IGCSE MATHEMATICS 0580 · CHAPTER 1 NOTES · ~20 MIN READ

Number toolkit

The foundations of every IGCSE Maths paper: types of number, primes with HCF and LCM, Venn diagrams, fractions, rounding and bounds, index laws, standard form and surds, with every step shown.

Types of number | Primes, HCF & LCM | Sets | Fractions | Rounding & bounds | Indices | Standard form | Surds

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No tag = **Core** (everyone) EXTENDED Extended only highlight = comes up again and again

Test yourself at the end

IN 30 SECONDS

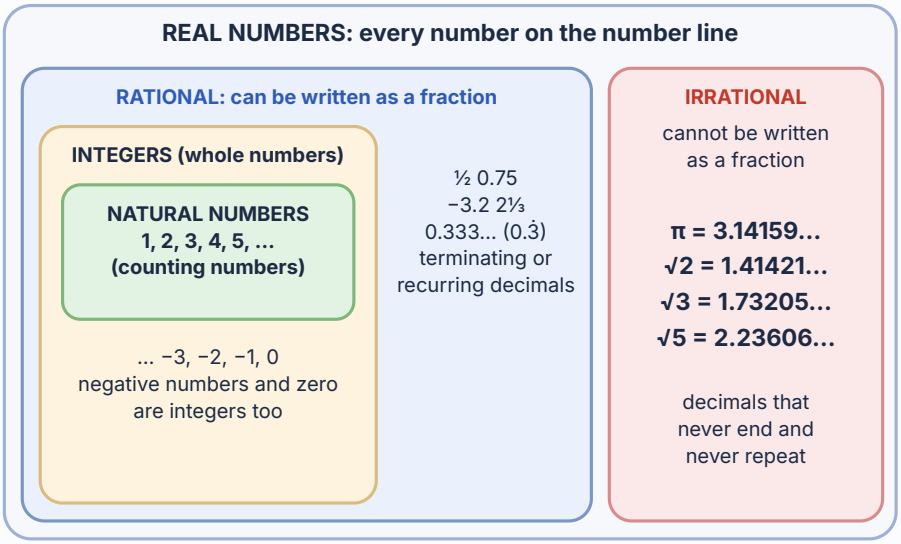
- Every number belongs to a **family**: natural, integer, rational or irrational. **Prime factors** give the **HCF** and **LCM**, and **Venn diagrams** show how sets overlap.
- Follow **BIDMAS**, make **denominators equal** before adding fractions, and **round only at the end**. **Index laws** and **standard form** make very big and very small numbers easy to handle.
- **Extended:** change **recurring decimals** to fractions, find **bounds** of calculations, and simplify and rationalise **surds**.

BY THE END YOU CAN

- Identify natural numbers, integers, primes, squares, cubes, factors, multiples, rational and irrational numbers and reciprocals.
- Write a number as a product of prime factors and find the HCF and LCM.
- Use set notation and Venn diagrams, and solve problems with them.
- Use BIDMAS, work with negative numbers and calculate with fractions, decimals and percentages.
- Round to decimal places and significant figures, estimate, and give the limits of accuracy of a rounded value.
- Use the index laws with positive, zero and negative powers, and write numbers in standard form.
- Change recurring decimals into fractions. EXT
- Find upper and lower bounds in calculations. EXT
- Use fractional indices, calculate in standard form and simplify and rationalise surds. EXT

1 Types of number

The number family



Every number you meet in IGCSE is real. It is either rational (a fraction exists) or irrational (it does not).

Integer — a **whole number**: positive, negative or zero (..., −2, −1, 0, 1, 2, ...).

Prime number — a number with **exactly two factors**: 1 and itself.

Rational number — a number that can be written as a **fraction** of two integers. It is a **terminating** or **recurring** decimal.

Irrational number — a number that **cannot** be written as a fraction. Its decimal **never ends and never repeats**, for example π and √2.

Reciprocal — the number you **multiply by to get 1**. The reciprocal of x is 1 ÷ x.

- **Factors** of 12 are the numbers that **divide into** it: 1, 2, 3, 4, 6, 12. **Multiples** of 12 are its **times table**: 12, 24, 36, ...
- **Square numbers:** 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225. **Cube numbers:** 1, 8, 27, 64, 125.
- **Primes up to 50:** 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47. 1 is not prime, and **2 is the only even prime**.
- The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$. The reciprocal of 5 is $\frac{1}{5}$. The reciprocal of 0.25 is 4. **Zero has no reciprocal.**

