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- Subject - Mathematics
- Chapter - Statistics

Today's Targets

- 1** What is STATISTICS ?
- 2** DATA Handling, Collection of Data, Representation of Data
- 3** Frequency distribution table (Ungrouped and Grouped frequency distributions)
- 4** Class interval, Upper and Lower limit, Class Size and Class Marks
- 5** Representation of Data (Tally Marks)
- 6** Discontinuous and Continuous Frequency distribution
- 7** Graphical Representation of Data : Bar Graph
- 8** Histogram with uniform and Varying Width ✓ (Imp.)

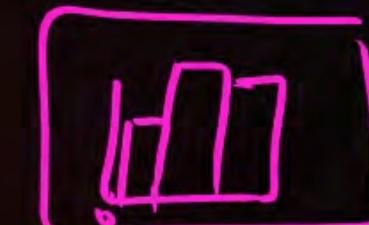
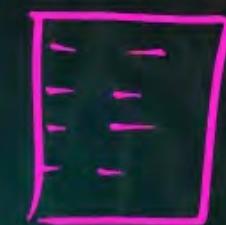
Today's Targets

- 1** Frequency Polygon with Misconceptions
- 2** Measures of Central Tendency
- 3** Mean/ Average of Data
- 4** Median of Data
- 5** Mode of Data



Statistics

Statistics is the study of the collection, analysis, interpretation, presentation, and organization of data in a particular manner. Statistics is defined as the process of collection of data, classifying data, representing the data for easy interpretation, and further analysis of data.



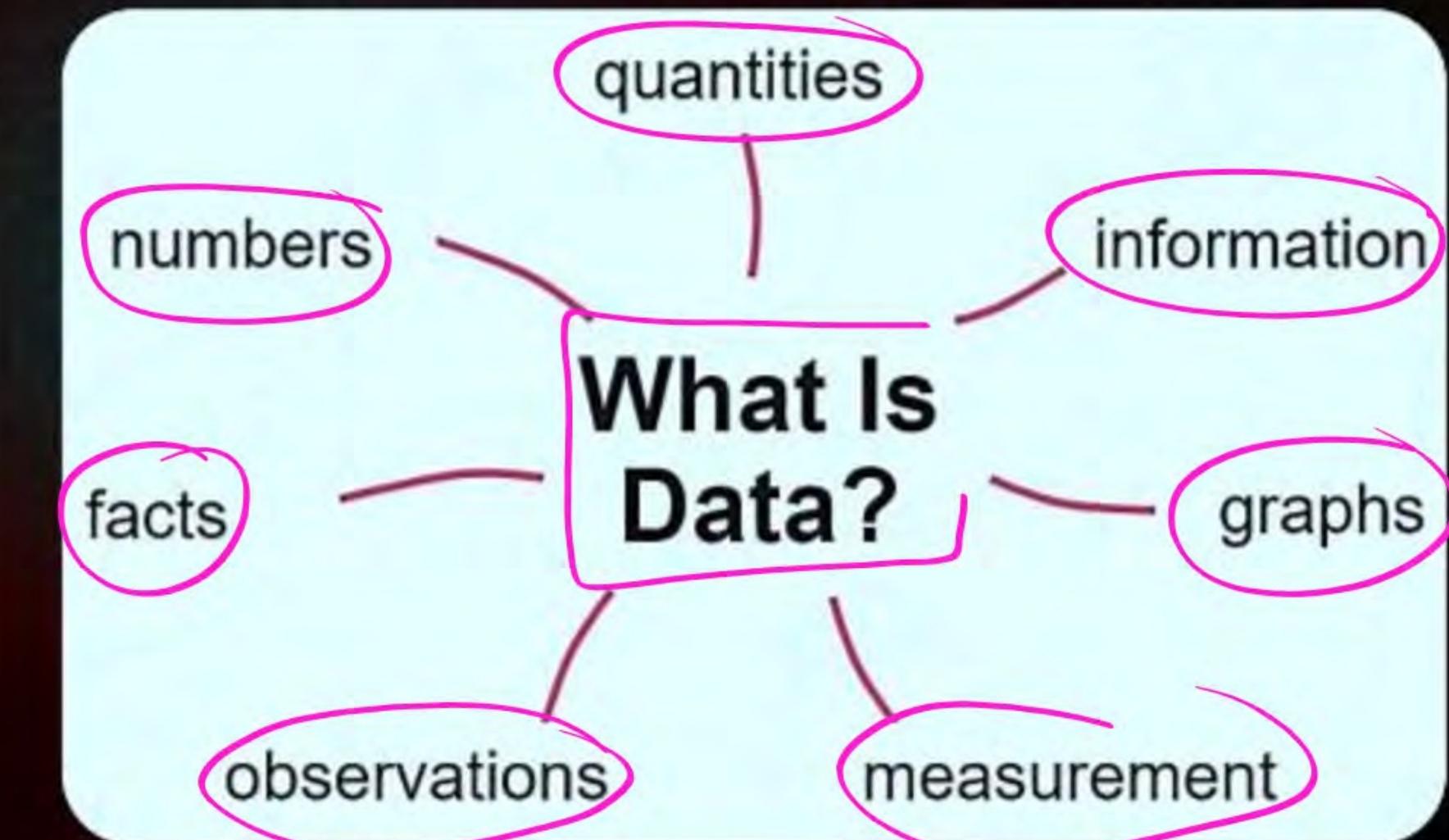
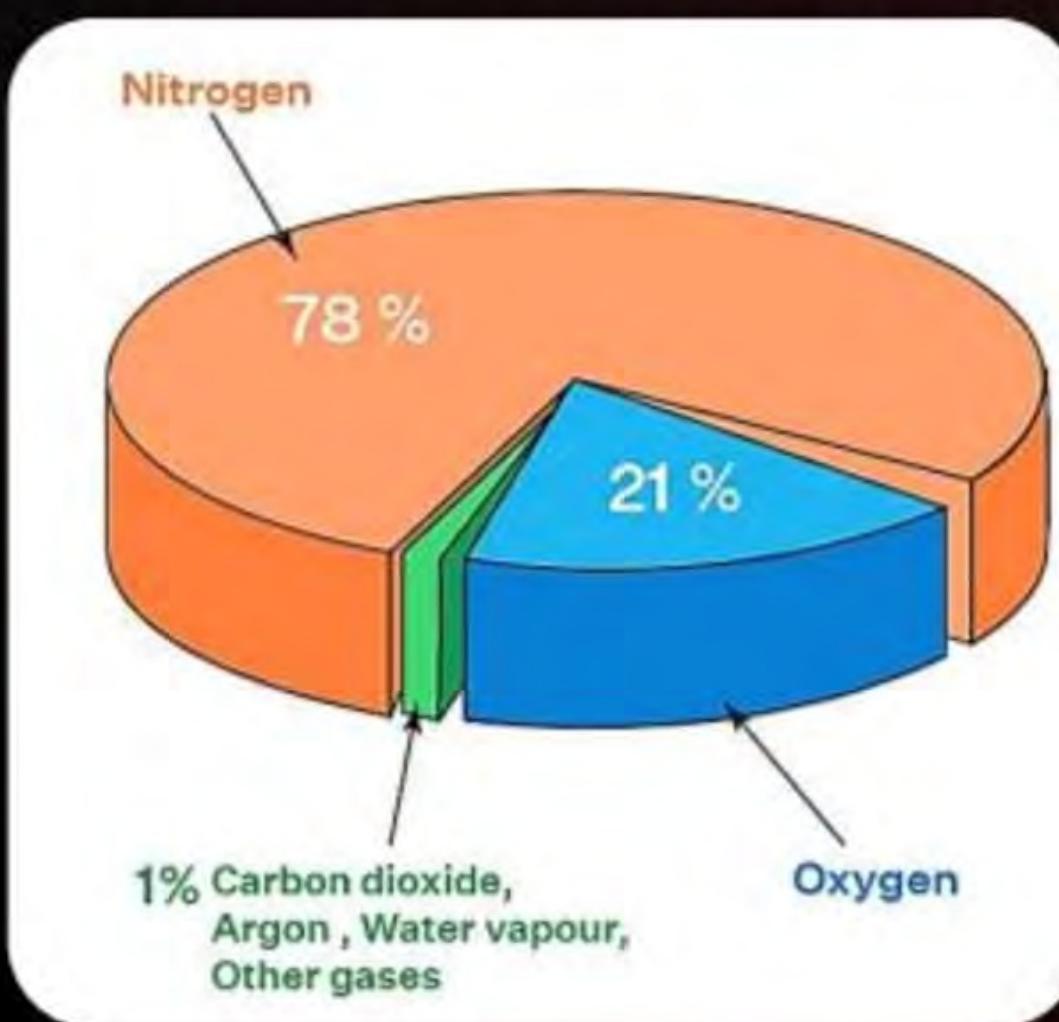
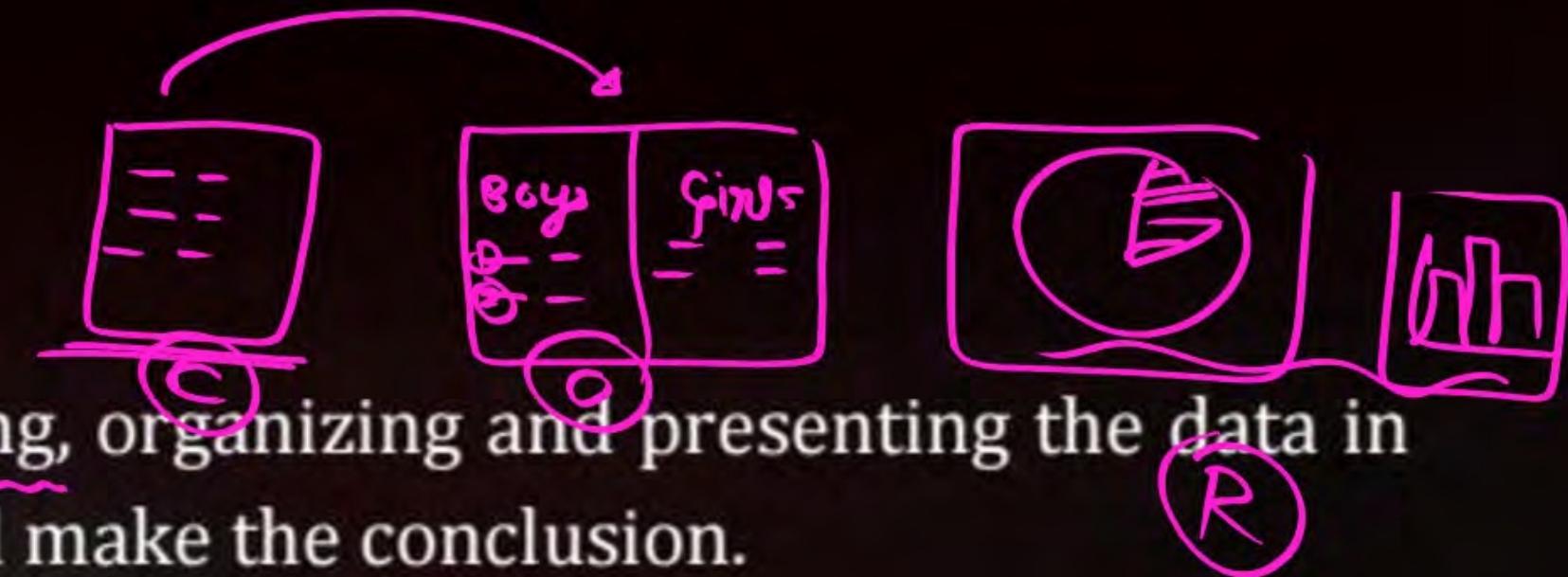
Statistics also is referred to as arriving at conclusions from the sample data that is collected using surveys or experiments.

Different sectors such as psychology, sociology, geology, probability, and so on also use statistics to function.



Data Handling

Data handling is the process of collecting, organizing and presenting the data in such a way that is helpful to analyze and make the conclusion.

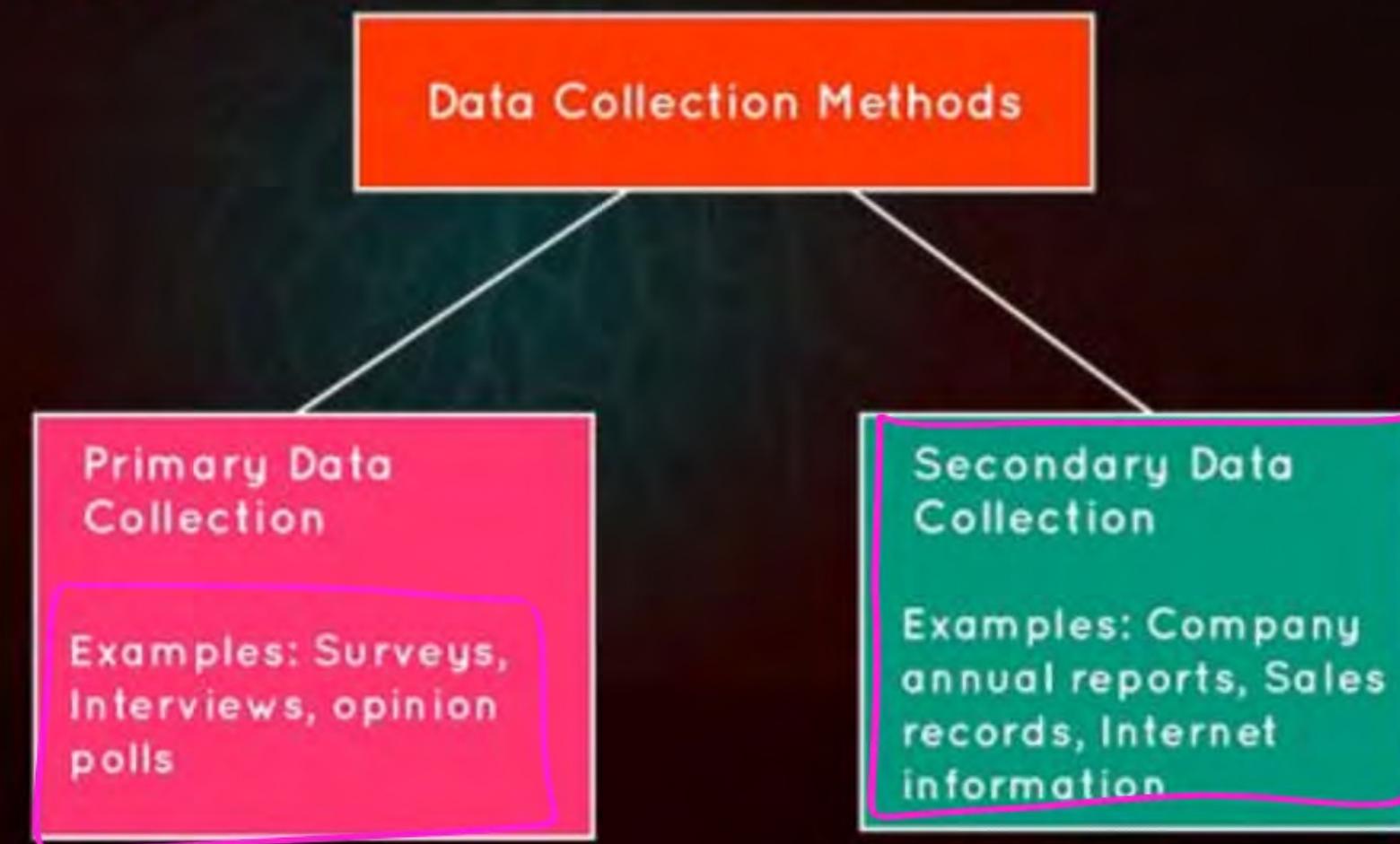




Collection of Data

Data collection is the procedure of collecting, measuring and analyzing accurate insights for research using standard validated techniques.

