HIGHER

2.7 Box Plots from Cumulative Frequency and Outliers: 1-hour Pack

Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The table shows the amounts, in pounds, that shoppers spent. There are 64 shoppers 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 (pounds)	Frequency
$0 < x \leq 10$	6
$10 < x \leq 20$	8
$20 < x \leq 30$	8
$30 < x \leq 40$	20
$40 < x \leq 50$	10
$50 < x \leq 60$	12

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

(b) Use linear interpolation to estimate the lower quartile and the upper quartile, and so the interquartile range. Give your answer to 1 decimal place.

(c) Estimate how many values are greater than 45.

(Total for Question 1 is 8 marks)

© Revision Library | revisionlibrary.co.uk

2 For the times, in minutes, taken by a group of people to finish a puzzle, the lower quartile is 35 and the upper quartile is 55. The smallest value is 8 and the largest value is 89. 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 2 is 4 marks)

---

3 A box plot shows the marks of 100 people in a test. The lower quartile is 27, the median is 30 and the upper quartile is 39.

(a) Work out the interquartile range.

(b) Estimate how many values are less than 27.

(c) Estimate how many values lie between 27 and 39.

(Total for Question 3 is 4 marks)

---

4 For the heights, in centimetres, of a group of people, the lower quartile is 14 and the upper quartile is 38. The smallest value is 3 and the largest value is 71. 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 4 is 4 marks)

© Revision Library | revisionlibrary.co.uk

5 A box plot shows the times, in minutes, taken by 120 people to finish a puzzle. The lower quartile is 20, the median is 31 and the upper quartile is 38.

(a) Work out the interquartile range.

(b) Estimate how many values are less than 20.

(c) Estimate how many values lie between 20 and 38.

(Total for Question 5 is 4 marks)

---

6 The table shows the speeds, in km/h, of cars on a road. There are 64 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
$10 < x \leq 20$	16
$20 < x \leq 30$	12
$30 < x \leq 40$	12
$40 < x \leq 50$	12
$50 < x \leq 60$	12

(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 6 is 7 marks)

© Revision Library | revisionlibrary.co.uk

7 A box plot shows the heights, in centimetres, of 200 people. The lower quartile is 38, the median is 44 and the upper quartile is 51.

(a) Work out the interquartile range.

(b) Estimate how many values are less than 38.

(c) Estimate how many values lie between 38 and 51.

(Total for Question 7 is 4 marks)

---

8 The table shows the speeds, in km/h, of cars on a road. There are 60 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
$0 < x \leq 20$	9
$20 < x \leq 40$	15
$40 < x \leq 60$	10
$60 < x \leq 80$	6
$80 < x \leq 100$	20

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

(b) Use linear interpolation to estimate the lower quartile and the upper quartile, and so the interquartile range. Give your answer to 1 decimal place.

(c) Estimate how many values are greater than 50.

(Total for Question 8 is 8 marks)

© Revision Library | revisionlibrary.co.uk

9 For the numbers of messages sent by a group of people in a day, the lower quartile is 37 and the upper quartile is 53. The smallest value is 19 and the largest value is 86. 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 9 is 4 marks)

© Revision Library | revisionlibrary.co.uk

10 The table shows the amounts, in pounds, that shoppers spent. There are 64 shoppers 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 (pounds)	Frequency
$0 < x \leq 20$	20
$20 < x \leq 40$	12
$40 < x \leq 60$	10
$60 < x \leq 80$	10
$80 < x \leq 100$	12

(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 30.

(Total for Question 10 is 7 marks)

---

11 For the masses, in kilograms, of a group of people, the lower quartile is 27 and the upper quartile is 49. The smallest value is 16 and the largest value is 91. 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 11 is 4 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 2.7 Box Plots from Cumulative Frequency and Outliers: 1-hour Pack

Question 1

uses 32 on the cumulative frequency axis	M1
linear interpolation within the class	M1
35 cao (accept values within 1 of this)	A1
positions 16 and 48 used	M1
linear interpolation for each quartile: LQ = 20 + (16 - 14)/8 x 10; UQ = 40 + (48 - 42)/10 x 10	M1
LQ = 22.5 pounds, UQ = 46.0 pounds and IQR = 23.5 pounds cao	A1
interpolates at 45 and subtracts from 64	M1
17 cao	A1

Answer: (a) 35.0 pounds; (b) LQ = 22.5 pounds, UQ = 46.0 pounds, IQR = 23.5 pounds; (c) 17

Question 2

20	B1
35 - 1.5 x 20 or 55 + 1.5 x 20	M1
5 and 85 cao	A1
the largest only	B1

Answer: (a) 20; (b) 5 and 85; (c) the largest only

Question 3

12	B1
quarter of 100	M1
25	A1
half of 100 = 50	B1

Answer: (a) 12; (b) 25; (c) 50

Question 4

24	B1
14 - 1.5 x 24 or 38 + 1.5 x 24	M1
-22 and 74 cao	A1
neither	B1

Answer: (a) 24; (b) -22 and 74; (c) neither

Question 5

18	B1
quarter of 120	M1
30	A1
half of 120 = 60	B1

Answer: (a) 18; (b) 30; (c) 60

Question 6

running totals of the frequencies	M1
16, 28, 40, 52, 64 cao	A1
uses 32 on the cumulative frequency axis	M1
linear interpolation within the class	M1
33.3 cao (accept values within 1 of this)	A1
reads or interpolates the cumulative frequency at 25	M1
22 cao	A1

Answer: (a) 16, 28, 40, 52, 64; (b) 33.3; (c) 22

Question 7

13	B1
quarter of 200	M1
50	A1
half of 200 = 100	B1

Answer: (a) 13; (b) 50; (c) 100

Question 8

uses 30 on the cumulative frequency axis	M1
linear interpolation within the class	M1
52 cao (accept values within 1 of this)	A1
positions 15 and 45 used	M1
linear interpolation for each quartile: LQ = 20 + (15 - 9)/15 x 20; UQ = 80 + (45 - 40)/20 x 20	M1
LQ = 28.0 km/h, UQ = 85.0 km/h and IQR = 57.0 km/h cao	A1
interpolates at 50 and subtracts from 60	M1
31 cao	A1

Answer: (a) 52.0 km/h; (b) LQ = 28.0 km/h, UQ = 85.0 km/h, IQR = 57.0 km/h; (c) 31

Question 9

16	B1
37 - 1.5 x 16 or 53 + 1.5 x 16	M1
13 and 77 cao	A1
the largest only	B1

Answer: (a) 16; (b) 13 and 77; (c) the largest only

Question 10

running totals of the frequencies	M1
20, 32, 42, 52, 64 cao	A1
uses 32 on the cumulative frequency axis	M1
linear interpolation within the class	M1
40 cao (accept values within 1 of this)	A1
reads or interpolates the cumulative frequency at 30	M1
26 cao	A1

Answer: (a) 20, 32, 42, 52, 64; (b) 40; (c) 26

Question 11

22	B1
27 - 1.5 x 22 or 49 + 1.5 x 22	M1
-6 and 82 cao	A1
the largest only	B1

Answer: (a) 22; (b) -6 and 82; (c) the largest only

© Revision Library | revisionlibrary.co.uk