INFOGRAPHHUB SERIES · 8 PARTS · AGES 11–14

Fractions

Eight infographics that take you from 'what is a numerator?' to dividing mixed numbers with confidence.

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Each part is one printable infographic. Work through them in order, or use the part you need. The quiz answers are printed upside down at the foot of the quiz. Sources for every part are listed on its page at infographhub.com.

infographhub.com/series/fractions/

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FRACTIONS PART 1 OF 8 · AGES 11–14

Fractions Explained

A fraction is part of a whole split into equal parts. These are the words and ideas you need to read one.

A fraction is equal parts

3/4 means a whole split into 4 equal parts, with 3 of them taken. It is also a division: 3/4 = 3 ÷ 4 = 0.75.

Numerator

The top number. It counts how many of the equal parts you have. In 3/8 you have 3 parts.

Denominator

The bottom number: how many equal parts the whole is split into. In 3/8 the parts are eighths. It can never be 0.

Unit fractions

A numerator of 1: 1/2, 1/3, 1/10. The bigger the denominator, the smaller each part, so 1/8 is less than 1/4.

Proper fractions

The numerator is smaller than the denominator, such as 3/5 or 7/10. A proper fraction is always worth less than 1.

Improper fractions

The numerator is bigger than the denominator, such as 9/4. It is worth more than 1 whole: 9/4 = 2.25.

Mixed numbers

A whole number plus a proper fraction. 9 ÷ 4 = 2 remainder 1, so 9/4 = 2 1/4. Back again: 2 × 4 + 1 = 9.

On a number line

Split 0 to 1 into 4 equal steps; 3 steps from 0 is 3/4. Keep going past 1 and you reach 5/4, the same point as 1 1/4.

Equal parts or it is not a fraction

Cut a cake into 4 pieces of different sizes and one piece is not a quarter. Fractions only work when every part of the whole is the same size.

NEXT IN THE SERIES
2. Equivalent Fractions and Simplifying

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FRACTIONS PART 2 OF 8 · AGES 11–14

Equivalent Fractions and Simplifying

Different numbers, same value: how to make equivalent fractions and cut any fraction down to its lowest terms.

1

= Spot equal values

Equivalent fractions are worth the same. 1/2 = 2/4 = 4/8: on a fraction wall they line up exactly.

2

× Multiply top and bottom

Multiply the numerator and denominator by the same number. 2/3 × 4/4 = 8/12. Multiplying by 4/4 is multiplying by 1.

3

Find a missing number

3/5 = ?/20. What turns 5 into 20? × 4. Do the same to the top: 3 × 4 = 12, so 3/5 = 12/20.

4

Find the HCF

To simplify 18/24, list factors. 18: 1, 2, 3, 6, 9, 18. 24: 1, 2, 3, 4, 6, 8, 12, 24. The highest common factor is 6.

5

÷ Divide by the HCF

Divide top and bottom by 6: 18 ÷ 6 = 3 and 24 ÷ 6 = 4. So 18/24 = 3/4.

6

✓ Check it is fully simplified

3 and 4 share no factor except 1, so 3/4 is in its lowest terms. Smaller steps reach it too: 18/24 → 9/12 → 3/4.

Only multiply or divide

Adding the same number to the top and bottom changes the value: 1/2 is not 2/3. Equivalent fractions only come from multiplying or dividing both parts by the same number.

NEXT IN THE SERIES

3. Adding and Subtracting Fractions

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FRACTIONS PART 3 OF 8 · AGES 11–14

Adding and Subtracting Fractions

Make the denominators match, then add or subtract only the numerators. Three examples, every step shown.

1 Same denominator

Work out 5/12 + 11/12.

1. The denominators already match: both are twelfths.
2. Add the numerators only: 5 + 11 = 16, giving 16/12.
3. Simplify: the HCF of 16 and 12 is 4, so 16/12 = 4/3.
4. 4/3 is improper: 4 ÷ 3 = 1 remainder 1, so 4/3 = 1 1/3.

ANSWER **1 and 1/3 (or 4/3)**

2 Different denominators

Work out 5/6 − 1/4.