- (1) Primary Data**
- (2) Secondary Data**

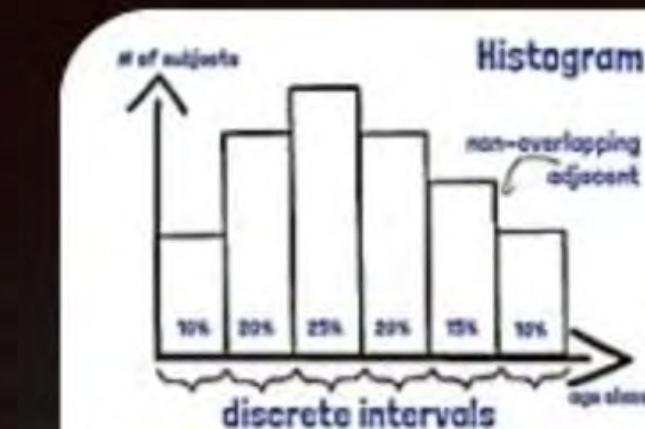




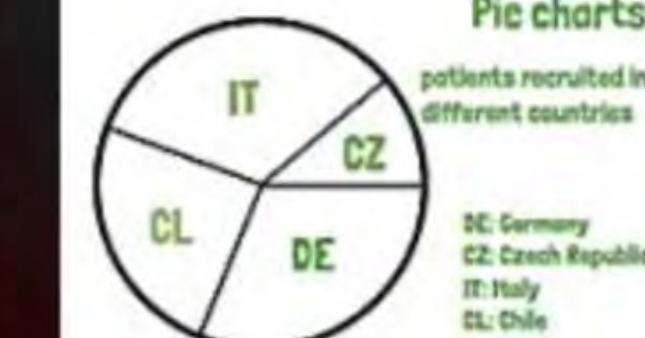
Presentation of Data

Data arranged in ascending or descending order is called **arrayed data** or an array. Arranging the marks out of 100 of 25 students in ascending order, we get the following array.

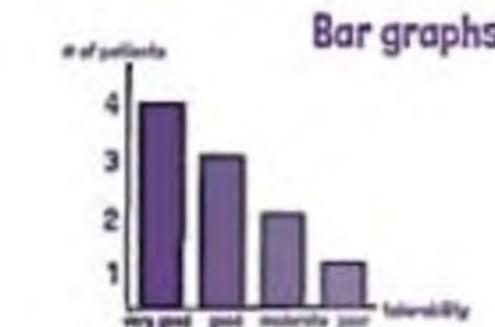
11, 13, 16, 19, 20, 21, 25, 27, 30, 32, 32, 32, 36, 38, 38, 40, 41, 41, 41, 43, 45, 49, 52, 75, 76



relative Frequency
→ proportion of scores that fall into each of the categories or intervals
→ total area equal to 1



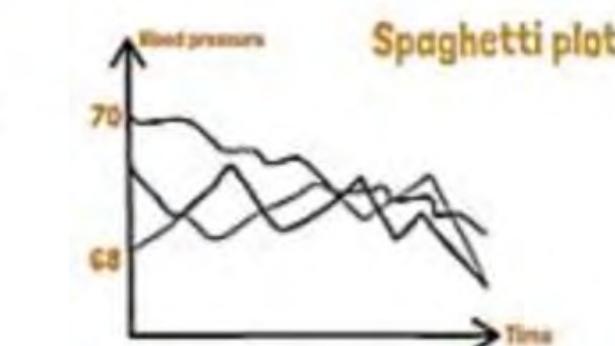
→ used to show proportion between different categories of a variable or sample
→ whole chart represents 100%
→ present frequencies



→ similar to Histogram but areas have no meaning
→ to compare groups or show trends
→ bars horizontally or vertically
→ intrinsically of qualitative nature



→ simplified visualizations of relationships or numbers using symbols, objects, or icons
→ comparisons made by number of symbols or differences in size of symbols



→ change in a variable over time
→ lesser clarity the more patients are included



Raw Data and Range of Data

Raw data or ungrouped data is the data obtained in original form. For example, the marks obtained by 25 students in a class in a physics examination are given below.

30, 38, 21, 27, 40, 41, 38, 11, 41, 32, 13, 16, 25, 19, 20, 32, 43, 32, 36, 41, 45, 49, 52, 76,
75.

This is ungrouped data.

Range of the data is the difference between the maximum and the minimum values of the observations So in this example range = $76 - 11 = 65$

Range of Data = Highest data - Lowest data



Frequency Distribution Table

The frequency of a value is the number of times it occurs in a dataset. A frequency distribution is the pattern of frequencies of a variable. It's the number of times each possible value of a variable occurs in a dataset.

Ungrouped frequency distributions: The number of observations of each value of a variable. You can use this type of frequency distribution for categorical variables.

Marks	Number of students (i.e., the frequency)
10	1
20	1
36	3
40	4
50	3
56	2
60	4
70	4
72	1
80	1
88	2
92	3
95	1
Total	30

frequency



Frequency Distribution Table

Grouped frequency distributions: The number of observations of each **class interval** of a variable. Class intervals are ordered groupings of a variable's values.

You can use this type of frequency distribution for quantitative variables.

✓ **Class interval:** The groups used to classify the data are known as class intervals i.e. 10-20, 20-30, etc.

✓ **Upper limit:** The greatest number in each class interval is the upper class limit.

Weights (in kg)	Number of students
31 - 35	9
36 - 40	5
41 - 45	14
46 - 50	3
51 - 55	1
56 - 60	2
61 - 65	2
66 - 70	1
71 - 75	1
Total	38



Grouped Frequency Distribution Table

- ✓(iv) Lower limit: The smallest number in each class interval is the lower-class limit.

class width or
09

- (v) **Class size:** It is the difference between the upper limit and the lower limit i.e. 10.

class size or class width = U-L

- (vi) Class mark: The midpoint of each class interval is the class mark.

$$\text{Class mark} = \frac{U+L}{2}$$

mid value
of data

lower

Weights (in kg)	Number of students
31 - 35	9
36 - 40	5
41 - 45	14
46 - 50	3
51 - 55	1
56 - 60	2
61 - 65	2
66 - 70	1
71 - 75	1
Total	38





Frequency Distribution Table

What if two new students of weights 35.5 kg and 40.5 kg are admitted in this class, then in which interval will we include them?

Grouped data could be of two types as below:

Inclusive or discontinuous Frequency distribution:

A frequency distribution is said to be an inclusive or discontinuous frequency distribution if the upper limit of one class is different from the lower limit of next class.

Exclusive or continuous frequency distribution: A frequency distribution is said to be exclusive or continuous frequency distribution if the upper limit of one class is the same as the lower limit of the next class.

Weights (in kg)	Number of students
31 - 35	9
36 - 40	5
41 - 45	14
46 - 50	3
51 - 55	1
56 - 60	2
61 - 65	2
66 - 70	1
71 - 75	1
Total	38

1013]	38
11 - 12	1



Representation of Data

100 plants each were planted in 100 schools during Van Mahotsav. After one month, the number of plants that survived were recorded as :

95	67	28	32	65	65	69	33	98	96
76	42	32	38	42	40	40	69	95	92
75	83	76	83	85	62	37	65	63	42
89	65	73	81	49	52	64	76	83	92
93	68	52	79	81	83	59	82	75	82
86	90	44	62	31	36	38	42	39	83
87	56	58	23	35	76	83	85	30	68
69	83	86	43	45	39	83	75	66	83
92	75	89	66	91	27	88	89	93	42
53	69	90	55	66	49	52	83	34	36

Tally
|||



Representation of Numbers

Tally Marks

Number of plants survived	Tally Marks	Number of schools (frequency)
20 - 29		3
30 - 39		14
40 - 49		12
50 - 59		8
60 - 69		18
70 - 79		10
80 - 89		23
90 - 99		12
Total		100



Representation of Numbers

Tally Marks

Number of plants survived	Tally Marks	Number of schools (frequency)
20 - 29		3
30 - 39		14
40 - 49		12
50 - 59		8
60 - 69		18
70 - 79		10
80 - 89		23
90 - 99		12
Total		100

Question

The class mark of the class 90 - 120 is:

90

105

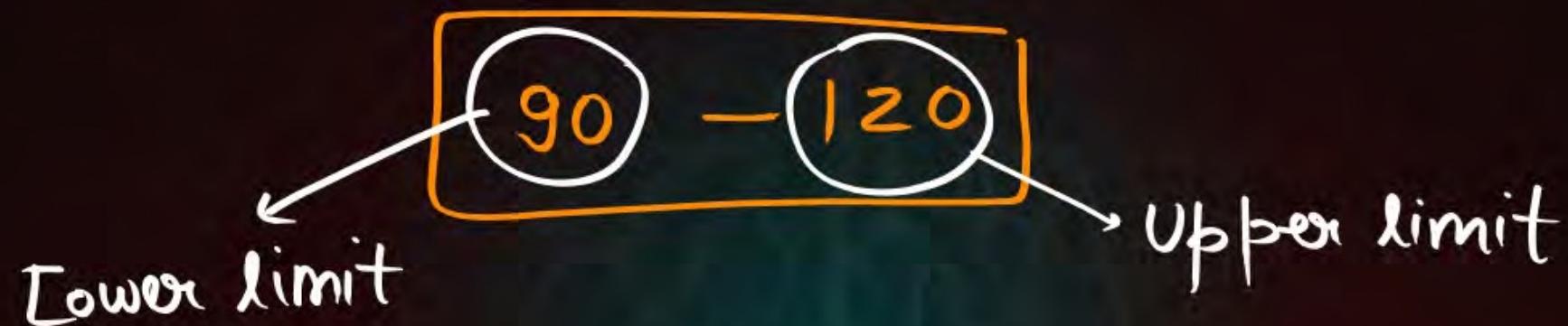
115

120

Question

The class mark of the class 90 - 120 is:

- A 90
- B 105
- C 115
- D 120



$$\begin{aligned}\text{class mark} &= \frac{120 + 90}{2} \\ &= \frac{210}{2} \\ &= 105\end{aligned}$$

- Class size or width:
 $= U - L$
- Class mark
 $= \frac{U+L}{2}$

Question

The range of the data : 25, 18, 20, 22, 16, 6, 17, 15, 12, 30, 32, 10, 19, 8, 11, 20 is

10

15

18

26

Question

The range of the data : 25, 18, 20, 22, 16, 6, 17, 15, 12, 30, 32, 10, 19, 8, 11, 20 is

- A** 10
- B** 15
- C** 18
- D** 26

$$\begin{aligned}\text{Range of Class} &= 32 - 6 \\ &= 26\end{aligned}$$

Question

In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is :

6

7

8

12

Question

In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is :

- A 6
- B 7
- C 8
- D 12

$$L - U$$

mid value \rightarrow class mark

$$\frac{U+L}{2}$$

$$10 = \frac{(6+L)+L}{2}$$

$$20 = 6 + 2L$$

$$14 = 2L \Rightarrow L = 7$$

$$\text{class width} = 6$$

$$U - L = 6$$

$$U = 6 + L$$

Question

Let m be the mid-point and $\textcircled{1}$ be the upper-class limit of a class in a continuous frequency distribution. The lower-class limit of the class is :

$$2m + 1$$

$$2m - 1$$

$$m - 1$$

$$m - 2l$$

Question

Let m be the mid-point and l be the upper-class limit of a class in a continuous frequency distribution. The lower-class limit of the class is :

A $2m + 1$

B $2m - 1$

C $m - 1$

D $m - 2l$

class mark / mid value = $\frac{\text{Upper} + \text{Lower}}{2}$
of C.T.

$$m = \frac{1 + \text{lower limit}}{2}$$

$$2m = 1 + \text{lower limit}$$

$$\text{lower limit} = 2m - 1$$

Question

The blood groups of 30 students of Class VIII are recorded as follows:

A, B, O, O, AB, O, A, O, B, A, O, O, A, AB, O, A, A, O, O, AB, B, A, O, B, A, B, O.

Represent this data in the form of a frequency distribution table. Which is the most common, and which is the rarest, blood group among these students?

Blood group	Tally	No. of students
A		4
B		2
O	-	1
AB		4

Total = 30

Question

The blood groups of 30 students of Class VIII are recorded as follows:

A, B, O, O, AB, O, A, O, B, A, O, O, A, AB, O, A, A, O, O, AB, B, A, O, B, A, B, O.

Represent this data in the form of a frequency distribution table. Which is the most common, and which is the rarest, blood group among these students?

Blood Group	Tally	No. of students
A		5
B		3
O		12
AB		3

$$\text{Total} = \underline{\underline{30}}$$

Question

The distance (in km) of 40 engineers from their residence to their place of work were found as follows:

5 3 10 20 25 11 13 7 12 31
19 10 12 17 18 11 32 17 16 2
7 9 7 8 3 5 12 15 18 3
12 14 2 9 6 15 15 7 6 12

Construct a grouped frequency distribution table with class size 5 for the data given above taking the first interval as 0-5 (5 not included). What main features do you observe from this tabular representation?

