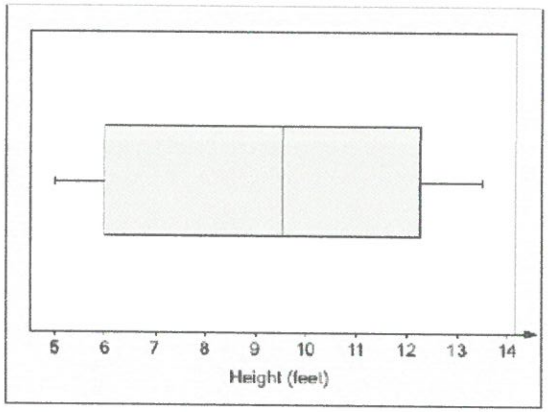
Intermediate Numeracy Cumulative Frequency & Box Plot Questions

1. **12.** The box-and-whisker plot shows information about the height, in feet, of waves measured at a beach on a particular day.



(a) About what fraction of the waves measured were less than 6 feet? [1]

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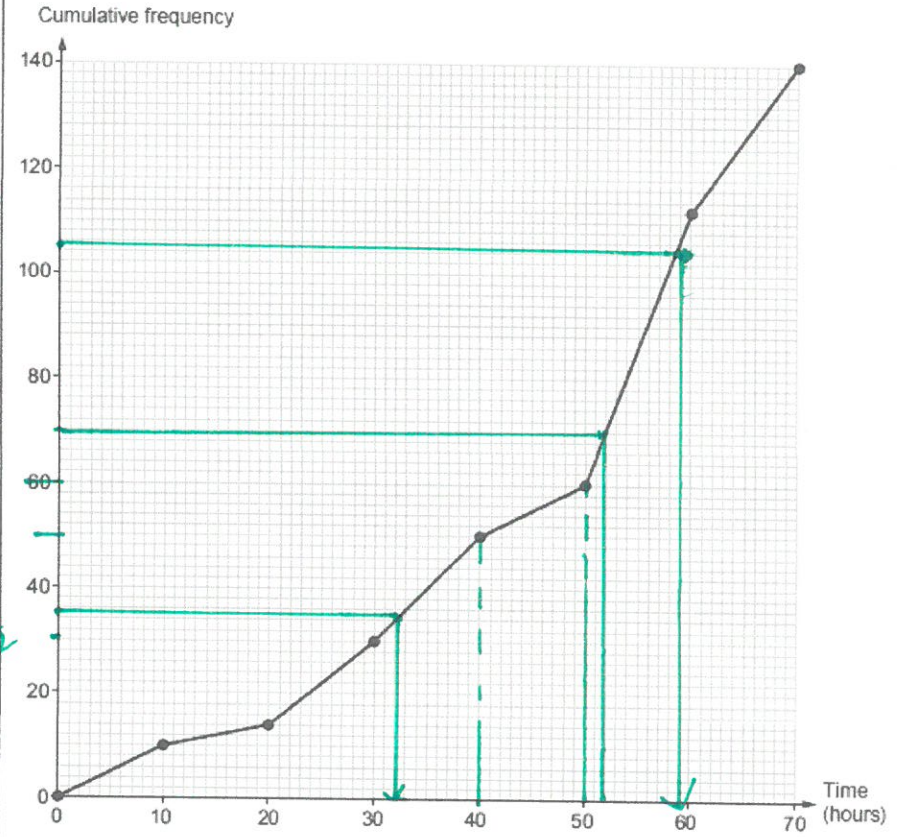
(b) Circle either TRUE or FALSE for each of the following statements. [2]

The smallest wave measured was 5 feet.	TRUE	FALSE
The range of the heights of the waves measured was 6·5 feet.	TRUE	FALSE
Approximately a half of the waves measured were more than 9·5 feet.	TRUE	FALSE
Approximately a quarter of the waves measured were between 6 feet and 9·5 feet.	TRUE	FALSE
The biggest wave measured was 12·25 feet.	TRUE	FALSE

2. **11.** *(a)* 140 girls were asked how long they spent revising for their GCSE examinations. The cumulative frequency diagram shows the results.



