

Fractions & Decimals

Formulas, rules and quick reference - Primary to lower secondary

A practical reference for understanding fractions and decimals, including equivalent fractions, operations, comparisons, conversions, place value and real-life percentage links.

1. Fraction Basics

Fraction meaning	A fraction represents part of a whole or part of a set.
Numerator	The top number shows how many parts are being considered.
Denominator	The bottom number shows how many equal parts make the whole.
Proper fraction	Numerator is smaller than denominator.
Improper fraction	Numerator is equal to or greater than denominator.
Mixed number	A whole number together with a proper fraction.

2. Equivalent & Simplified Fractions

Equivalent fractions	$a/b = (a \times n)/(b \times n)$, where n is not 0.
Simplifying	Divide numerator and denominator by their greatest common factor.
Lowest terms	A fraction is in lowest terms when numerator and denominator have no common factor greater than 1.
Common denominator	A shared denominator used to compare or operate on fractions.

3. Mixed Numbers & Improper Fractions

Mixed to improper	$a \frac{b}{c} = (a \times c + b)/c$.
Improper to mixed	Divide numerator by denominator; quotient is the whole part and remainder is the numerator.
Whole number as fraction	$n/1$.
Fraction greater than 1	A fraction with numerator greater than denominator has a value greater than 1.

Adding & Subtracting Fractions

Rules for like and unlike denominators

4. Same Denominator

Addition	$a/c + b/c = (a + b)/c.$
Subtraction	$a/c - b/c = (a - b)/c.$
Rule	Keep the denominator the same and add or subtract the numerators.
Final step	Simplify the answer when possible.

5. Different Denominators

Step 1	Find a common denominator, often using the LCM of the denominators.
Step 2	Rewrite each fraction as an equivalent fraction with the common denominator.
Step 3	Add or subtract the numerators.
Step 4	Simplify the final answer.

6. Adding & Subtracting Mixed Numbers

Method	Add or subtract whole-number parts and fractional parts, then regroup if needed.
Alternative	Convert mixed numbers to improper fractions, operate, then convert back.
Regrouping	If a fractional part is 1 or more, convert the extra whole into the whole-number part.

7. Comparing Fractions

Same denominator	The fraction with the larger numerator is greater.
Same numerator	For positive fractions, the fraction with the smaller denominator is greater.
Cross multiplication	For positive a/b and c/d , compare $a \times d$ with $b \times c$.
Number line	A fraction farther to the right is greater.

Multiplying & Dividing Fractions

Essential formulas and problem-solving rules

8. Multiplication

Fraction x fraction $a/b \times c/d = (a \times c)/(b \times d)$.

Whole number x fraction $n \times a/b = (n \times a)/b$.

Fraction of a quantity Fraction of quantity = fraction x quantity.

Simplify Cancel common factors before multiplying when helpful.

9. Division

Fraction division a/b divided by $c/d = a/b \times d/c$, where c/d is not 0.

Keep-change-flip Keep the first fraction, change division to multiplication, flip the second fraction.

Whole number division n divided by $a/b = n/1 \times b/a$.

Check Use multiplication as the inverse operation to check the answer.

10. Fraction of a Quantity

Formula Fraction of quantity = numerator/denominator x quantity.

Example structure $3/5$ of 40 = $3/5 \times 40$.

Unit fractions Find $1/\text{denominator}$ of the quantity first, then multiply by the numerator.

11. Useful Fraction Facts

Zero $0/b = 0$, where b is not 0.

One $a/a = 1$, where a is not 0.

Reciprocal The reciprocal of a/b is b/a , where a and b are not 0.

Reciprocal product A non-zero fraction multiplied by its reciprocal equals 1.

Decimals & Place Value

Understanding, comparing and calculating with decimals

12. Decimal Place Value

Tenths	$1/10 = 0.1$.
Hundredths	$1/100 = 0.01$.
Thousandths	$1/1000 = 0.001$.
Place value rule	Each place to the right is one tenth of the place immediately to its left.
Expanded decimal	Example structure: $3.45 = 3 + 4/10 + 5/100$.

