

2.5 Collect, classify and display data without overstating evidence

Name: _____ Class: _____ Date: _____ Total: 24 marks

KEY WORDS population 总体 • sample 样本 • bias 偏差

Objective

Collect, classify and display data without overstating evidence. Original GAC004-aligned practice, not an official assessment. Show the method as well as the result. All applied scenarios are invented classroom problems.

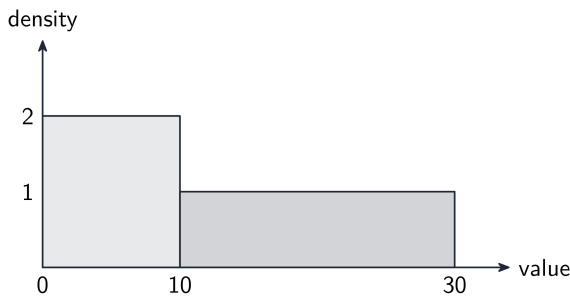
1 Key knowledge and worked examples

■ Key knowledge: a sample and a graph both need a defined scope

The **population** 总体 is the group a question concerns; a **sample** 样本 is the observed subset. A **bias** 偏差 can systematically favour some members or responses. A large convenience sample does not automatically represent the population. Record units, collection method, nonresponse and the question asked.

Categorical data use labels; quantitative data use numbers with a meaningful measurement scale. Discrete data are counts and continuous data are measured over an interval. Use separated bars for categories. For unequal-width continuous histogram classes, frequency density is frequency divided by class width; area, not height alone, represents frequency. Association in observational data does not establish causation.

■ Worked example: equal bar heights can conceal unequal frequencies



Known: class 0 to 10 has frequency 20; class 10 to 30 has frequency 20. Widths differ, so calculate frequency density.

$$D = \frac{f}{w}$$

$$D_1 = \frac{20}{10} = 2$$

$$D_2 = \frac{20}{20} = 1$$

The second bar is half as high but twice as wide. Both areas represent 20 observations.

2 Practice

2.1 A school studies all 600 students but surveys 60 randomly selected students. Identify its population and sample. [2]

2.2 Classify each variable as categorical or quantitative: (a) preferred bus route label, (b) travel time in minutes. [2]

2.3 A school asks only members of its sports club whether more money should go to sports facilities. Identify a sampling limitation, explain its effect, and suggest a better selection method. [3]

2.4 A histogram class from 20 to 30 minutes has frequency 15. Find its width and frequency density, and state what the area of its bar represents. [3]

3 Exam-style questions

3.1 A supplied travel-time table uses classes 0 to less than 10 minutes: 12 students; 10 to less than 20: 18; 20 to less than 40: 20. (a) Find the total count. (b) Find each frequency density for a histogram. (c) Find the proportion taking less than 20 minutes. (d) Explain why using frequencies directly as bar heights would distort the unequal-width histogram. [6]

3.2 An optional online survey was sent to 200 students. Sixty responded; 45 of those preferred later club meetings. A report says, “75% of all students want later meetings, so later meetings will improve attendance.” (a) Calculate the response rate and the preference percentage among respondents. (b) Explain two distinct unsupported claims in the report. (c) Propose a better way to study the preference and a separate way to evaluate attendance after a permitted schedule change. [8]