(i) Estimate the median time the girls spent revising.
Circle your answer. [1]

35 hours 40 hours 48 hours 52 hours 70 hours

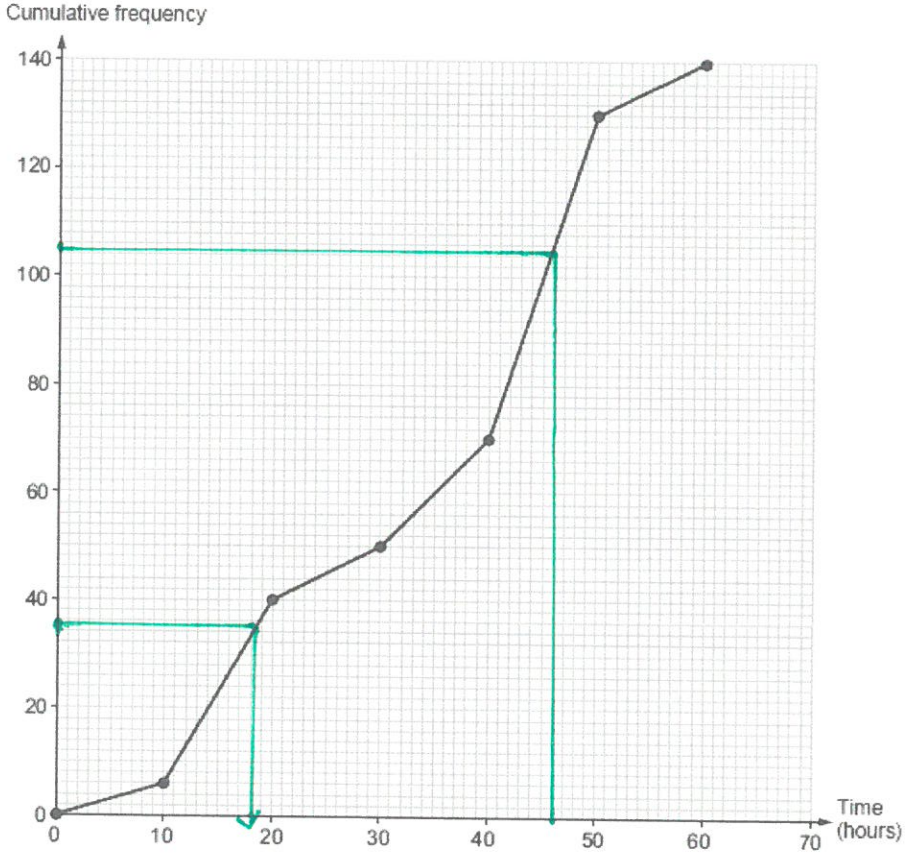
(ii) Calculate the number of girls who spent between 40 and 50 hours revising.
Circle your answer. [1]

0 girls 5 girls 10 girls 15 girls 20 girls

(iii) Circle either TRUE or FALSE for each of the following statements. [2]

25 girls spent between 30 and 50 hours revising.	TRUE	FALSE
No girls spent more than 80 hours revising.	TRUE	FALSE
The modal group is between 50 and 60 hours spent revising.	TRUE	FALSE
20 girls spent more than 60 hours revising.	TRUE	FALSE

(b) 140 boys were asked how long they spent revising for their GCSE examinations. The cumulative frequency diagram below shows the results.



Trefor makes two statements.

1. The boys' interquartile range is greater than the girls' interquartile range.
2. On average, boys spent more time revising.