Class Interval	Tally Mark	Frequency			
0 - 5	-	-	20 - 25		
5 - 10	-	-	25 - 30		
10 - 15	-	-	30 - 35		
15 - 20	-	-			

Question

The distance (in km) of 40 engineers from their residence to their place of work were found as follows:

53 10 20 25 11 13 7 12 31
19 10 12 17 18 11 32 17 16 2
7 9 7 8 3 5 12 15 18 3
12 14 2 9 6 15 15 7 6 12

Construct a grouped frequency distribution table with class size 5 for the data given above taking the first interval as 0-5 (5 not included). What main features do you observe from this tabular representation?

Class Interval	Tally Mark	Frequency
0 - 5		5
5 - 10		11
10 - 15		11
15 - 20		9

20 - 25		1
25 - 30		1
30 - 35		2

$$\text{Total} = 40$$

Question

Thirty children were asked about the number of hours they watched TV programs in the previous week. The results were found as follows:

1 6 2 3 5 12 5 8 4 8
10 3 4 12 2 8 15 1 17 6
3 2 8 5 9 6 8 7 14 12

Make a grouped frequency distribution table for this data, taking class width 5 and one of the class intervals as 5 - 10.

How many children watched television for 15 or more hours a week?

Question

Three coins were tossed 30 times simultaneously. Each time the number of heads occurring was noted down as follows:

0 1 2 2 1 2 3 1 3 0
1 3 1 1 2 2 0 1 2 1
3 0 0 1 1 2 3 2 2 0

Prepare a frequency distribution table for the data given above.

No. of Head occurs	Tally	No. of times it happen
0	-	
1	-	
2		
3		
		Total =

Question

Three coins were tossed 30 times simultaneously. Each time the number of heads occurring was noted down as follows:

0 1 2 2 1 2 3 1 3 0
1 3 1 1 2 2 0 1 2 1
3 0 0 1 1 2 3 2 2 0

Prepare a frequency distribution table for the data given above.

No. of Head occurs	Tally	No. of times it happen
0		6
1		10
2		9
3		5
Total = 30		

Question

The value of π up to 50 decimal places is given below:

3.14159265358979323846264338327950288419716939937510

Make a frequency distribution of the digits from 0 to 9 after the decimal point.

What are the most and the least frequently occurring digits?

Question

Let U be the upper-class boundary of a class in a frequency distribution and M be the midpoint of the boundary of the class. Which one of the following is the lower class boundary of the class?

$$M + \frac{(M+L)}{2}$$

$$L + \frac{M+L}{2}$$

$$2M - U$$

$$M - 2L$$

Question

Let U be the upper-class boundary of a class in a frequency distribution and M be the midpoint of the boundary of the class. Which one of the following is the lower class boundary of the class?

A $M + \frac{(M+L)}{2}$

B $L + \frac{M+L}{2}$

C $2M - U$

D $M - 2L$

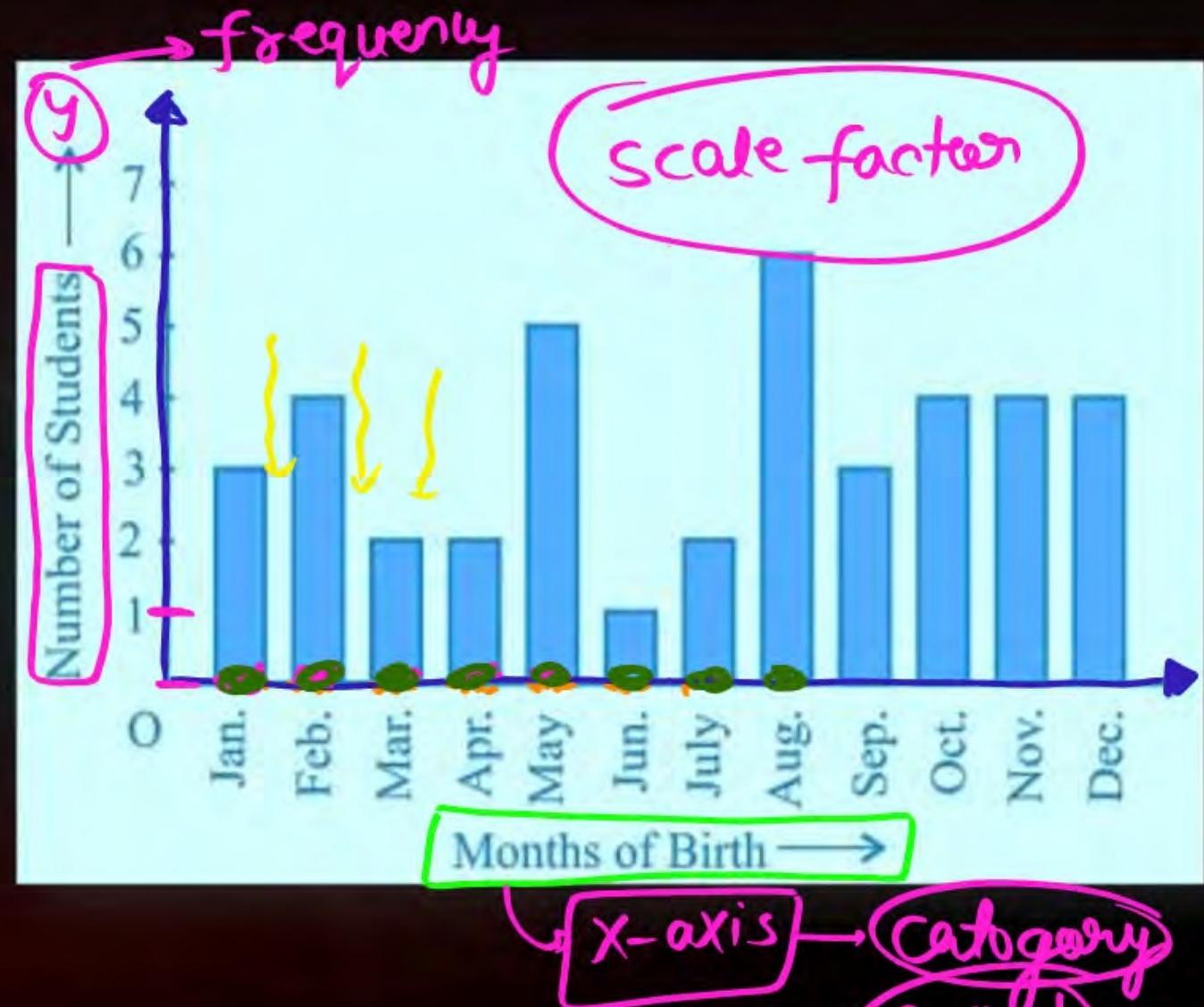
$$m = \frac{U+L}{2}$$
$$2m = U+L$$
$$L = 2m - U$$



Graphical Representation of Data : Bar Graph

A graphical representation is a visual display of data and statistical results. It is more effective than presenting the data in tabular form.

(A) **Bar graphs:** A bar graph is a pictorial representation of data in which usually bars of **uniform width** are drawn with equal spacing between them on one axis (say, the x – axis), depicting the variable. The values of the variable are shown on the other axis (say, the y – axis) and the heights of the bars depend on the values of the variable.



Note: The lengths of the rectangles are proportional to the frequencies. That is why, we draw the lengths accordingly.

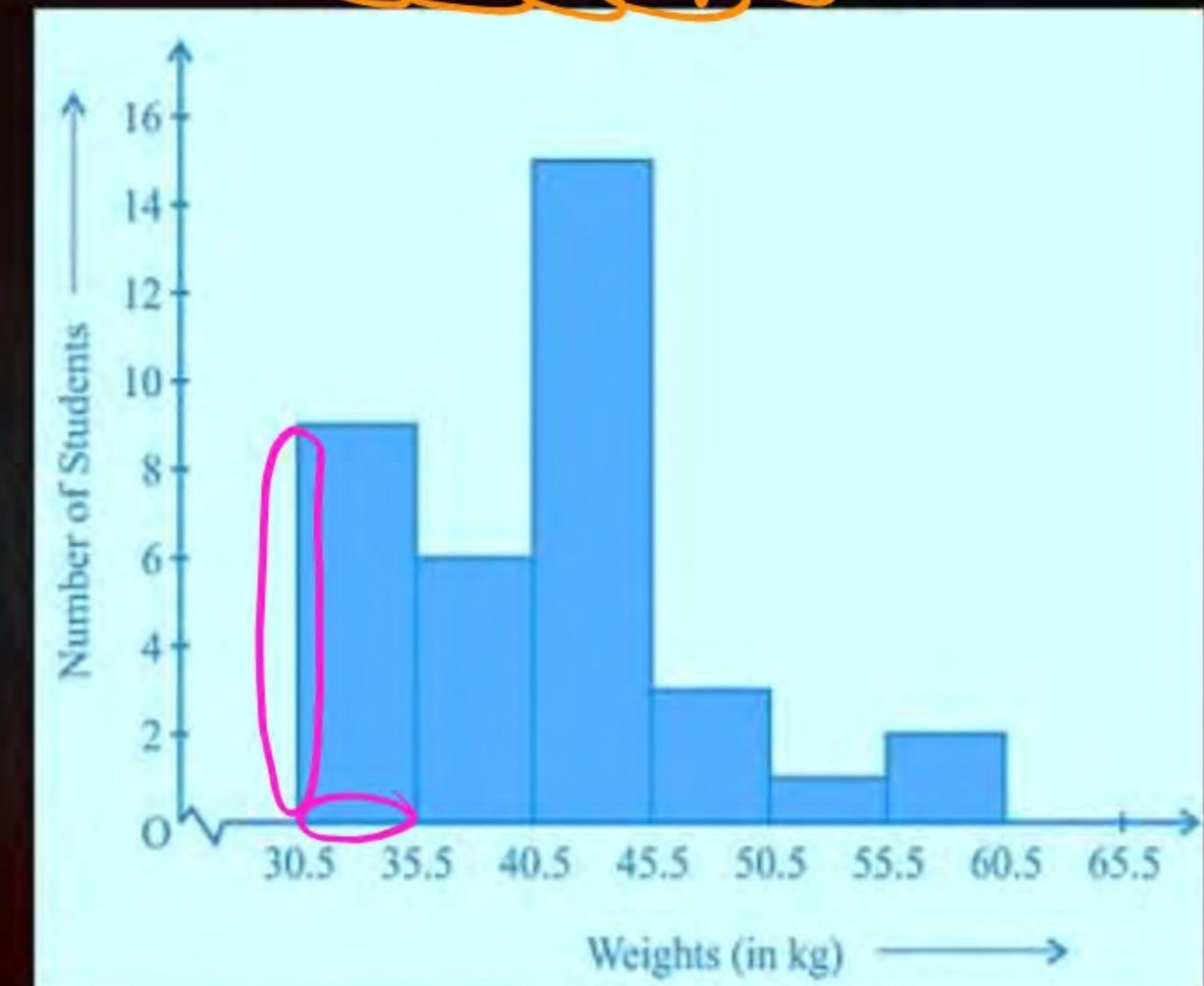


Graphical Representation of Data : Histogram

#Chitkugram

(B) Histogram: A histogram is a graphical representation of a grouped frequency distribution with continuous classes. Also, unlike a bar graph, the width of the bar plays a significant role in its construction.

A histogram is a diagram involving **rectangles** whose area is proportional to the **frequency** of a variable and width is equal to the class interval.



~~Note: The lengths of the rectangles are proportional to the frequencies. That is why, we draw the lengths accordingly.~~

Agar Har Ek Class Interval ki width uniform(same) ho to
Histogram me waake bars ki height (length) will directly
vary according to their frequency

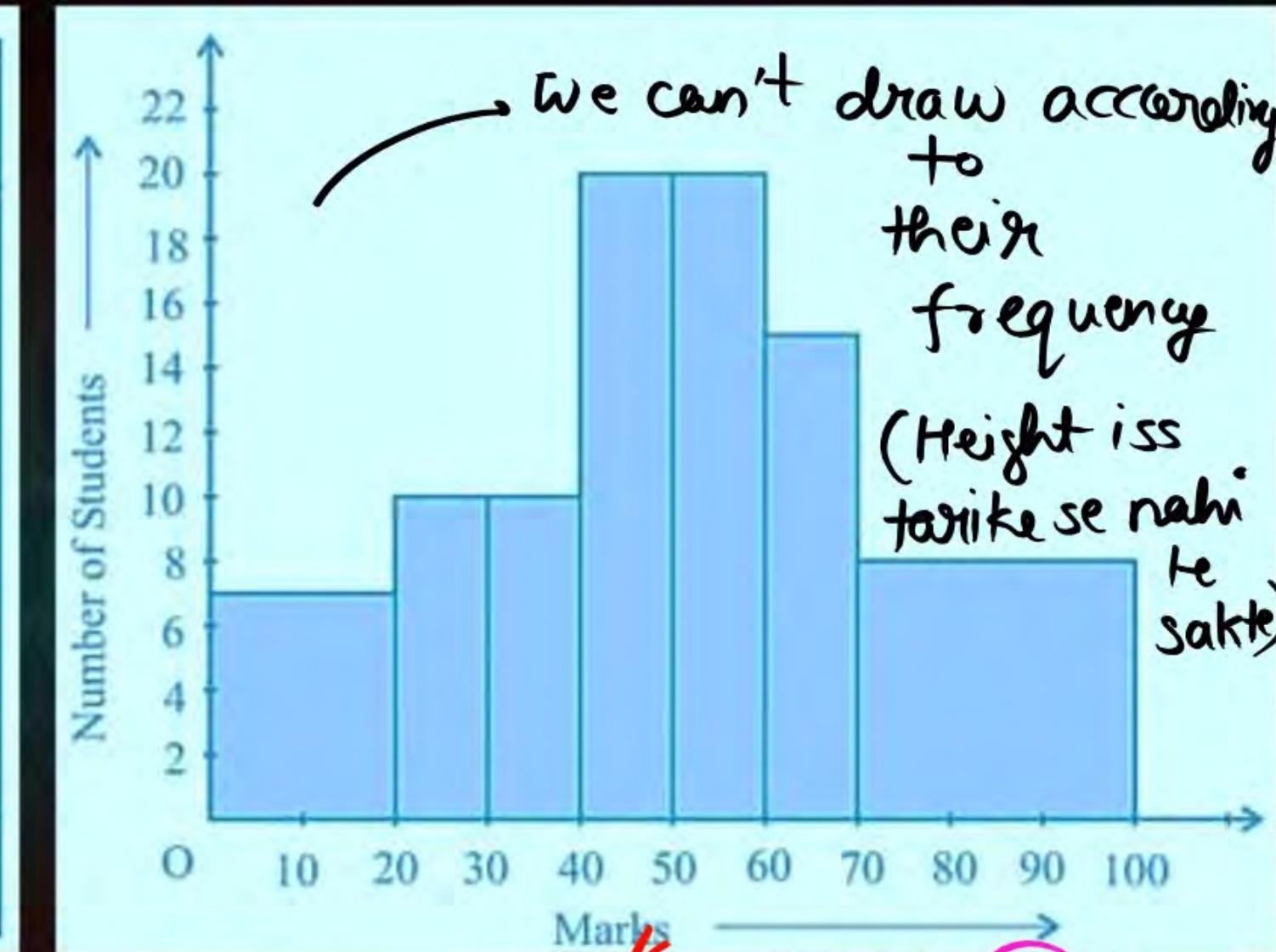
Bars ke case me width
Uniform Hoti Hai



Let's carefully examine this graphical representation

A teacher wanted to analyze the performance of two sections of students in a mathematics test of 100 marks. Looking at their performances, she found that a few students got under 20 marks, and a few got 70 marks or above. So she decided to group them into intervals of varying sizes as follows: 0 - 20, 20 - 30, . . . , 60 - 70, 70 - 100. Then she formed the following table:

Marks	Number of students
0 - 20	20
20 - 30	10
30 - 40	10
40 - 50	10
50 - 60	10
60 - 70	10
70 - above	Pta Hi nahi Hai
Total	90



~~Histogram~~



Let's carefully examine this graphical representation

The steps to be followed are as given below:

1. Select a class interval with the **minimum class size.** In the given example, the minimum class-size is 10.
2. The lengths of the rectangles are then modified to be proportionate to the class-size 10.

