STATISTICS

GRAPHICAL REPRESENTATION OF STATISTICS DATA

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Graphical representation of statistical data is very useful in comparison of statistical data. We use the following diagrams or (curves) for the pictorial representation of grouped data. To analyse and draw quick conclusion from the numerical data, data is suitably represented through graphs. In this class, we study only three types of graphical representation of data. The three types of graph are

(a) Bar graph (b) Histogram and (c) Frequency polygon

(a) Bar Graph:

Bar graph is the simple most and popular graph to shows ungrouped (or discrete) frequency distribution graphically. To draw bar graph, rectangular bars of uniform width with equal spaces in between them are drawn on a horizontal ray OX. Data (or items) are taken on OX ray. Each bar represent a data (or items). Height of each bar represents frequency of the corresponding data. Suitable scale of height of bars are shown on a vertical ray OY. See the following table:

Years	Expenditure (in 10 lak of rupees) (frequency)
2004	5
2005	15
2006	25
2007	35
2008	10

The above table is the discrete frequency distribution table, which shows expenditure on health by ABC Pvt Ltd. during the years (2004 to 2008).

Bar graph of the above discrete frequency distribution is shown below:



(Bar graph of the expenditure of health by ABC Pvt. Ltd.)

Some Points:

While constructing a bar graphs the following points should be kept in mind:

- The width of the bars should be uniform throughout
- The gap between one bar and another should be uniform throughout.
- Bar may be either horizontal or vertical. The vertical bars should be preferred because they give a better look.
- Ex.1 70 student from a locality use different modes of transport to go to school as given below: Draw the bar graph representing the above data.

Mode of	Car	Bus	Moped	Bicycle	Rickshaw
transport					
Number of	4	27	11	20	8
students					

Sol. Take the mode of transport along the x-axis. The number of students along the y-axis.



(b) Histogram:

A histogram is special type of bar graph which shows the cumulative frequency distribution graphically. See the following table

Monthly Earning	Nouf Workers
(in hundred rupees)	
80-120	4
120-160	6
160-200	12
200-240	8
240-280	5

To draw the histogram of the above frequency distribution we follow the following steps:

- **Step-I** On the horizontal axis, mark the class intervals with a uniform scale.
- **Step-II** On the vertical axis mark a scale to measure the height of bars which is equal to the frequencies, with a uniform scale.
- **Step III** Construct rectangles with class intervals as bases and the corresponding frequencies as heights



The above graph is the graph of histogram of the given grouped frequency distribution.

Type 1. Histrogram when frequency distribution is in exclusive form.

Ex.1: The following is the distribution of weights (in kg) of 50 persons:

Weight (in kg):	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90
Number of	12	8	5	4	5	7	6	3
persons:	12	5	5	т	5	/	5	5

Draw the histogram for the above data.



Sol.

Type 2. When frequency distribution is in inclusive form.

Ex.2 The following table present the number of illiterate females in the age group (10-34) in a town.

Age group:	10-14	15-19	20-24	25-29	30-34
Number of Females:	300	980	800	580	290

Draw the histogram for the above data.

Sol The difference between the lower limit of a class and the upper limit of the preceding class is i.e. h = 1. To convert the given frequency distribution into a continuous frequency distribution, subtract $\frac{h}{2} = \frac{1}{2} = 0.5$ from each lower limit and add $\frac{h}{2} = 0.5$ to each upper limit. The distribution so obtained is as given below:

Age Group:	9.5-14.5	14.5-19.5	19.5-24.5	24.5-29.5	29.5-34.5
Number of Females:	300	980	800	580	290



Type 3. Histogram when class intervals are of unequal size.

Ex.3 Draw a histogram for the marks of student given below:

Marks:	0-10	10-30	30-45	45-50	50-60
No. of Students:	8	32	18	10	6

Sol. Here, minimum class-size = 5. So, we adjust the frequencies by using the following formula:

Adjust frequency of a class $=\frac{\min class \ size}{class \ size} \times Frequency \ of \ the \ class$

The adjusted frequencies are computed as follows:

Class Interval (Marks)	No. of students Frequency	Adjusted frequency
0-10	8	$\frac{5}{10} \times 8 = 4$
10-30	32	$\frac{5}{20} \times 32 = 8$
3045	18	$\frac{5}{15} \times 18 = 6$
45-50	10	$\frac{5}{5} \times 10 = 10$
50-60	6	$\frac{3}{10} \times 6 = 3$



Type 4. When class marks (mid-points) are given.

