

Measures of Location and Spread

Location

Mean - influenced by outliers

Median - not influenced by outliers

Mode - next to useless!

Spread
Standard
Deviation

IQR

Range

{
100
100
100
100
600

Median and IQR

n items in order

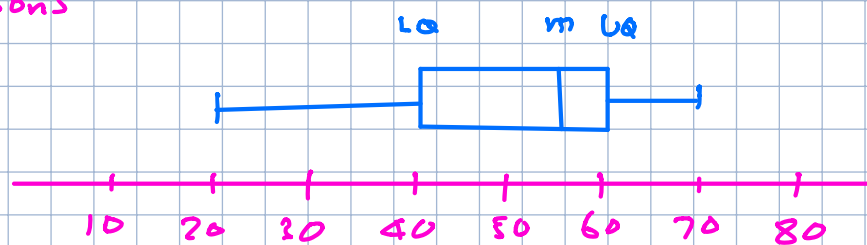
median = item $\frac{n+1}{2}$. If this is not whole number
median halfway between
values either side

LQ If $\frac{n}{4}$ is whole number use halfway
between item $\frac{n}{4}$ and the one above
otherwise round $\frac{n}{4}$ up and use that item

UQ If $\frac{3n}{4}$ is whole number use halfway
between item $\frac{3n}{4}$ and the one above
otherwise round $\frac{3n}{4}$ up and use that item

Comparisons

Girls



Boys



- 1) On average the girls performed better than the boys, they had a median score of 55 compared to 45 for the boys
- 2) The boys results were more consistent than the girls. Boys had IQR of 10 whereas girls had IQR of 20

Mean and Standard Deviation

$$\text{Mean } \bar{x} = \frac{\sum x}{n} \quad \text{or} \quad \frac{\sum fx}{\sum f}$$

$$\text{Standard Deviation } \sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$$

Example

5, 9, 20, 26, 44

$$\text{Mean} = \frac{5 + 9 + 20 + 26 + 44}{5} = \frac{104}{5} = 20.8$$

$$\sigma = \sqrt{\frac{(5-20.8)^2 + (9-20.8)^2 + (20-20.8)^2 + (26-20.8)^2 + (44-20.8)^2}{5}}$$

$$\sigma = 13.8$$

$$\sigma = \sqrt{\frac{(5^2 + 9^2 + 20^2 + 26^2 + 44^2)}{5} - 20.8^2} = 13.8$$

$$\sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}}$$