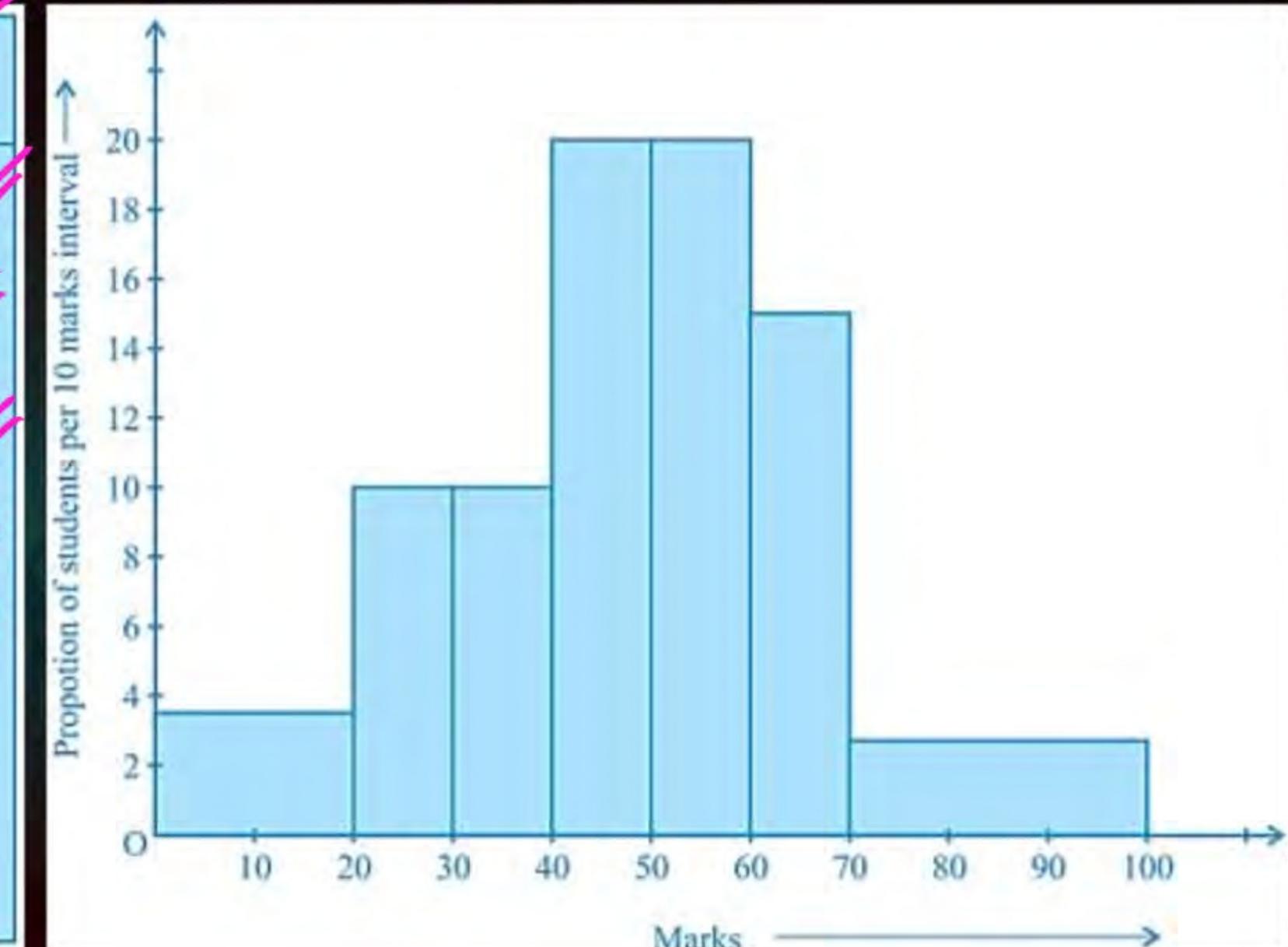
Reference

Self → **lowest**

Uniform Width

Height or Length of bar

Marks	Frequency	Width of the class	Length of the rectangle
0 - 20	7	20	$\frac{7}{20} \times 10 = 3.5$
20 - 30	10	10	$\frac{10}{10} \times 10 = 10$
30 - 40	10	10	$\frac{10}{10} \times 10 = 10$
40 - 50	20	10	$\frac{20}{10} \times 10 = 20$
50 - 60	20	10	$\frac{20}{10} \times 10 = 20$
60 - 70	15	10	$\frac{15}{10} \times 10 = 15$
70 - 100	8	30	$\frac{8}{30} \times 10 = 2.67$



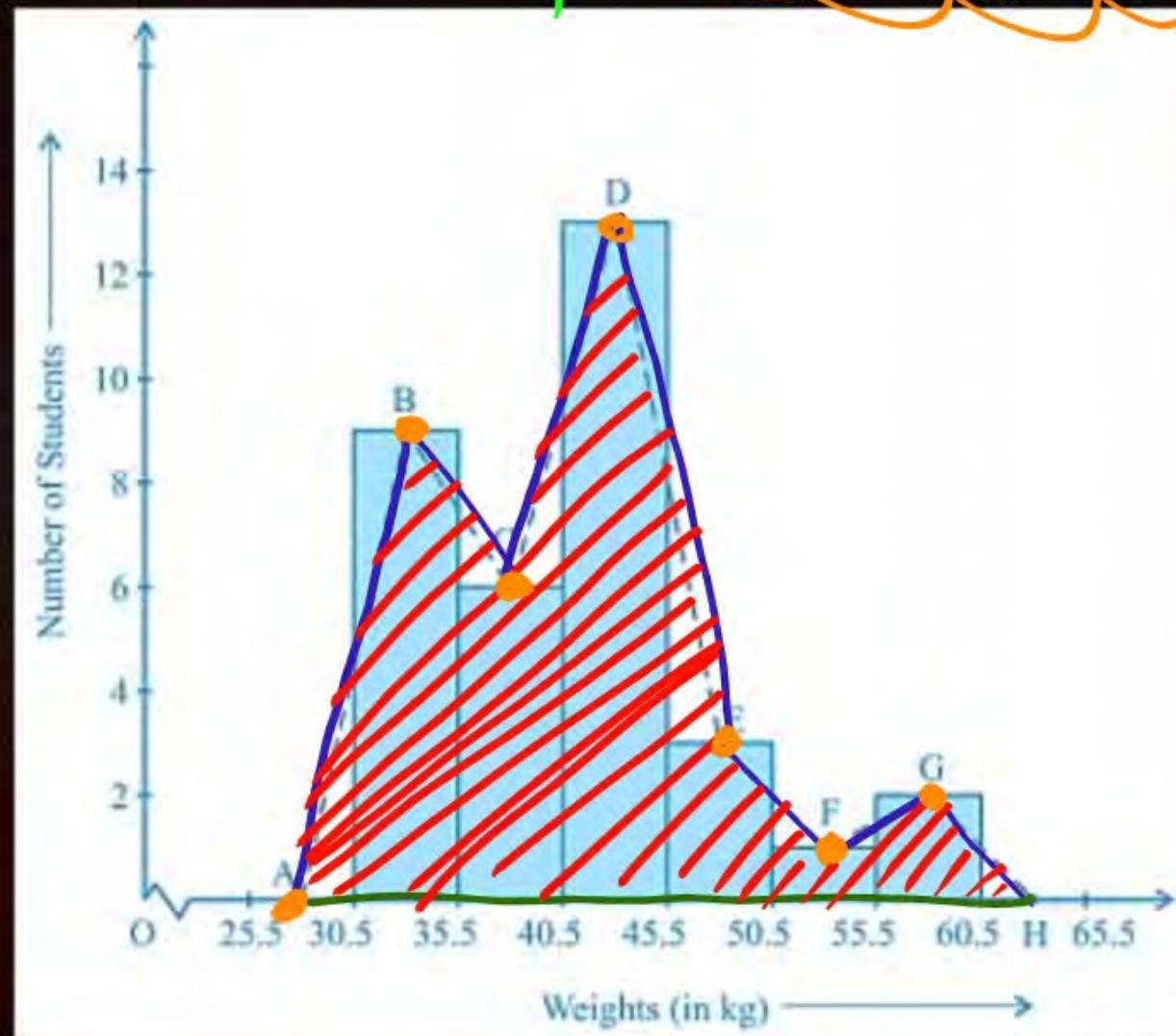
Unitary $C_1^{20} \rightarrow 7$



Graphical Representation of Data

(C) Frequency Polygon: A frequency polygon is a line graph representation of class frequency plotted against the midpoint of the tops of the rectangles in the histogram class frequency. Frequency polygons can also be drawn independently without drawing histograms. For this, we require the mid-points of the class-intervals used in the data. These mid-points of the class-intervals are called class-marks. To find the class-mark of a class interval, we find the sum of the upper limit and lower limit of a class and divide it by 2.

Histogram me class mark ko join karne hai



Note: There exists no class preceding the lowest class and no class succeeding the highest class.

Question

A histogram is a pictorial representation of the grouped data in which class intervals and frequency are respectively taken along

Vertical axis and horizontal axis

Vertical axis only

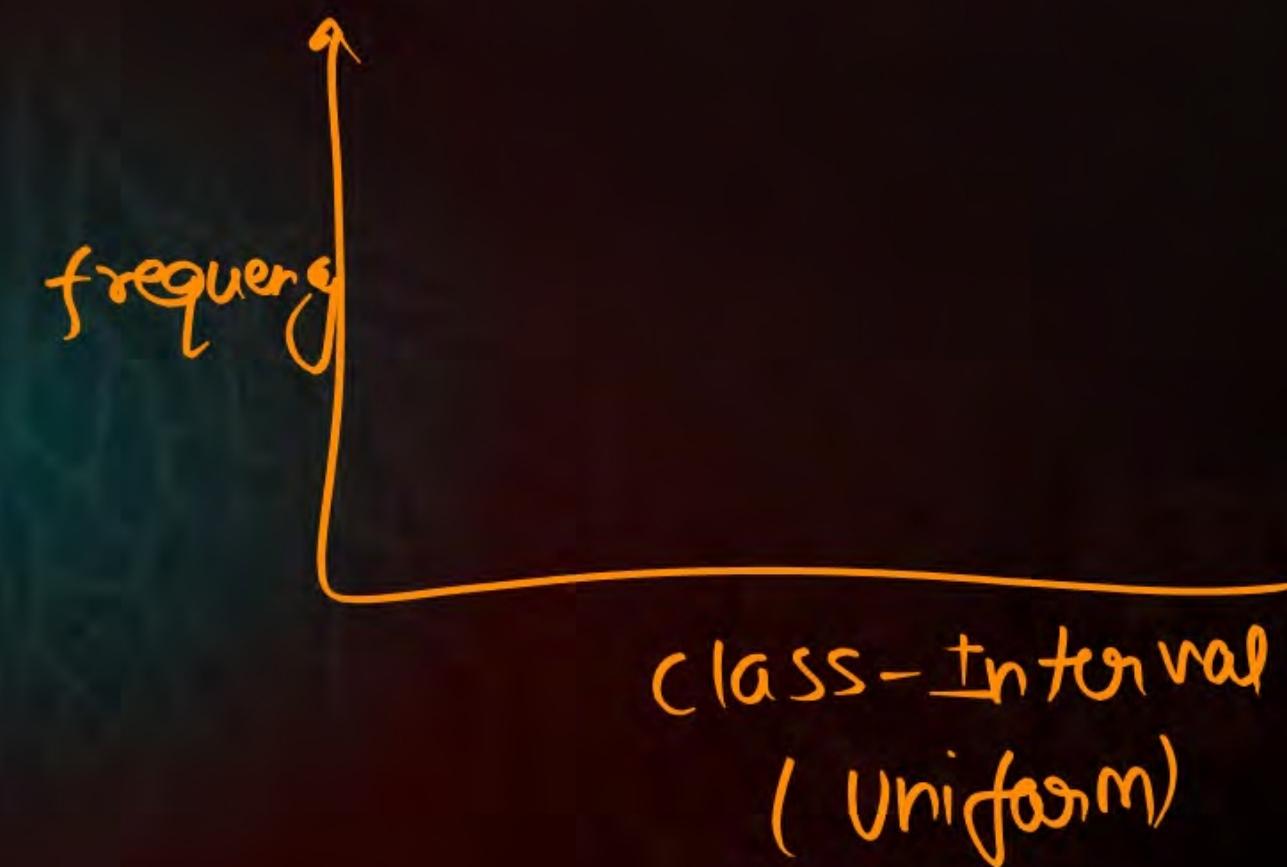
Horizontal axis only

Horizontal axis and vertical axis

Question

A histogram is a pictorial representation of the grouped data in which class intervals and frequency are respectively taken along

