

Exercise walk-through

6.2.3

Histogram Density

AQA · GCSE · Mathematics

46. Histogram density and cumulative-frequency construction · Higher

Histogram density and cumulative-frequency construction · Higher

Use continuous adjoining class boundaries on the horizontal axis.

Density=frequency/class width, so bar area recovers frequency. Unequal widths require this adjustment. A cumulative-frequency graph plots each upper class boundary against the running total, beginning at the first lower boundary with zero. Read percentiles at fractions of the total; values within classes are estimates.

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 $(100 + 450 + 600)/70 \approx 16.43$.

62. Reasoning and check

Reasoning and check

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 density for frequency 20 in width 20.

2.2 (Higher) Find total frequency of 20,30,20.

2.3 (Higher) Find the linear-interpolated median from the stated cumulative points.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Higher) Find density for frequency 20 in width 20.

2.1 $20/20=1$.

2.2 (Higher) Find total frequency of 20,30,20.

2.2 Add all class frequencies.

2.3 (Higher) Find the linear-interpolated median from the stated cumulative points.

3 Exam-style questions

2.3 Count 35 is halfway from 20 to 50, so halfway from 10 to 20.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Histogram bar height always equals the number of observations.

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3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Histogram bar height always equals the number of observations.

3.1 False. A class of width 10 containing 20 observations has frequency density $20/10=2$. Area 10×2 recovers frequency 20; height alone does not.

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