Are both Trefor's statements correct?
Show calculations and give reasons to support your answers. [4]

Statement 1:

Boys LQ = 17 UQ = 46 IQR = 29

Girls LQ = 32 UQ = 59 IQR = 27

Their IQR is about the same, but boys is slightly higher

Statement 2:

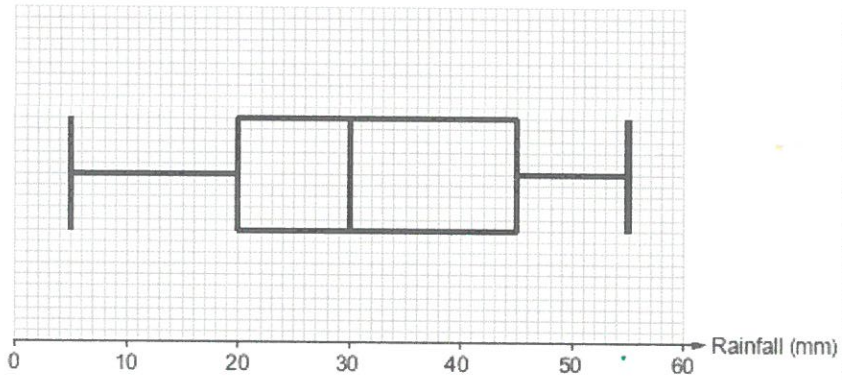
Median boys = 40 hours

Median girls = 52

So on average the girls spent more time revising

13. The following box-and-whisker plots illustrate the daily rainfall for April 2016 in Trefwen and in Nawrby.

April rainfall in Trefwen



April rainfall in Nawrby

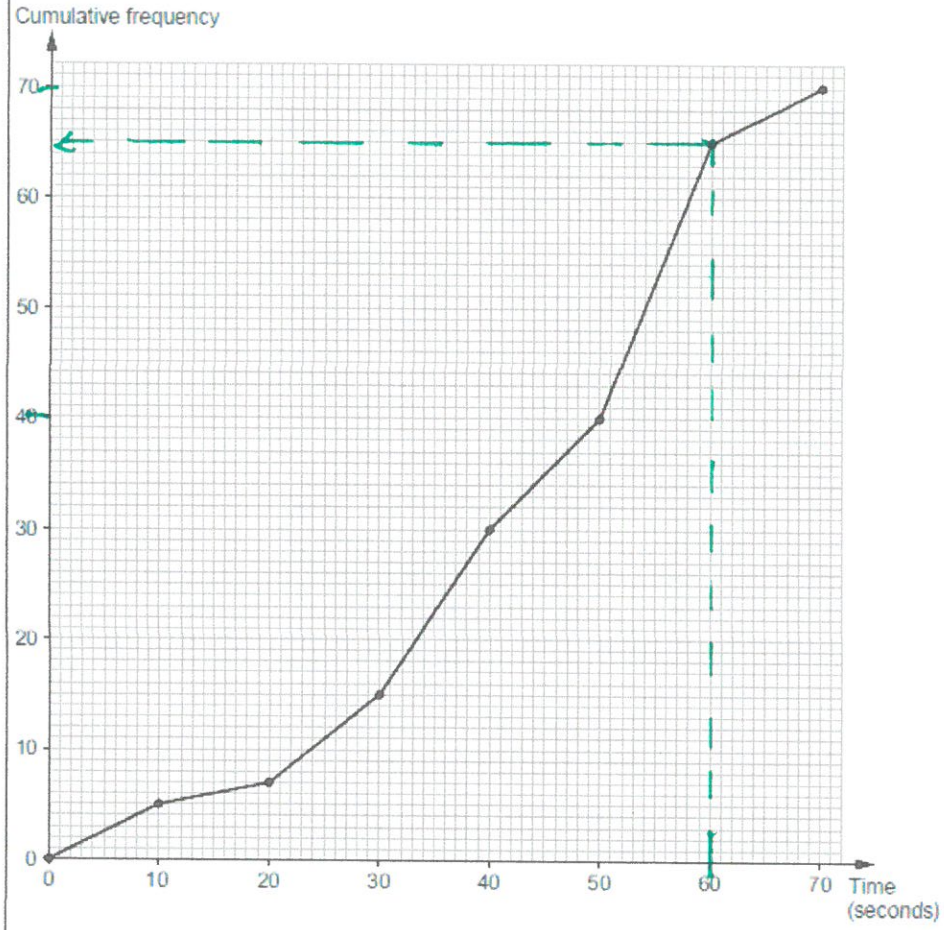
(a) Complete the following table. [4]