- A** Vertical axis and horizontal axis
- B** Vertical axis only
- C** Horizontal axis only
- D** Horizontal axis and vertical axis



Question

In a histogram, each class rectangle is constructed with base as

Frequency

Class-interval

Size of the class

Range

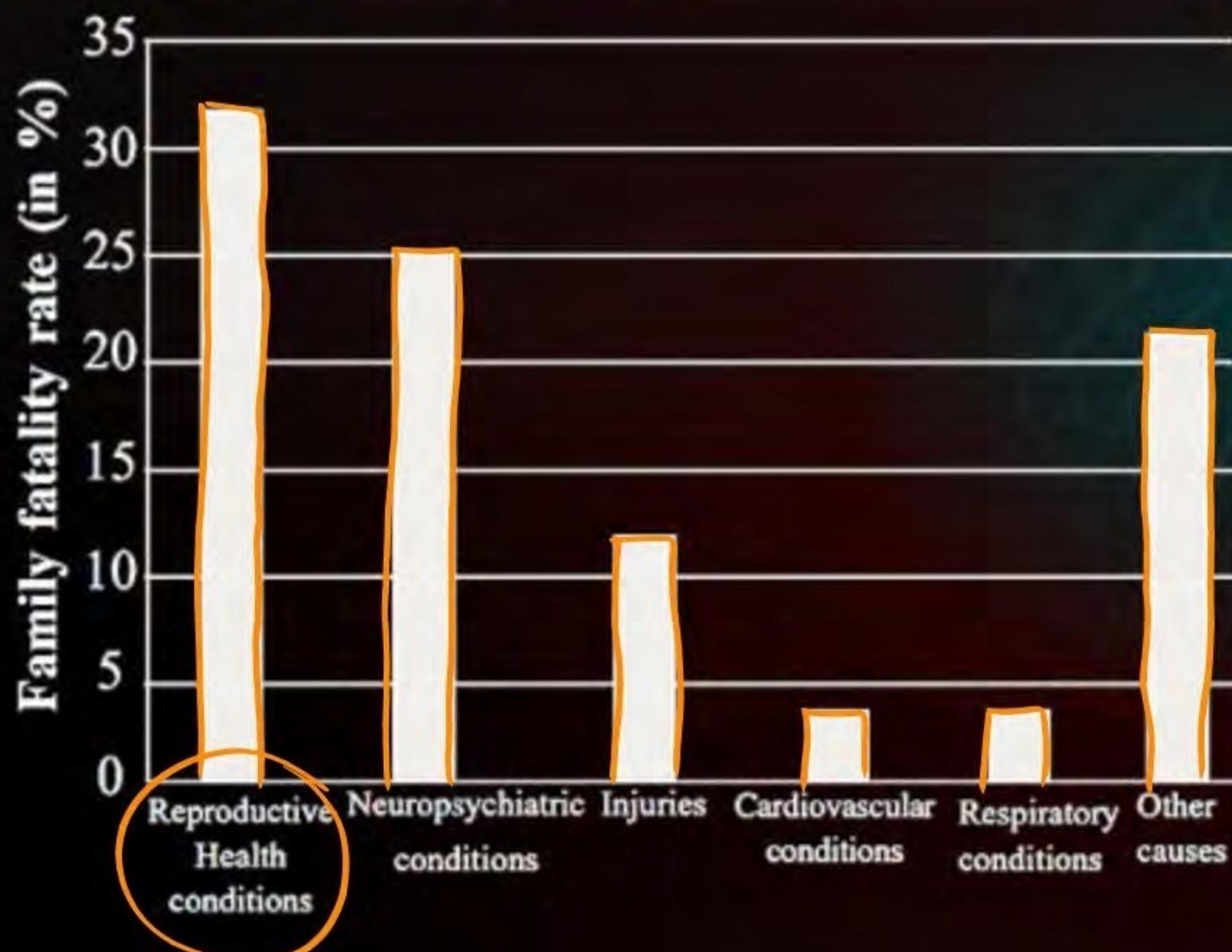
Question

In a histogram, each class rectangle is constructed with base as

- A Frequency
- B Class-interval
- C Size of the class
- D Range

Question

A survey conducted by an organization for the cause of illness and death among the women between the ages 15 - 44 (in years) worldwide, found the following figures (in %):

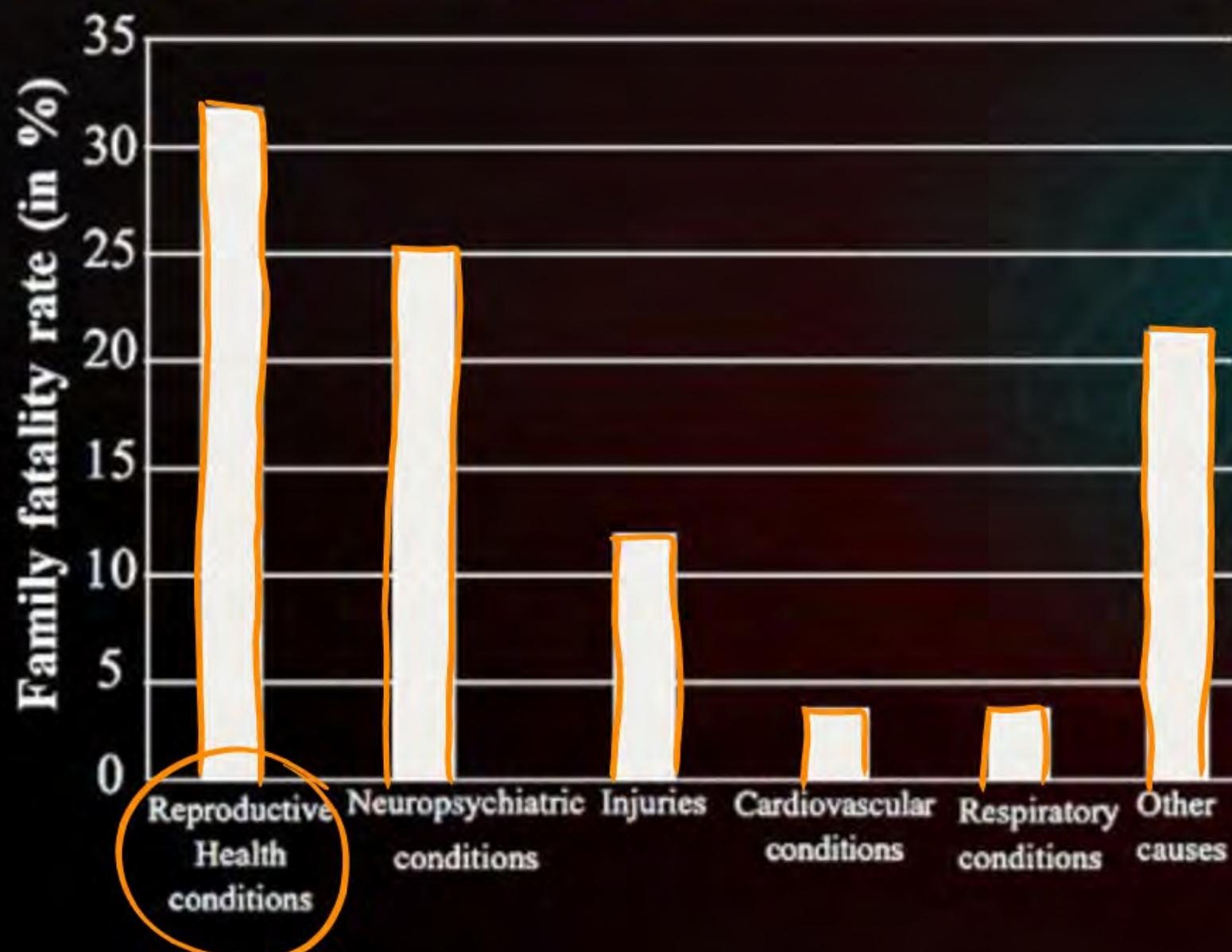


- Represent the information given above graphically.
- Which condition is the major cause of women's ill health and death worldwide?
- Try to find out, with the help of your teacher, any two factors which play a major role in the cause in (ii) above being the major cause.

S.No.	Cause	Female fatality rate (%)
1	Reproductive health conditions	31.8
2	Neuropsychiatric conditions	25.4
3	Injuries	12.4
4	Cardiovascular conditions	4.3
5	Respiratory conditions	4.1
6	Other causes	22.0

Question

A survey conducted by an organization for the cause of illness and death among the women between the ages 15 - 44 (in years) worldwide, found the following figures (in %):



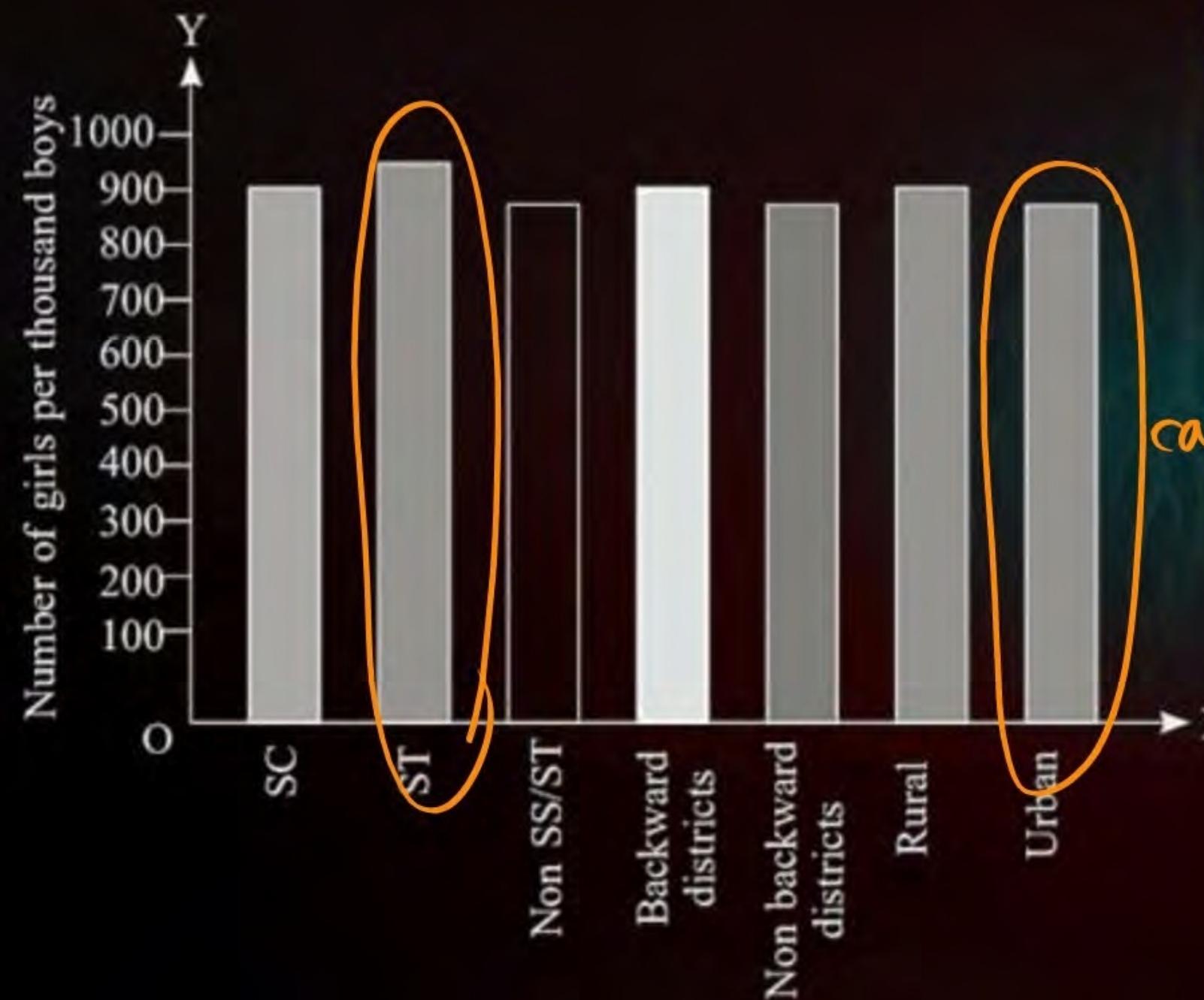
- (i) Represent the information given above graphically.
- (ii) Which condition is the major cause of women's ill health and death worldwide? *Reproductive Health cond*
- (iii) Try to find out, with the help of your teacher, any two factors which play a major role in the cause in (ii) above being the major cause.

