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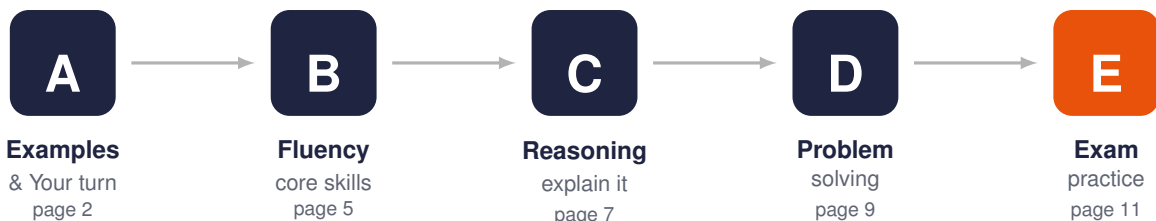
GCSE MATHEMATICS • NUMBER

Fractions

Worksheet

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • No calculator

Free Fractions worksheet for GCSE and iGCSE Maths, with full worked solutions



Tap a section to jump straight to it

By the end of this worksheet you can: simplify, convert and order fractions • add, subtract, multiply and divide fractions and mixed numbers • find a fraction of an amount and find the whole • *Higher:* work backwards through a chain of fractions, turn fraction information into an equation, and use fractions in algebra and proof.

Which questions are for me?

FOUNDATION Everyone starts here. These skills appear on both tiers.

HIGHER The same skills where Higher papers use them: working backwards, forming equations, fractions inside algebra and proof. Grades 6 to 9.

Every section has both, clearly labelled. Questions get harder as you go, and every skill in Sections A to D is needed in Section E.

Track your progress

Section	B	C	D	E
Foundation marks	37	14	19	20
Higher marks	11	14	18	16
My score				

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A**Worked examples & Your turn**

Read each example carefully. Cover it up, then answer the question beside it using the same method.

FOUNDATION*Everyone starts here***Worked example A1**Work out $\frac{3}{4} + \frac{1}{6}$ *Use a common denominator. The lowest common multiple of 4 and 6 is 12.*

$$\frac{3}{4} = \frac{9}{12} \quad \frac{1}{6} = \frac{2}{12}$$

Add the numerators. The denominator stays the same.

$$\frac{9}{12} + \frac{2}{12} = \frac{11}{12}$$

$$\frac{11}{12}$$

Your turn A1Work out $\frac{2}{5} + \frac{1}{4}$ **Worked example A2**Work out $\frac{3}{4} \div \frac{2}{5}$

Give your answer as a mixed number.

Keep the first fraction, change $\div$ to $\times$, flip the second fraction.

$$\frac{3}{4} \times \frac{5}{2} = \frac{15}{8}$$

$$15 \div 8 = 1 \text{ remainder } 7$$

$$1\frac{7}{8}$$

Your turn A2Work out $\frac{5}{6} \div \frac{2}{3}$

Give your answer as a mixed number.

Worked example A3Work out $2\frac{1}{3} + 1\frac{3}{4}$ *Change to improper fractions, then use a common denominator.*

$$\frac{7}{3} + \frac{7}{4} = \frac{28}{12} + \frac{21}{12} = \frac{49}{12}$$

$$49 \div 12 = 4 \text{ remainder } 1$$

$$4\frac{1}{12}$$

Your turn A3Work out $3\frac{2}{5} - 1\frac{2}{3}$ 

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HIGHER*Higher strategies: these are new ways of thinking, not longer sums***Worked example A4: working backwards through a chain**

Ava spends $\frac{1}{4}$ of her money on Monday. On Tuesday she spends $\frac{2}{3}$ of the money she has **left**. She then has £30
How much did Ava start with?

*Track the fraction of the **original** that remains.*

After Monday $\frac{3}{4}$ remains. After Tuesday $\frac{1}{3}$ of $\frac{3}{4} = \frac{1}{4}$ remains.

So $\frac{1}{4}$ of the original is £30

£120

Your turn A4

Tom uses $\frac{2}{5}$ of a tank of fuel on day 1. On day 2 he uses $\frac{3}{4}$ of the fuel that is **left**. There are then 9 litres in the tank.

How much fuel was in the tank at the start?

Worked example A5: turning fraction information into an equation

$\frac{3}{5}$ of the counters in a bag are red. The rest are blue. 8 red counters are taken out. Now $\frac{1}{2}$ of the counters are red.
How many blue counters are there?

