

## Topic 2: Descriptive Statistics

Topic number	Content
2.1	Classification of data as discrete or continuous.
2.2	Simple discrete data: frequency tables
2.3	Grouped discrete or continuous data: frequency tables; mid-interval values; upper and lower boundaries. Frequency histograms.
2.4	Cumulative frequency tables for grouped data; cumulative frequency curves, median and quartiles. Box-and-whisker diagram
2.5	Measures of central tendency. For simple discrete data: mean; median; mode. For grouped discrete and continuous data: estimate of a mean; modal class
2.6	Measures of dispersion: range, interquartile range, standard deviation.

### Brain Dump

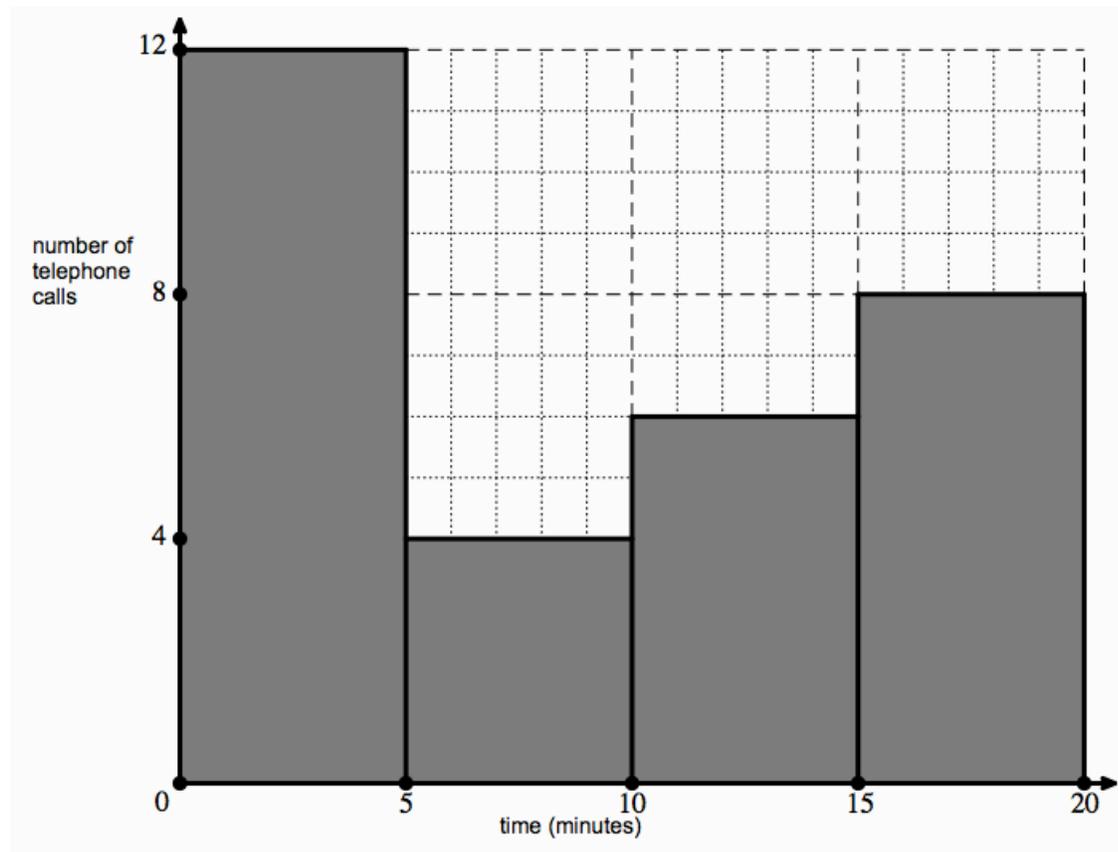
To find the estimated mean, use the mid-interval value times the frequency, add them up and find the mean

To enter data into a list, push STAT and EDIT

To find statistics for data that is in a list, push STAT, CALC and choose what you need

Continuous data has fractions/decimals, can be broken down into smaller measurements (like height), discrete data has specific values and can't be broken down (like number of siblings or shoe size)

1. Consider the frequency histogram for the distribution of the time,  $t$ , in minutes of telephone calls that Helen made last week.



a) Complete the frequency table for this distribution. (2 marks)

Time (minutes)	Number of telephone calls
$0 < t \leq 5$	
$5 < t \leq 10$	
$10 < t \leq 15$	
$15 < t \leq 20$	

b) Write down the modal class. (1 mark)

c) Write down the mid-interval value of the  $10 < t \leq 15$  class. (1 mark)

d) Use your graphic display calculator to find an estimate for the mean time. (2 marks)

