

Chapter 4: Presentation of Data

NCERT · Class 11 · Statistics

Textbook exercises

Question 1

Bar diagram is a (i) one-dimensional diagram (ii) two-dimensional diagram (iii) diagram with no dimension (iv) none of the above

Solution

ANSWER **(i) one-dimensional diagram.** In a bar diagram only the height (length) of the bar represents the magnitude of the data; the width of the bar is unimportant. Since only one dimension carries meaning, a bar diagram is a one-dimensional diagram.

Question 2

Data represented through a histogram can help in finding graphically the (i) mean (ii) mode (iii) median (iv) all the above

Solution

ANSWER **(ii) mode.** A histogram gives the value of the mode of a frequency distribution graphically — the x-coordinate of the dotted vertical line drawn through the tallest rectangle gives the mode.

Question 3

Ogives can be helpful in locating graphically the (i) mode (ii) mean (iii) median (iv) none of the above

Solution

ANSWER **(iii) median.** The point where the 'less than' ogive and the 'more than' ogive intersect gives the median of the frequency distribution.

Question 4

Data represented through arithmetic line graph help in understanding (i) long term trend (ii) cyclicity in data (iii) seasonality in data (iv) all the above

Solution

ANSWER **(iv) all the above.** An arithmetic line graph (time series graph) helps in understanding the long-term trend, cyclicity (periodicity) and seasonality in data over time.

Question 5

Width of bars in a bar diagram need not be equal (True/False).

Solution

ANSWER **False.** In a bar diagram the bars are equi-width (and equi-spaced). Although the width itself is unimportant for comparison — only height matters — by convention all bars are drawn of equal width.

Question 6

Width of rectangles in a histogram should essentially be equal (True/False).

Solution

ANSWER **False.** The width of a rectangle in a histogram equals the width of its class interval, and class intervals may be unequal. When widths differ, the heights are adjusted using frequency density so that the areas remain proportional to the frequencies.

Question 7

Histogram can only be formed with continuous classification of data (True/False).

Solution

ANSWER **True.** A histogram is drawn only for a continuous variable. If the classes are not continuous, they must first be converted into continuous classes (exclusive form) before a histogram can be drawn.

Question 8

Histogram and column diagram are the same method of presentation of data. (True/False)

Solution

ANSWER **False.** They are different. In a histogram no space is left between rectangles and it is drawn only for continuous variables, where area (not just height) is meaningful. In a column (bar) diagram,

spaces are left between bars, it can be used for discrete and continuous data, and only the height matters.

Question 9

Mode of a frequency distribution can be known graphically with the help of histogram. (True/False)

Solution

ANSWER **True**. A histogram gives the mode graphically; the x-coordinate of the vertical line through the tallest rectangle (located by drawing diagonals at the peak) is the mode.

Question 10

Median of a frequency distribution cannot be known from the ogives. (True/False)

Solution

ANSWER **False**. The median can be found from ogives — the point of intersection of the 'less than' and 'more than' ogives gives the median of the distribution.

Question 11

What kind of diagrams are more effective in representing the following? (i) Monthly rainfall in a year (ii) Composition of the population of Delhi by religion (iii) Components of cost in a factory

Solution

ANSWER **(i) Monthly rainfall in a year:** a **simple bar diagram** is most effective — twelve equispaced bars (one per month) whose heights show the rainfall, allowing easy month-to-month comparison. (An arithmetic line graph can also show the trend across the year.) **(ii) Composition of the population of Delhi by religion:** a **pie diagram** is most effective, because it shows how the whole population is divided proportionally among the different religious communities as shares of one circle. **(iii) Components of cost in a factory:** a **component (sub-divided) bar diagram** or a **pie diagram** is most effective, since the total cost can be split into its component heads (raw material, labour, power, etc.) and each component compared as a part of the whole.

Question 12

Suppose you want to emphasise the increase in the share of urban non-workers and lower level of urbanisation in India as shown in Example 4.2. How would you do it in the tabular form?

Solution

ANSWER The data (Census of India 2001, in crores) relate to workers and non-workers by location. To emphasise the **share of non-workers** and the **level of urbanisation**, present the figures as **percentages** rather than as raw numbers, because percentages make the comparison between rural and urban India direct. From the data: total population = 102 crore; rural = 74 crore and urban = 28 crore; rural non-workers = 43 crore and urban non-workers = 19 crore. Urbanisation = $(28 \div 102) \times 100 \approx 27.5\%$ (so about 72.5% of people live in rural areas — a low level of urbanisation). Share of non-workers within urban India = $(19 \div 28) \times 100 \approx 67.9\%$, compared with $(43 \div 74) \times 100 \approx 58.1\%$ in rural India — clearly higher in towns and cities. A suitable table emphasising these points is given below.

