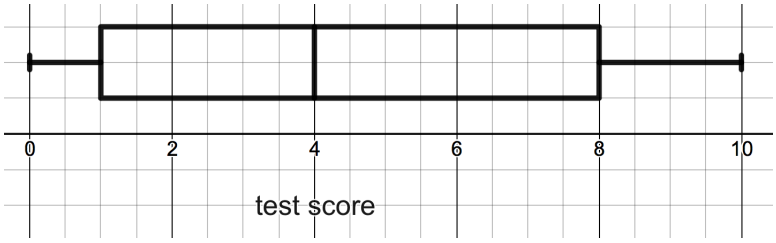
Box and whisker, Cumulative frequency, Standard deviation

Name……

(1) The scores that students get on a test out of 15 are recorded in a box and whisker plot shown below:



(a) Find the inter quartile range

8-1=7

(b) What percentage of students got less than 8 marks?

75%

(c) A score greater than k would be classified as an outlier. Find k.

$$UQ + 1.5\times IQR$$
$$8 + 1.5(7) = 18.5$$
$$k = 18.5$$

(d) Explain why there can be no outliers for this data.

$$LQ - 1.5\times IQR$$
$$1 - 1.5(7) = -9.5$$

It is not possible to get a negative score on a test.

(2) The number of cups of coffee students drink each week is recorded below:

0, 0 , 1, 1, 1, 2, 2, 2 , 2, 3, 3, 4, 5, 8, 12, 15

(a) Find the median, lower quartile, upper quartile and interquartile range.

Median = 2, LQ = 1, UQ = 4.5, IQR = 4.5-1 = 3.5

(b) Find the standard deviation.

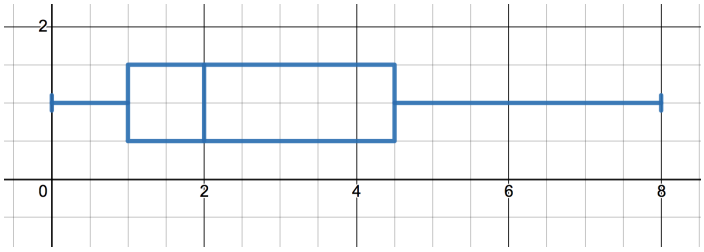
s.d = 4.17

(c) Find any outliers for this data.

$$UQ + 1.5\times IQR$$
$$4.5 + 1.5(3.5) = 9.75$$

$$Outliers = 12 \; and \; 15.$$

(d) Draw the box and whisker plot of this data:



(3) A survey of teachers' sleep obtained the following results:

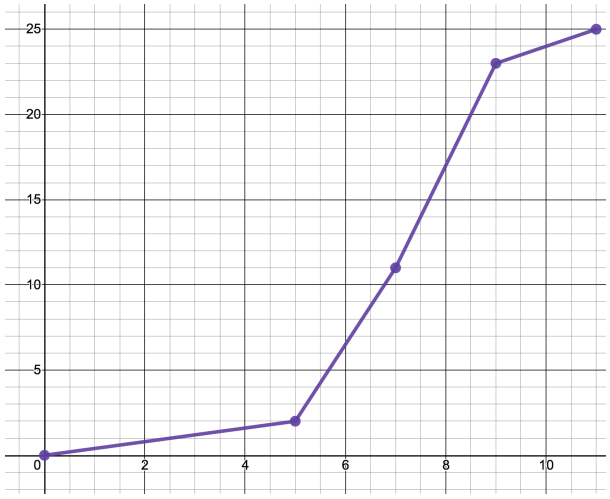
Hours sleep	$0 \leq h < 5$	$5 \leq h < 7$	$7 \leq h < 9$	$9 \leq h < 11$
Frequency	2	9	12	2

(a) Find an estimation for the mean.

Mean = 7

(b) Draw a cumulative frequency curve on the graph below.

(note students should join with a smooth curve)



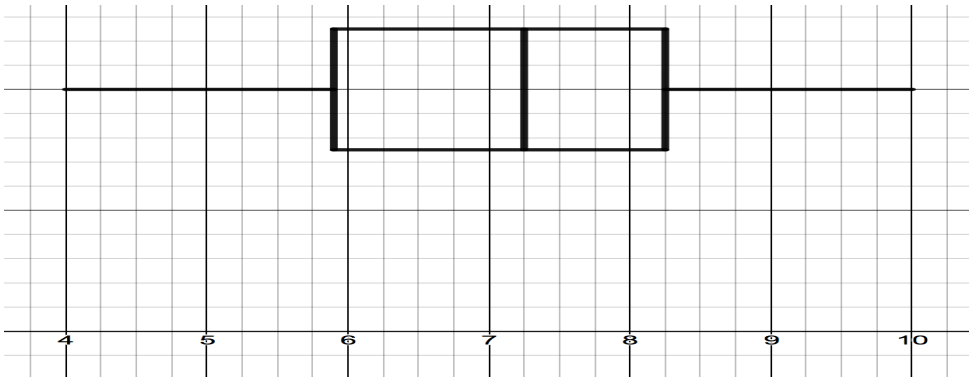
(c) Find the median and interquartile range from your curve.