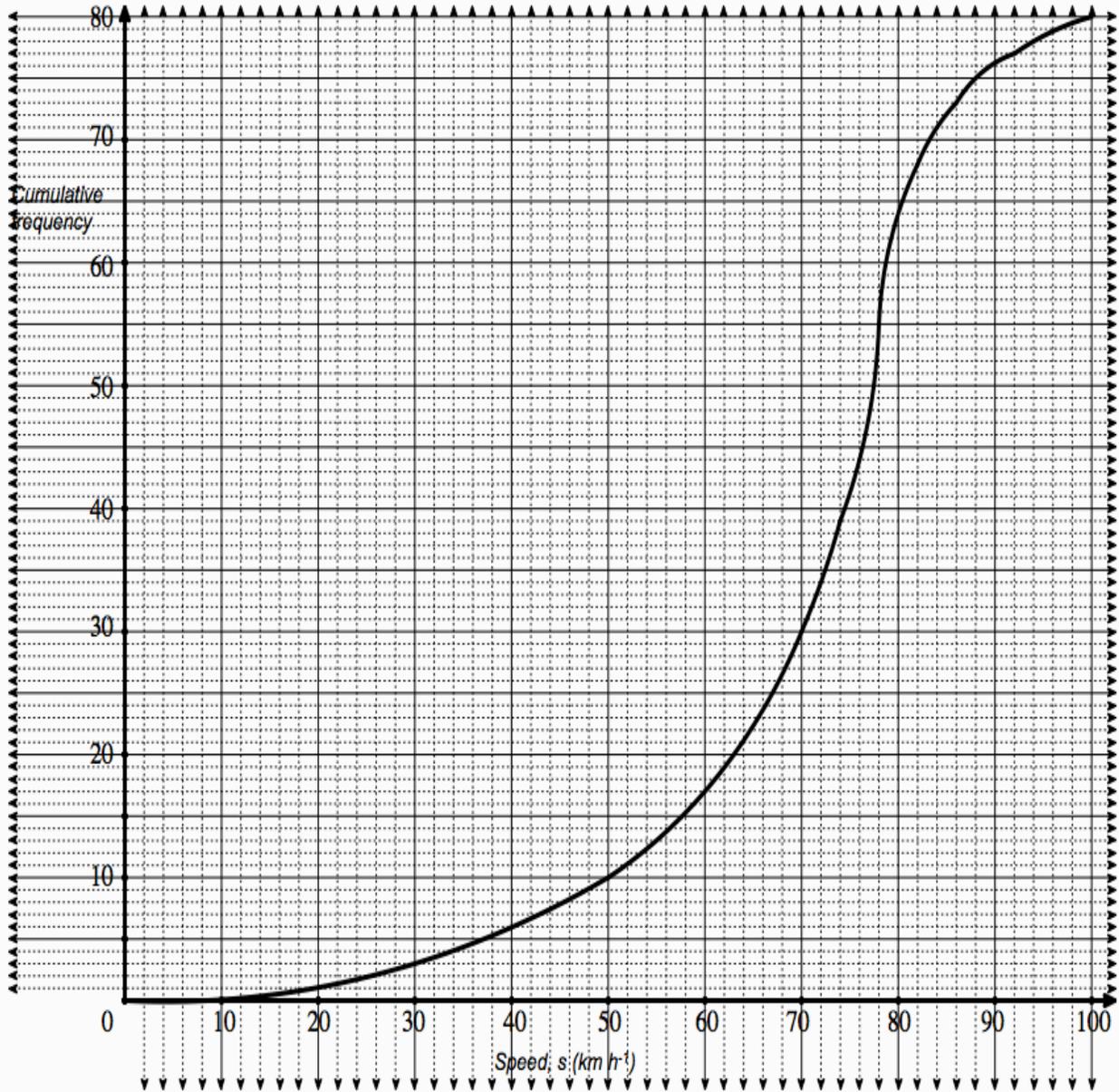
2. A class of 13 Mathematics students received the following grades in their final IB examination.

3    5    3    4    7    3    2    7    5    6    5    3    4

For these grades, find

- a) The mode; (1 mark)
- b) The median; (2 marks)
- c) The upper quartile; (1 mark)
- d) The interquartile range. (2 marks)

3. The cumulative frequency graph represents the speed,  $s$ , in  $\text{km h}^{-1}$ , of 80 cars passing a speed camera.