COMMON MISTAKE

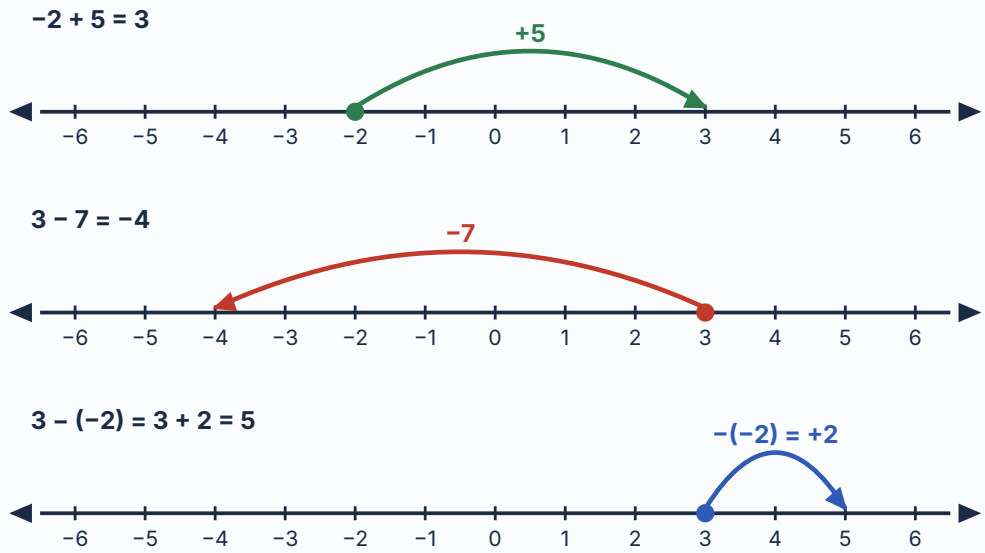
"√9 = 3, so it is irrational." **No.** A root is only irrational if it is **not exact**. √9 = 3 is **rational**, but √2 and √7 are irrational.

WORKED EXAMPLE

Which of these are irrational? π, √16, 0.7, √5, $\frac{22}{7}$

1. **π** is irrational (its decimal never ends or repeats)
2. √16 = 4 is **rational**
3. 0.7 = $\frac{7}{10}$ is **rational**
4. **√5** is irrational (5 is not a square number)
5. $\frac{22}{7}$ is a fraction, so it is **rational** (it is only an approximation to π)
6. **answer: π and √5**

Negative numbers



On the number line, adding moves right and subtracting moves left. Subtracting a negative moves right.

- **Adding a negative = subtracting**: 5 + (−2) = 3. **Subtracting a negative = adding**: 5 − (−2) = 7.
- **Multiplying or dividing: same signs → positive, different signs → negative.** (−4) × (−6) = 24, (−12) ÷ 3 = −4.

WORKED EXAMPLE

Work out −7 + 12 − (−3) − 5.

1. −7 + 12 = **5**
2. 5 − (−3) = 5 + 3 = **8**
3. **8 − 5 = 3**

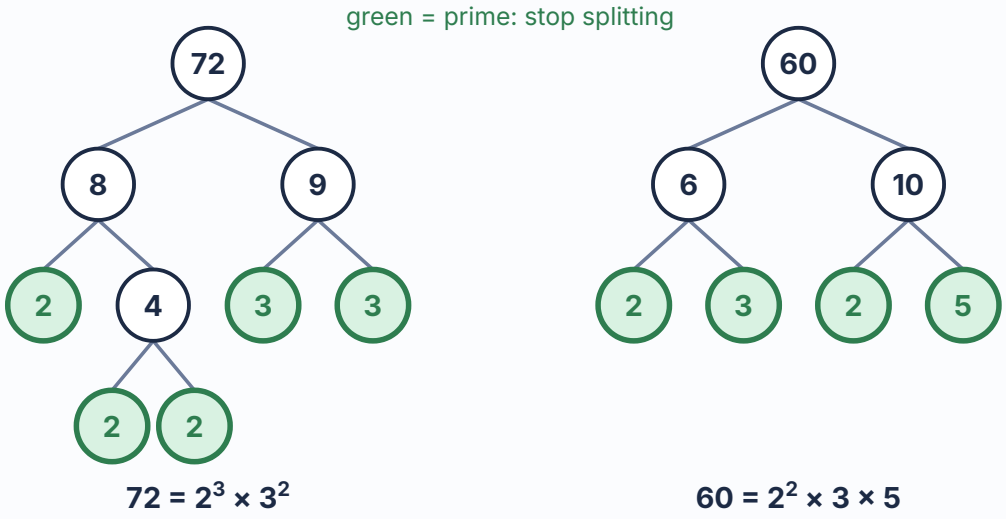
EXAM TIP

On a calculator use the **(−)** key for a negative number, and put **brackets** around it: $(-3)^2 = 9$ but $-3^2 = -9$.

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2 Factors, multiples and primes

Prime factors



$72 = 2^3 \times 3^2$

$60 = 2^2 \times 3 \times 5$

Keep splitting until every branch ends in a prime. Write the primes with powers.

- **Prime factor decomposition:** write the number as a **product of primes**. Use a **factor tree**: split into any two factors, then keep splitting the composite ones.
- $72 = 2 \times 2 \times 2 \times 3 \times 3 = \mathbf{2^3 \times 3^2}$. $60 = \mathbf{2^2 \times 3 \times 5}$. Write the **smallest prime first**.

