

6.2.3 Histogram Density

Name: _____ Class: _____ Date: _____

KEY WORDS frequency density

<!-- Session 2 native-skill companion -->

Objective

Practise histogram density within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Histogram density and cumulative-frequency construction · Higher

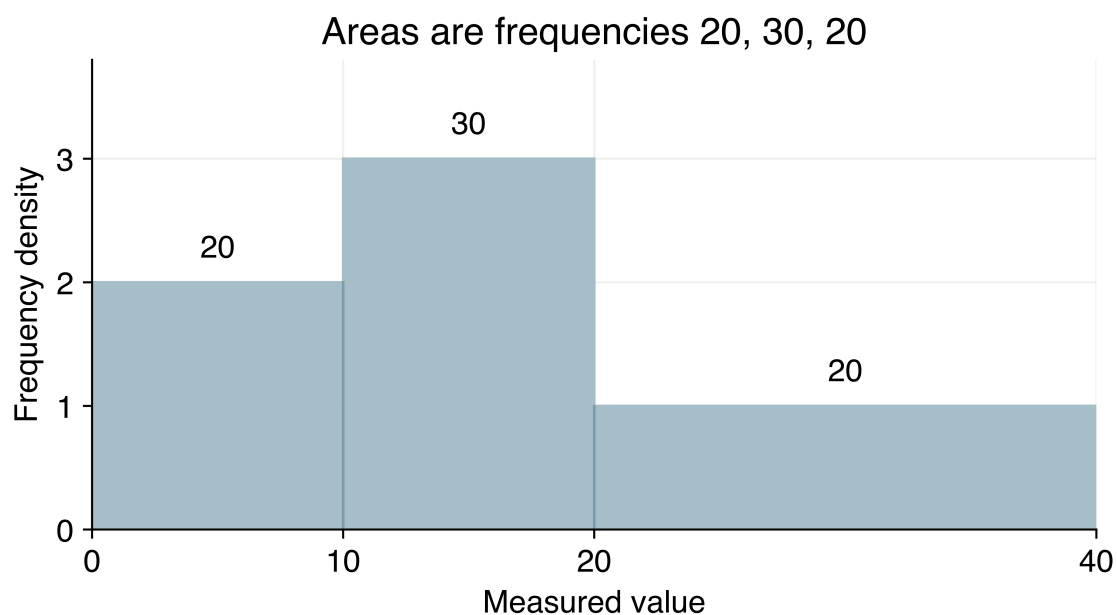
Use continuous adjoining class boundaries on the horizontal axis. Density=frequency/class width, so bar area recovers frequency. Unequal widths require this adjustment. A cumulative-frequency graph plots each upper class boundary against the running total, beginning at the first lower boundary with zero.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

$$d = \frac{f}{w}, \quad f = dw$$

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 mid-points 5,15,30 give estimated mean $(100+450+600)/70 \approx 16.43$. A sketch that joins upper boundaries with a smooth curve can give slightly different readings, so use the stated precision and graph.

A histogram uses density on its vertical axis when widths differ. Plot cumulative totals at boundaries, not midpoints. Grouped percentiles depend on interpolation assumptions and are not exact individual measurements.

AQA S3 Higher includes equal/unequal-class histograms and cumulative-frequency graphs, with suitable interpretation. Explain why bar area represents frequency and label the graph axes/units.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

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

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

Solutions

2.1 $20/20=1$.

2.2 Add all class frequencies.

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

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.