

Exercise walk-through

6.1.2

Cumulative

AQA · GCSE · Mathematics

48. Histogram density and cumulative-frequency construction · Higher

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For classes $0 \leq x < 10$, $10 \leq x < 20$, $20 \leq x < 40$ with frequencies 20, 30, 20, widths are 10, 10, 20 and densities 2, 3, 1. The last two bars have different heights but areas 30 and 20. Cumulative points are $(0, 0)$, $(10, 20)$, $(20, 50)$, $(40, 70)$. The median is at cumulative count 35; a straight-line estimate in the second class gives $10 + (35 - 20)/30 \times 10 = 15$. Q1 is at 17.5 and Q3 at 52.5, giving corresponding interpolated estimates 8.75 and 22.5. Class midpoints 5, 15, 30 give estimated mean $(100 + 450 + 600)/70 \approx 16.43$.

55. Quartiles, box plots and distribution comparisons · Higher

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Group A has summary 2,5,8,11,18 and group B has 1,6,8,10,20. Both medians are 8. A has $IQR=6$ and $range=16$; B has $IQR=4$ and $range=19$. B's middle half is more consistent although its full range is larger. Under a stated $1.5 \times IQR$ outlier rule, A's fences are $5-9=-4$ and $11+9=20$; a new value 23 lies above the upper fence. This rule is a specified convention, not a compulsory rule for every box plot. When using cumulative frequency, read Q1 at $N/4$ and Q3 at $3N/4$, then subtract; small reading errors affect the estimated IQR.

62. Reasoning and check

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Class widths are 10,20,5. Frequency density is frequency divided by width, giving 0.8,0.6,2; bar areas return 8,12,10. Cumulative frequencies at upper class boundaries 10,30,35 are 8,20,30, starting from (0,0). Midpoints 5,20,32.5 give estimated total $8(5) + 12(20) + 10(32.5) = 605$, hence estimated mean $605/30 = 121/6$, about 20.17. Within-class positions are unknown; the midpoint model estimates their total. Height alone is not frequency when widths differ, and a cumulative curve depends on an interpolation assumption between boundaries.

Exercises 2.1·2.3

2.1 (Higher) Find the IQR when $Q_1=12, Q_3=21$.

2.2 (Higher) For 80 observations, find the cumulative frequency used for the median.

2.3 (Higher) For $Q_1=12, IQR=9$, find $Q_1-1.5IQR$.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Higher) Find the IQR when $Q_1=12, Q_3=21$.

2.1 $IQR=Q_3-Q_1=21-12=9$.

2.2 (Higher) For 80 observations, find the cumulative frequency used for the median.

2.2 The median position is half the total cumulative frequency: $80/2=40$.

2.3 (Higher) For $Q_1=12, IQR=9$, find $Q_1-1.5IQR$.

3 Exam-style questions

2.3 The lower outlier fence is $12-1.5 \times 9 = -1.5$.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: The interquartile range always equals the maximum minus the minimum.

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3.1 False. A five-number summary 1,3,5,8,12 has IQR $8-3=5$ and range $12-1=11$.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.