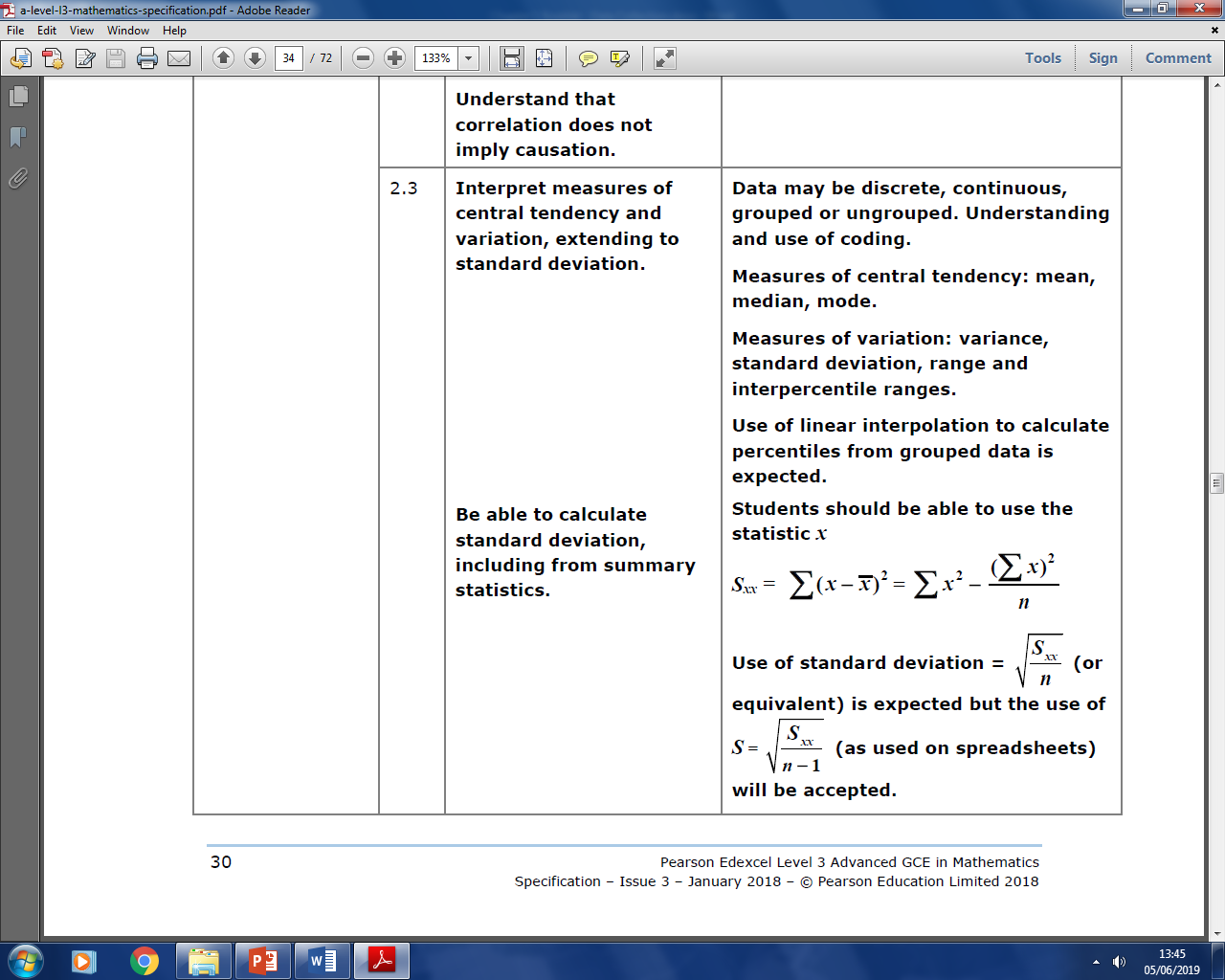
A Level Mathematics

Chapter 2 - Statistics

Measures of Location and Spread

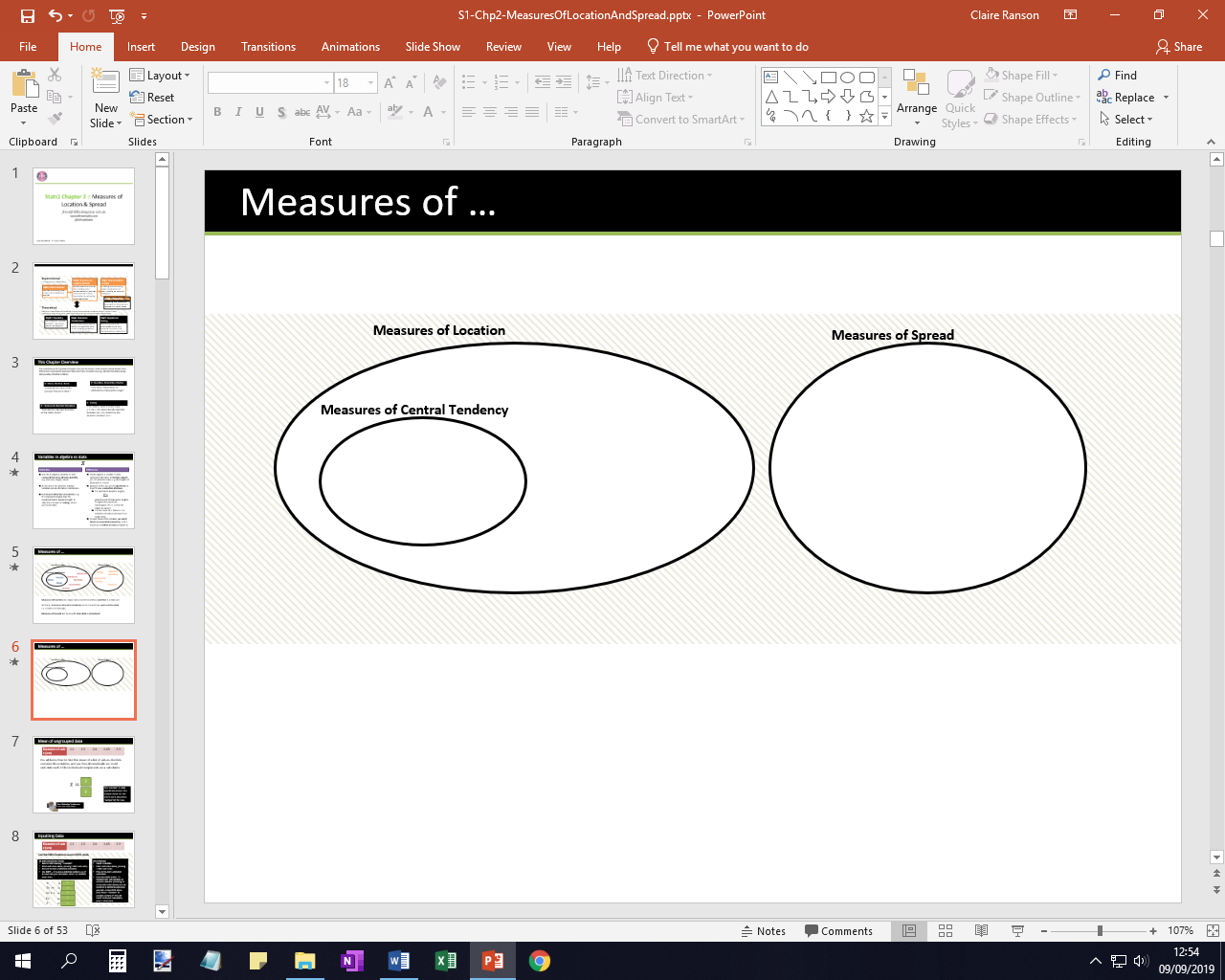
Chapter Overview

1. Measures of Central Tendency
2. Other measures of location
3. Measures of Spread
4. Variance and Standard Deviation
5. Coding