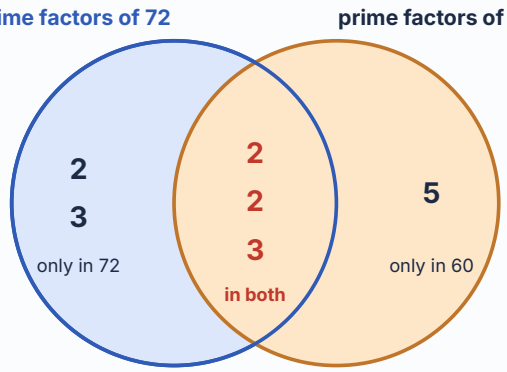
WORKED EXAMPLE

Write 360 as a product of prime factors.

1. $360 = 36 \times 10$
2. $36 = 6 \times 6 = 2 \times 3 \times 2 \times 3$ and $10 = 2 \times 5$
3. collect: $2 \times 2 \times 2 \times 3 \times 3 \times 5$
4. $= \mathbf{2^3 \times 3^2 \times 5}$

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HCF and LCM



HCF = multiply the overlap = 2 × 2 × 3 = 12
(the biggest number that divides both)

LCM = multiply every number, overlap once: 2×3×2×2×3×5 = 360
(the smallest number both go into)

Put the prime factors in a Venn diagram. The overlap gives the HCF, and everything (overlap once) gives the LCM.

HCF — the **highest common factor**: the **biggest number that divides into both** numbers.

LCM — the **lowest common multiple**: the **smallest number that both** numbers divide into.

- **Prime factor method:** HCF = **lowest power** of each **shared** prime. LCM = **highest power** of **every** prime that appears.
- $72 = 2^3 \times 3^2$ and $60 = 2^2 \times 3 \times 5$. HCF = $2^2 \times 3$ = **12**. LCM = $2^3 \times 3^2 \times 5$ = **360**.

EXAM TIP

Check: HCF × LCM = the **product** of the two numbers. 12 × 360 = 4 320 = 72 × 60. ✓

WORKED EXAMPLE

A bus leaves a station every 12 minutes and a tram every 18 minutes. Both leave at 08:00. When do they next leave together?

1. you need the **LCM** of 12 and 18
2. $12 = 2^2 \times 3$ and $18 = 2 \times 3^2$
3. LCM = $2^2 \times 3^2$ = **36**
4. **they leave together again at 08:36**

WORKED EXAMPLE

Find the HCF and LCM of 24 and 36.

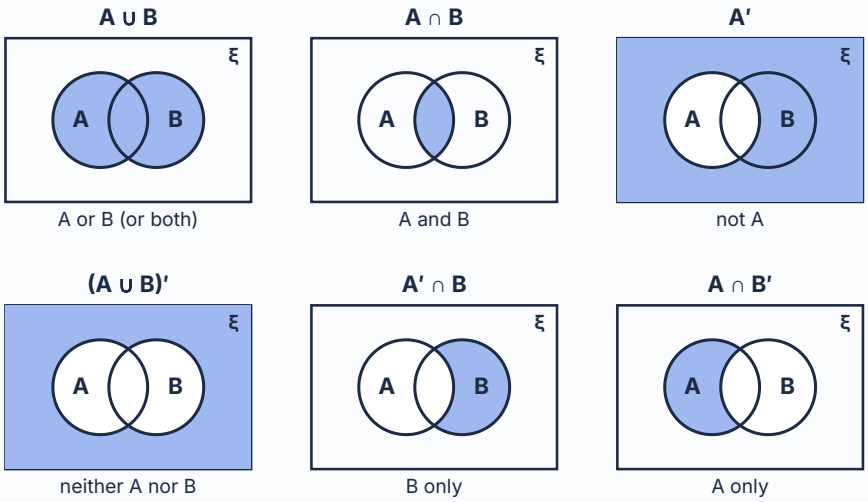
1. $24 = 2^3 \times 3$ and $36 = 2^2 \times 3^2$
2. HCF = lowest powers = $2^2 \times 3$ = **12**
3. LCM = highest powers = $2^3 \times 3^2$ = **72**
4. **check: 12 × 72 = 864 = 24 × 36 ✓**

3 Sets and Venn diagrams

Set language

Symbol	Meaning	Example
ξ	the **universal set**: everything we are considering	ξ = {1, 2, ..., 10}
∈	**is an element of**	3 ∈ {1, 2, 3}
∉	**is not** an element of	5 ∉ {1, 2, 3}
A ∪ B	**union**: in A **or** B (or both)	{1, 2} ∪ {2, 3} = {1, 2, 3}
A ∩ B	**intersection**: in A **and** B	{1, 2} ∩ {2, 3} = {2}
A′	the **complement**: **not** in A	everything in ξ except A
n(A)	the **number** of elements in A	n({4, 6, 8}) = 3
∅ or { }	the **empty set**	no elements
A ⊂ B	A is a **subset** of B (all of A is inside B)	{2} ⊂ {1, 2, 3}