- a) Write down the number of cars passing the camera with speed of less than or equal to  $50 \text{ km h}^{-1}$ . (1 mark)

b) Complete the following grouped frequency table for  $s$ , the speed of the cars passing the camera. (1 mark)

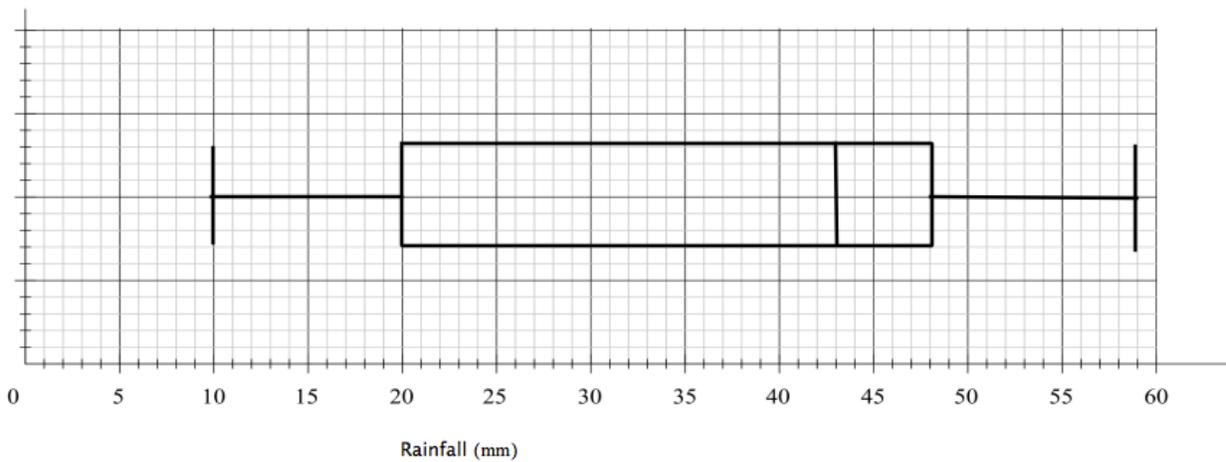
$s$ ( $km\ h^{-1}$ )	$0 < s \leq 50$	$50 < s \leq 70$	$70 < s \leq 80$	$80 < s \leq 90$	$90 < s \leq 100$
<b>Frequency</b>			<b>34</b>		<b>4</b>

c) Write down the mid-interval value of the  $50 < s \leq 70$  interval. (1 mark)

d) Use your graphic display calculator to find an estimate of

- i. The mean speed of the cars passing the camera;
- ii. The standard deviation of the speed of the cars passing the camera (3 marks)

4. The distribution of rainfall in a town over 80 days is displayed on the following box-and-whisker diagram.



a) Write down the median rainfall. (1 mark)

b) Write down the minimum rainfall. (1 mark)

c) Find the interquartile range. (2 marks)

d) Write down the number of days the rainfall will be (2 marks)