1. Measure of Central Tendency

**Measures of…**

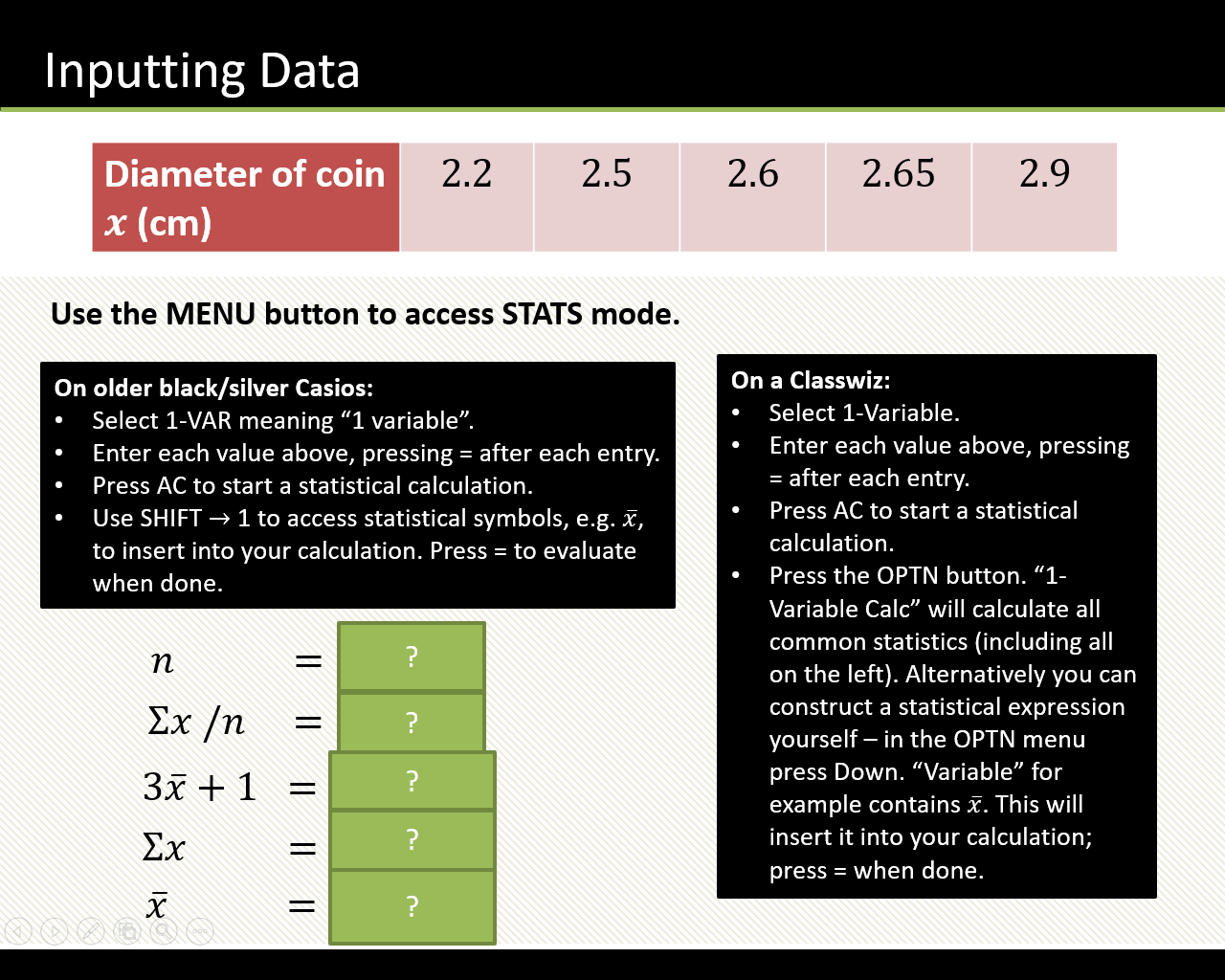


**Finding the mean**

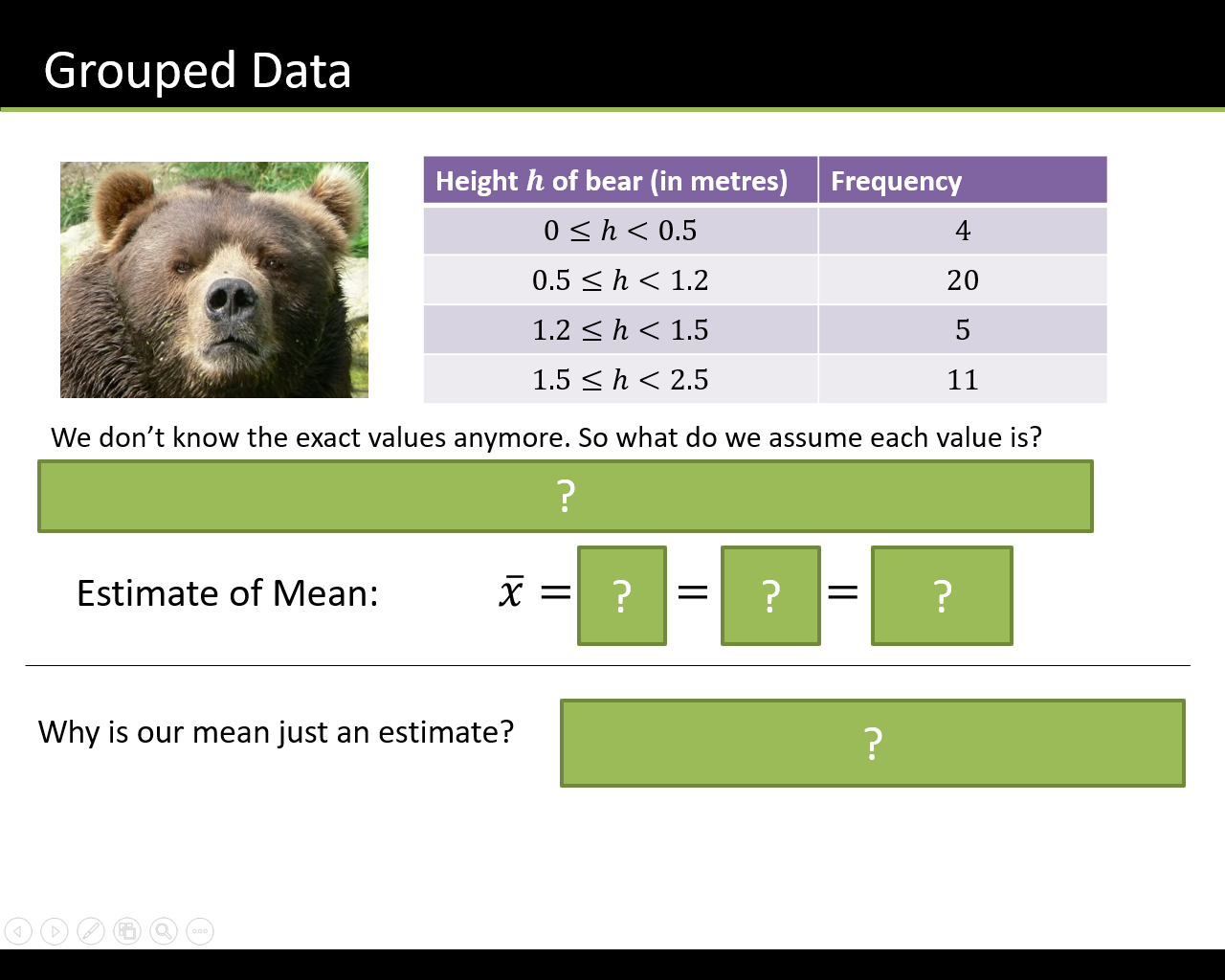
**Using your calculator**

**On a Classwiz:**

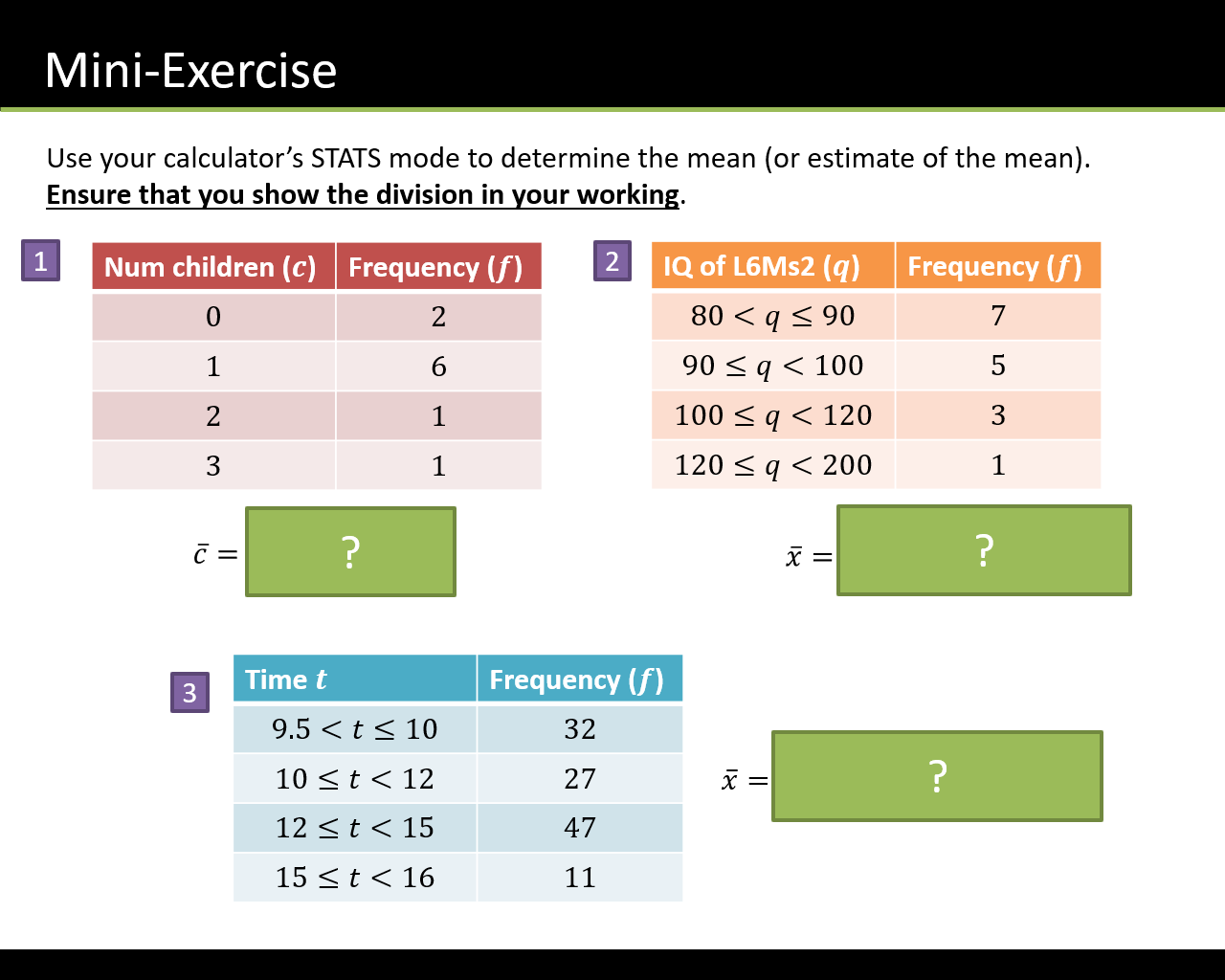
* Select 1-Variable.
* Enter each value above, pressing = after each entry.
* Press AC to start a statistical calculation.
* Press the OPTN button. “1-Variable Calc” will calculate all common statistics (including all on the left). Alternatively, you can construct a statistical expression yourself – in the OPTN menu press Down. “Variable” for example contains . This will insert it into your calculation; press = when done.

