Cumulative Frequency and Box Plots

GCSE Mathematics • **Higher Tier** • Grades 6–7 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 49 / 49

Show all your working. Marks are given for correct method as well as the final answer.

1. The table shows the masses of 80 parcels. Work out the cumulative frequency for $m \leq 30$. **[2 marks]**

Mass m (g)	$0 < m \leq 10$	$10 < m \leq 20$	$20 < m \leq 30$	$30 < m \leq 40$	$40 < m \leq 50$	$50 < m \leq 60$
Frequency	6	16	24	20	10	4

add up all the frequencies so far
6 + 16 + 24
= 46

Answer: 46

2. Using the same table, work out the cumulative frequency for $m \leq 50$. **[2 marks]**

Mass m (g)	$0 < m \leq 10$	$10 < m \leq 20$	$20 < m \leq 30$	$30 < m \leq 40$	$40 < m \leq 50$	$50 < m \leq 60$
Frequency	6	16	24	20	10	4

6 + 16 + 24 + 20 + 10
= 76

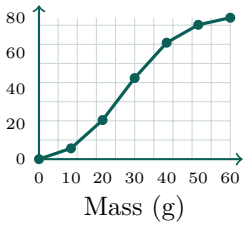
Answer: 76

3. Explain why a cumulative frequency graph is plotted at the UPPER bound of each class. **[2 marks]**

not the midpoint -- that is for estimating a mean

Answer: that is the point by which all of them have occurred

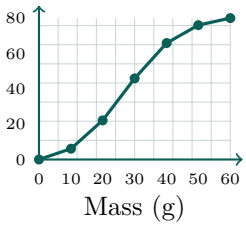
4. Use the curve to estimate the median mass. **[2 marks]**



median is the $\frac{80}{2}$ = 40th value
go across from 40, then down

Answer: about 31 g

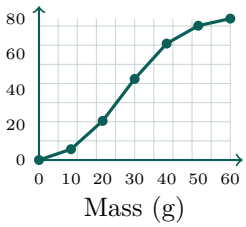
5. Use the curve to estimate the lower quartile. **[2 marks]**



LQ is the $\frac{80}{4}$ = 20th value

Answer: _____ about 21 _____ **g**

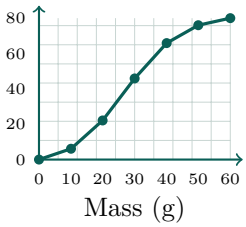
6. Use the curve to estimate the upper quartile. **[2 marks]**



UQ is the $\frac{3\times80}{4}$ = 60th value

Answer: _____ about 38 _____ **g**

7. Use your quartiles to work out the interquartile range. **[2 marks]**



IQR = UQ – LQ
38 – 21 = 17

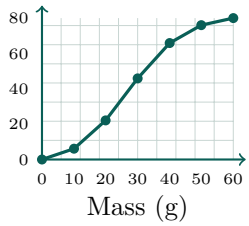
Answer: _____ about 17 _____ **g**

8. Explain why the interquartile range is often preferred to the range. **[2 marks]**

the range uses only the two most extreme values
the IQR covers the middle half

Answer: ____ it ignores extreme values ____

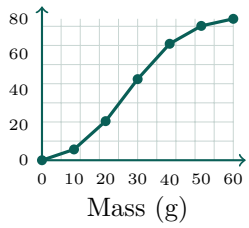
9. Use the curve to estimate how many parcels weigh more than 45 g. **[3 marks]**



read the cf at 45: about 71
80 – 71
= 9

Answer: _____ about 9 _____

10. Use the curve to estimate how many parcels weigh between 25 g and 45 g. **[3 marks]**



cf at 45 is about 71
cf at 25 is about 34
71 – 34 = 37

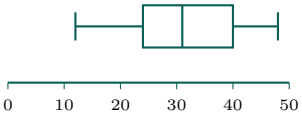
Answer: _____ about 37 _____

11. Write down the five values a box plot shows. **[2 marks]**

the box gives the quartiles and the median
the whiskers give the extremes

Answer: ____ minimum, LQ, median, UQ, maximum ____

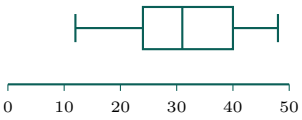
12. Write down the median shown by this box plot. **[1 mark]**



the line inside the box

Answer: _____ 31 _____

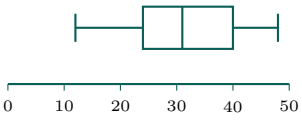
13. Using the same box plot, work out the interquartile range. **[2 marks]**



40 − 24
= 16

Answer: 16

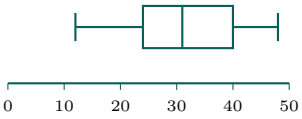
14. Using the same box plot, work out the range. **[2 marks]**



48 − 12
= 36

Answer: 36

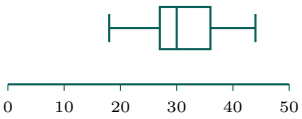
15. Using the same box plot, write down the percentage of the data below 24. **[1 mark]**



24 is the lower quartile

Answer: 25%

16. Write down the median and the IQR of this box plot. **[2 marks]**



median line at 30
36 − 27 = 9

Answer: median 30, IQR 9

17. Compare the two sets of data shown by box plots A (median 31, IQR 16) and B (median 30, IQR 9). **[3 marks]**

averages: medians are close, 31 and 30
spread: B's IQR is much smaller
always compare BOTH an average and a spread

Answer: similar medians, B is far more consistent

18. A box plot has minimum 5, LQ 12, median 15, UQ 26, maximum 40.

(a) Work out the interquartile range. **[2 marks]**

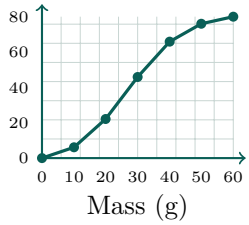
26 − 12
= 14

(b) Explain what the position of the median inside the box tells you. **[2 marks]**

the median is nearer the LQ
so the data is bunched at the lower end
a long upper whisker means a positive skew

Answer: 14 ; bunched low, skewed towards the higher values

19. The curve shows the masses of 80 parcels.



(a) Estimate the median and the quartiles. **[4 marks]**

40th value: median ≈ 31 g
20th value: LQ ≈ 21 g
60th value: UQ ≈ 38 g

(b) Use them to describe the shape of the distribution. **[2 marks]**

31 − 21 = 10, 38 − 31 = 7
the lower half is more spread out

Answer: median 31, LQ 21, UQ 38 ; lower half more spread

20. Two classes sat the same test. Class X had median 58 and IQR 20. Class Y had median 64 and IQR 8.

(a) Write down which class did better on average, with a reason. **[2 marks]**

Class Y
its median is higher, 64 against 58

(b) Write down which class was more consistent, with a reason. **[2 marks]**

Class Y
its IQR is smaller, 8 against 20
smaller spread means more consistent

Answer: Y on average ; Y more consistent

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