Unit 21 · Statistics

STUDY NOTES

WHAT THE BLE ASKS

- **CDC's grid:** Statistics: 3 of 50 marks
- **In our 10 model papers:** 1-mark ×10 · 2-mark ×10
- **Model paper, question 12a (1 mark, application):** a family's spending in four months, in a table: find the monthly average
- **Model paper, question 12b (2 marks, application):** present that spending in a pie chart

Key terms

Pie chart: a circle that stands for the whole of the data, cut into slices, one for each heading.

Sector: a slice: the part between two radii.

Individual series: a plain list of values, one for each person or thing.

Mean $\overline{X}$: the sum divided by how many there are; also the arithmetic mean, or the average.

Median M_d: the value that divides the data, in order, into two equal parts.

Mode M_o: the value repeated the most times.

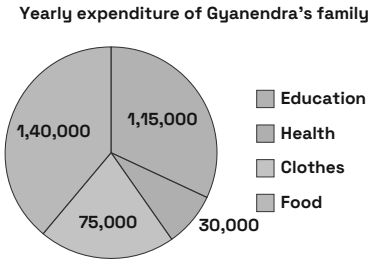
Formulas

$\frac{\text{value}}{\text{total}} \times 360^\circ$	the angles add up to 360° **Use:** the angle of a sector
$\frac{\text{total}}{360}$	what 1° stands for **Use:** reading angles back
$\overline{X} = \frac{\Sigma X}{n}$	ΣX, "sigma X": the sum; n: how many **Use:** the mean
$\left(\frac{n+1}{2}\right)$th item	n odd, values in order **Use:** the median
$M_d = \frac{a+b}{2}$	n even; a: the $\left(\frac{n}{2}\right)$th item; b: the next **Use:** the median

Drawing a pie chart

1. find the total of the data
2. find each heading's angle
3. check the angles add up to 360°
4. draw a circle and one radius
5. with a protractor, draw each angle in turn, **from the last line**
6. color each sector and show the colors in a key
7. give the chart a title

- after rounding, the angles may miss by 1°: change the sector that was rounded most
- a pie is for parts of **one whole**: if students may tick two favorite games, the answers add up to more than the class: use a bar graph
- a line or bar graph compares headings with each other; a pie chart shows how a whole is shared out



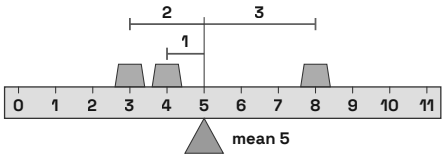
Rs 3,60,000 in all, so each Rs 1,000 is 1°: education Rs 1,15,000 is 115°, health Rs 30,000 is 30°, clothes Rs 75,000 is 75°, food Rs 1,40,000 is 140°.

Reading a pie chart

- it is the same sum backward
- if the chart shows the numbers, add them
- if it shows the angles, first find what 1° stands for
- one amount known: food Rs 8,500 at 68°: 1° = Rs 125; the whole = 360 × 125 = Rs 45,000

Mean

- what each would have if the total were shared out equally
- a **balance point**: distances below the mean add up to the same as distances above it



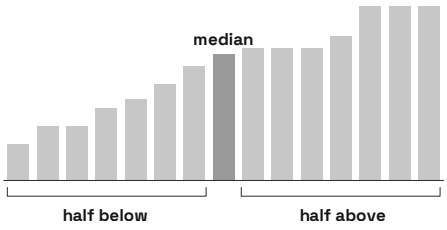
3, 4 and 8 have the mean 5: 2 + 1 on the left, 3 on the right.

- **a missing value:** put what you know in the formula: $8 = \frac{77 + m}{10} \rightarrow m = 3$
- the sum needed: 9 values with mean 19: $9 \times 19 = 171$
- one far-out value pulls the mean a long way
- nobody need have the mean: 4.37 people per household in the 2021 census is an equal share

Median

1. put the values **in order**
2. find the position
3. read the value at that position

- $(n + 1) \div 2$ gives a **position**, not the answer: 4 means the 4th value
- far-out values hardly move it
- with x: x, $x + 2$, $x + 5$, $x + 7$, $x + 8$, median 15: the middle one, $x + 5 = 15$, $x = 10$



Fifteen values in order: half of the others below the median, half above.

Mode

- the value, not the count: 149 cm comes 3 times, so the mode is 149 cm, not 3
- data may have two modes (2, 2, 5, 5, 7) or none (1, 4, 6, 9)
- it also works for words: favorite subjects and blood groups have no mean or median, but they have a mode

Which one to use

Question	Use	Why
Each one's fair share of the bill?	mean	it shares out the total
Is my mark in the top half of the class?	median	half are below it, half above
Which size should a shop stock most of?	mode	it is the commonest

When you read “average”, ask which one, and whether one big value is pulling it: nine people earn Rs 25,000 and one Rs 5,00,000; the mean is Rs 72,500, the median Rs 25,000.

Where it is used

- census: totals, means and shares
- weather: a month's “average rain” is a mean over many years
- health: a child's height is judged against the **median** of the WHO's growth standards
- home: a month's spending in one pie chart

COMMON MISTAKES

✗ angles that don't add up to 360°
✓ check before drawing.

✗ a chart with no title or no key
✓ add both.

✗ a median from a list not put in order
✓ order first.

✗ the position given for a median
✓ give the value.

✗ an average with no unit
✓ write Rs, kg or cm.