# Maths Knowledge Organiser
## Year 10 (H) Further Statistics

### Population
A population is the entire pool from which a statistical sample is drawn

### Census
A census is a survey conducted on the whole population

### Sample
Refers to a set of observations drawn from a population

### Bias
A systematic (built-in) error which makes all values wrong by a certain amount.

### Cumulative frequency graphs
This is a running total of the frequency, **add** the previous frequency

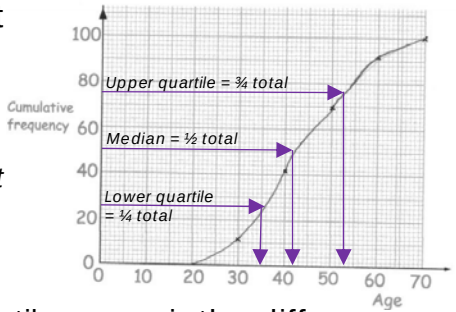
| Age, x years | Frequency | Cumulative frequency |
|---|---|---|
| 20 < x ≤ 30 | 12 | 12 |
| 30 < x ≤ 40 | 30 | 42 |
| 40 < x ≤ 50 | 28 | 70 |
| 50 < x ≤ 60 | 22 | 92 |
| 60 < x ≤ 70 | 8 | 100 |

The same → 12; +30 → 42; +28 → 70; +22 → 92; +8 → 100

The last cumulative frequency should be the total

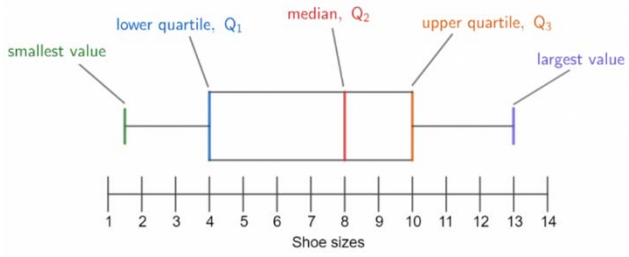
Then to plot the graph use the upper bound to plot

*Don't forget the first point*




IQR Inter quartile range is the difference between the upper and lower quartile

### Box plots
Get the below information and plot




### Simple random sampling
A selection that is chosen randomly (purely by chance, with no predictability)
*For example picking names out of a hat*

### Stratified sampling
This is where we divide the population into groups (*strata*) by some characteristic such as age or occupation or gender.
Then make sure the right proportion is in each group.

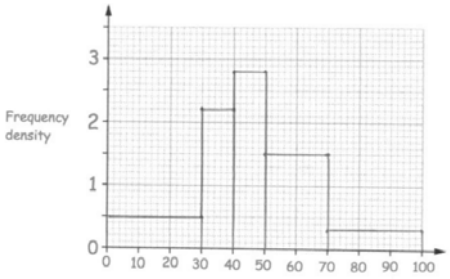
$$Number\ selected\ from\ each\ strata = \left(\frac{strata\ size}{total\ population}\right) \times sample\ size$$

### Histograms
It is similar to a bar Chart, but a histogram groups numbers into ranges**.**

The big difference is there are no gaps and we use frequency density

$$\textbf{Frequency density} = \frac{\textbf{Frequency}}{\textbf{Class width}}$$

| Test score, x | Frequency | Frequency density |
|---|---|---|
| 0 < x ≤ 30 | 15 | 0.5 |
| 30 < x ≤ 40 | 22 | 2.2 |
| 40 < x ≤ 50 | 28 | 2.8 |
| 50 < x ≤ 70 | 30 | 1.5 |
| 70 < x ≤ 100 | 9 | 0.3 |




Frequency can be calculated from histograms by the following formula

$$Frequency = Frequency\ density \times class\ width$$

Frequency can be used to work out estimates

$$Number\ selected\ from\ each\ strata = \left(\frac{ata\ size}{opulation}\right) \times sample\ size$$

$$Number\ selected\ from\ each\ strata = \left(\frac{strata\ size}{total\ population}\right) \times sample\ size$$

| Age, x years | Frequency | Cumulative frequency |
|---|---|---|
| $20 < x \leq 30$ | 12 | 12 |
| $30 < x \leq 40$ | 30 | 42 |
| $40 < x \leq 50$ | 28 | 70 |
| $50 < x \leq 60$ | 22 | 92 |
| $60 < x \leq 70$ | 8 | 100 |

The same → 12 +30 42 +28 70 +22 92 +8 100