HIGHER

2.7 Box Plots from Cumulative Frequency and Outliers: 30-minute Pack

Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 For the marks of a group of people in a test, the lower quartile is 22 and the upper quartile is 37. The smallest value is 6 and the largest value is 63. A value is an outlier if it is more than 1.5 x interquartile range below the lower quartile or above the upper quartile.

(a) Work out the interquartile range.

(b) Work out the limits beyond which a value is an outlier.

(c) State which of the smallest and the largest value, if any, are outliers.

(Total for Question 1 is 4 marks)

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2 Two box plots show the masses, in kilograms, of each group. The five-figure summaries are in the table.

Statistic	Team X	Team Y
Minimum	15	9
Lower quartile	28	19
Median	37	30
Upper quartile	48	43
Maximum	59	58

(a) Work out the interquartile range for Team X and for Team Y.

(b) Write down one comparison of the averages and one comparison of the spread, in context.

(Total for Question 2 is 4 marks)

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3 The table shows the speeds, in km/h, of cars on a road. There are 72 cars altogether. The cumulative frequency graph is drawn by plotting the upper class boundary against the cumulative frequency and joining the points with straight lines.

Class (km/h)	Frequency
$0 < x \leq 10$	10
$10 < x \leq 20$	8
$20 < x \leq 30$	15
$30 < x \leq 40$	12
$40 < x \leq 50$	12
$50 < x \leq 60$	15

(a) Work out the cumulative frequency for each class.

(b) Use linear interpolation between the plotted points to estimate the median. Give your answer to 1 decimal place.

(c) Estimate how many values are less than 35.

(Total for Question 3 is 7 marks)

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4 Two box plots show the times, in minutes, taken by each group to finish a puzzle. The five-figure summaries are in the table.

Statistic	Team X	Team Y
Minimum	30	12
Lower quartile	34	21
Median	42	32
Upper quartile	50	44
Maximum	68	50

(a) Work out the interquartile range for Team X and for Team Y.

(b) Write down one comparison of the averages and one comparison of the spread, in context.

(Total for Question 4 is 4 marks)

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5 The table shows the heights, in centimetres, of young trees. There are 64 trees altogether. The cumulative frequency graph is drawn by plotting the upper class boundary against the cumulative frequency and joining the points with straight lines.

Class (cm)	Frequency
$0 < x \leq 10$	20
$10 < x \leq 20$	15
$20 < x \leq 30$	8
$30 < x \leq 40$	6
$40 < x \leq 50$	15

(a) Work out the cumulative frequency for each class.
(b) Use linear interpolation between the plotted points to estimate the median. Give your answer to 1 decimal place.
(c) Estimate how many values are less than 25.

(Total for Question 5 is 7 marks)

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6 For the heights, in centimetres, of a group of people, the lower quartile is 31 and the upper quartile is 51. The smallest value is 7 and the largest value is 90. A value is an outlier if it is more than 1.5 x interquartile range below the lower quartile or above the upper quartile.
(a) Work out the interquartile range.
(b) Work out the limits beyond which a value is an outlier.
(c) State which of the smallest and the largest value, if any, are outliers.

(Total for Question 6 is 4 marks)

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Mark scheme · 2.7 Box Plots from Cumulative Frequency and Outliers: 30-minute Pack

Question 1

15	**B1**
22 - 1.5 x 15 or 37 + 1.5 x 15	**M1**
-0.5 and 59.5 cao	**A1**
the largest only	**B1**

Answer: (a) 15; (b) -0.5 and 59.5; (c) the largest only

Question 2

upper quartile minus lower quartile	**M1**
20 and 24 cao	**A1**
Team X has the higher median (37 compared with 30)	**B1**
Team X has the smaller interquartile range, so the data is less spread out	**B1**

Answer: (a) Team X 20, Team Y 24; (b) Team X has the higher median; Team X has the smaller IQR so is more consistent

Question 3

running totals of the frequencies	**M1**
10, 18, 33, 45, 57, 72 cao	**A1**
uses 36 on the cumulative frequency axis	**M1**
linear interpolation within the class	**M1**
32.5 cao (accept values within 1 of this)	**A1**
reads or interpolates the cumulative frequency at 35	**M1**
39 cao	**A1**

Answer: (a) 10, 18, 33, 45, 57, 72; (b) 32.5; (c) 39

Question 4

upper quartile minus lower quartile	**M1**
16 and 23 cao	**A1**
Team X has the higher median (42 compared with 32)	**B1**
Team X has the smaller interquartile range, so the data is less spread out	**B1**

Answer: (a) Team X 16, Team Y 23; (b) Team X has the higher median; Team X has the smaller IQR so is more consistent

Question 5

running totals of the frequencies	**M1**
20, 35, 43, 49, 64 cao	**A1**
uses 32 on the cumulative frequency axis	**M1**
linear interpolation within the class	**M1**
18 cao (accept values within 1 of this)	**A1**
reads or interpolates the cumulative frequency at 25	**M1**
39 cao	**A1**

Answer: (a) 20, 35, 43, 49, 64; (b) 18; (c) 39

Question 6

20	**B1**
31 - 1.5 x 20 or 51 + 1.5 x 20	**M1**
1 and 81 cao	**A1**
the largest only	**B1**

Answer: (a) 20; (b) 1 and 81; (c) the largest only

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