

Mean, median and mode answer one question — **what is a typical value?** — in three different ways.

The three measures at a glance

Measure	What it tells you	Grouped-data formula
Mean ($\bar{x}$)	The arithmetic average of all the values	$\bar{x} = \Sigma f_i x_i / \Sigma f_i$
Median	The middle-most value of the ordered data	$l + ((n/2 - cf) / f) \times h$
Mode	The most frequent value	$l + ((f_1 - f_0) / (2f_1 - f_0 - f_2)) \times h$

Class mark = (upper limit + lower limit)/2. It is the x_i the mean formula needs, so every grouped-data answer starts with that column. Classes must be **continuous** before the median and mode formulas are applied.

One data set, all three answers

Class	0–10	10–20	20–30	30–40	40–50
Frequency f_i	7	10	15	8	10
Class mark x_i	5	15	25	35	45
$f_i x_i$	35	150	375	280	450
Cumulative cf	7	17	32	40	50

Mean $\Sigma f_i = 50$ and $\Sigma f_i x_i = 1290$, so $\bar{x} = 1290/50 = 25.8$. **Median** $n/2 = 25$, so the median class is 20–30: $20 + ((25 - 17)/15) \times 10 = 25.33$. **Mode** modal class 20–30: $20 + ((15 - 10)/(30 - 10 - 8)) \times 10 = 24.17$.

Empirical check. $3 \times 25.33 = 76.00$ against $\text{Mode} + 2 \text{Mean} = 24.17 + 51.60 = 75.77$. Close, not equal — $3 \text{Median} = \text{Mode} + 2 \text{Mean}$ is an approximation, and this is what “close” looks like.

What the picture has to show



Left: symmetric data — all three sit on the peak. Right: a right-skewed tail — mode at the peak, median next, mean pulled furthest along the tail.

NCERT and CBSE scope. All three measures are **Chapter 13, Statistics**. The mean is taught in **Section 13.2** but drilled in **Exercise 13.1** (9 questions) — §13.1 is only the introduction, the same offset as Chapters 3 and 9. The scope covers the mean by the **direct, assumed mean and step-deviation** methods (all three are still examinable — the “deleted” lists online are quoting the temporary 2020–21 reduced syllabus), the median and mode of grouped data, and the relationship between them. **Drawing the ogive was removed**; cumulative frequency itself stays, because the median needs it. Statistics and Probability together carry **11 of the 80** theory marks, and CBSE publishes no separate figure for this chapter.

Key takeaways

- ▶ **Mean** uses every value, **median** ignores extremes, **mode** counts popularity. Pick by what the question needs.
- ▶ **Class marks first.** Class limits in the $f_i x_i$ column make every later line wrong.
- ▶ **cf is the class before** the median class — not the median class itself.
- ▶ **f_0 is below, f_2 is above** the modal class. Swapping them changes the answer silently.
- ▶ **$3 \text{Median} = \text{Mode} + 2 \text{Mean}$** is approximate. Use it to estimate a third value, never to check an exact answer.
- ▶ **Symmetric data: all three coincide.** They separate only when the data is skewed — and then the mode sits at the peak.

SYMMETRIC DATA · 3 MARKS

Find the mean, median and mode of: **0-20: 4 · 20-40: 6 · 40-60: 10 · 60-80: 6 · 80-100: 4.**

Step 1 — mean. Class marks 10, 30, 50, 70, 90. $\Sigma f_i = 30$ and $\Sigma f_i x_i = 40 + 180 + 500 + 420 + 360 = 1500$, so $\bar{x} = 1500/30 = 50$.

Step 2 — median. cf = 4, 10, 20, 26, 30 and $n/2 = 15$, so the median class is 40-60 ($l = 40$, $cf = 10$, $f = 10$, $h = 20$).
Median = $40 + ((15 - 10)/10) \times 20 = 50$.

Step 3 — mode. Modal class 40-60 with $f_1 = 10$, $f_0 = 6$, $f_2 = 6$. Mode = $40 + ((10 - 6)/(20 - 6 - 6)) \times 20 = 50$.

Check: the table is symmetric about 50, so all three *must* land on 50 — and the empirical relationship holds exactly: $3(50) = 50 + 2(50)$. This is why a symmetrical bell curve cannot have mean, median and mode marked at three different points.

SKEWED DATA · 3 MARKS

Same three formulas, on **0-10: 8 · 10-20: 15 · 20-30: 12 · 30-40: 6 · 40-50: 4.**

Mean. $\Sigma f_i = 45$, $\Sigma f_i x_i = 40 + 225 + 300 + 210 + 180 = 955$, so $\bar{x} = 955/45 = 21.22$.

Median. cf = 8, 23, 35, 41, 45 and $n/2 = 22.5$, so the median class is 10-20. Median = $10 + ((22.5 - 8)/15) \times 10 = 19.67$.

Mode. Modal class 10-20 with $f_1 = 15$, $f_0 = 8$, $f_2 = 12$. Mode = $10 + ((15 - 8)/(30 - 8 - 12)) \times 10 = 17.00$.

Check: in increasing order the three answers run Mode 17.00, then Median 19.67, then Mean 21.22 — the long tail is on the right, and the mean is the one dragged furthest towards it. Empirically $3(19.67) = 59.00$ against $17.00 + 2(21.22) = 59.44$.

WHICH MEASURE WOULD YOU REPORT?

The situation	Report	Because
Average marks of two classes	Mean	Uses every value; no outliers.
Wages with a few top earners	Median	Extremes cannot move it.
Shoe size a shop should stock	Mode	You want the commonest item.

WHERE THE MARKS ACTUALLY GO

- ▶ **Class limits in the $f_i x_i$ column** instead of class marks — the mean and everything after it is lost.
- ▶ **cf read off the median class** rather than the class before it — a whole class size of error.
- ▶ **f_0 and f_2 taken from the wrong side** of the modal class, which usually still gives a plausible-looking number.
- ▶ **No table.** The class-mark, $f_i x_i$ and cf columns carry method marks; a bare final answer collects none of them.
- ▶ **Reporting the wrong measure.** Mean to compare two groups, median when a few extreme values distort, mode for the most common item.

NOW TRY THIS ONE

Find all three for **0-10: 6 · 10-20: 16 · 20-30: 12 · 30-40: 10 · 40-50: 6**, then say which measure you would report if the top class held one unusually large value.

Answers: $\Sigma f_i = 50$, $\Sigma f_i x_i = 1190$ so Mean = **23.80**; cf = 6, 22, 34, 44, 50 and $n/2 = 25$ gives median class 20-30 and

Median = **22.50**; modal class 10-20 gives Mode = $10 + ((16 - 6)/(32 - 6 - 12)) \times 10 = 17.14$. Report the **median** — it is the one an extreme value cannot move.

Practise all three measures on examfront

- ✓ **Chapter 1 is free** — start today, no payment and no card needed.
- ✓ **Mistake identification** tells you whether you lost the mark on class marks, on cf, or on choosing the wrong measure.
- ✓ **Anytime tests** let you drill mean, median and mode the moment you finish a section.
- ✓ **Weekly tests** keep Statistics warm while you move on to the next chapter.
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