	Range	Median	Interquartile range
Trefwen	50 mm	30 mm	25 mm
Nawrby	49 mm	29 mm	30 mm

(b) Iona is going on holiday next April.
She is hoping for good weather, with hardly any rain.
She decides to go to Nawrby.
Give a reason to support Iona's decision.
Include values for both Trefwen and Nawrby. [1]

Because the median rainfall is lower in Nawrby than in Trefwen.

10. *Cambria Airlines* has planes that can carry up to 70 passengers.
For safety, the crew practise the emergency exit procedures with a group of 70 passengers.
Every 10 seconds the safety officer records the total number of passengers who have left the plane.
He has displayed the results in the cumulative frequency diagram shown below.



(a) Estimate the median time taken by the passengers to leave the plane. [1]

..... seconds

(b) How many passengers took more than 50 seconds to leave the plane?
Circle your answer. [1]

10 20 (30) 40 50

(c) *Cambria Airlines* has a policy that states the following.

'In the event of an emergency exit procedure, at least 90% of the 70 passengers must have left the plane within 1 minute.'

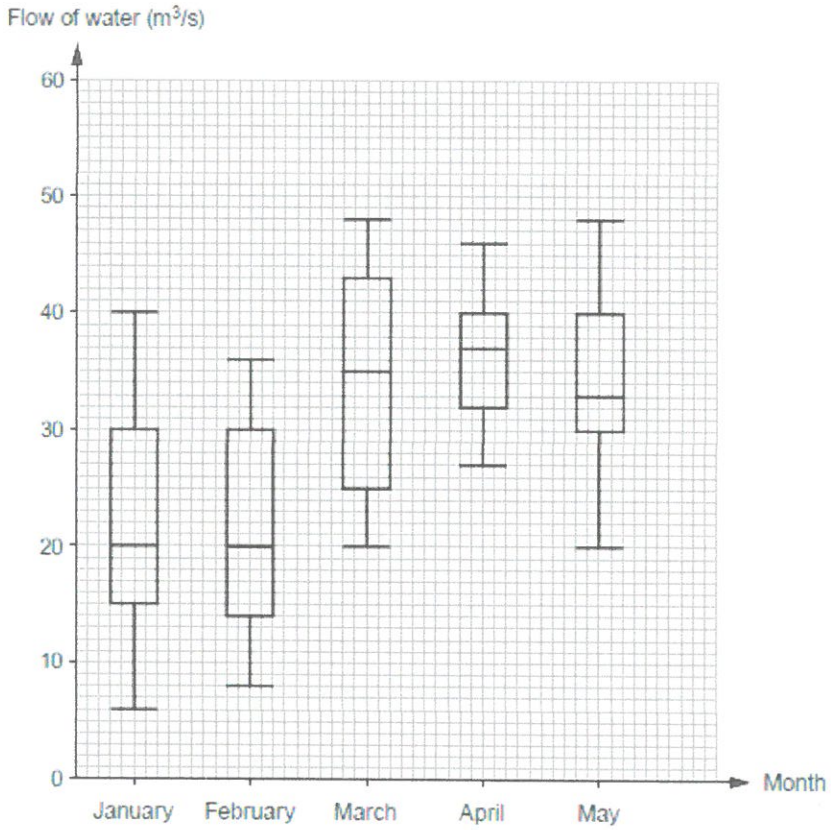
Did the practice emergency exit procedure meet the requirements of the airline's policy?
You must show all your working. [4]

Need 90% of 70 = 63 passengers out by 60sec

In fact 65 passengers had left by 60 sec,

So yes the requirements were met.