Use a multiplier k : red = $3k$, blue = $2k$, total = $5k$ *Write the new situation as an equation.*

$$\frac{3k - 8}{5k - 8} = \frac{1}{2} \quad \text{so} \quad 6k - 16 = 5k - 8 \quad \text{so} \quad k = 8$$

blue = $2k = 16$

Your turn A5

$\frac{2}{3}$ of the students in a club are girls. The rest are boys. 6 more boys join the club. Now $\frac{3}{5}$ of the students are girls.

How many girls are in the club?



Worked example A6: fractions inside an equation

Solve $\frac{x+1}{2} - \frac{x-2}{5} = 3$

Multiply every term by the common denominator, 10.
Keep brackets.

$$5(x+1) - 2(x-2) = 30$$

Expand carefully. $-2 \times -2 = +4$

$$5x + 5 - 2x + 4 = 30 \quad \text{so} \quad 3x = 21$$

$x = 7$

Your turn A6

Solve $\frac{x+4}{3} - \frac{x-2}{4} = 2$

Worked example A7: fractions in a formula, working backwards

A rectangle has area $2\frac{5}{8} \text{ m}^2$ and width $1\frac{3}{4} \text{ m}$.

Work out its length.

Area = length $\times$ width, so length = area $\div$ width.

$$\frac{21}{8} \div \frac{7}{4} = \frac{21}{8} \times \frac{4}{7} = \frac{84}{56} = \frac{3}{2}$$

$1\frac{1}{2} \text{ m}$

Your turn A7

A triangle has area $3\frac{3}{4} \text{ cm}^2$ and base $2\frac{1}{2} \text{ cm}$.

Work out its height.



B**Fluency**

Each question is a designed sequence. From one part to the next, ask yourself: what changed, and what did it do to the answer?

FOUNDATION*Everyone starts here*

B1 Write each fraction in its simplest form. If it cannot be simplified, say so.

(a) $\frac{12}{18}$

(b) $\frac{35}{50}$

(c) $\frac{17}{51}$

(d) $\frac{9}{20}$

[4 marks]

B2 Write (a) and (b) as mixed numbers. Write (c) and (d) as improper fractions.

(a) $\frac{11}{4}$

(b) $\frac{29}{6}$

(c) $3\frac{2}{7}$

(d) $5\frac{7}{9}$

[4 marks]

B3 Work out

(a) $\frac{1}{5}$ of 35

(b) $\frac{3}{5}$ of 35

(c) $\frac{3}{5}$ of 36

(d) $\frac{5}{3}$ of 36

[4 marks]

B4 Work out. Give each answer in its simplest form.

(a) $\frac{1}{2} + \frac{1}{3}$

(b) $\frac{1}{2} + \frac{2}{3}$

(c) $\frac{5}{6} - \frac{3}{10}$

(d) $\frac{3}{4} - \frac{5}{6}$

[4 marks]

B5 Work out. Give each answer in its simplest form.

(a) $\frac{1}{2} \times \frac{3}{5}$

(b) $\frac{4}{9} \times \frac{3}{8}$

(c) $5 \times \frac{2}{3}$

(d) $\frac{2}{3} \times \frac{3}{2}$

[4 marks]

B6 Work out. Give each answer in its simplest form.

(a) $\frac{1}{4} \div \frac{1}{2}$

(b) $\frac{1}{2} \div \frac{1}{4}$

(c) $6 \div \frac{3}{4}$

(d) $\frac{3}{4} \div 6$

[4 marks]

B7 Write these fractions in order of size. Start with the smallest.

$\frac{1}{2}$

$\frac{3}{8}$

$\frac{5}{12}$

$\frac{1}{3}$

[2 marks]



FOUNDATION*continued: mixed numbers and finding the whole***B8** Work out. Give each answer as a mixed number in its simplest form.

(a) $1\frac{1}{2} + 2\frac{3}{5}$

(b) $4\frac{1}{4} - 1\frac{5}{6}$

(c) $5 - 2\frac{3}{8}$

(d) $3\frac{1}{6} - 1\frac{7}{9}$

[4 marks]

B9 Work out. Give each answer in its simplest form.

(a) $1\frac{1}{3} \times 2\frac{1}{5}$

(b) $3\frac{1}{3} \times 1\frac{1}{5}$

(c) $4\frac{1}{2} \div 1\frac{1}{5}$

(d) $2\frac{5}{8} \div 1\frac{3}{4}$

[4 marks]

B10 Work out the number in each case.