1. Lowest common multiple of 6 and 4: multiples of 6 are 6, 12…; of 4 are 4, 8, 12… So use 12.
2. Rename: 5/6 = 10/12 (× 2 top and bottom) and 1/4 = 3/12 (× 3 top and bottom).
3. Subtract the numerators: 10 − 3 = 7, giving 7/12.
4. 7 and 12 share no factor except 1, so 7/12 is fully simplified.
5. Using 24 also works: 20/24 − 6/24 = 14/24 = 7/12, but needs more simplifying.

ANSWER **7/12**

3 Mixed numbers

Work out 3 1/4 − 1 2/3.

1. Make improper fractions: 3 1/4 = 13/4 (3 × 4 + 1) and 1 2/3 = 5/3 (1 × 3 + 2).
2. The LCM of 4 and 3 is 12: 13/4 = 39/12 and 5/3 = 20/12.
3. Subtract the numerators: 39 − 20 = 19, giving 19/12.
4. Back to a mixed number: 19 ÷ 12 = 1 remainder 7, so 1 7/12.
5. Check with decimals: 3.25 − 1.67 ≈ 1.58, and 1 7/12 ≈ 1.58.

ANSWER **1 and 7/12**

Estimate first

Before you start, guess roughly how big the answer should be. 5/6 is between 3/4 and 1, so 5/6 − 1/4 is between 1/2 and 3/4. 7/12 is about 0.58, so it fits. An answer far from your estimate means a slip.

NEXT IN THE SERIES
4. Multiplying and Dividing Fractions

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FRACTIONS PART 4 OF 8 · AGES 11–14

Multiplying and Dividing Fractions

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

× Multiplying

2/3 × 4/5 = 8/15	**Multiply across** Numerator × numerator, denominator × denominator: 2 × 4 = 8 and 3 × 5 = 15. No common denominator needed.
3/4 of 20 = 15	**'Of' means ×** 3/4 × 20/1 = 60/4 = 15. In your head: divide by the denominator (20 ÷ 4 = 5), then multiply by the numerator (5 × 3 = 15).
3/8 × 4/9 = 1/6	**Cancel first** Divide 3 and 9 by 3, and 4 and 8 by 4, before multiplying: 1/2 × 1/3 = 1/6. Smaller numbers, fewer slips.
2 1/2 × 1 1/3 = 3 1/3	**Mixed numbers: go improper** Convert first: 5/2 × 4/3 = 20/6 = 10/3 = 3 1/3.
6 × 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 ÷ 2/5 = 3/4 × 5/2	**Keep, change, flip** Keep the first fraction, change ÷ to ×, flip the second: 3/4 × 5/2 = 15/8 = 1 7/8. Only the second fraction flips.
2/5 × 5/2 = 1	**The reciprocal** Flipping a fraction gives its reciprocal. A number times its reciprocal always makes 1. Zero has no reciprocal.
3 ÷ 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 ÷ 4/9 = 3/2	**Why: make the divisor 1** Multiply both numbers by 9/4 (like 12 ÷ 4 = 24 ÷ 8). 4/9 becomes 1, leaving 2/3 × 9/4 = 18/12 = 3/2. That is keep-change-flip.
6 ÷ 3/4 = 8	**Whole numbers over 1** Write 6 as 6/1, then flip and multiply: 6/1 × 4/3 = 24/3 = 8. Check: 3/4 fits into 6 eight times.
4 ÷ 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 ÷ 2/5: does 2/5 fit into 3/4 about twice? Just under, as 2 × 2/5 = 4/5 is a bit more than 3/4. So an answer just under 2, like 1 7/8, makes sense.

NEXT IN THE SERIES
5. Fractions, Decimals and Percentages

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FRACTIONS PART 5 OF 8 · AGES 11–14

Fractions, Decimals and Percentages

Three ways to write the same amount. Learn the common ones by heart, then convert any value either way.