11. The following box and whisker plots show the flow of water through a drain, measured in m^3/s. The flow of water was measured at 11 a.m. each day for the first 5 months of the year.



(a) In which of the five months was the median flow of water the greatest? [1]

April

(b) In which of the five months was the range of the flow of water the greatest? [1]

January

(c) Iona is writing some statements for a report on the flow of water through the drain. Complete each of the statements given below.

(i) 'Both the upper quartiles and medians in the months of Jan and Feb were the same.' [1]

(ii) '25% of the results in March show the flow of water was greater than 43 m^3/s.' [1]

(d) Circle either TRUE or FALSE for each of the following statements. [2]

25% of the results in January show the flow of water was less than 6 m^3/s.	TRUE	(FALSE)
The units, m^3/s, measure the volume of water passing through the drain each second.	(TRUE)	FALSE
The mean flow of water in April was certainly greater than 36 m^3/s.	TRUE	(FALSE)
The month with the greatest difference between the lower quartile and the median was May.	TRUE	(FALSE)

10.

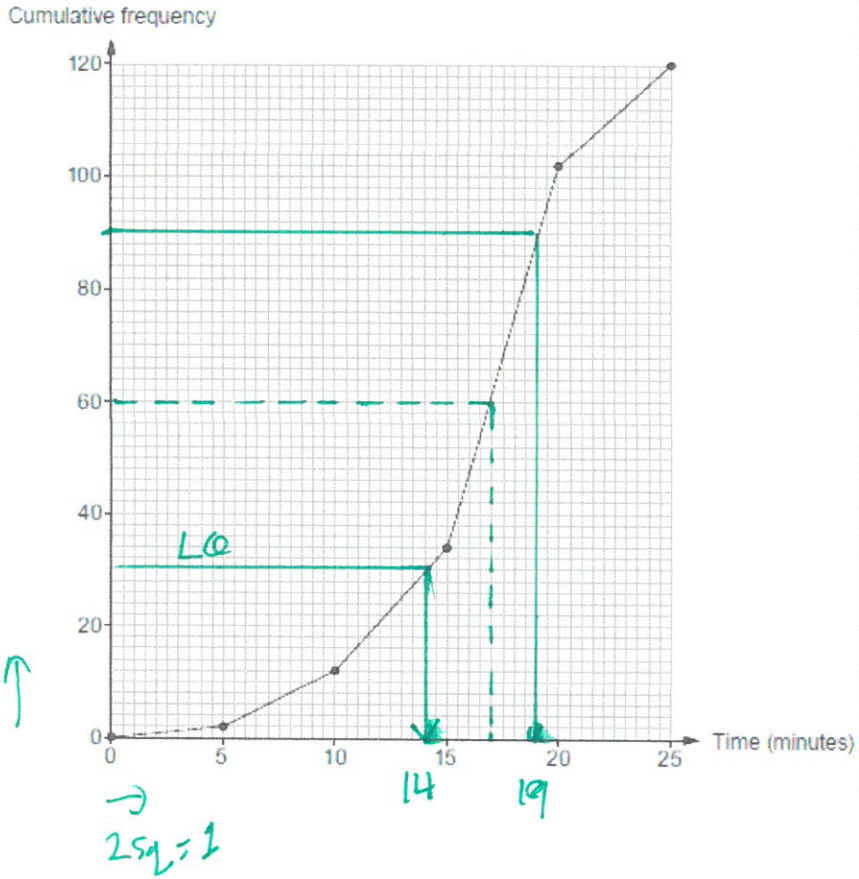
Meirion's Window Cleaning Business

No job too small!

Email: meirion@mwcb.cymru

Meirion is a window cleaner.
From Monday to Friday, he records how long he spends cleaning windows for each of his customers.

He draws a cumulative frequency diagram to display the findings.