Shading regions



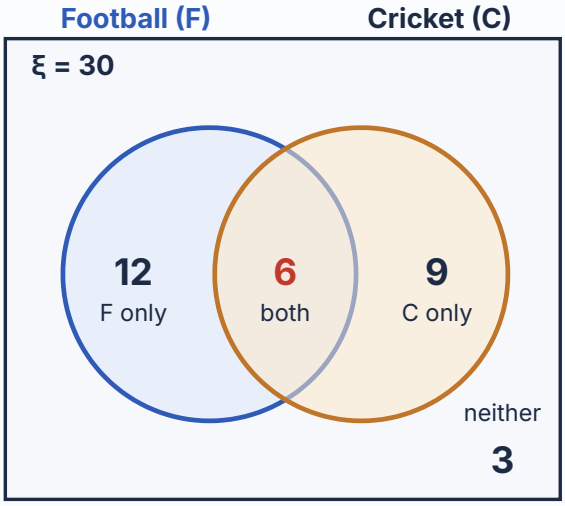
Shade the region that matches the words: or = union, and = intersection, not = complement.

- Read the **symbols as words**: ∪ = "or", ∩ = "and", ′ = "not". Then find which parts of the diagram match.
- For a **complement**, shade **everything outside** the set, including the area outside both circles.

COMMON MISTAKE

Leaving out the area **outside the circles**. In A′ the shading covers B-only **and** the region inside the rectangle but outside both circles.

Problems with Venn diagrams



n(F) = 18, n(C) = 15
n(F ∩ C) = 6, none = 3
1 Both: write 6 first
2 F only = 18 − 6 = 12
3 C only = 15 − 6 = 9
4 Neither = 30 − 27 = 3
n(F ∪ C) = 18 + 15 − 6 = 27

Fill the overlap first, then work outwards, then find the number in neither set.

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

subtract the overlap so it is not counted twice

- **Method:** (1) write the number in **both** sets **first**; (2) subtract it from each total to find **"only"** numbers; (3) **add everything** and take it from the total to find **"neither"**.

WORKED EXAMPLE

In a class of 40, 24 speak French (F), 20 speak Spanish (S) and 8 speak both. How many speak neither?

1. both = **8**
2. French only = 24 − 8 = **16**, Spanish only = 20 − 8 = **12**
3. in at least one language = 16 + 8 + 12 = **36**
4. **neither = 40 − 36 = 4**

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Order of operations

B **Brackets** ( )

↓

I **Indices** powers and roots

↓

DM **Divide / Multiply** left to right

↓

AS **Add / Subtract** left to right

Work out $3 + 4 \times 2^2$

$3 + 4 \times 2^2$

↓

$3 + 4 \times 4$ power first

↓

$3 + 16$ multiply

↓

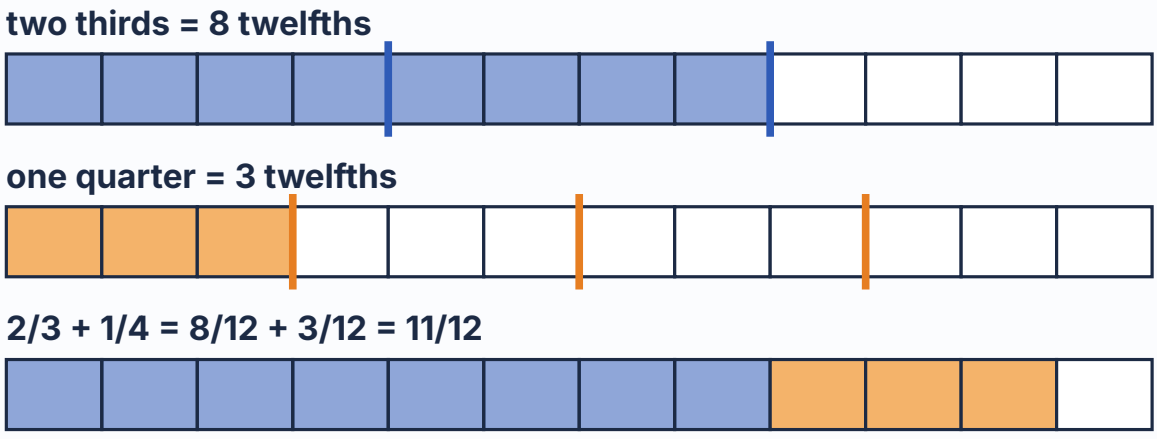
19 add last

NOT $7 \times 4 = 28$ (adding first is wrong)

Brackets, then Indices, then Divide and Multiply (left to right), then Add and Subtract (left to right).

- **BIDMAS** (or BODMAS). Operations of the **same level** are done **left to right**: $12 \div 3 \times 2 = 4 \times 2 = \mathbf{8}$ (not 2).
- A fraction line acts as a **bracket**: $\frac{5+7}{2\times3}$ means $(5 + 7) \div (2 \times 3) = 2$.