• Lack of correct knowledge of Treatment • Lack of medical facilities

S.No.	Cause	Female fatality rate (%)
1	Reproductive health conditions	31.8
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3	Injuries	12.4
4	Cardiovascular conditions	4.3
5	Respiratory conditions	4.1
6	Other causes	22.0

Question

The following data on the number of girls (to the nearest ten) per thousand boys in different sections of Indian society is given below

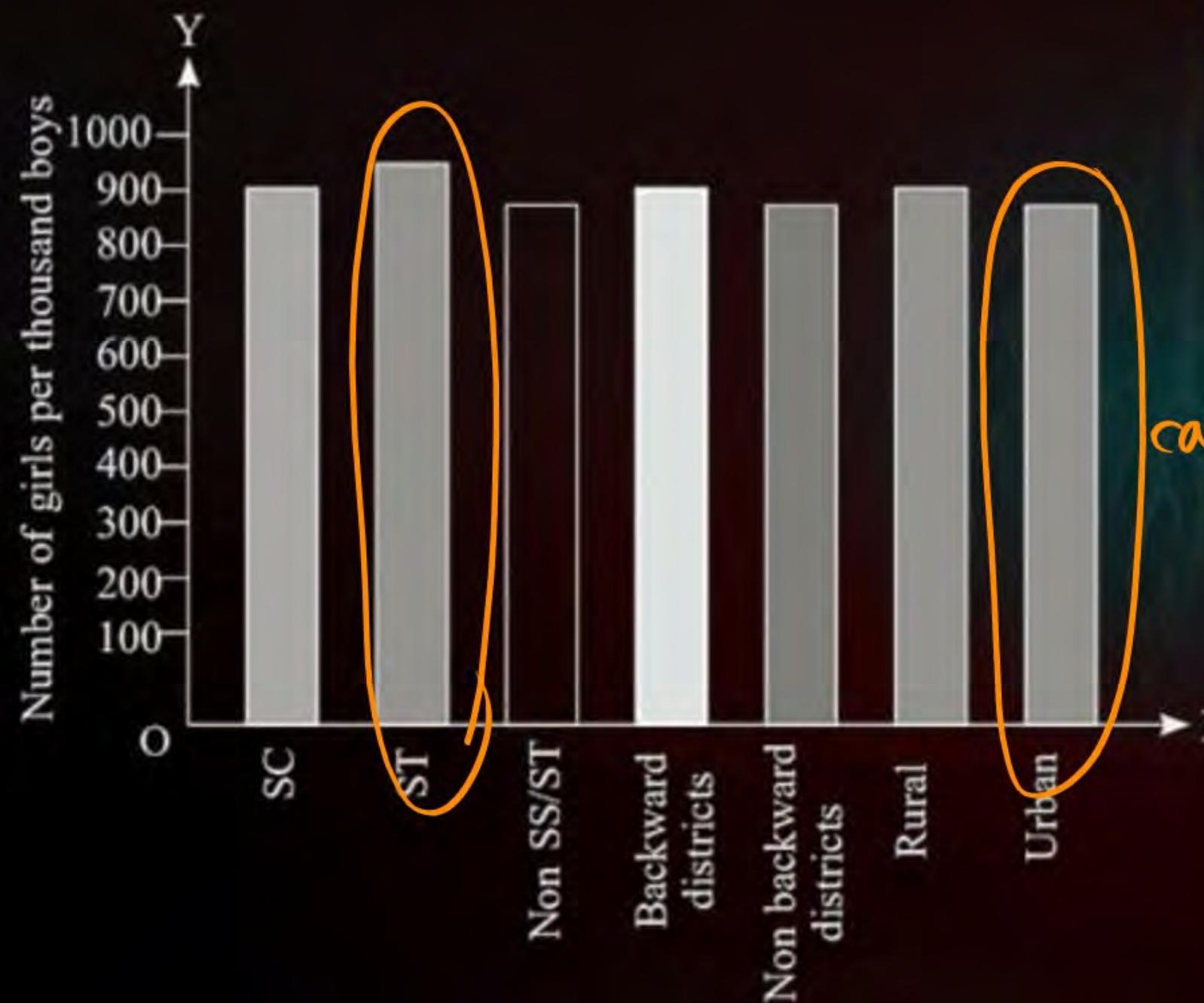


- I. Represent the information above by a bar
- II. In the classroom discuss what conclusions can be arrived at from the graph.

Section	Number of girls per thousand boys
Scheduled Caste (SC)	940
Scheduled Tribe (ST)	970
Non SC/ST	920
Backward districts	950
Non-backward districts	920
Rural	930
Urban	910

Question

The following data on the number of girls (to the nearest ten) per thousand boys in different sections of Indian society is given below



- I. Represent the information above by a bar ✓
- II. In the classroom discuss what conclusions can be arrived at from the graph.



Number of girls per thousand boys

Question

The following table gives the distribution of students of two sections according to the marks obtained by them:

Represent the marks of the students of both the sections on the same graph by two frequency polygons. From the two polygons compare the performance of the two sections

For section A,

Marks	Class Marks	Frequency
0-10	5	3
10-20	15	9
20-30	25	17
30-40	35	12
40-50	45	9

For section B,

Marks	Class Marks	Frequency
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1

Section A		Section B	
Marks	Frequency	Marks	Frequency
0 - 10	3	0 - 10	5
10 - 20	9	10 - 20	19
20 - 30	17	20 - 30	15
30 - 40	12	30 - 40	10
40 - 50	9	40 - 50	1

Question

The following table gives the distribution of students of two sections according to the marks obtained by them:

Represent the marks of the students of both the sections on the same graph by two frequency polygons. From the two polygons compare the performance of the two sections

For section A,

Marks	Class Marks	Frequency
0-10	5	3
10-20	15	9
20-30	25	17
30-40	35	12
40-50	45	9

For section B,

Marks	Class Marks	Frequency
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1

Histogram (Uniform Class width)

Height

Bar ka mid point

Height

Bar ka mid point

Section A		Section B	
Marks	Frequency	Marks	Frequency
0 - 10	3	0 - 10	5
10 - 20	9	10 - 20	19
20 - 30	17	20 - 30	15
30 - 40	12	30 - 40	10
40 - 50	9	40 - 50	1

Answer

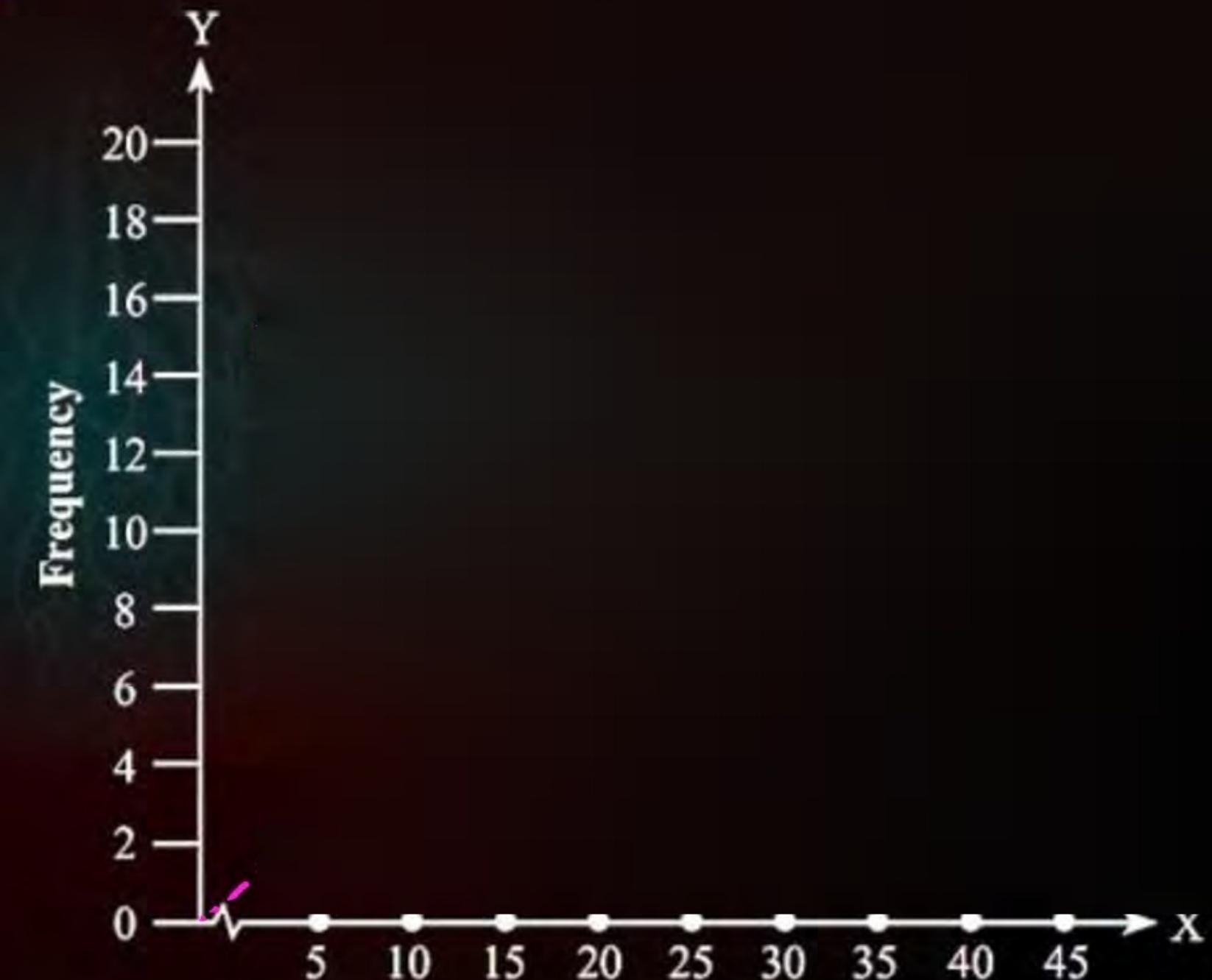
The following table gives the distribution of students of two sections according to the marks obtained by them:

For section A,

Marks	Class Marks	Frequency
0-10	5	3
10-20	15	9
20-30	25	17
30-40	35	12
40-50	45	9

For section B,

Marks	Class Marks	Frequency
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1



Answer

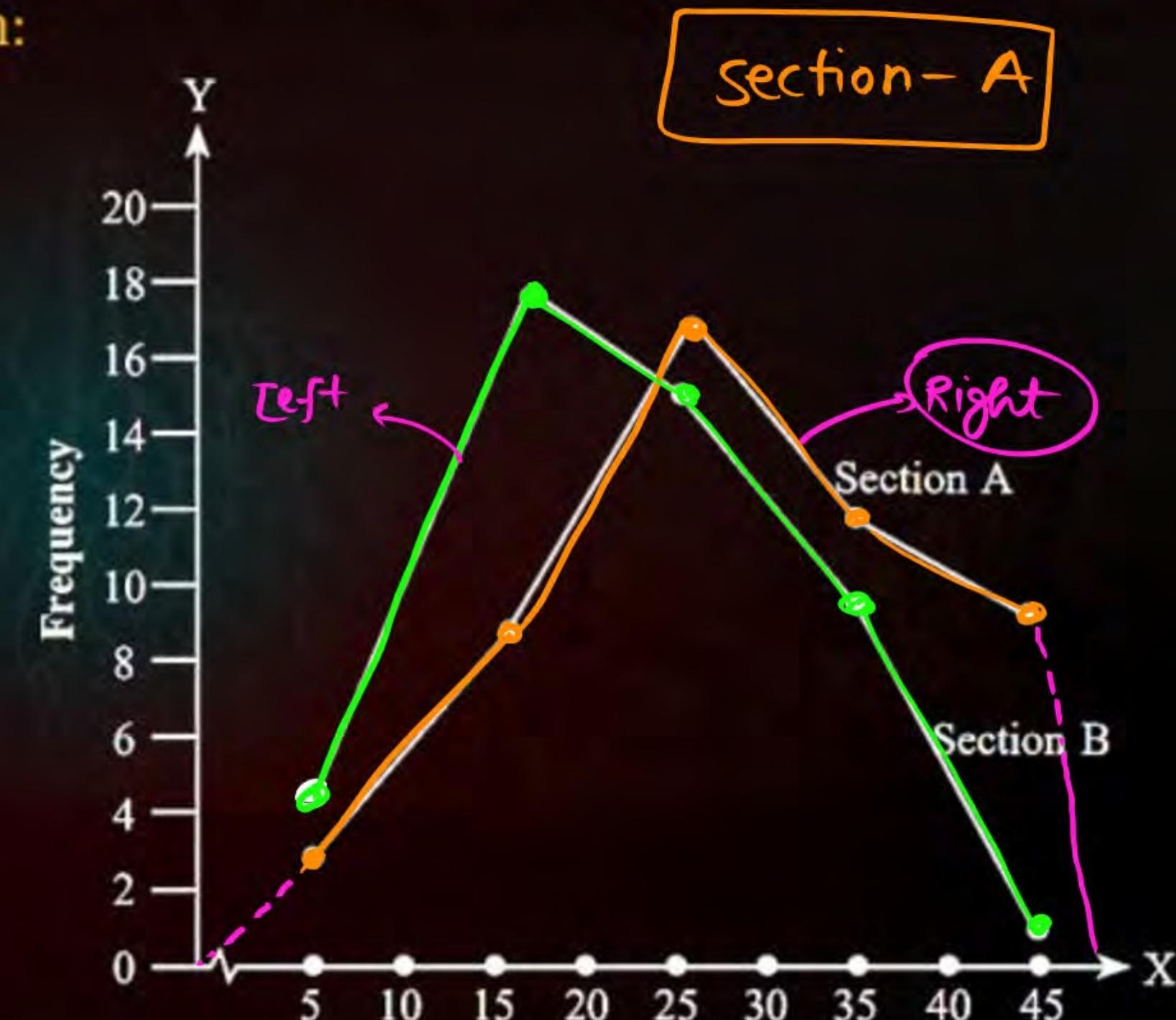
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For section B,

Marks	Class Marks	Frequency
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1



Question

100 surnames were randomly picked up from a local telephone directory and a frequency distribution of the number of letters in the English alphabet in the surnames was found as follows:

Draw a histogram to depict the given information.

Write the class interval in which the maximum number of surnames lie

Number of letters	Width	Number of surnames
1 - 4	3	6
4 - 6	2	30
6 - 8	2	44
8 - 12	4	16
12 - 20	8	4

Question

100 surnames were randomly picked up from a local telephone directory and a frequency distribution of the number of letters in the English alphabet in the surnames was found as follows:

Draw a histogram to depict the given information.

Write the class interval in which the maximum number of surnames lie



Class width
Non-uniform

Number of letters	width	Number of surnames	balance frequency
1 - 4	3	6	$\frac{6}{3} \times 2 = 4$
4 - 6	2	30	$\frac{30}{2} \times 2 = 30$
6 - 8	2	44	$\frac{44}{2} \times 2 = 44$
8 - 12	4	16	$\frac{16}{4} \times 2 = 8$
12 - 20	8	4	$\frac{4}{8} \times 2 = 1$

Non-Uniform

Question

A random survey of the number of children of various age groups playing in a park was found as follows: Draw a histogram to represent the data above.

Age (in years) ω	Number of children
1 - 2	5
2 - 3	3
3 - 5	6
5 - 7	12
7 - 10	9
10 - 15	10
15 - 17	4

Question

A random survey of the number of children of various age groups playing in a park was found as follows: Draw a histogram to represent the data above.

