

MATHEMATICS • CLASS 11

CHAPTER 13

Statistics

CHAPTER NOTES



STATISTICS AND CENTRAL TENDENCY

What statistics tells us

Statistics deals with data collected for a purpose. We analyse and interpret data to make decisions. Mean, median and mode are measures of central tendency. They give an idea of where the data are centred.

$$\text{Mean } \bar{x} = \frac{\sum x_i}{n}$$

The same centre can hide different spreads

The runs scored in the last ten matches are:

Batsman A: 30, 91, 0, 64, 42, 80, 30, 5, 117, 71

Batsman B: 53, 46, 48, 50, 53, 53, 58, 60, 57, 52

Batsman	Mean	Median
A	53	53
B	53	53

Their centres are the same, but their scores are not equally spread out. A measure of dispersion describes this spread.

RANGE AND SPREAD

Range

Range is the difference between the largest and smallest values.

Range = Maximum value - Minimum value

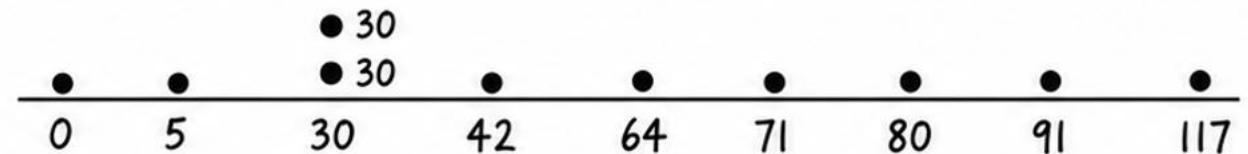
Range for A = $117 - 0 = 117$

Range for B = $60 - 46 = 14$

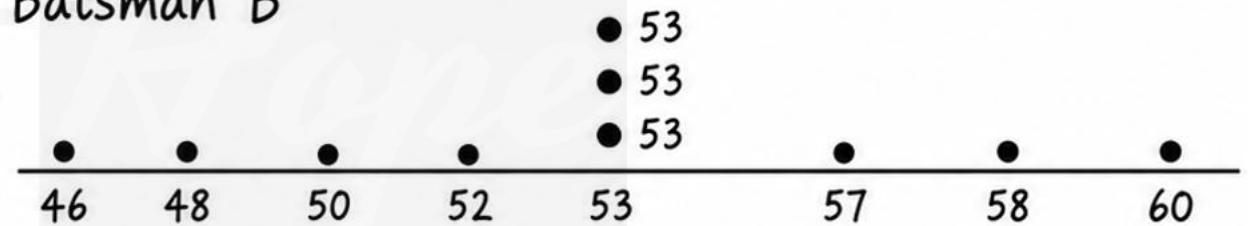
The second batsman's scores are much closer together.

Compare the batsmen

Batsman A



Batsman B



Schematic dotplots - not to scale

Range gives only a rough idea of spread. It uses just the extreme values, not the distances of all values from the centre.

The chapter discusses range, mean deviation, variance and standard deviation. Quartile deviation is mentioned but not studied here.

MEAN DEVIATION: MEANING

Deviation

A deviation is the difference between an observation and a chosen central value.

$$\text{Deviation} = x_i - a$$

Some deviations are positive and some negative. Their signs can cancel.
Deviations from the mean always add to zero.

$$\sum (x_i - \bar{x}) = 0$$

Why absolute values?

Absolute value gives the distance from the central value, without a minus sign.

$$\text{Distance} = |x_i - a|$$

Mean deviation

Mean deviation is the average of these absolute distances.

$$\text{M.D.}(a) = \frac{\sum |x_i - a|}{n}$$

Mean deviation about the mean and about the median are commonly used.

UNGROUPED DATA: THE METHOD

Find the centre

First calculate the mean, or arrange the data and find the median.

$$\bar{x} = \frac{\sum x_i}{n}$$

For an odd number of observations, take the middle observation in the ordered data.

$$\text{Median } M = \text{value at position } \frac{n+1}{2}$$

For an even number, average the two middle observations.

$$M = \frac{\text{value at position } \frac{n}{2} + \text{value at position } \left(\frac{n}{2} + 1\right)}{2}$$

Find the mean deviation

Subtract the chosen centre from every value. Take each absolute value, add them, and divide by the number of observations.

$$M.D.(\bar{x}) = \frac{\sum |x_i - \bar{x}|}{n}$$

$$M.D.(M) = \frac{\sum |x_i - M|}{n}$$



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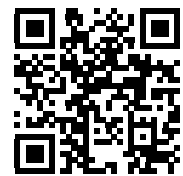


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