Fractions



Same denominator first (12), then add the numerators.

To add or subtract, make the denominators the same. The numerators then add as whole numbers.

- **Add / subtract:** common denominator, then add or subtract the numerators: $\frac{2}{3} + \frac{1}{4} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12}$.
- **Multiply:** top × top, bottom × bottom (cancel first): $\frac{2}{3} \times \frac{9}{10} = \frac{3}{5}$.

- **Divide:** keep, change, flip : $\frac{5}{6} \div \frac{2}{3} = \frac{5}{6} \times \frac{3}{2} = \frac{15}{12} = \frac{5}{4}$.
- **Mixed numbers:** change to **improper** fractions first: $3\frac{1}{2} = \frac{7}{2}$.

- **Fraction of an amount:** divide by the denominator, multiply by the numerator. $\frac{3}{8}$ of 64 = 64 ÷ 8 × 3 = **24**.

WORKED EXAMPLE

Work out $4\frac{1}{3} - 1\frac{5}{6}$.

1. change to improper fractions: $\frac{13}{3} - \frac{11}{6}$
2. common denominator 6: $\frac{26}{6} - \frac{11}{6}$
3. = $\frac{15}{6}$
4. **simplify: $\frac{5}{2} = 2\frac{1}{2}$**

WORKED EXAMPLE

Write in order of size (smallest first): $\frac{2}{5}$, 0.38, 37%.

1. change all to decimals
2. $\frac{2}{5}$ = **0.4**, 0.38, 37% = **0.37**
3. **order: 37%, 0.38, $\frac{2}{5}$**

Fraction, decimal and percentage equivalents

Fraction	Decimal	Percentage
1/2	0.5	50%
1/4	0.25	25%
3/4	0.75	75%
1/5	0.2	20%
1/8	0.125	12.5%
1/3	0.333...	33.3...%
2/3	0.666...	66.6...%

- Learn these: they save time in non-calculator papers. To change a **fraction to a percentage**, multiply by 100: $\frac{3}{8}$ = 37.5%.

Recurring decimals as fractions

EXTENDED

- EXT **Algebra method:** let x = the recurring decimal. **Multiply by 10, 100...** so the recurring parts line up, then **subtract**.

WORKED EXAMPLE

EXT **Write 0.454545... (the digits 45 repeat) as a fraction in its simplest form.**

1. let x = 0.454545...
2. 100x = 45.454545...
3. subtract: 99x = 45
4. **x = $\frac{45}{99} = \frac{5}{11}$**

WORKED EXAMPLE

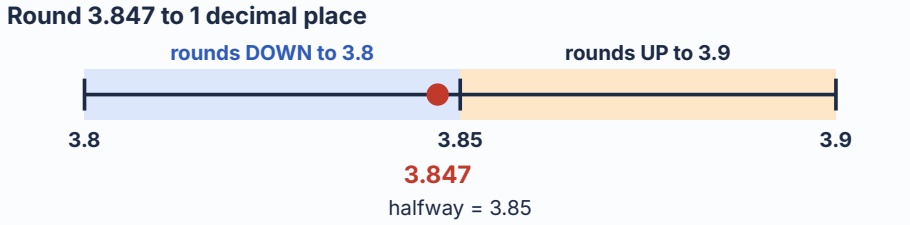
EXT **Write 0.16666... (only the 6 repeats) as a fraction.**

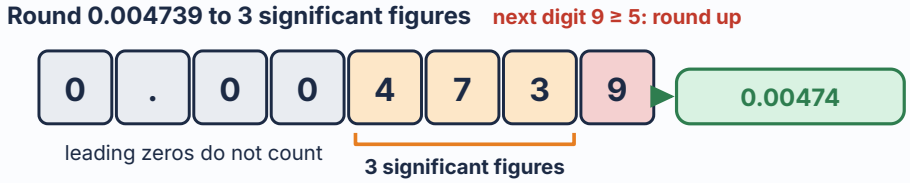
1. let x = 0.1666...
2. 10x = 1.666... and 100x = 16.666...
3. subtract: 90x = 15
4. **x = $\frac{15}{90} = \frac{1}{6}$**

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5 Accuracy

Rounding





5 or more: round UP. 4 or less: stay the same. Count s.f. from the first non-zero digit.

Look at the digit after the one you keep. 5 or more rounds up. Zeros at the start do not count as significant figures.

- **Decimal places (d.p.)** count **after the decimal point**. **Significant figures (s.f.)** count from the **first non-zero digit**.
- 45 678 → **46 000** (2 s.f.). 0.004739 → **0.00474** (3 s.f.). 5.9996 → **6.00** (2 d.p.).

EXAM TIP

Give answers to **3 significant figures** unless the question says otherwise (angles to **1 decimal place**). **Keep the full calculator value** until the last step, then round.

COMMON MISTAKE

Rounding in the **middle** of a calculation. This builds up errors and loses the accuracy mark.