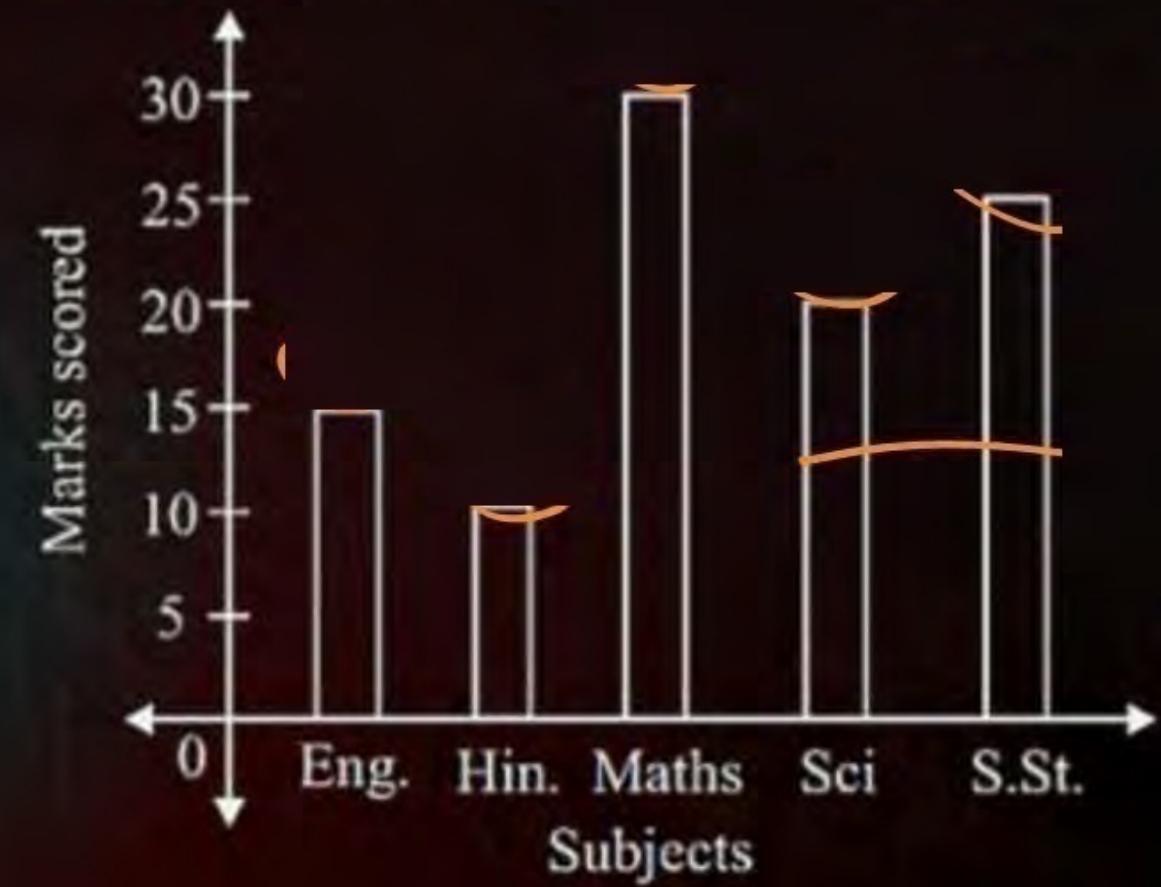
Age (in years)	Number of children
1 - 2	5
2 - 3	3
3 - 5	6
5 - 7	12
7 - 10	9
10 - 15	10
15 - 17	4

$$\begin{aligned} \frac{5}{1} \times 1 &= 5 \\ \frac{3}{1} \times 1 &= 3 \\ \frac{6}{2} \times 1 &= 3 \\ \frac{12}{2} \times 1 &= 6 \\ \frac{9}{3} \times 1 &= 3 \\ \frac{10}{5} \times 1 &= 2 \\ \frac{4}{2} \times 1 &= 2 \end{aligned}$$

Question

If the student wants to raise his total score up to 225, then how many more marks should be scored?

125
100
200
25

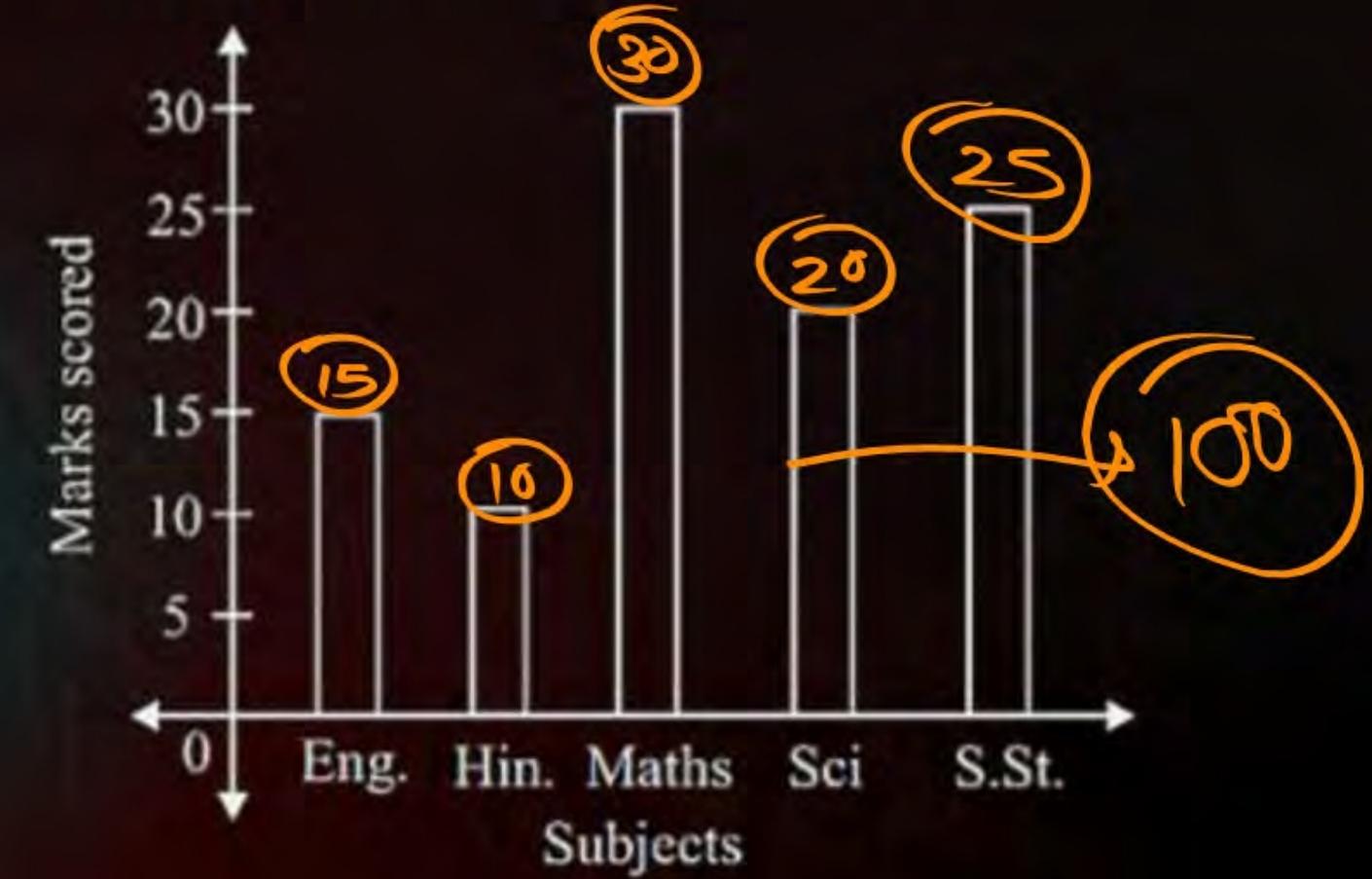


Question

If the student wants to raise his total score up to 225, then how many more marks should be scored?

- A 125
- B 100
- C 200
- D 25

$$\begin{array}{c} 10 \\ \curvearrowright \\ 225 \\ \circled{125} \end{array}$$



Question

The runs scored by two teams A and B on the first 60 balls in a cricket match are given below: Represent the data of both the teams on the same graph by frequency polygons. [Hint : First make the class intervals continuous.]

cont

discontinuous → *continuous*

Number of balls	Team A	Team B
1 - 6	2	5
7 - 12	1	6
13 - 18	8	2
19 - 24	9	10
25 - 30	4	5
31 - 36	5	6
37 - 42	6	3
43 - 48	10	4
49 - 54	6	8
55 - 60	2	10

Number of balls	Class Mark	Team A	Team B
0.5 - 6.5	3.5	2	5
6.5 - 12.5	9.5	1	6
12.5 - 18.5	15.5	8	2
18.5 - 24.5	21.5	9	10
24.5 - 30.5	27.5	4	5
30.5 - 36.5	33.5	5	6
36.5 - 42.5	39.5	6	3
42.5 - 48.8	45.5	10	4
48.5 - 54.5	51.5	6	8
54.5 - 60.5	57.5	2	10

uniform width

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The runs scored by two teams A and B on the first 60 balls in a cricket match are given below: Represent the data of both the teams on the same graph by frequency polygons. [Hint : First make the class intervals continuous.]

continuous

discontinuous → **continuous**

Number of balls	Team A	Team B
1 - 6	2	5
7 - 12	1	6
13 - 18	8	2
19 - 24	9	10
25 - 30	4	5
31 - 36	5	6
37 - 42	6	3
43 - 48	10	4
49 - 54	6	8
55 - 60	2	10

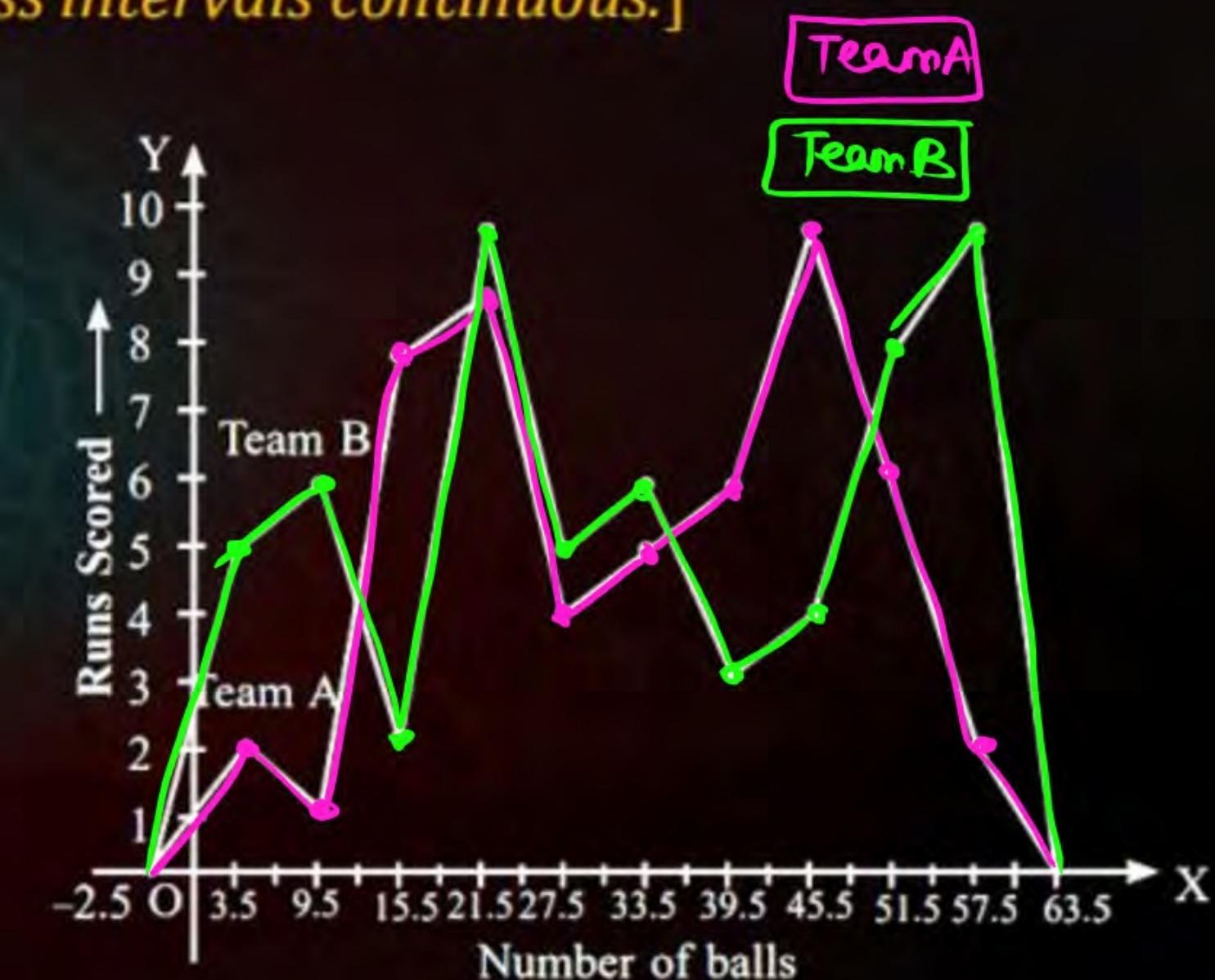
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24.5 - 30.5	27.5	4	5
30.5 - 36.5	33.5	5	6
36.5 - 42.5	39.5	6	3
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uniform width

Answer

The runs scored by two teams A and B on the first 60 balls in a cricket match are given below: Represent the data of both the teams on the same graph by frequency polygons. [Hint: First make the class intervals continuous.]