Ex.4 Construct a histogram from the following distribution of total marks obtained by 65 students of IX class in the final examination.

Marks (mid-points)	150	160	170	180	190	200
No. of students	8	10	25	12	7	3

Ascertainment of lower and upper class limits:

Sol. Since the difference between the second and first mid-points is 160 - 150 = 10.

$$\therefore$$
 h=10 $\Rightarrow \frac{h}{2}=5$

So, lower and upper limits of the first class are 150 – 5 and 150 + 5 i.e. 145 and 155 respectively.

First class interval is 145-155.

Using the same procedure, we get the classes of other mid-points as under:

Marks	145-155	155-165	165-175	175-185	185-195	195-205
No. of students	8	10	25	12	7	3

The histogram of the above frequency distribution is given in fig.



(C) Frequency polygon:

Frequency polygon of a frequency distribution is obtained from the histogram of the frequency distribution by joining the mid points of respective tops of the rectangles in a histogram. To complete the polygon the mid points at each end are joined to the immediately lower or higher mid points (as case may be) at zero frequency.

Frequency polygon can also be drawn independently without drawing histograms, for this mid points of the class intervals called class marks are required.

Frequency polygon is a line graph of grouped frequency distribution plotted between class marks and frequencies. It can be obtained in two ways

- (1) By first drawing Histogram and
- (2) Without drawing Histogram

(1) Steps of Drawing Frequency Polygon (By First Drawing Histogram):

Following are the steps :

- Step-1 Draw the histogram from the given data
- **Step-2** Obtain the mid points of the upper horizontal sides of each rectangle.
- **Step-3** Join these mid points of the adjacent rectangles by dotted line segments.
- **Step-4** Obtain the mid Point of two assumed class intervals of zero frequency. One before the first and other after the last class interval
- **Step-5** Complete the polygon by joining the mid–point of class first to mid–point of its left adjacent class and mid point of last class intervals to the mid point of its right adjacent class interval.
- **Ex.5** Draw a histogram and a frequency polygon of the following data:

Age in years	0-6	6-12	12-18	18-24	24-30	30-36	36-42
Nouf persons	6	11	25	35	18	12	6

Sol. First we draw histogram of the given data, then we will locate mid – points of top horizontal side of rectangles.



Now, join these mid points by dotted line segments. Complete the polygon by joining the mid points of first interval to the mid – point of its left adjacent assumed class interval of zero frequency and mid point of last class interval to its adjacent right assumed class interval of zero frequency.

- (2) Steps of Drawing Frequency Polygon (Without Drawing Histogram)
- **Step-1** First calculate the class marks (mid points) x₁, x₂, x₃, x_n of the given class intervals.
- **Step-2** Mark $x_1, x_2, x_3, \dots, x_n$ along X axis.
- **Step-3** Mark respective frequencies f₁, f₂, f₃, f_n along Y- axis.
- **Step-4** Plot the points $(x_1, f_1), (x_2, f_2), (x_3, f_3), \dots, (x_n, f_n)$
- **Step-5** Join points plotted in steps (iv) by line segments.
- **Step-6** Take two class intervals of zero frequency, one just before the first and other just after the last class interval given. Locate their mid points
- **Step-7** Complete the frequency polygon by joining the point (x_1, f_1) to the mid point of the assumed class interval of zero frequency just before the first class interval and (x_n, f_n) to the assumed class interval of zero frequency just right to the last class interval.

MATHS

CLASS 9

Ex.6 Construct a frequency polygon for the following data without drawing the

histogram:

Class Interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	10	16	24	15	7

Sol. Calculate class marks of given frequency distribution

Class interval	Class Mark (mid-point)	Frequency
0-8	4	8
8-16	12	10
16-24	20	16
24-32	28	24
32-40	36	15
40-48	44	7