Estimation

- **Round every number to 1 significant figure** first, then calculate. It checks that a calculator answer is sensible.

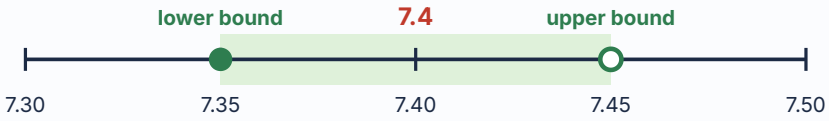
WORKED EXAMPLE

Estimate $\frac{48.7 \times 3.1}{0.52}$.

1. round to 1 s.f.: 48.7 → 50, 3.1 → 3, 0.52 → 0.5
2. $\frac{50 \times 3}{0.5} = \frac{150}{0.5}$
3. **= 300**

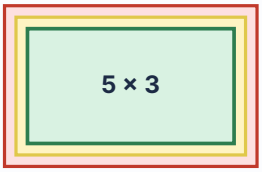
Upper and lower bounds

7.4 cm measured to 1 decimal place



7.35 ≤ L < 7.45 (half a unit either side; the upper bound is not reached)

Rectangle 5 cm × 3 cm, each side to the nearest cm



inner = lower bounds, outer = upper bounds

smallest area: 4.5 × 2.5 = 11.25
largest area: 5.5 × 3.5 = 19.25

lower × lower = lowest
upper × upper = highest

A value of 7.4 cm to 1 d.p. lies from 7.35 up to, but not including, 7.45.

- A rounded value is **somewhere in an interval**. Go **half a unit** either side: 7.4 cm (1 d.p.) → **7.35 ≤ L < 7.45**. The **upper bound** is not reached, but we use it in calculations.
- EXT **Smallest sum / difference / product / quotient:**

Calculation	Largest answer	Smallest answer
a + b	upper + upper	lower + lower
a − b	upper − lower	lower − upper
a × b	upper × upper	lower × lower
a ÷ b	upper ÷ lower	lower ÷ upper

WORKED EXAMPLE

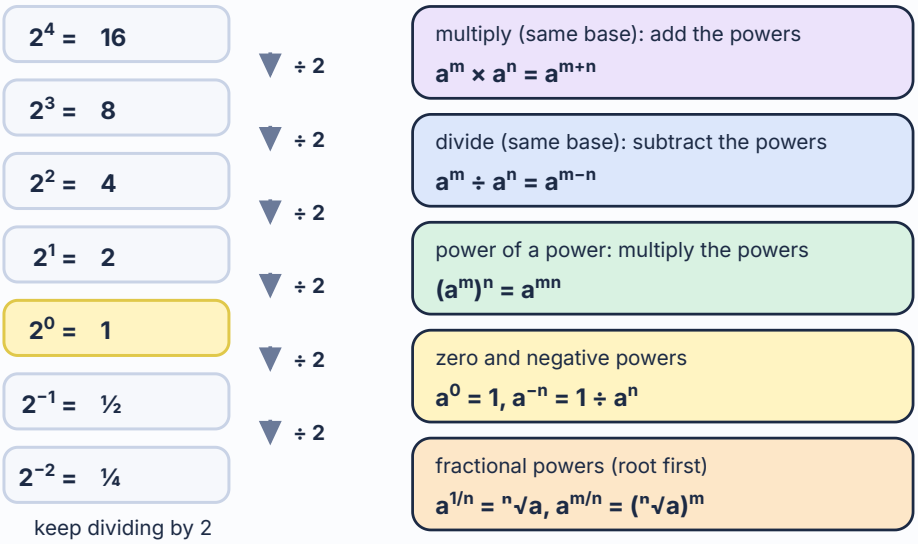
EXT **A runner covers 120 m (nearest 10 m) in 15 s (nearest second). Find the greatest possible speed.**

1. distance: 115 ≤ d < 125, time: 14.5 ≤ t < 15.5
2. speed = distance ÷ time
3. greatest speed = **upper distance ÷ lower time**
4. **= 125 ÷ 14.5 = 8.62 m/s (3 s.f.)**

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6 Powers, roots and standard form

Index laws



Add the powers when multiplying, subtract when dividing, multiply when raising a power to a power.

- **Same base only.** $a^3 \times a^4 = \mathbf{a^7}$; $a^8 \div a^3 = \mathbf{a^5}$; $(a^2)^3 = \mathbf{a^6}$. (Algebra uses the same laws with letters.)
- **Zero:** $a^0 = \mathbf{1}$. **Negative:** $a^{-n} = \frac{1}{a^n}$, so $2^{-3} = \frac{1}{8}$. A negative power means **reciprocal**, not a negative number.
- EXT **Fractional:** $a^{1/n}$ = **n-th root** of a; $a^{m/n} = (\sqrt[n]{a})^m$. **Root first**, then the power.