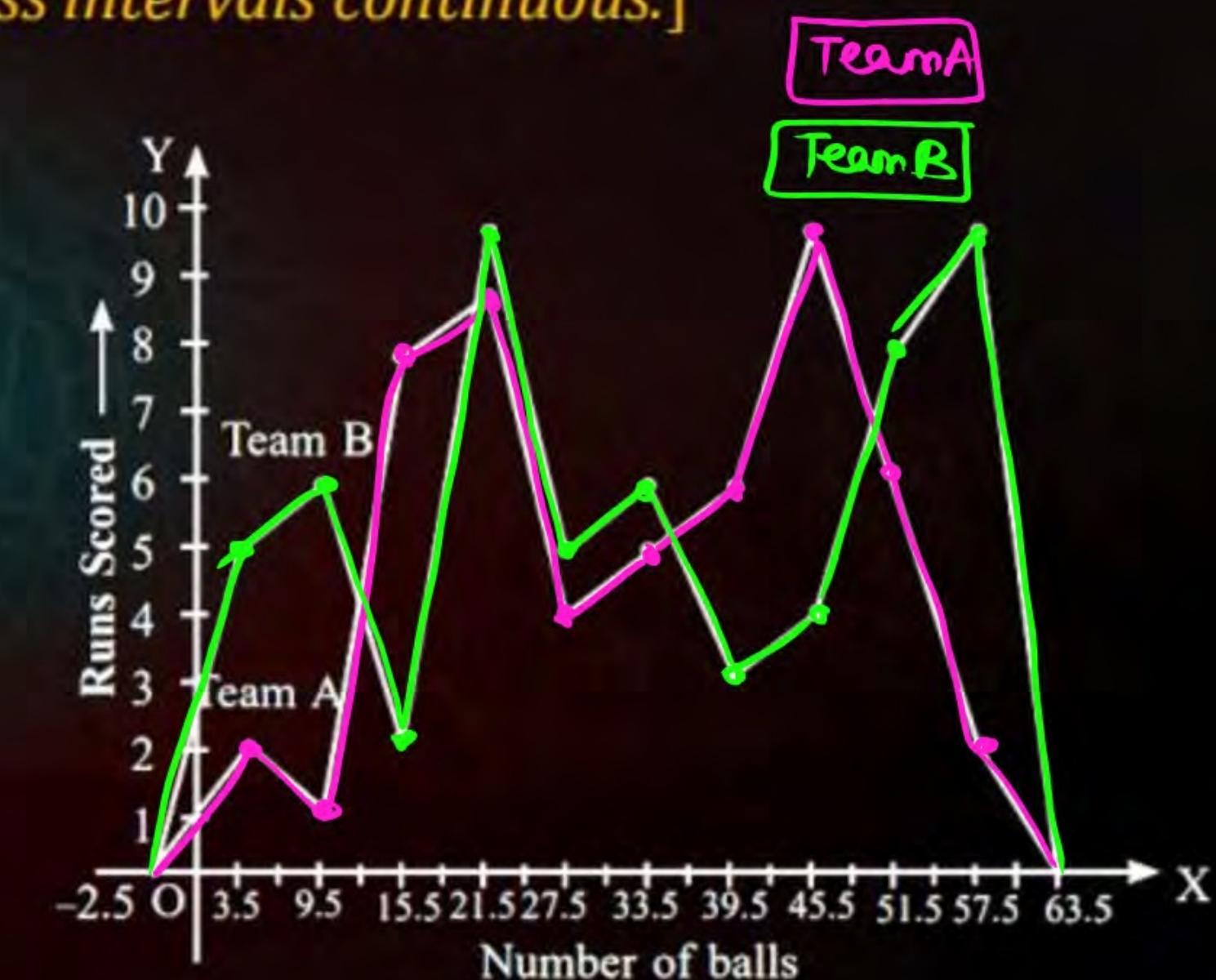
Number of balls	Class Mark	Team A	Team B
0.5 - 6.5	3.5	2	5
6.5 - 12.5	9.5	1	6
12.5 - 18.5	15.5	8	2
18.5 - 24.5	21.5	9	10
24.5 - 30.5	27.5	4	5
30.5 - 36.5	33.5	5	6
36.5 - 42.5	39.5	6	3
42.5 - 48.8	45.5	10	4
48.5 - 54.5	51.5	6	8
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Answer

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24.5 - 30.5	27.5	4	5
30.5 - 36.5	33.5	5	6
36.5 - 42.5	39.5	6	3
42.5 - 48.8	45.5	10	4
48.5 - 54.5	51.5	6	8
54.5 - 60.5	57.5	2	10





Measures of Central Tendency

The central tendency is stated as the statistical measure that represents the single value of the entire distribution or a dataset. It aims to provide an accurate description of the entire data in the distribution.

The mean (often called the average) is most likely the measure of central tendency that you are most familiar with, but there are others, such as the median and the mode. The mean, median and mode are all valid measures of central tendency, but under different conditions, some measures of central tendency become more appropriate to use than others.

Central Tendency

Mean

Median

Mode

MEAN

MEDIAN

MODE



Let's Analyze a scenario

Consider a situation when two students Mary and Hari received their test copies. The test had five questions, each carrying ten marks. Their scores were as follows:

Question Numbers	1	2	3	4	5
Mary's score	10	8	9	8	7
Hari's score	4	7	10	10	10

Mary's Score	7	8	8	9	10
Hari's Score	4	7	10	10	10



Let's Analyze a scenario

Consider a situation when two students Mary and Hari received their test copies. The test had five questions, each carrying ten marks. Their scores were as follows:

Question Numbers	1	2	3	4	5
Mary's score	10	8	9	8	7
Hari's score	4	7	10	10	10

Mary's Score	7	8	8	9	10
Hari's Score	4	7	10	10	10

→ Ascending order

$$\begin{aligned} \text{Mary's Total Score} &= 42 \\ \text{Hari's Total Score} &= 41 \end{aligned}$$



Measures of Central Tendency

The average score that Mary found in the first case is the mean. The ‘middle’ score that Hari was using for his argument is the median. The most often scored mark that Hari used in his second strategy is the mode.

- ✓ **Mean-** Sum of all observations divided by the total number of observations.
- ✓ **Median-** The middle or central value in an **ordered set.** → Ascending / Descending
- ✓ **Mode-** The most frequently occurring value in a data set.



Mean / Average of Data

The mean (or average) of a number of observations is the sum of the values of all the observations divided by the total number of observations. It is denoted by the symbol \bar{x} , read as 'x bar'.

$$\sum_{i=1}^n x_i \rightarrow \text{summation}$$
$$x_1 + x_2 + x_3 + \dots$$

We use the Greek symbol Σ (for the letter Sigma) for summation. Instead of writing

$x_1 + x_2 + x_3 + \dots + x_n$, we write $\sum_{i=1}^n x_i$, which is read as 'the sum of x_i as i varies from 1 to n '.

$$\text{mean} = \frac{\text{sum of all observation}}{\text{No. of observation}}$$

$$\text{Mean} = \frac{\left(\sum_{i=1}^n x_i \right)}{n}$$

Question

Find the mean of the marks obtained by 30 students of Class IX of a school, given below as

10	20	36	92	95	40	50	56	60	70
92	88	80	70	72	70	36	40	36	40
92	40	50	50	56	60	70	60	60	88

Question

Find the mean of the marks obtained by 30 students of Class IX of a school, given below as

10	20	36	92	95	40	50	56	60	70
92	88	80	70	72	70	36	40	36	40
92	40	50	50	56	60	70	60	60	88

$$60 + 60 + 60 + 60$$

$$= \boxed{60} \times 4$$

$$\boxed{x_i \times f}$$



Mean / Average of Data by using frequency distribution table

Is the process consuming more time?
Let's simplify by forming a frequency table for this data.

Marks (x_i)	Number of students (f_i)	$f_i x_i$
10	1	10
20	1	20
36	3	108
40	4	160
50	3	150
56	2	112
60	4	240
70	4	280
72	1	72
80	1	80
88	2	176
92	3	276
95	1	95
$\sum_{i=1}^{13} f_i = 30$		
$\sum_{i=1}^{13} f_i x_i = 1779$		



Mean / Average of Data by using frequency distribution table

Is the process consuming more time?
Let's simplify by forming a frequency table for this data

$$\text{Mean} = \frac{\sum_{i=1}^{13} x_i f_i}{\sum_{i=1}^{13} f_i}$$

Marks (x_i)	Number of students (f_i)	$f_i x_i$
10	1	10
20	1	20
36	3	108
40	4	160
50	3	150
56	2	112
60	4	240
70	4	280
72	1	72
80	1	80
88	2	176
92	3	276
95	1	95
$\sum_{i=1}^{13} f_i = 30$		$\sum_{i=1}^{13} f_i x_i = 1779$



Median of Data

The median of a set of data is the **middlemost number** or centre value in the set. The median is also the number that is halfway into the set. To find the median, the data should be arranged first in order of least to greatest or greatest to the least value.

For Example: 142, 140, 130, 150, 160, 135, 158, 132

Dhyan dene vali Baat :

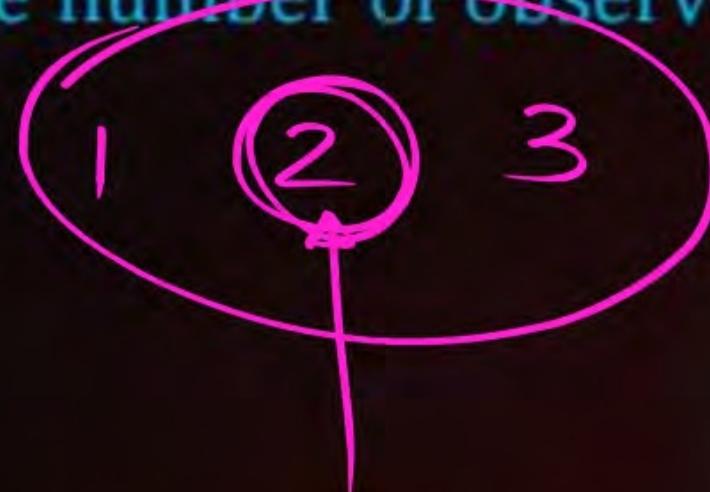
Given data must be either in ascending order or in descending order





Median of Data if number of observation is even/odd

When the number of observations (n) is odd, the median is the value is calculated as:



$$\text{Median} = \left(\frac{n+1}{2} \right)^{\text{th}} \text{ term}$$



When the number of observations (n) is even, the median is the value is calculated as:

$$\text{Median} = \frac{\left(\frac{n}{2} \right)^{\text{th}} + \left(\frac{n}{2} + 1 \right)^{\text{th}}}{2}$$

Question

The points scored by a Kabaddi team in a series of matches are as follows:

17, 2, 7, 27, 15, 5, 14, 8, 10, 24, 48, 10, 8, 7, 18, 28

Find the median of the points scored by the team.



Mode of Data

In Statistics, Mode or modal value is that observation which occurs at the maximum time or has the highest Frequency in the given set of data.

Question

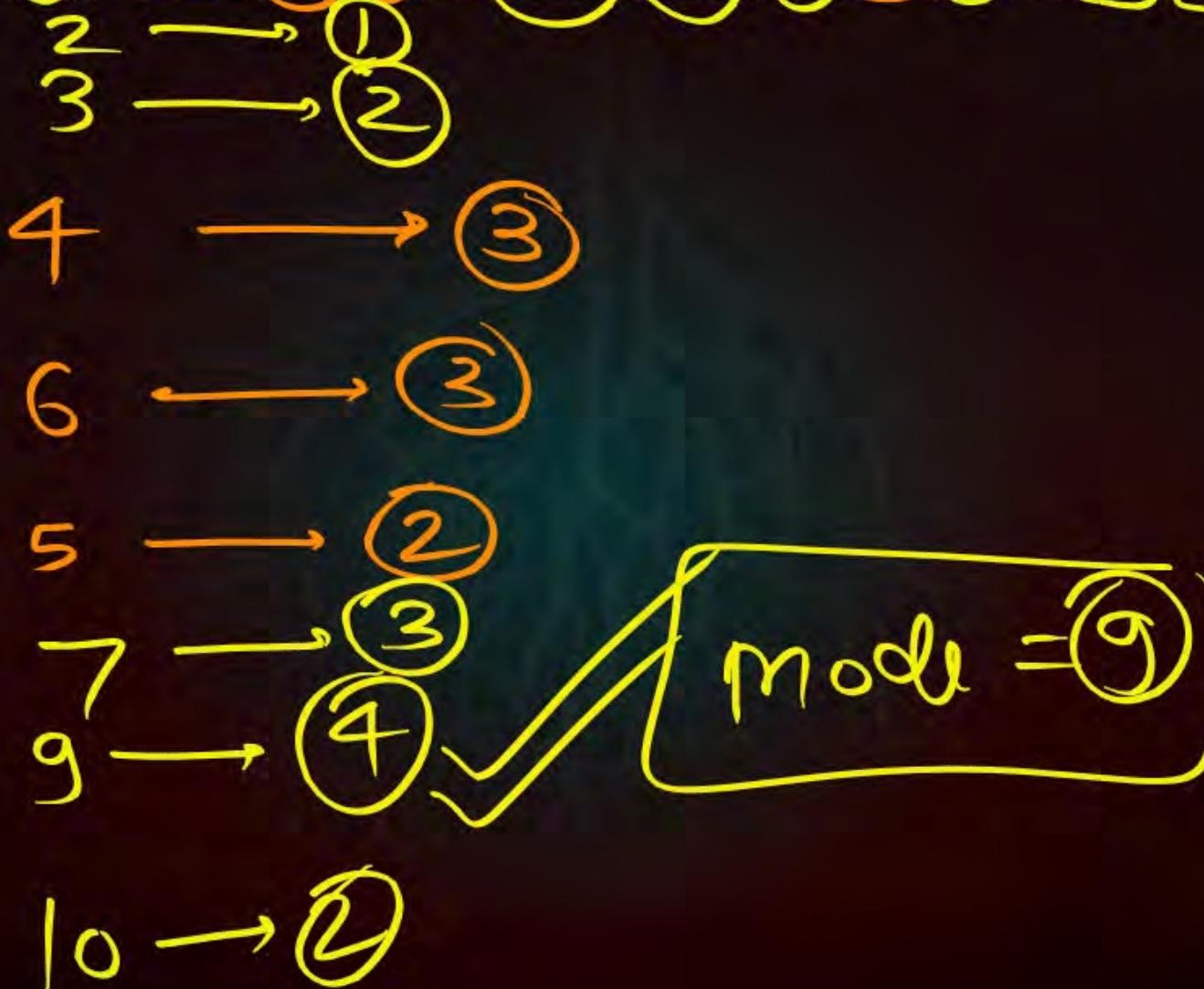
Find the mode of the following marks (out of 10) obtained by 20 students:

4 6 5, 9, 3, 2 7, 7, 6 5, 4 9, 10, 10, 3, 4, 7, 6, 9, 9

Question

Find the mode of the following marks (out of 10) obtained by 20 students:

4 6 5 9 10 3 2 7 7 6 5 4 9 10 10 3 4 7 6 9 9



Question

The following number of goals were scored by a team in a series of 10 matches:

2, 3, 4, 5, 0, 1, 3, 3, 4, 3

Find the mean, median and mode of these scores.

Question

The following number of goals were scored by a team in a series of 10 matches:

2, 3, 4, 5, 0, 1, 3, 3, 4, 3

Find the mean, median and mode of these scores.

$$\begin{array}{r} \downarrow \\ \frac{28}{10} \\ = 2.8 \end{array}$$

0, 1, 2, 3, 3, 3, 3, 4, 4, 5

$$\text{Median} = \frac{\left(\frac{10}{2}\right)^{\text{th}} + \left(\frac{10}{2}+1\right)^{\text{th}}}{2}$$
$$= \underline{\underline{5^{\text{th}} + 6^{\text{th}}}}$$

$$= \frac{3+3}{2} = \frac{6}{2} = 3$$

Mode = 3

THANK

YOU

VIPIN KAUSHIK ASOSE SURAJMAL VIHAR