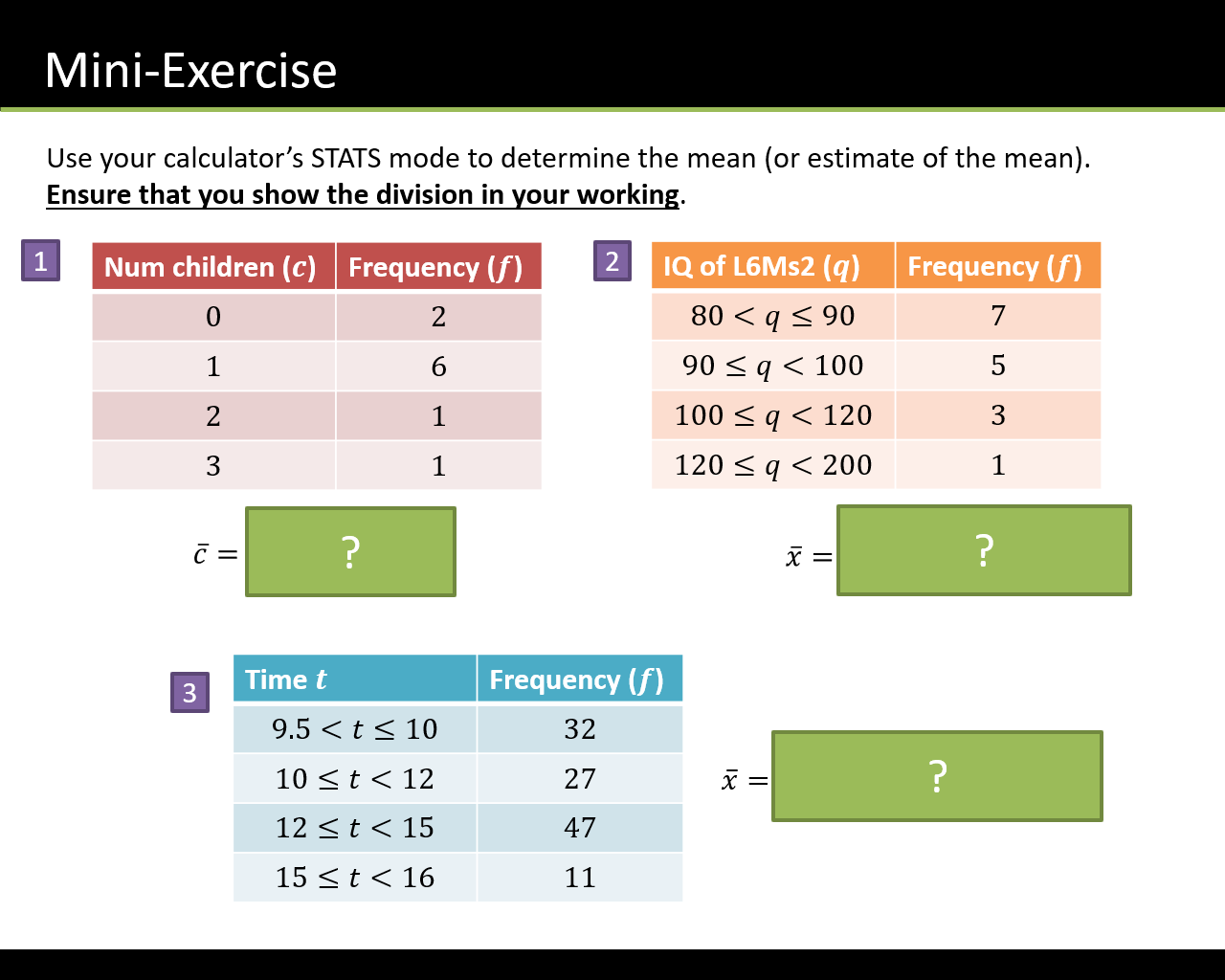


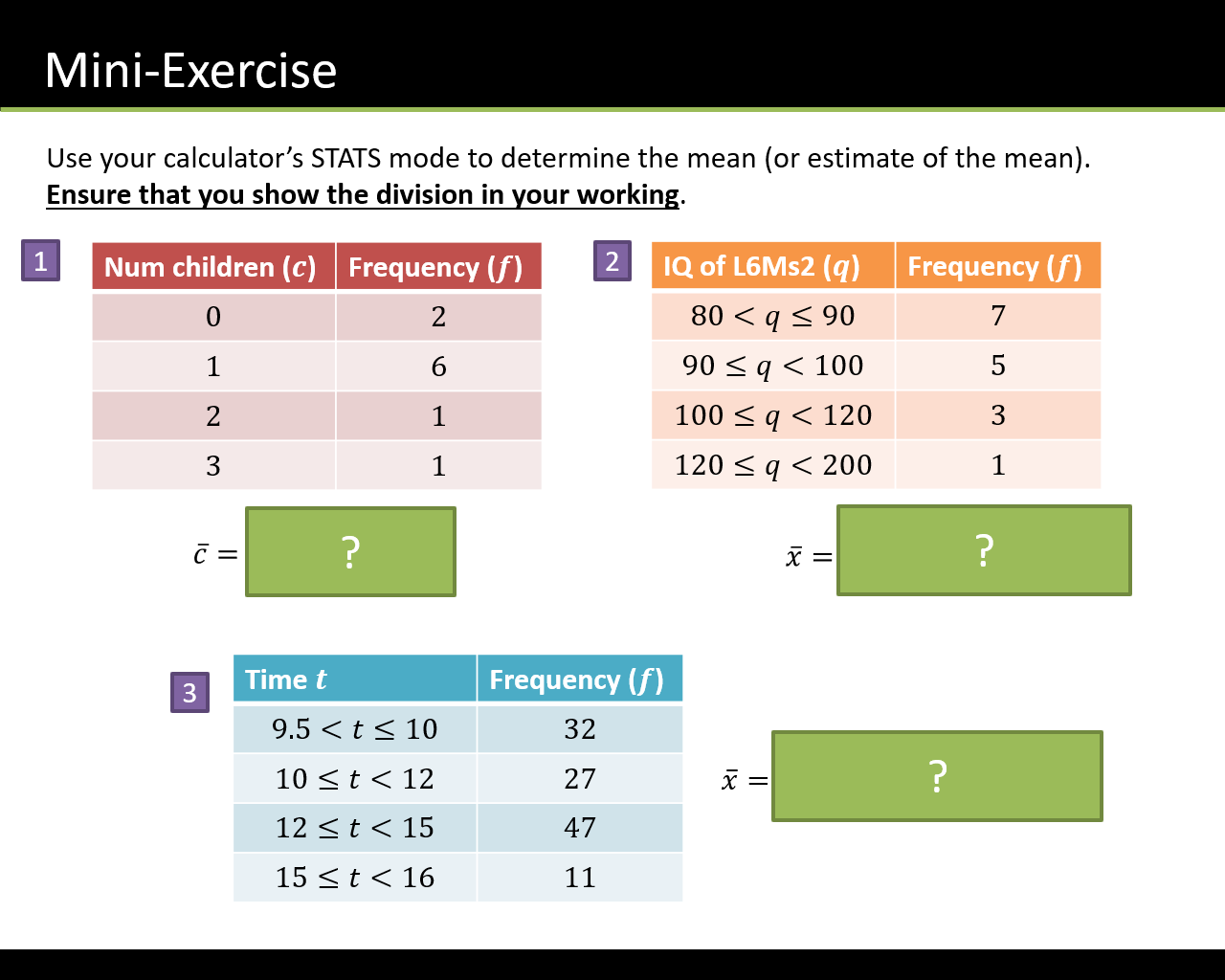
**Grouped Data**



**Mini-Exercise**

1.