(a) $\frac{2}{3}$ of a number is 18

(b) $\frac{5}{8}$ of a number is 45

(c) $\frac{9}{7}$ of a number is 108

[3 marks]

HIGHER*Higher tier only***B11** Write down the fraction of the original amount that is **left** after

(a) $\frac{1}{3}$ is used, then $\frac{1}{4}$ of the remainder

(b) $\frac{2}{5}$ is used, then $\frac{1}{3}$ of the remainder

(c) $\frac{1}{4}$ is used, then $\frac{5}{6}$ of the remainder

[3 marks]

B12 Solve

(a) $\frac{x}{3} + \frac{x}{6} = 5$

(b) $\frac{x+1}{2} = \frac{x+5}{4}$

(c) $\frac{2x}{5} - \frac{x}{4} = 3$

(d) $\frac{x-1}{3} + \frac{x+2}{6} = 2$

[4 marks]

B13 Write each expression as a single fraction in its simplest form.

(a) $\frac{a}{2} + \frac{a}{3}$

(b) $\frac{2}{x} + \frac{3}{x}$

(c) $\frac{1}{x} + \frac{1}{2x}$

(d) $\frac{x}{4} - \frac{x-1}{6}$

[4 marks]



C

Reasoning

Show your working and explain your thinking. A correct answer without a reason does not score full marks.

FOUNDATION

Everyone starts here

- C1 Which is greater, $\frac{7}{9}$ or $\frac{3}{4}$?

You **must** show your working.

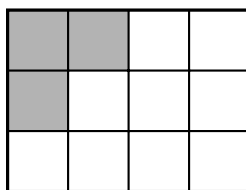
[2 marks]

- C2 Tom writes $\frac{1}{3} + \frac{1}{4} = \frac{2}{7}$

Explain what Tom has done wrong, and work out the correct answer.

[2 marks]

- C3 The rectangle is made from 12 equal squares. 3 of the squares are shaded.



How many more squares must be shaded so that $\frac{2}{3}$ of the rectangle is shaded?

[2 marks]

- C4 Without working out the answer, decide whether $\frac{3}{4} \times \frac{5}{6}$ is greater than or less than $\frac{3}{4}$

Give a reason for your answer.

[2 marks]

- C5 Ali says, " $\frac{1}{2} \times \frac{1}{3}$ is the same as $\frac{1}{3} \times \frac{1}{2}$, so $\frac{1}{2} \div \frac{1}{3}$ must be the same as $\frac{1}{3} \div \frac{1}{2}$."

Is Ali correct? You **must** show your working.

[3 marks]

- C6 Priya writes $2\frac{1}{2} \times 3\frac{1}{3} = 6\frac{1}{6}$

(a) Explain the mistake Priya has made. (b) Work out the correct answer.

[3 marks]



HIGHER*Higher tier only*

- C7** Find a fraction that is greater than $\frac{3}{7}$ and less than $\frac{4}{9}$

You must show your working.

[3 marks]

- C8** p and q are fractions between 0 and 2

Is the statement " $p \div q$ is greater than p " always true, sometimes true or never true?

You must justify your answer.

[3 marks]

- C9** (a) Show that $\frac{1}{n} - \frac{1}{n+1} = \frac{1}{n(n+1)}$

(b) Hence, or otherwise, work out the exact value of $\frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30}$

[5 marks]

- C10** a and b are positive whole numbers with $a < b$.

Prove that $\frac{a+1}{b+1}$ is always greater than $\frac{a}{b}$

[3 marks]



D**Problem solving**

You decide the method. Read the whole question first, and show every step.

FOUNDATION

Everyone starts here

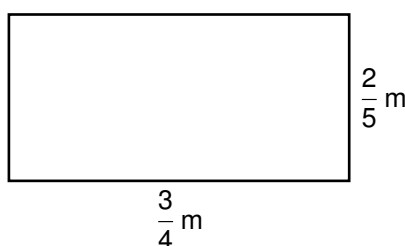
D1 A container holds 6 litres of juice.

How many bottles, each holding $\frac{3}{4}$ of a litre, can be completely filled from the container? [2 marks]

D2 A recipe uses $\frac{2}{3}$ of a cup of sugar to make 12 biscuits.

How much sugar is needed to make 30 biscuits? Give your answer as a mixed number. [3 marks]

D3 Here is a rectangle.



