part	What it tells you
Half batch	3/8 cup
One batch	3/4 cup
Two batches	1 1/2 cups

Work it through

For one and a half batches, add the original 3/4 cup and its half, 3/8 cup. The total is 9/8 cup.

Catch the mistake

Multiplication can give a smaller amount. A scale factor between zero and one keeps only part of the original amount.

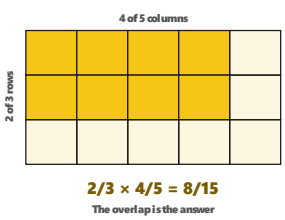
Compare the cases

Try two thirds of four fifths

The whole has three rows and five columns, making fifteen equal cells.

Two rows of four selected columns contain eight cells: 2/3 × 4/5 = 8/15.

Area model



Area model for fraction multiplication

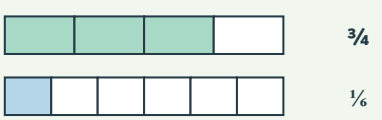
Connect the rule to the model

The selected count is 2 × 4. The total equal-cell count is 3 × 5.

That explains multiplying numerators and denominators. A common denominator is not required for this multiplication.

Change one condition

Double the half-batch amount. Two lots of 3/8 make 6/8 or 3/4 cup, recovering the original recipe.



How much greater is the first amount?

Use twelfths. 9/12 − 2/12 = 7/12.

A FRACTION OF A FRACTION

Compare the models

Scaling changes size

Taking a positive proper fraction of a positive amount reduces it.

Multiplying by one keeps it unchanged. A factor greater than one enlarges the amount.

Do not add the selected parts

Taking half of three quarters is not half plus three quarters.

The word “of” selects a part of the amount, not a second amount to join.

Check against the starting amount

Half of three quarters must be below three quarters.

Three eighths fits. A result greater than the starting amount would contradict taking half.

Explain your reasoning

Find half of two thirds. Explain the equal parts.

One third. Split thirds into sixths; half of four sixths is two sixths, or one third.

Two more worked cases

Situation	Reasoning
Scale 3/5 by one	One complete copy keeps the amount 3/5.
Does multiplying any positive amount by 4/7 increase it?	Four of seven equal shares is less than the whole, so it decreases.

$$1\tfrac{1}{3} + \tfrac{3}{4}$$
$$\downarrow$$
$$1 + 4/12 + 9/12$$
$$\downarrow$$
$$2\ 1/12$$

Why does the whole number increase?

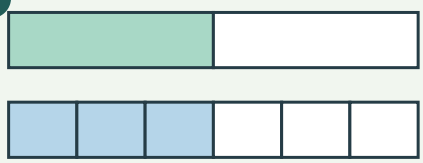
Thirteen twelfths can be regrouped as a whole and one twelfth.

ILLUSTRATED PROBLEM SHEET

Name the fraction by its whole and its unit

When numerator and denominator scale together, the represented fraction stays fixed.

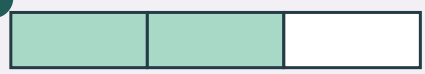
1

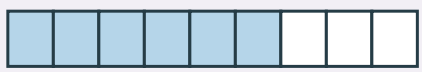


Do the equal-length bars agree?

Yes. Splitting each half into three pieces gives three shaded sixths.

2





Which multiplier connects the labels?

Multiply both numbers by three. The strip keeps the same length.

3

18/24
↓
divide both by 6
↓
3/4

Why divide by their greatest common factor?

It reaches lowest terms in one step. Three and four share no positive factor beyond one.

4

3/5 and 5/8
↓
3 × 8 = 24
↓
5 × 5 = 25

Which is larger?

Write both in fortieths. 25/40 exceeds 24/40, so 5/8 is larger.

6/8 = 3/4
divide numerator and denominator by 2.

6/10 = 3/5
the same numerator did not guarantee the same fraction.

CHAPTER PROBLEM

Should 2/3 of 3/5 be greater than 3/5?

No. Taking a positive fraction below one reduces the positive starting amount.

QUESTION BANK · FOLD OR COVER THE RIGHT COLUMN

Check your reasoning

Try the problem	Solution and reasoning
01 What happens when the factor is exactly one?	The starting value stays the same. One whole copy is retained.
02 If half a small cake and half a big cake have the same fraction label, must the pieces weigh the same?	No. Equal fractions describe shares of their own wholes.
03 A batch needs 2/3 cup. How much do three quarters of a batch need?	Three quarters of two thirds is 6/12 = 1/2 cup. It is smaller than the original two thirds.
04 A rope is 3/5 m long. What is two thirds of it?	(2/3)(3/5) = 2/5 m.
05 Scale 9/10 by 10/9. Explain the result.	The factors are reciprocals; their product is one whole.

Predict before multiplying

Scale 3/4 of a metre by 2/3. One third of 3/4 is 1/4, so two thirds is 2/4 or 1/2 metre.

Multiplying by 2/3 shrinks a positive length. A result larger than 3/4 would fail that check.

2¼ − ⅔
↓
1 + 15/12 − 8/12
↓
1 7/12

Where did the extra twelve twelfths come from?

One of the two wholes was exchanged. Total value stays fixed.

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