2.

3.

Exercise 2A/2B Pages 22-23, 24-25

**Combined Mean**

Example

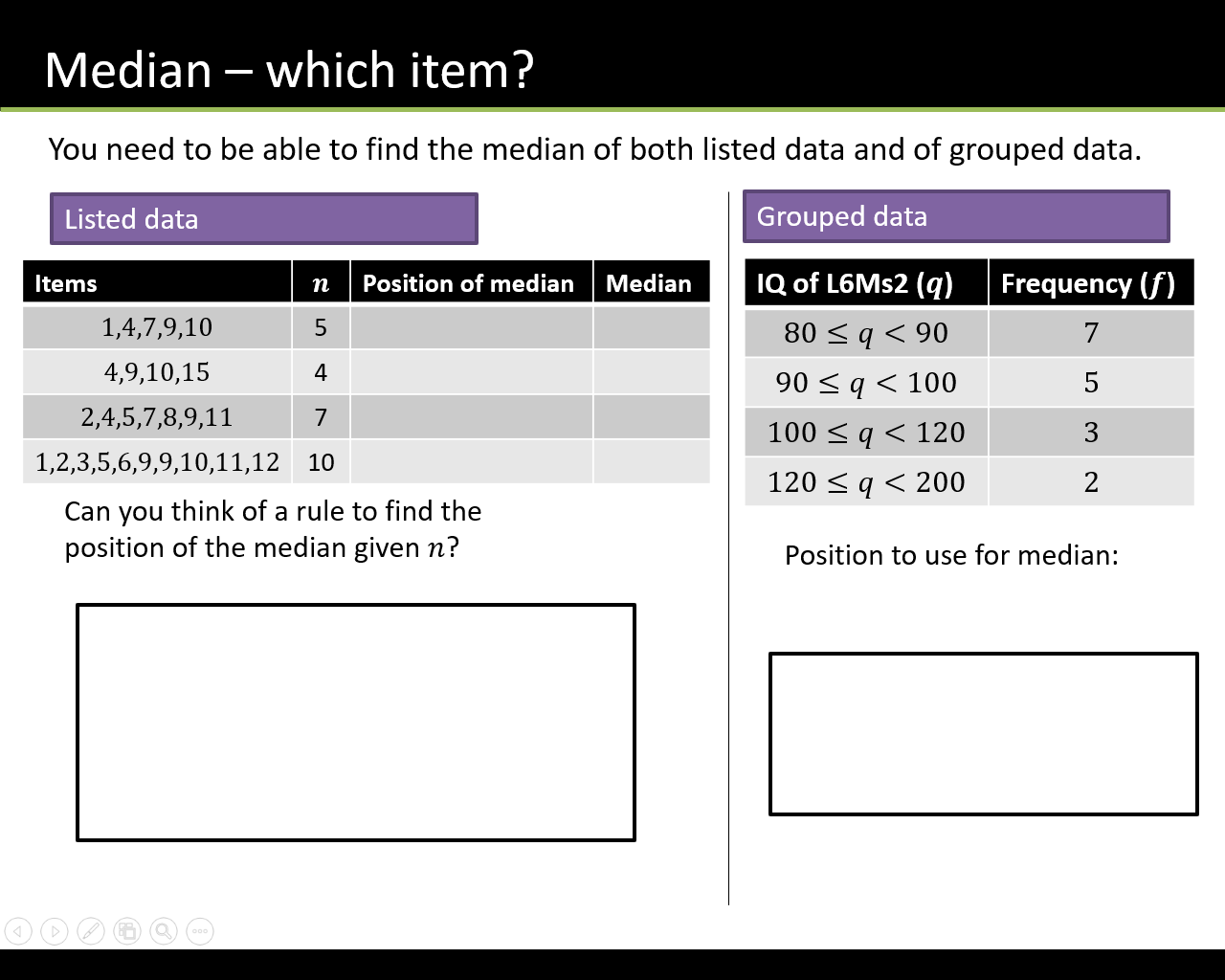
The mean maths score of 20 pupils in class A is 62.

The mean maths score of 30 pupils in class B is 75.