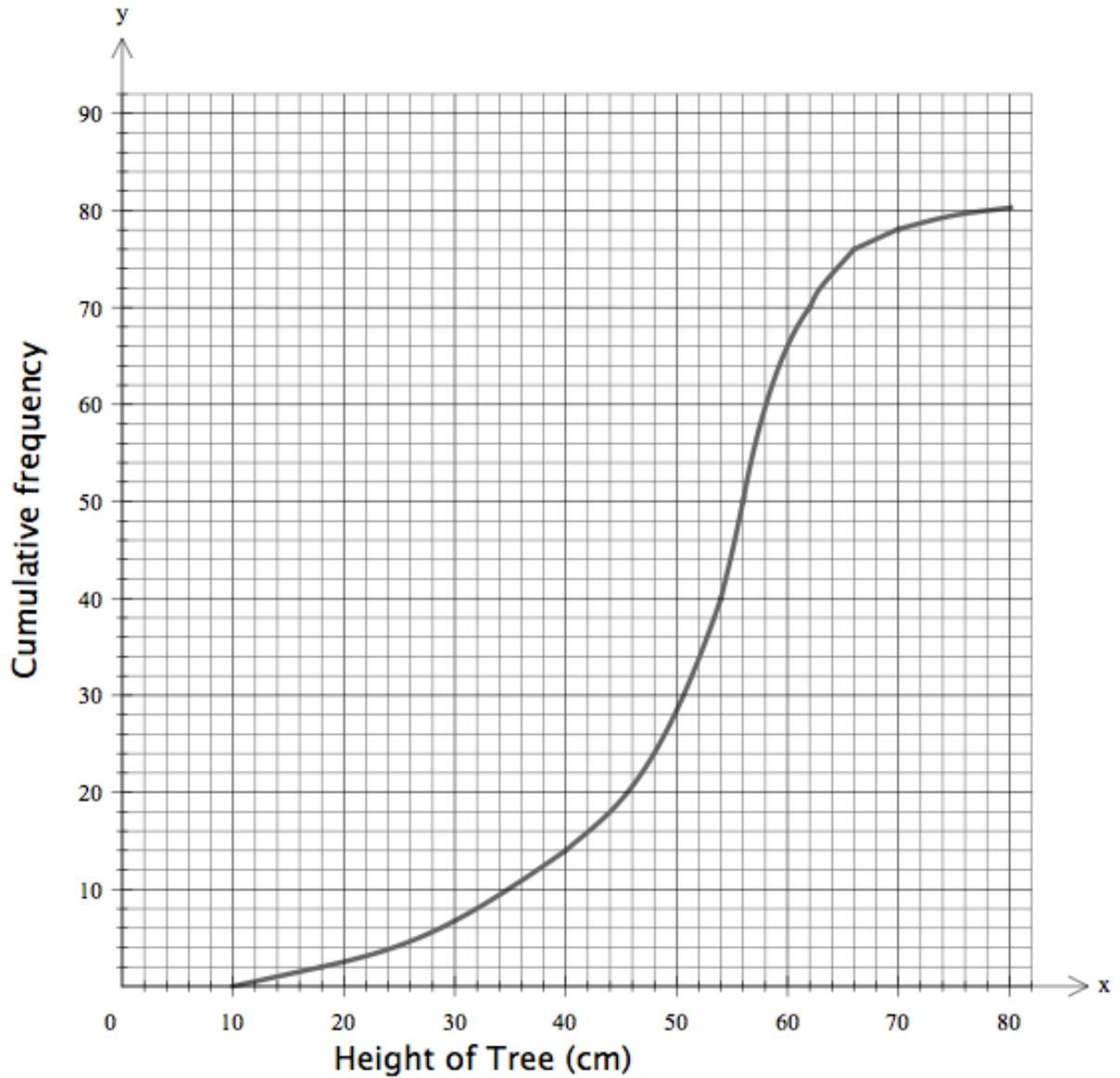
i. Between 43 mm and 48 mm;

ii. Between 20 mm and 59 mm.

5. The heights of apple trees in an orchard are normally distributed with a mean of  $3.42\text{ m}$  and a standard deviation of  $0.21\text{ m}$ .

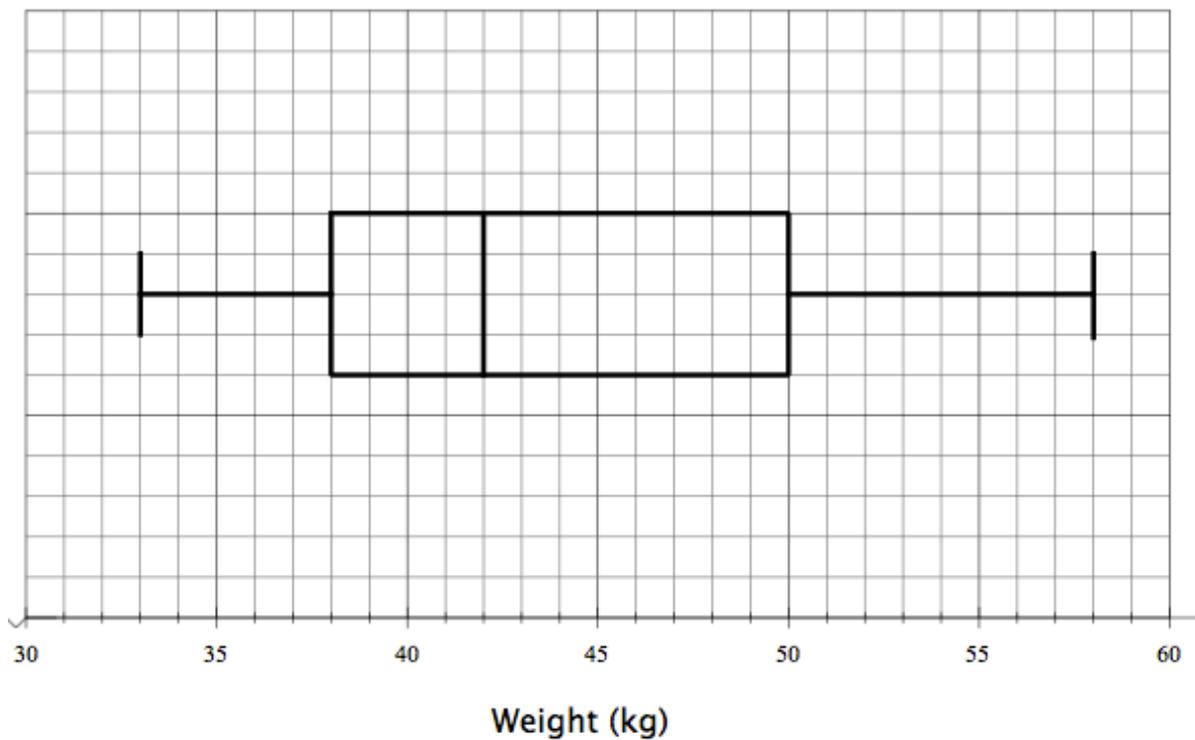
- a) Write down the probability that a randomly chosen tree has a height greater than  $3.42\text{ m}$ . (1 mark)
- b) Write down the probability that a randomly chosen tree will be within 2 standard deviations of the mean of  $3.42\text{ m}$ . (1 mark)
- c) Use your graphic display calculator to calculate the probability that a randomly chosen tree will have a height greater than  $3.35\text{ m}$ . (2 marks)
- d) The probability that a particular tree is less than  $x$  metres high is  $0.65$ . Find the value of  $x$ . (2 marks)

