

DIRECT PROPORTION

- As one amount **increases**, the other increases in the **same ratio**.
- Double one → double the other. If one is **zero**, so is the other.
- Unitary method**: find the value of **one** first, then multiply.

THE UNITARY METHOD

5 pens cost £3.50. Find the cost of 8.

1 pen: $3.50 \div 5 = £0.70$

8 pens: $0.70 \times 8 = \text{£}5.60$

RECIPES

Scale every ingredient by the **same amount**.

Recipe for **4** uses 200 g flour. For **6**:

$200 \div 4 \times 6 = \text{300 g}$

For **10**: $50 \times 10 = \text{500 g}$

BEST BUYS

Make the comparison **fair** — find the price for **one** of the same thing.

A: 4 for £3.00 → £0.75 each

B: 6 for £4.20 → £0.70 each

B is better value ✓

Or compare **amount per £1** — **more** is better.

ALWAYS SAY WHY

- State the **unit price** for both, then say which is cheaper.
- A comparison with **no working** earns no marks.

EXCHANGE RATES

Rate: £1 = €1.15

£ → €: $\times 1.15$. £200 = **€230**

€ → £: $\div 1.15$. €345 = **£300**

INVERSE PROPORTION

- As one amount **increases**, the other **decreases**.
- The two multiplied together stays the **same**.
- Think: **more** workers → **fewer** days.

INVERSE WORKED EXAMPLE

4 workers take 6 days. How long for 3 workers?

Total work: $4 \times 6 = 24$ worker-days

3 workers: $24 \div 3 = \text{8 days}$

Fewer workers, so it takes **longer** — check it makes sense.

WHICH TYPE IS IT?

Direct	Inverse
Both go up	One up, one down
Cost of items	Workers and time
Recipe amounts	Speed and time

⚠ COMMON EXAM MISTAKES (recurring errors flagged in examiners' reports)

- ✗ Treating an **inverse** situation as direct (3 workers taking **less** time).
- ✗ Best buys: comparing **different amounts** without finding a unit price.
- ✗ Exchange rates: multiplying when you should divide.
- ✗ Rounding the **unit value** too early, so the final answer is out.
- ✗ Giving an answer with **no working** on a "show which is better value" question.
- ✗ Forgetting the **units** (£, g, days) in the answer.

THE FOUR MEASURES

Measure	How to find it
Mode	The most common value
Median	The middle value when ordered
Mean	Total ÷ how many
Range	Largest – smallest

Range is a measure of spread, not an average.

ALL FOUR AT ONCE

3, 7, 7, 9, 14

Mode = **7** (appears twice)

Median = **7** (middle of five)

Mean = $40 \div 5 = 8$

Range = $14 - 3 = 11$

AN EVEN NUMBER OF VALUES

- The median is **halfway between** the two middle values.
- 2, 5, 8, 11 → $(5 + 8) \div 2 = 6.5$
- Order the list first** — every time.

USING TOTALS

Total = mean × how many

5 numbers have a mean of 6 → total = **30**

If a 6th number 13 is added: total = 43, new mean = $43 \div 6 = 7.2$ (1 d.p.)

COMBINED MEAN

Add the **totals**, then divide by the **total number**.

10 pupils, mean 6 → total 60

15 pupils, mean 11 → total 165

$225 \div 25 = 9$

Never just average the two means.

EFFECT OF A NEW VALUE

- A value **above** the mean pulls the mean **up**; below pulls it **down**.
- A new **largest** or **smallest** value changes the **range**.
- The **mode** only changes if a value becomes most common.

WHICH AVERAGE TO USE?

Use	When
Mode	Data is words / categories
Median	There are extreme values
Mean	Uses all the data, no extremes

COMPARING TWO SETS

- Compare **one average** and **the range**.
- Higher **mean** → better on average / higher scores.
- Smaller **range** → more **consistent**.
- Write it **in context**: "Class A had a higher mean, so they scored better on average."

FINDING A MISSING VALUE

Four numbers have a mean of 7 → total 28.

Three of them are 5, 6, 9 (total 20).

Missing value = $28 - 20 = 8$

⚠ COMMON EXAM MISTAKES (recurring errors flagged in examiners' reports)

- ✗ **Not ordering** the list before finding the median.
- ✗ Calling the **range** an average.

- ✗ **Averaging the two means** instead of using totals for a combined mean.
- ✗ Giving the **position** of the median instead of its value.

- ✗ Comparing sets with **no context**, or comparing only one measure.
- ✗ Saying "no mode" when two values tie — there can be **more than one** mode.

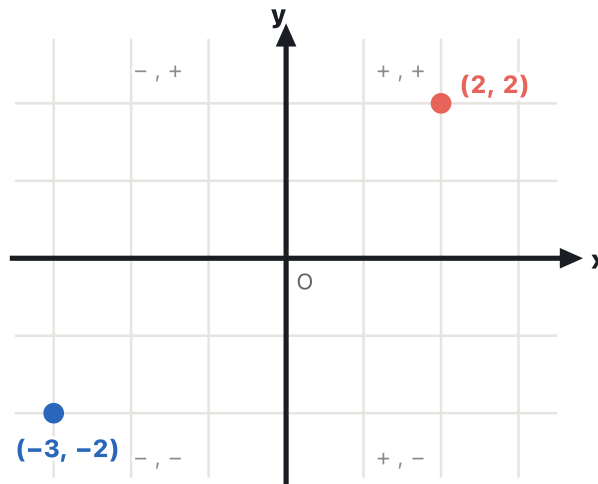
THE BASICS

- Coordinates are written **(x, y)** — always in **brackets**, with a **comma**.
- x** is **across**, **y** is **up** — “along the corridor, then up the stairs”.
- The **origin** is (0, 0).
- The **x-axis** is horizontal; the **y-axis** is vertical.