= Worth knowing by heart

1/2 = 0.5 = 50%	**One half** 1 ÷ 2 = 0.5, and 0.5 × 100 = 50%.
1/4 = 0.25 = 25%	**One quarter** Half of a half: 25/100 simplified by 25.
3/4 = 0.75 = 75%	**Three quarters** Three lots of 0.25.
1/5 = 0.2 = 20%	**One fifth** 1/5 = 2/10 = 20/100.
1/10 = 0.1 = 10%	**One tenth** Ten of them make the whole.
1/8 = 0.125 = 12.5%	**One eighth** Half of a quarter: 0.25 ÷ 2 = 0.125.
1/3 = 0.333... ≈ 33.3%	**One third** A recurring decimal: the 3s never end. Exactly 33 1/3%.
2/3 = 0.666... ≈ 66.7%	**Two thirds** Double 1/3. Rounded to three decimal places it is 0.667.

⇆ Converting each way

3/8 = 3 ÷ 8 = 0.375	**Fraction → decimal** Divide the numerator by the denominator.
0.35 = 35/100 = 7/20	**Decimal → fraction** Use place value: hundredths go over 100. Then simplify.
0.07 × 100 = 7%	**Decimal → percentage** Multiply by 100. Digits move two places left.
4% ÷ 100 = 0.04	**Percentage → decimal** Divide by 100. 4% is 0.04, not 0.4.
45% = 45/100 = 9/20	**Percentage → fraction** Write the percentage over 100, then simplify.
7/20 = 35/100 = 35%	**Fraction → percentage** Make the denominator 100, or divide and multiply by 100.
3/40 = 0.075 · 1/6 = 0.1666...	**Will the decimal end?** Simplify first. Denominator made only of 2s and 5s: it ends. Any other prime factor: it recurs.

Ordering mixed forms

Put 3/5, 0.62 and 61% in order by writing them all as decimals: 0.6, 0.62 and 0.61. Smallest to largest: 3/5, 61%, 0.62.

NEXT IN THE SERIES
6. Common Fraction Mistakes

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FRACTIONS PART 6 OF 8 · AGES 11–14

Common Fraction Mistakes

Six slips that cost marks, with the wrong working, the right working and why it goes wrong.

1 Adding the denominators

✕ WRONG

~~1/2 + 1/3 = 2/5~~

✓ RIGHT

1/2 + 1/3 = 3/6 + 2/6 = 5/6

Denominators name the size of the parts. Make the parts the same size first, then add only the numerators. 2/5 is less than 1/2, so it cannot be right.

2 Not simplifying

✕ WRONG

~~4/10 + 2/10 = 6/10, left as it is~~

✓ RIGHT

6/10 = 3/5 (divide top and bottom by 2)

6/10 is correct but not finished. Answers are expected in their simplest form: divide by the highest common factor.

3 Flipping the wrong fraction

✕ WRONG

~~2/3 ÷ 4/5 = 3/2 × 4/5 = 6/5~~

✓ RIGHT

2/3 ÷ 4/5 = 2/3 × 5/4 = 10/12 = 5/6

Only the second fraction, the divisor, is flipped. Check: 2/3 is less than 4/5, so the answer must be less than 1.

4 Multiplying mixed numbers in pieces

✕ WRONG

~~2 1/2 × 2 1/2 = 4 1/4~~

✓ RIGHT

5/2 × 5/2 = 25/4 = 6 1/4

2 1/2 means 2 + 1/2, so splitting it misses 2 × 1/2 and 1/2 × 2. Convert to improper fractions first. Check: 2.5 × 2.5 = 6.25.

5 Comparing by denominator size

✕ WRONG

~~5/8 > 2/3 because 8 > 3~~

✓ RIGHT

5/8 = 15/24 and 2/3 = 16/24, so 2/3 is bigger

A bigger denominator means smaller pieces, not a bigger fraction. Use a common denominator or decimals (0.625 and 0.666…).

6 Adding to top and bottom

✕ WRONG

~~2/3 = 3/4 (add 1 to both)~~

✓ RIGHT

2/3 = 4/6 (multiply both by 2)

Only multiplying or dividing top and bottom by the same number keeps the value. 2/3 ≈ 0.667 but 3/4 = 0.75.

Estimate, then check

Most of these slips give an answer of the wrong size. Before you calculate, decide roughly how big the answer should be. Afterwards, check it with decimals.