6. The cumulative frequency graph shows the heights, in cm, of **80** young trees.



- Write down the median height of the trees. (1 mark)
- Write down the 75<sup>th</sup> percentile. (1 mark)
- Find the interquartile range. (2 marks)
- Estimate the number of trees that are more than 40 cm in height. (2 marks)

7. The weights, in kg, of 60 adolescent females were collected and are summarized in the box and whisker diagram shown below.



- a) Write down the median weight of the females. (1 mark)
- b) Calculate the range. (2 marks)
- c) Estimate the probability that the weight of a randomly chosen female is more than 50 kg. (1 mark)
- d) Use the box and whisker diagram to determine if the mean weight of the females is less than the median weight. Give a reason for your answer. (2 marks)

8. The ACT test scores are normally distributed with a mean score of 21.0 and a standard deviation of 5.2.

a) Write down the probability that a randomly chosen student has a score greater than 21.0. (1 mark)

b) Write down the probability that a randomly chosen student will be within 2 standard deviations of the mean of 21.0. (1 mark)

c) Use your graphic display calculator to calculate the probability that a randomly chosen student will have a score greater than 20.0. (2 marks)

d) The probability that a particular student scores less than  $x$  is 0.42. Find the value of  $x$ . (2 marks)

e) The probability that a particular student scores more than  $y$  is 0.18. Find the value of  $y$ . (2 marks)

9. The table shows the number of bicycles owned by 50 households.

Number of bicycles per household	Frequency (number of households)	Cumulative frequency
0	3	3
1	7	10
2	12	22
3	14	36
4	4	40
5	$t$	$w$
6	2	50

a) Write down the value of

i.  $t$ :

ii.  $w$ .

(2 marks)

b) Indicate with a tick ( $\checkmark$ ) whether the following statements are True or False.

(4 marks)

Statement	True	False
Every household owns at least 1 bicycle.		
The median number of bicycles per household is 3		
The 25 <sup>th</sup> percentile is 1 bicycle per household.		
There are 10 households with at most 1 bicycle.		

10. The number of passengers in the first ten carriages of a train is listed below.

6, 8, 6, 3, 8, 4, 8, 5,  $p$ ,  $p$

The mean number of passengers per carriage is 5.6.

a) Calculate the value of  $p$ . (2 marks)

b) Find the median number of passengers per carriage. (2 marks)

If the passengers in the eleventh carriage are also included, the mean number of passengers per carriage increases to 6.0.

c) Determine the number of passengers in the eleventh carriage of the train, (2 marks)

11. The table below shows the frequency distribution of the number of dental fillings for a group of 25 children.

<b>Number of fillings</b>	0	1	2	3	4	5
<b>Frequency</b>	4	3	8	$q$	4	1

a) Find the value of  $q$  (2 marks)

b) Use your graphic display calculator to find

i. The mean number of fillings:

ii. The median number of fillings;

iii. The standard deviation of the number of fillings. (4 marks)