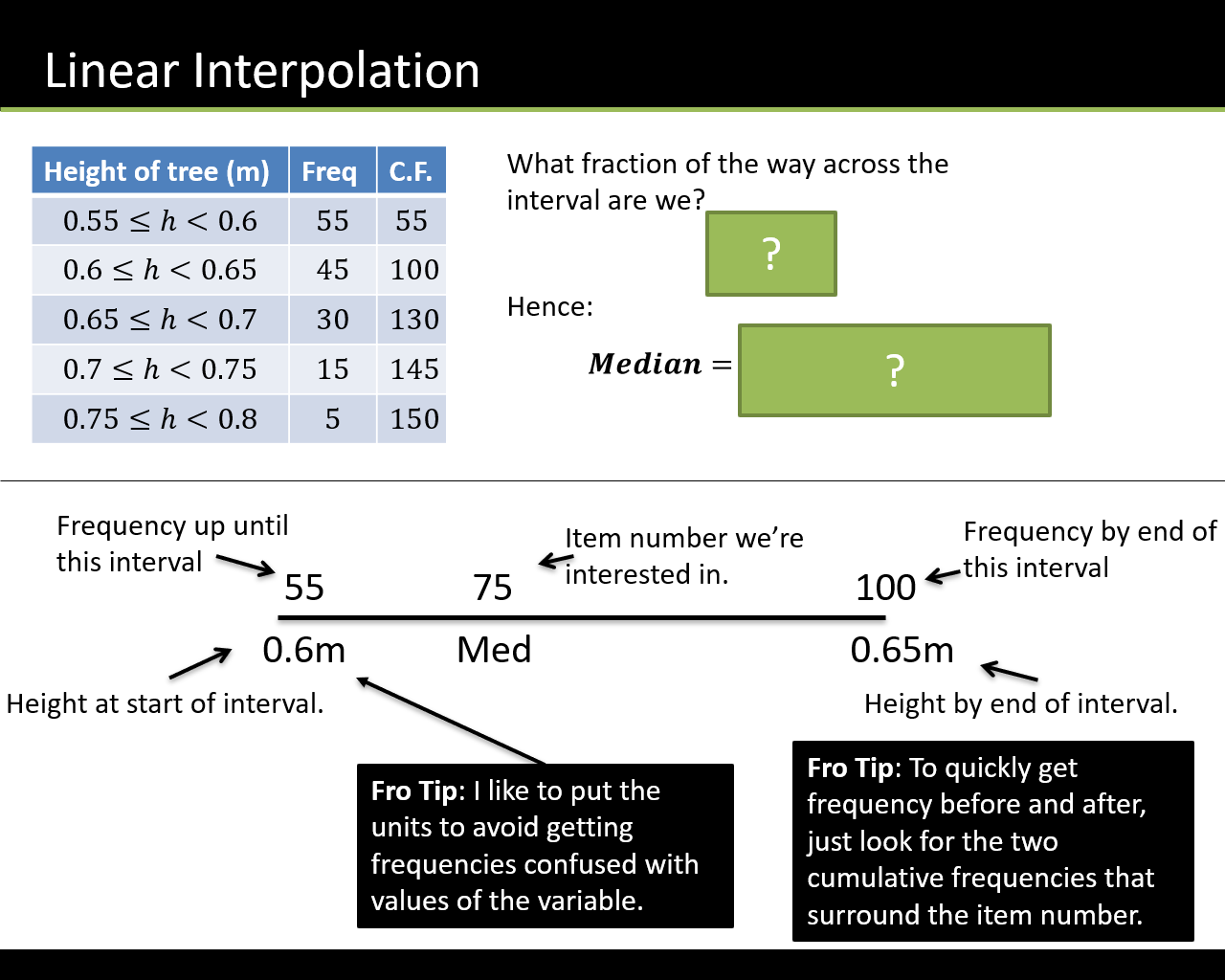
1. What is the overall mean of all the pupils’ marks.
2. The teacher realises they mismarked one student’s paper; he should have received 100 instead of 95. Explain the effect on the mean and median.

Question

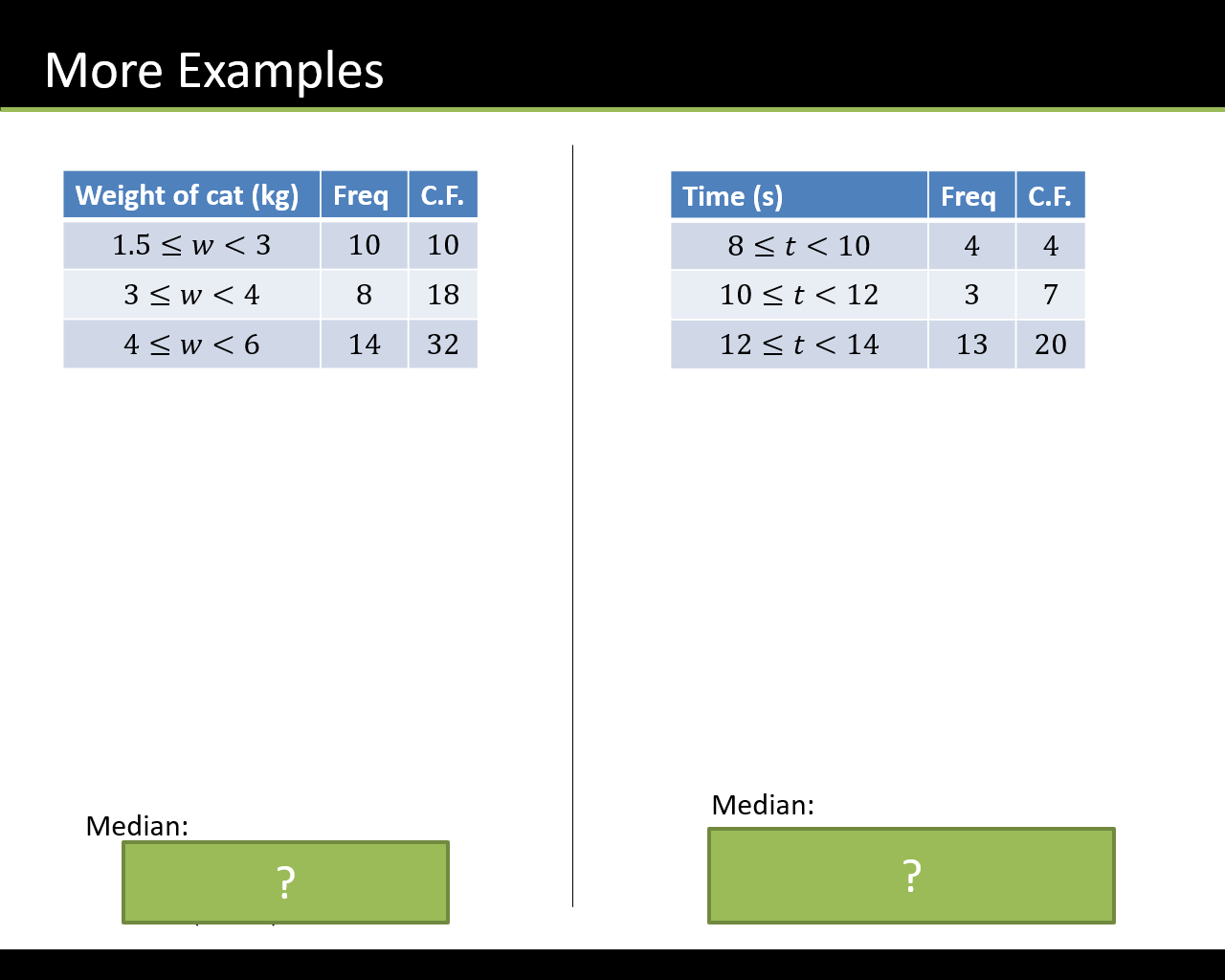
Archie the Archer competes in a competition with 50 rounds. He scored an average of 35 points in the first 10 rounds and an average of 25 in the remaining rounds. What was his average score per round?