NEXT IN THE SERIES

7. Fractions in Everyday Life

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FRACTIONS PART 7 OF 8 · AGES 11–14

Fractions in Everyday Life

Recipes, clocks, sales and scorelines: eight places you use fractions every week, each with the numbers worked out.

Scaling recipes

A cake for 8 uses 300 g of flour. For 6 people use 6/8 = 3/4 of it: 300 ÷ 4 × 3 = 225 g.

Telling the time

A quarter of an hour is 60 ÷ 4 = 15 minutes, three quarters is 45 minutes, and 20 minutes is 1/3 of an hour.

Prices and discounts

'1/3 off' a EUR 45 jacket saves 45 ÷ 3 = EUR 15, so you pay EUR 30. With 100 cents to the euro, 1/4 of a euro is 25 cents.

Sharing fairly

3 pizzas shared equally by 4 friends: each gets 3 ÷ 4 = 3/4 of a pizza. A fraction is a division.

Metric measurements

1/2 litre = 500 ml, 3/4 kilogram = 750 g, 1/4 metre = 25 cm and 1/5 kilometre = 200 m.

Sport statistics

A football match has two halves of 45 minutes. Scoring 18 of 24 free throws is 18/24 = 3/4 = 75%.

Chance

A fair coin lands heads with probability 1/2. Rolling a 6 on a fair dice: 1 way out of 6, so 1/6.

Gauges and batteries

Fuel gauges are often marked E, 1/4, 1/2, 3/4, F. A phone at 25% has about a quarter of its charge left.

One method for most of them

To find a fraction of an amount, divide by the denominator, then multiply by the numerator. 2/5 of 40 = 40 ÷ 5 × 2 = 16.

NEXT IN THE SERIES
8. Fractions Quiz: Test Yourself

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FRACTIONS PART 8 OF 8 · AGES 11–14

Fractions Quiz

Ten questions on the whole series. Show your working, then turn the page round to check.

1 In the fraction 5/8, what does the 8 tell you?

- A How many parts you have
- B How many equal parts the whole is split into
- C How big the whole is
- D How many wholes there are

2 Which fraction is equivalent to 3/4?

- A 4/5
- B 6/7
- C 9/12
- D 5/6

3 What is 18/30 in its simplest form?

- A 9/15
- B 6/10
- C 2/3
- D 3/5

4 Work out 1/4 + 2/3.

- A 3/7
- B 11/12
- C 3/12
- D 2/7

5 Write 2 3/5 as an improper fraction.

- A 13/5
- B 6/5
- C 10/5
- D 23/5

6 Work out 2/3 × 3/4.

- A 5/7
- B 8/9
- C 1/2
- D 9/8

7 Work out 3/5 ÷ 1/10.

- A 3/50
- B 1/6
- C 30
- D 6

8 Write 3/8 as a decimal and as a percentage.

.....

9 A recipe for 6 people uses 450 g of rice. How much rice do 4 people need?

.....

10 Explain why 5 ÷ 1/2 = 10 and not 2 1/2.

.....

Got one wrong?

Go back to the part that covers it: Part 2 for simplifying, Part 3 for adding, Part 4 for multiplying and dividing, Part 5 for decimals and Part 6 for common slips.

ANSWERS

1. B: How many equal parts the whole is split into
2. C: 9/12 (multiply top and bottom by 3)
3. D: 3/5 (divide top and bottom by the HCF, 6)
4. B: 11/12 (3/12 + 8/12)
5. A: 13/5 (2 × 5 + 3 = 13)
6. C: 1/2 (6/12 simplified)
7. D: 6 (3/5 × 10/1 = 30/5 = 6)
8. 0.375 and 37.5% (3 ÷ 8 = 0.375, then multiply by 100)
9. 300 g. You need 4/6 = 2/3 of the amount: 450 ÷ 3 × 2 = 300 g.
10. It asks how many halves fit into 5. Each whole holds 2 halves, so 5 holds 10. Half of 5 (5 × 1/2) is 2 1/2.

SERIES COMPLETE

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