(a) Work out the area of the rectangle.

(b) Work out the perimeter of the rectangle. Give your answer as a mixed number. [4 marks]

D4 A book has 240 pages.

Mia reads $\frac{1}{3}$ of the book on Monday. On Tuesday she reads $\frac{1}{4}$ of the pages that are **left**.

How many pages does Mia still have to read? [3 marks]

D5 Raj spends $\frac{2}{5}$ of his money. He has £42 left.

How much money did Raj have at the start? [3 marks]

D6 A plank of wood is $4\frac{1}{2}$ metres long. Pieces of length $\frac{5}{8}$ of a metre are cut from the plank.

(a) What is the greatest number of pieces that can be cut?

(b) What length of wood is left over? Give your answer as a fraction of a metre. [4 marks]



HIGHER*Higher tier only*

D7 Leah is reading a book.

On Monday she reads $\frac{1}{3}$ of the book. On Tuesday she reads $\frac{3}{5}$ of the pages that are **left**.

She still has 48 pages to read. How many pages are in the book?

[4 marks]

D8 Cara has $\frac{5}{6}$ as much money as Ben. Ben has $\frac{3}{4}$ as much money as Ali.

Cara has £35. How much money does Ali have?

[3 marks]

D9 A rectangle has length $2\frac{1}{4}$ m and area $3\frac{3}{8}$ m².

Work out the perimeter of the rectangle.

[4 marks]

D10 A bag contains only red, green and blue counters. A counter is taken at random.

The probability that it is red is $\frac{1}{4}$ and the probability that it is green is $\frac{2}{5}$

There are 21 blue counters in the bag. Work out the number of red counters.

[3 marks]

D11 The denominator of a fraction is 5 more than its numerator.

When 3 is added to the numerator and 3 is added to the denominator, the new fraction is equal to $\frac{3}{4}$

Find the original fraction. You must show algebraic working.

[4 marks]



E**Exam practice**

Exam-style questions. Write your answers in the spaces. Aim for about one minute per mark.

FOUNDATION*Foundation and Higher crossover*

- E1** (a) Write $\frac{18}{30}$ in its simplest form.

.....
(1)

- (b) Write $\frac{17}{5}$ as a mixed number.

.....
(1)

- (c) Work out $\frac{3}{8}$ of 56

.....
(2)

(Total for Question E1 is 4 marks)

- E2** (a) Work out $\frac{2}{3} + \frac{1}{5}$

.....
(2)

- (b) Work out $\frac{5}{6} - \frac{3}{4}$

.....
(2)

(Total for Question E2 is 4 marks)



E3 Write these fractions in order of size. Start with the smallest fraction.

$$\frac{2}{3} \quad \frac{3}{5} \quad \frac{7}{10} \quad \frac{11}{15}$$

.....

(Total for Question E3 is 2 marks)

E4 Jo has £180

She spends $\frac{1}{3}$ of the money on rent. She spends $\frac{3}{8}$ of the money she has **left** on food.

Work out how much money Jo has now.

£

(Total for Question E4 is 4 marks)

E5 Work out $2\frac{1}{4} \times 1\frac{3}{5}$

Give your answer as a mixed number in its simplest form.

.....

(Total for Question E5 is 3 marks)



E6 Show that $3\frac{1}{3} \div 2\frac{1}{2} = 1\frac{1}{3}$

(Total for Question E6 is 3 marks)

HIGHER

Higher tier only

E7 $\frac{2}{5}$ of the people at a concert are adults. $\frac{3}{8}$ of the adults are women.

There are 45 women at the concert.

Work out the total number of people at the concert.

.....
(Total for Question E7 is 4 marks)

E8 Solve $\frac{3x+1}{4} - \frac{x-2}{3} = 3$

$x =$

(Total for Question E8 is 3 marks)



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E9 160 students go on an activity day.

number of boys : number of girls = 3 : 5

Each student either goes kayaking or goes climbing. $\frac{7}{12}$ of the boys go kayaking.

Three times as many girls go climbing as go kayaking.

Work out how many students go kayaking.

.....
(Total for Question E9 is 5 marks)

E10 A box contains only red pens and blue pens. $\frac{3}{7}$ of the pens are red.

12 more red pens are put in the box. Now $\frac{1}{2}$ of the pens in the box are red.

Work out the number of blue pens in the box.

.....
(Total for Question E10 is 4 marks)

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