SIGNS IN EACH QUADRANT

Quadrant	x	y
Top right	+	+
Top left	−	+
Bottom left	−	−
Bottom right	+	−

THE FOUR QUADRANTS



Read the **x** value first, then the **y** value.

PLOTTING & READING

- To **plot**: start at the origin, go **across** by x, then **up or down** by y.
- Mark the point with a small, neat **cross** or dot.
- To **read** a point, drop straight down to the x-axis and across to the y-axis.

COORDINATES WITH SHAPES

Three corners of a rectangle are (1, 1), (5, 1) and (1, 4). Find the fourth.

Opposite sides are equal and parallel.

The fourth corner is **(5, 4)**

Sketch it — the missing point becomes obvious.

MIDPOINT OF A LINE

- The midpoint is **halfway** in both directions — average the x values and the y values.
- Midpoint of (2, 3) and (8, 7) is **(5, 5)**.

⚠ COMMON EXAM MISTAKES (recurring errors flagged in examiners' reports)

✗ Writing the coordinates the **wrong way round** — y before x.

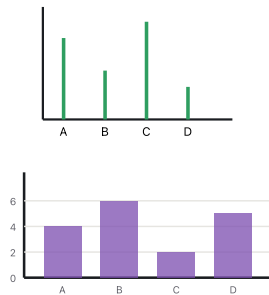
✗ Getting the **sign** wrong in the negative quadrants.

✗ Miscalculating the squares, especially when one square is not one unit.

✗ Leaving out the **brackets** or the **comma**.

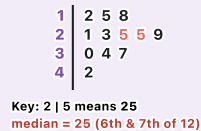
✗ Plotting a point **between** gridlines instead of on the intersection.

BAR CHARTS & VERTICAL LINE CHARTS



- Label both axes and use an **even scale**.
- Bars are the **same width** with **gaps** between them.
- A **vertical line chart** is the same but with lines instead of bars.
- A **dual** bar chart compares two sets — it needs a **key**.

STEM AND LEAF DIAGRAMS

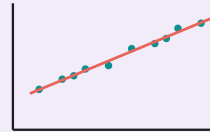


- The **stem** is the tens digit, the **leaf** is the units digit.
- Leaves are written in **order**, smallest first, with a **key**.
- Key: 2 | 5 means 25.
- Because it is ordered, the **median** is easy to read off.

TWO-WAY TABLES

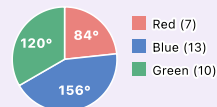
- Fill gaps using the **row and column totals**.
- Check the totals add up **both ways**.

SCATTER DIAGRAMS



- Show whether two things are **linked** (correlation).
- **Positive:** as one goes up, so does the other.
- **Negative:** as one goes up, the other goes down.
- **No correlation:** points are scattered with no pattern.
- An **outlier** is a point that does not fit the pattern.
- A **straight** line following the trend, with roughly **equal numbers of points** each side.
- Use it to **estimate** a missing value.

PIE CHARTS



The whole circle is **360°** and shows the **whole** set.

Angle for each item = $\frac{360}{\text{total}} \times \text{frequency}$

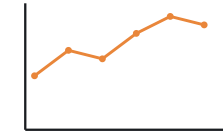
30 people $\rightarrow 360 \div 30 = 12^\circ$ per person

7 people $\rightarrow 7 \times 12 = 84^\circ$

Angles must total **360°** — always check.

- A pie chart shows **proportions**, not amounts — you need the total to find a frequency.
- Two pie charts can look the same but represent **different totals**.

LINE GRAPHS & TIME SERIES



- Used for data over **time** — join the points with straight lines.
- Describe the **trend**: rising, falling, or steady.
- Points **between** plotted values are only an estimate.

WORKED PIE CHART

Colour	Freq	Angle
Red	7	84°
Blue	13	156°
Green	10	120°
Total	30	360°

30 people $\rightarrow 360 \div 30 = 12^\circ$ each. Angles **must** total 360°.

PICTOGRAMS



- Every pictogram **must have a key**, e.g. "● = 4 people".
- Use **part symbols** for part values — half a symbol is half the key value.
- Read the **key** first — the symbol is rarely worth 1.
- Key ● = 4: ●●● = 12, ●●● = 10.

⚠ **COMMON EXAM MISTAKES** (recurring errors flagged in examiners' reports)

- ✗ Pictograms: ignoring the **key** and counting symbols as 1 each.
- ✗ Pie charts: angles that do **not** total 360°.

- ✗ Reading a **frequency** straight off a pie chart without the total.
- ✗ Stem and leaf with **no key**, or leaves not in order.

- ✗ Line of best fit drawn **through the origin** or as a curve joining dots.
- ✗ Saying correlation **proves cause**.