WORKED EXAMPLE

EXT **Work out $8^{-2/3}$.**

1. the **denominator 3** means **cube root**: $\sqrt[3]{8} = \mathbf{2}$
2. the **numerator 2** means square: $2^2 = \mathbf{4}$
3. **the negative means reciprocal: $\frac{1}{4}$**

WORKED EXAMPLE

Simplify $(2x^3)^2 \times 3x^{-1}$.

1. $(2x^3)^2 = 2^2 \times x^6 = \mathbf{4x^6}$
2. **multiply: $4x^6 \times 3x^{-1} = 12x^5$ (multiply numbers, add powers of x)**

WORKED EXAMPLE

EXT **Solve $2^{x+1} = 32$.**

1. write 32 as a power of 2: $32 = \mathbf{2^5}$
2. the bases match, so the powers match: $x + 1 = 5$
3. **$x = 4$**

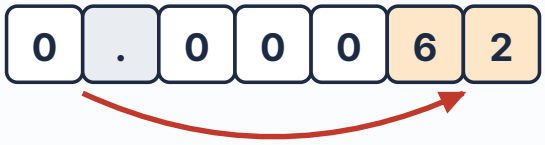
Standard form

45 000 → 4.5×10^4



4.5×10^4

0.00062 → 6.2×10^{-4}



6.2×10^{-4}

big number: power is +
small number: power is –

Standard form is A × 10^n with A between 1 and 10. Count how many places the decimal point moves.

- **$A \times 10^n$** with **$1 \leq A < 10$** and **n an integer**. **Big numbers: n positive. Small numbers: n negative.**
- 45 000 = **4.5×10^4**. 0.00062 = **6.2×10^{-4}**. And 7.5×10^{-3} = 0.0075.
- EXT **Multiply / divide:** multiply or divide the **A parts**, and use the index laws on the **powers**. Adjust the answer if A is not between 1 and 10.
- EXT **Add / subtract:** write both with the **same power of 10** first.

COMMON MISTAKE

45×10^3 or 0.45×10^5 is **not** standard form. A must be **at least 1 and less than 10**.

WORKED EXAMPLE

EXT **Work out $(4 \times 10^6) \times (5 \times 10^3)$. Give the answer in standard form.**

1. multiply the numbers: 4 × 5 = **20**
2. add the powers: $10^6 \times 10^3$ = **10^9**
3. 20×10^9 is **not** standard form
4. **$2 \times 10 \times 10^9 = 2 \times 10^{10}$**

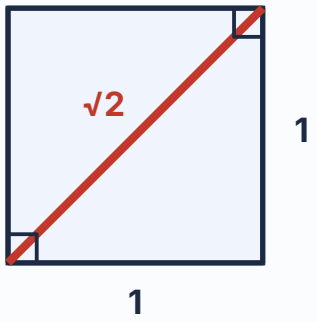
WORKED EXAMPLE

EXT **Work out $2.5 \times 10^4 + 3.5 \times 10^3$.**

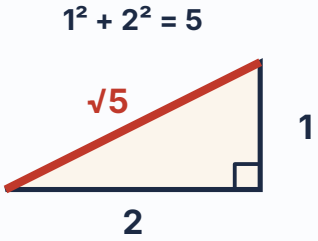
1. same power: 3.5×10^3 = **0.35×10^4**
2. add: 2.5 + 0.35 = **2.85**
3. **answer: 2.85×10^4**

Surds

EXTENDED



Pythagoras: $1^2 + 1^2 = 2$
so the diagonal is $\sqrt{2} = 1.41421...$
The decimal never ends and never repeats,
so $\sqrt{2}$ is irrational.



A surd is a root that is not exact. √2 is the diagonal of a unit square, and its decimal never ends.

Surd — EXT an **irrational root** that cannot be written exactly as a decimal or fraction, for example √2, √3 and 5√7.

- EXT **Rules:** $\sqrt{a} \times \sqrt{b} = \sqrt{(ab)}$, and $\sqrt{a} \div \sqrt{b} = \sqrt{(a \div b)}$. **Simplify** by taking out the **biggest square factor**: $\sqrt{50} = \sqrt{25} \times \sqrt{2} = \mathbf{5\sqrt{2}}$.
- EXT **Add / subtract** only **like surds**: $2\sqrt{3} + 3\sqrt{3} = \mathbf{5\sqrt{3}}$.
- EXT **Rationalise the denominator:** multiply top and bottom by the **surd** (or by the **conjugate** if the denominator is a sum): $\frac{6}{\sqrt{3}} = \frac{6\sqrt{3}}{3} = \mathbf{2\sqrt{3}}$.