13. Comparing & Ordering Decimals

Compare whole parts	The number with the larger whole-number part is greater.
Equalise places	Add zeros to the right when useful: $0.5 = 0.50 = 0.500$.
Number line	A decimal farther to the right is greater.
Ordering	Arrange from least to greatest or greatest to least as required.

14. Decimal Addition & Subtraction

Main rule	Align decimal points before adding or subtracting.
Add zeros	Trailing zeros may be added without changing the value.
Estimate	Round first to check whether the final answer is sensible.

15. Decimal Multiplication

Whole-number method	Multiply as whole numbers first.
Decimal places	Count the total number of decimal places in the factors and place the decimal accordingly.
Multiply by 10, 100, 1000	Move the decimal point 1, 2 or 3 places right.

Decimal Division & Fraction-Decimal Conversion

Quick methods for converting and dividing

16. Decimal Division

Divide by 10, 100, 1000 Move the decimal point 1, 2 or 3 places left.

Whole-number divisor Divide normally and place the decimal point in the quotient.

Decimal divisor Multiply both dividend and divisor by the same power of 10 to make the divisor a whole number.

Check Divisor x quotient should give the dividend, allowing for rounding.

17. Fraction to Decimal

Method Divide numerator by denominator.

Terminating decimal A fraction in lowest terms has a terminating decimal when its denominator has no prime factors other than 2 and/or 5.

Repeating decimal Some fractions produce decimals whose digits repeat indefinitely.

18. Decimal to Fraction

One decimal place Write the decimal over 10, then simplify.

Two decimal places Write the decimal over 100, then simplify.

Three decimal places Write the decimal over 1000, then simplify.

General rule Number of decimal places determines the power of 10 in the denominator.

19. Fractions, Decimals & Benchmarks

Common equivalences $\frac{1}{2} = 0.5$; $\frac{1}{4} = 0.25$; $\frac{3}{4} = 0.75$.

Useful benchmark $\frac{1}{10} = 0.1$; $\frac{1}{5} = 0.2$; $\frac{1}{100} = 0.01$.

Whole $1 = 1.0 = 1.00 = 1.000$.

Fractions, Decimals & Percent Connections

Useful links for everyday maths and later topics

20. Fraction to Percent

Formula	Fraction $\times$ 100% = percentage.
Example structure	$\frac{3}{4} \times 100\% = 75\%$.
Alternative	Convert the fraction to a decimal, then multiply by 100.

21. Decimal to Percent

Formula	Decimal $\times$ 100 = percentage.
Example structure	$0.35 \times 100 = 35\%$.
Reverse	Percentage divided by 100 = decimal.

22. Percentage of a Quantity

Formula	Percentage of quantity = percentage/100 $\times$ quantity.
Fraction connection	A percentage is a fraction with denominator 100.
Decimal connection	Convert the percentage to a decimal, then multiply by the quantity.

23. Everyday Applications

Money	Use decimals for prices and fractions for parts of a quantity.
Measurement	Fractions and decimals describe parts of units.
Sharing	Fractions represent equal parts of a whole or group.
Data	Decimals, fractions and percentages can describe proportions.
Cooking	Fractions are commonly used for parts of cups, quantities and ingredients.

Quick Reference & Common Mistakes

Fast reminders for teaching, revision and self-checking

24. Quick Conversion Reference

Fraction to decimal	Divide numerator by denominator.
Decimal to fraction	Write over 10, 100, 1000, etc., then simplify.
Fraction to percent	Multiply by 100%.
Decimal to percent	Multiply by 100.
Percent to decimal	Divide by 100.

25. Common Mistakes to Watch

Denominators	Do not add or subtract denominators when adding or subtracting fractions.
Equivalent fractions	If you multiply the denominator, multiply the numerator by the same number.
Decimal alignment	Align decimal points, not the last digits.
Decimal multiplication	Remember to count total decimal places.
Division	When the divisor is a decimal, make it a whole number by multiplying both numbers by the same power of 10.

26. Calculation Checks

Estimate	Round numbers first and predict the approximate answer.
Inverse operations	Use multiplication to check division and division to check multiplication.
Reasonableness	Check that the answer is the correct size and sign.
Simplify	Give fractions in lowest terms unless another form is requested.

Maths Connects Us All

Fractions and decimals may appear in different forms, but they represent the same mathematical ideas and help us describe quantities precisely.