Location	Population (crore)	Share in total population (%)	Non-workers (crore)	Non-workers as % of that area
Rural	74	72.5	43	58.1
Urban	28	27.5	19	67.9
All India	102	100.0	62	60.8

The percentage columns highlight both facts at a glance: urbanisation is low (only ~27.5% urban) while the proportion of non-workers is higher in urban India (~67.9%) than in rural India (~58.1%). *Source: Census of India 2001.*

Question 13

How does the procedure of drawing a histogram differ when class intervals are unequal in comparison to equal class intervals in a frequency table?

Solution

ANSWER When the class intervals are **equal**, all rectangles have the same base (width), so the area of each rectangle is automatically proportional to its frequency. Hence the **height of each rectangle can simply be taken equal to the frequency** of that class, and the histogram is drawn directly. When the class intervals are **unequal**, taking the frequency as the height would distort the picture, because a wider class would get a larger area for the same frequency. In a histogram it is the **area** (not the height) that must be proportional to the frequency. So the heights are adjusted: for each class we compute the **frequency density = class frequency $\div$ class width**, and plot frequency density (adjusted frequency)

on the Y-axis instead of the raw frequency. This keeps the area of every rectangle proportional to its frequency and gives a correct histogram.

Question 14

The Indian Sugar Mills Association reported that, 'Sugar production during the first fortnight of December 2001 was about 3,87,000 tonnes, as against 3,78,000 tonnes during the same fortnight last year (2000). The off-take of sugar from factories during the first fortnight of December 2001 was 2,83,000 tonnes for internal consumption and 41,000 tonnes for exports as against 1,54,000 tonnes for internal consumption and nil for exports during the same fortnight last season.' (i) Present the data in tabular form. (ii) Suppose you were to present these data in diagrammatic form which of the diagrams would you use and why? (iii) Present these data diagrammatically.

Solution

ANSWER (i) **Tabular form** (figures in '000 tonnes, i.e. thousand tonnes), for the first fortnight of December:

Item	2000 ('000 tonnes)	2001 ('000 tonnes)
Production	378	387
Off-take: Internal consumption	154	283
Off-take: Exports	Nil (0)	41
Total off-take	154	324

Source: Indian Sugar Mills Association. (ii) **Choice of diagram:** a **component (sub-divided) bar diagram** is most suitable. Off-take has two components — internal consumption and exports — whose total can be shown as one bar split into parts. A component bar diagram for each year compares both the totals and the share of each component between 2000 and 2001 in a single picture. (Production can be shown as a separate simple bar alongside.) (iii) **Diagram described in words:** Take the years (2000, 2001) on the X-axis and quantity in '000 tonnes on the Y-axis (scale, say, 1 cm = 50 thousand tonnes). • **2000 off-take bar:** a single bar of total height 154; the whole bar is 'internal consumption' (154) with no export segment (exports = 0). • **2001 off-take bar:** a single bar of total height 324, divided into two segments — a lower segment of 283 for internal consumption and an upper segment of 41 for exports (283 + 41 = 324). The two bars (one beside the other), with the export segment shaded differently, immediately show that total off-take rose from 154 to 324 thousand tonnes and that exports (nil in 2000) appeared in 2001. Production can be added as two adjacent simple bars of heights 378 and 387.

Question 15

The following table shows the estimated sectoral real growth rates (percentage change over the previous year) in GDP at factor cost.

Year	Agriculture and allied sectors	Industry	Services
1994–95	5.0	9.2	7.0
1995–96	−0.9	11.8	10.3
1996–97	9.6	6.0	7.1
1997–98	−1.9	5.9	9.0
1998–99	7.2	4.0	8.3
1999–2000	0.8	6.9	8.2

Represent the data as multiple time series graphs.

Solution

ANSWER Multiple time series graph described in words: On the same pair of axes plot three line graphs — one each for Agriculture, Industry and Services. Take the **years (1994–95 to 1999–2000) on the X-axis** at equal spacing, and the **growth rate (per cent) on the Y-axis**. Because some agriculture values are negative, the Y-axis must extend from below 0 (about −2%) up to about 12% (suggested scale: 1 cm = 2%, with a clear zero line). **Plot and join the points for each sector with a distinct line** (different colour or line style, with a legend):

- **Agriculture and allied:** 5.0 → −0.9 → 9.6 → −1.9 → 7.2 → 0.8. This line zig-zags sharply, even dipping below zero in 1995–96 and 1997–98, showing that agricultural growth is highly fluctuating (depends on the monsoon).
- **Industry:** 9.2 → 11.8 → 6.0 → 5.9 → 4.0 → 6.9. This line starts high, peaks in 1995–96 and then falls and recovers slightly — a generally declining-then-stabilising trend.
- **Services:** 7.0 → 10.3 → 7.1 → 9.0 → 8.3 → 8.2. This line stays comparatively high and stable (between about 7% and 10%) throughout the period.

Interpretation: the three lines together show that the **services sector grew most steadily and strongly, industry slowed down** over the period, and **agriculture was the most volatile**, with negative growth in two years. This is exactly what a multiple time series (arithmetic line) graph is meant to reveal — comparative trends of several variables over time.