Median 7.25
LQ 5.9
UQ 8.25
IQR = 2.35
(answers will vary!)

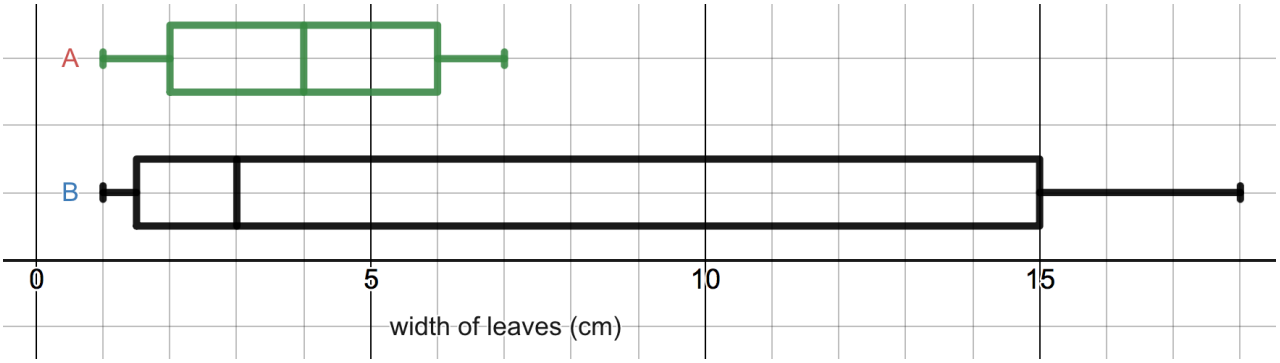
(ii) Approximately what percentage of teachers got more than 8 hours sleep?

32%

(d) If the teacher with the least hours sleep had 4 hours sleep the range was 6 hours, sketch a box and whisker plot beneath your cumulative frequency curve.



(4) A gardener collects 2 different types of leaves (A and B) in their garden and notes their widths. She then draws the following box and whisker plots:



(a) With reference to both the median and interquartile range compare the two distributions.

Leaf A has a higher median so has a larger width on average.
Leaf B has a larger IQR so has a greater spread of widths.

(b) Which type of leaf width could be normally distributed? Explain your answer.

Leaf A has a symmetrical distribution and so could be normally distributed.

(5) Students are asked about the number of brothers and sisters that they have. The results are recorded below:

Number of siblings	0	1	2	3	4
Frequency	8	12	15	5	2

(a) Find the standard deviation.

$$s.d = 1.07$$

(b) Find the mean.

$$Mean = 1.55$$

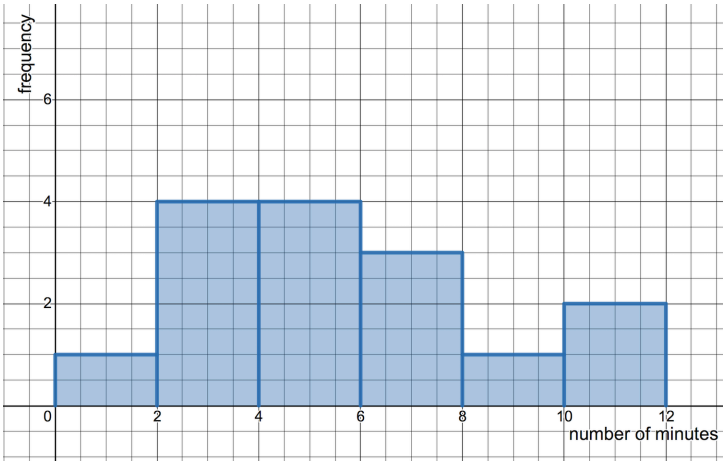
(c) What percentage of students' answers are within one standard deviation of the mean?

$$1.55 \pm 1.07$$

$$0.48 \leq x \leq 2.62$$

$$\frac{27}{42} \times 100 = 64.3\%$$

(6) A group of office workers are given a task to complete and the time taken is recorded.



(a) Find an estimation for the mean number of minutes taken.

$$Mean = 5.67$$

(b) Use the data mid points to find an estimation for the standard deviation.

$$s.d = 2.89$$

(c) Any worker who was more than 2 standard deviations above the mean has to attend an extra weekend training session. Workers taking longer than what time will have to attend?

$$5.67 + 2(2.89) = 11.5\ mins$$

(7) Students are given a maths test in which the average score is 65 marks and the standard deviation is 18.

(a) The teacher decides that they have marked too harshly and decides to increase everyone's score by 5 marks. Find the new mean and standard deviation.

Mean = 70
Standard deviation = 18

(b) The teacher decides to increase everyone's original scores by 5%. Find the new mean and standard deviation.

Mean = $65 \times 1.05 = 68.25$
Standard deviation = $18 \times 1.05 = 18.9$