**Finding the Median**

**Linear Interpolation**



**Formula**

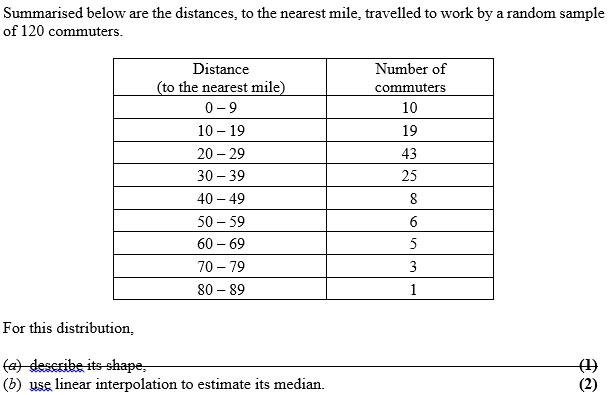
Examples

**Class width**

|  |  |
| --- | --- |
| **Weight of cat to nearest kg** | **Frequency** |
|  |  |
|  |  |
|  |  |
|  |  |

**Linear Interpolation with gaps**

Example

****

**Test Your Understanding**

Use linear interpolation to estimate the median of the following:

|  |  |
| --- | --- |
| **Age of relic (years)** | **Frequency** |
| 0-1000 | 24 |
| 1001-1500 | 29 |
| 1501-1700 | 12 |
| 1701-2000 | 35 |

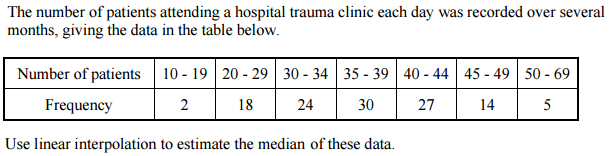
1)

|  |  |
| --- | --- |
| **Shark length (cm)** | **Frequency** |
|  | 17 |
|  | 5 |
|  | 8 |
|  | 10 |

2)

**Supplementary Exercise 1**

**Q1) Solomon Paper A Q5b**



**Q2) Solomon Paper E Q4a**

The ages of 300 houses in a village are recorded given the following table of results.

|  |  |
| --- | --- |
| Age (years) | Number of houses |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Use linear interpolation to estimate the median.

**Q3) Solomon Paper L Q7a**

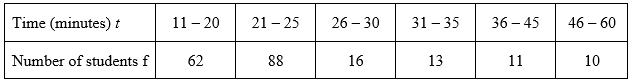
A cyber-café recorded how long each user stayed during one day giving the following results.

|  |  |
| --- | --- |
| Length of stay (minutes) | Number of houses |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Use linear interpolation to estimate the median of these data.

**Q4) S1 May 2013 Q4**

The following table summarises the times, *t* minutes to the nearest minute, recorded for a group of students to complete an exam.



[You may use ∑f*t*2 *=* 134281.25]

(*a*) Estimate the mean ~~and standard deviation~~ of these data. **(5)**

(*b*) Use linear interpolation to estimate the value of the median. **(2)**

Exercise 2C Pages 27-28

1. Other measures of location

**Quartiles**

Listed Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Items** |  | **Position of LQ & UQ** | **LQ & UQ** |
|  | 5 |  |  |
|  | 4 |  |  |
|  | 7 |  |  |
|  | 10 |  |  |

Quartiles – Listed Data

Grouped Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Items** |  | **Position of LQ & UQ** | **LQ & UQ** |
|  | 5 |  |  |
|  | 4 |  |  |
|  | 7 |  |  |
|  | 10 |  |  |

