

Histograms and frequency density

Topic cliff notes / objectives, key ideas and examples

Learning objectives

- Calculate frequency density for unequal class widths.
- Recover frequency from a histogram bar area.

Key ideas

- Use the class boundaries to find each width.

$$\text{class width} = \text{upper boundary} - \text{lower boundary}$$

- Divide frequency by class width to calculate the bar height.

$$\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$$

- Multiply density by width to recover frequency.

$$\text{frequency} = \text{density} \times \text{class width}$$

- Histogram bar area represents frequency. Adjoining bars can have unequal widths.

Worked example

Times are grouped in intervals from zero to ten, ten to thirty and thirty to fifty, with frequencies 8, 30 and 12. Find their densities.

$$0 \leq t < 10, \quad 10 \leq t < 30, \quad 30 \leq t < 50$$

$$\text{class widths : } 10, 20, 20$$

$$\text{densities : } \frac{8}{10}, \frac{30}{20}, \frac{12}{20}$$

Answer

$$0.8, \quad 1.5, \quad 0.6$$

Quick example

A class has width eight and frequency twenty-four. Find its density.

$$\text{density} = \frac{24}{8}$$

Answer

$$3$$

Watch out

Bar height is density, not frequency. Equal heights can represent different frequencies when class widths differ.