(a) (i) Use Meirion's cumulative frequency diagram to find the median and interquartile range of the times he spends cleaning windows for each of his customers. [3]

Median 17 minutes

UQ = 19 LQ = 14 IQR = 5

Interquartile range ..... minutes

(ii) Meirion looks back at his raw data.
He finds that the median is actually 17 minutes 30 seconds.
Why is there a difference between the median from his cumulative frequency diagram and the actual median from his raw data? [1]

because the median from a c.f. diagram is only an estimate.

(b) Meirion is looking at the time it took to clean individual customers' windows.
Find the number of customers whose windows took between 10 and 15 minutes to clean. [2]

10min = 12 people, 15min = 34 people
So 22 people between 10 & 15 mins

(c) Meirion thinks that for approximately 80% of his customers, he cleaned their windows in less than 20 minutes.
Is Meirion correct?
You must show all your working. [3]

80% of 120 = 96 customers

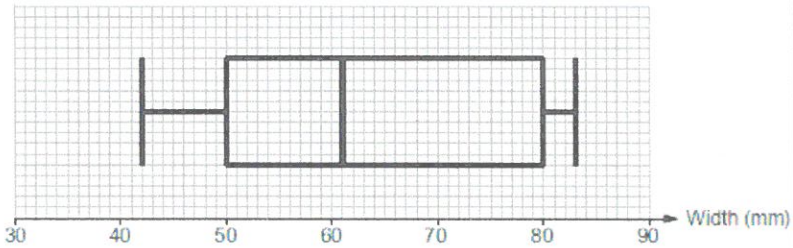
From graph 102 were cleaned in <20mins

which is $\frac{102}{120} \times 100 = 85\%$

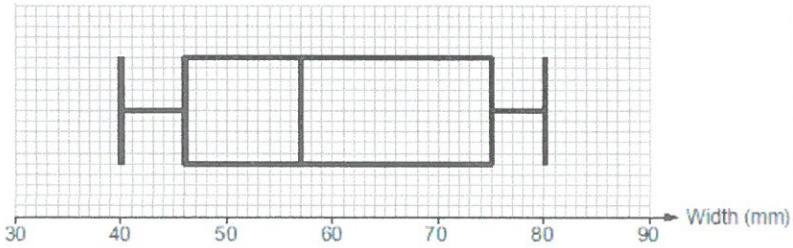
12. Lena has three apple trees in her garden.
She has one Gala apple tree, one Orange Pippin tree and one Pink Lady tree.
She picks 50 apples from each of the 3 trees.
She records the width of each apple, as shown.

Lena constructs box and whisker diagrams for the widths of the apples collected from each of the three trees.

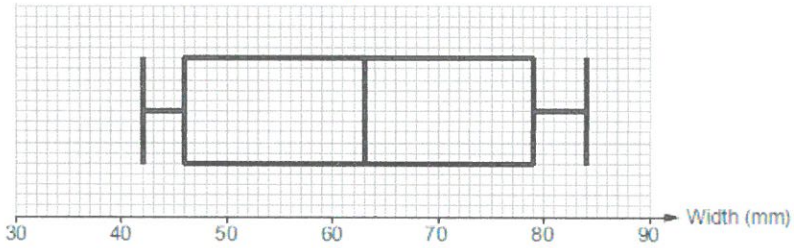
Gala apple tree



Orange Pippin apple tree



Pink Lady apple tree



(a) Complete each of the following statements.

(i) 'Apples from the ORANGE PIPPIN. apple tree have the least median width.

The median width of apples recorded for this tree is 56 mm.' [1]

(ii) 'The range of the widths of apples recorded for the Gala apple tree is 41 mm.' [1]

83 - 42 = 41 mm

(iii) 'The Pink Lady apple tree has apples with the greatest interquartile range of widths.

The interquartile range of the widths of apples recorded for this tree is 33 mm.' [2]

79 - 46 = 33 mm

(b) Which tree has a higher proportion of larger apples?
You must give a reason for your answer. [1]

Pink Lady because half the apples are wider than 63mm