WORKED EXAMPLE

EXT **Simplify $\sqrt{12} + \sqrt{27}$.**

1. $\sqrt{12} = \sqrt{4} \times \sqrt{3} = \mathbf{2\sqrt{3}}$
2. $\sqrt{27} = \sqrt{9} \times \sqrt{3} = \mathbf{3\sqrt{3}}$
3. **add like surds: $2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3}$**

WORKED EXAMPLE

EXT **Rationalise the denominator of $\frac{1}{2 + \sqrt{3}}$.**

1. multiply top and bottom by the **conjugate** $(2 - \sqrt{3})$
2. top = $1 \times (2 - \sqrt{3}) = \mathbf{2 - \sqrt{3}}$
3. bottom = $(2 + \sqrt{3})(2 - \sqrt{3}) = 4 - 3 = \mathbf{1}$
4. **answer: $2 - \sqrt{3}$**

MEMORY TRICK

The **conjugate** of $(a + \sqrt{b})$ is $(a - \sqrt{b})$. Multiplying them gives **$a^2 - b$: the square root vanishes**.

7 Test yourself

Test yourself — cover the answers first

QUICK CHECK

1. Is 1 a prime number?
2. List the factors of 18.
3. Write 84 as a product of prime factors.
4. Find the HCF of 36 and 48.
5. Find the LCM of 6 and 8.
6. What is the reciprocal of $\frac{3}{4}$?
7. Work out $(-5) \times (-3) - 4$.
8. Work out $3 + 4 \times 2^2$.
9. Work out $\frac{3}{4} \div \frac{3}{8}$.
10. Write 0.375 as a fraction.
11. Write 0.00473 to 2 significant figures.
12. Write 3.456 to 2 decimal places.
13. Write 7.4 cm (1 d.p.) as an inequality.
14. Simplify $a^5 \times a^{-2}$.
15. Evaluate $5^0 + 2^{-2}$.
16. Write 360 000 in standard form.
17. Write 0.0000805 in standard form.
18. EXT Evaluate $16^{3/4}$.
19. EXT Write 0.777... (7 repeating) as a fraction.
20. EXT Simplify $\sqrt{72}$.
21. EXT Rationalise $\frac{10}{\sqrt{5}}$.
22. EXT Work out $(3 \times 10^5) \div (6 \times 10^2)$ in standard form.
23. EXT A length is 12 cm to the nearest cm. Write its upper bound.

EXAM-STYLE

24. Write 180 as a product of its prime factors. Hence find the HCF of 180 and 150. [4]
25. In a class of 30 students, 18 play tennis (T), 14 play hockey (H) and 6 play neither. Find how many play both, and draw the Venn diagram numbers. [4]
26. Work out $\frac{2}{3} + \frac{3}{4}$ and give the answer as a mixed number. [3]
27. Estimate the value of $\frac{19.8 \times 4.1}{0.48}$, showing the rounding. [2]
28. EXT Write 0.272727... (27 repeating) as a fraction in its simplest form. [3]
29. EXT A square has sides of length 8.5 cm correct to 1 decimal place. Find the lower and upper bounds of its perimeter. [3]
30. EXT Simplify fully $(2 + \sqrt{3})^2$ and show that it is not a rational number. [3]
31. EXT Work out $(6.4 \times 10^5) \div (2 \times 10^2)$ and give your answer in standard form. [2]

Show answers

1. no (it has only one factor)
2. 1, 2, 3, 6, 9, 18
3. $2^2 \times 3 \times 7$
4. 12
5. 24
6. $\frac{4}{3}$
7. 11
8. 19
9. 2
10. $\frac{3}{8}$
11. 0.0047
12. 3.46
13. $7.35 \leq L < 7.45$
14. a^3
15. $\frac{5}{4}$
16. 3.6×10^5
17. 8.05×10^{-5}
18. 8
19. $\frac{7}{9}$
20. $6\sqrt{2}$
21. $2\sqrt{5}$
22. 5×10^2
23. 12.5 cm
24. $180 = 2^2 \times 3^2 \times 5$
    $150 = 2 \times 3 \times 5^2$
    HCF = lowest powers of shared primes = $2 \times 3 \times 5$
    $= 30$
25. in at least one sport = 30 − 6 = 24
    n(T) + n(H) = 18 + 14 = 32
    both = 32 − 24 = 8
    tennis only 10, both 8, hockey only 6, neither 6
26. common denominator 12: $\frac{8}{12} + \frac{9}{12}$
    $= \frac{17}{12}$
    $= 1\frac{5}{12}$
27. 20×4 and 0.5
    $\frac{80}{0.5} = 160$

28. $x = 0.2727\ldots$, $100x = 27.2727\ldots$
    $99x = 27$
    $x = \frac{27}{99} = \frac{3}{11}$

29. side bounds: $8.45 \leq s < 8.55$
    lower perimeter $= 4 \times 8.45 = 33.8$
    upper perimeter $= 4 \times 8.55 = 34.2$

30. $(2 + \sqrt{3})(2 + \sqrt{3}) = 4 + 4\sqrt{3} + 3$
    $= 7 + 4\sqrt{3}$
    $\sqrt{3}$ is irrational, so $7 + 4\sqrt{3}$ is irrational

31. $6.4 \div 2 = 3.2$
    $10^5 \div 10^2 = 10^3$, so 3.2×10^3

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Ask Riyaz Sir

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