Quartiles – Grouped Data

cv

Percentiles

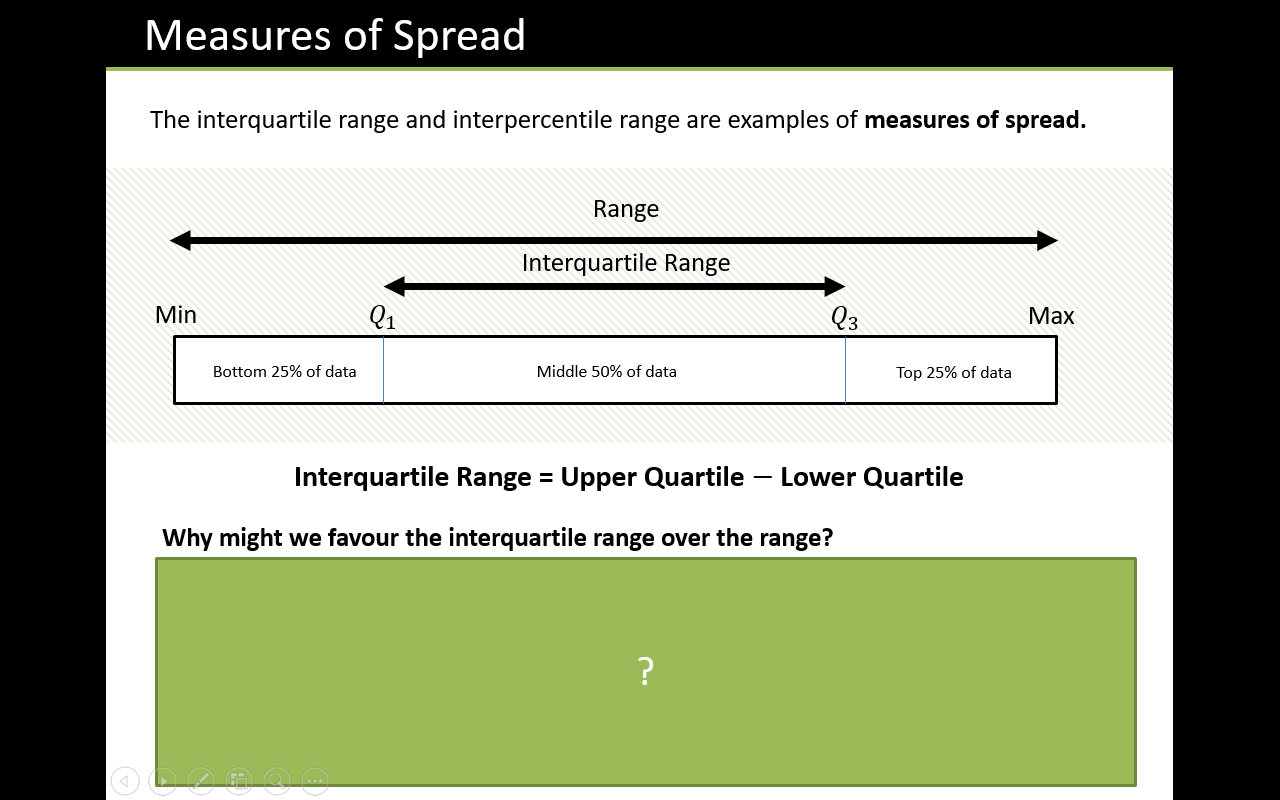
cv

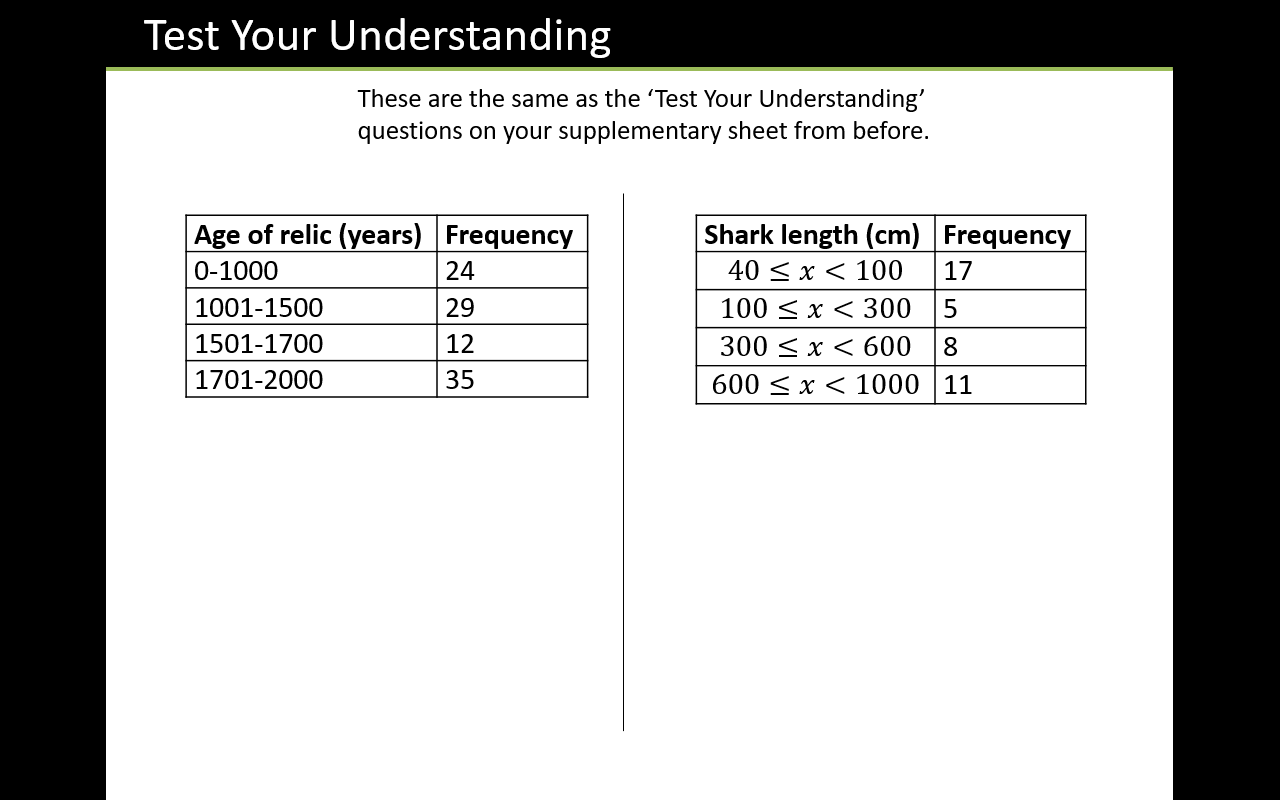
**Notation**

Lower Quartile: Median:

Upper Quartile: 57th Percentile:

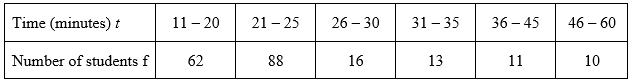
1. Measures of Spread



**Test your understanding**

**Q1) S1 May 2013 Q4 (continued)**

The following table summarises the times, *t* minutes to the nearest minute, recorded for a group of students to complete an exam.



(*c*) Show that the estimated value of the lower quartile is 18.6 to 3 significant figures.

**(1)**

(*d*) Estimate the interquartile range of this distribution.

**(2)**

**Q2) S1 June 2005 Q2**

The following table summarises the distances, to the nearest km, that 134 examiners travelled to attend a meeting in London.

|  |  |
| --- | --- |
| **Distance (km)** | **Number of examiners** |
| 41–45 | 4 |
| 46–50 | 19 |
| 51–60 | 53 |
| 61–70 | 37 |
| 71–90 | 15 |
| 91–150 | 6 |

(*c*) Use interpolation to estimate the median *Q*2, the lower quartile *Q*1, and the upper quartile *Q*3 of these data.

**Q3)** The ages of 300 houses in a village are recorded given the following table of results.

|  |  |
| --- | --- |
| Age (years) | Number of houses |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Use linear interpolation to estimate the lower quartile, upper quartile and hence the interquartile range.

**Q4)**

A cyber-café recorded how long each user stayed during one day giving the following results.

|  |  |
| --- | --- |
| Length of stay (minutes) | Number of houses |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Use linear interpolation to estimate:

1. The lower quartile.
2. The upper quartile.
3. The 90th percentile.

**Q5)**

|  |  |
| --- | --- |
| Distance  (to the nearest mile) | Number of  commuters |
| 0 – 9 | 10 |
| 10 – 19 | 19 |
| 20 – 29 | 43 |
| 30 – 39 | 25 |
| 40 – 49 | 8 |
| 50 – 59 | 6 |
| 60 – 69 | 5 |
| 70 – 79 | 3 |
| 80 – 89 | 1 |

Find the interquartile range for the distance travelled by commuters.

1. Variance and Standard Deviation

Variance

cv

Examples

1. 3, 11 Variance

Standard Deviation

1. 2, 3, 3, 5, 7 Variance

Standard Deviation

1. 2, 4, 6 Variance

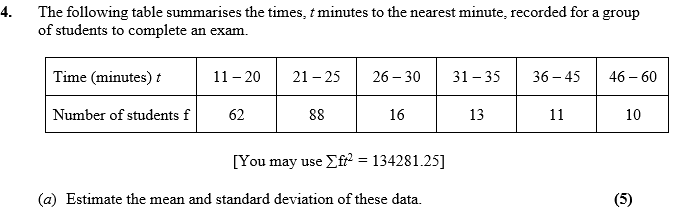
Standard Deviation

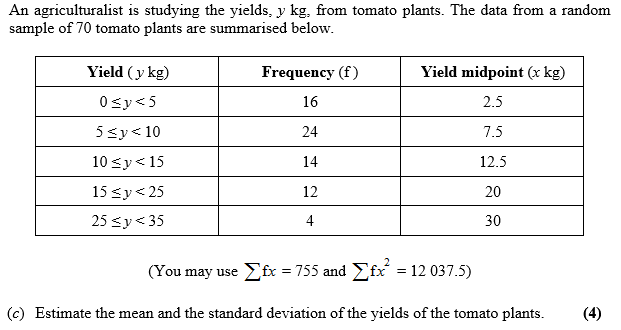
1. 1, 2, 3, 4, 5 Variance

Standard Deviation

Variance – frequency tables

cv

Examples



1. Coding

