

Master Lesson Plan

for

Statistics

Board	Standard	Subject	Chapter	Language
NCERT	STD IX	Mathematics	Statistics	English

CURRICULAR GOALS	CG-8: Builds skills such as visualisation, optimisation, representation, and mathematical modelling along with their application in daily life
COMPETENCIES AS PER NCF/NIPUN BHARAT	C-8.1: Models daily-life phenomena and uses representations such as graphs, tables, and equations to draw conclusions
SDG(Sustainable Development Goals)	SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Technology aids	PPT
NCF Recommrned Strategies	Project-Based - SA_Allocate Shops
Cross-Cutting Themes	Educational Technology - PPTs for every component Values and Dispositions - VC_Actions speak Louder

MS_Objectives of Statistics

Objective: Teacher will be able to get an overview of the Asset objectives in the MLP of the chapter Statistics

Notes to the teacher: This asset lays down the proposed plan for transacting this chapter. It states asset objectives of the MLP. This asset is for teacher's reference and need not be taught to the students.

The students will be able to -

- differentiate between the types of graphical representation
- draw a bar graph and histogram with a given set of data and interpret a chart
- determine the location of shops in the farmer's market after analysing the data
- construct a frequency polygon for a given data
- relate to uses of different types of graph in day to day life
- appreciate how graphs can be used to interpret TRP for TV shows and advertisements
- examine different scenarios in which the collected data can be represented graphically and inferences could be drawn
- appreciate the importance of unity in thought, word and deed
- summarise the importance of the chapter Statistics.

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Main Script	Statistics	Representation of data(pictograph, bar graph & double bar graph)

IQ_Graphical representation

Objective: Students will be able to differentiate between the types of graphical representation.

Teaching Aids: PPT

Notes to the teacher: Teacher will show the following image of a telephone game. Also make a case study and questions based on that.

Telephone game



Boy 1: [freepik.com/free-vector/cute-happy-smiling-child-isolated-white_5135263.htm](https://www.freepik.com/free-vector/cute-happy-smiling-child-isolated-white_5135263.htm); Attribution: brgfx

Boy 2: [freepik.com/free-vector/cute-happy-smiling-child-isolated-white-background_5597184.htm](https://www.freepik.com/free-vector/cute-happy-smiling-child-isolated-white-background_5597184.htm); Attribution: brgfx

Girl 1: [freepik.com/free-vector/cute-happy-smiling-child-isolated-white-background_19023163.htm](https://www.freepik.com/free-vector/cute-happy-smiling-child-isolated-white-background_19023163.htm); Attribution: brgfx

Boy 3: [freepik.com/free-vector/little-boy-purple-shirt-waving-hand_3516499.htm](https://www.freepik.com/free-vector/little-boy-purple-shirt-waving-hand_3516499.htm); Attribution: brgfx

Boy 4: [freepik.com/free-vector/cute-happy-smiling-child-isolated-white_6892756.htm](https://www.freepik.com/free-vector/cute-happy-smiling-child-isolated-white_6892756.htm); Attribution: brgfx

What is the starting information?

peas

What is the information received by the last person?

fleas

Is the information starting with and ending with the same word?

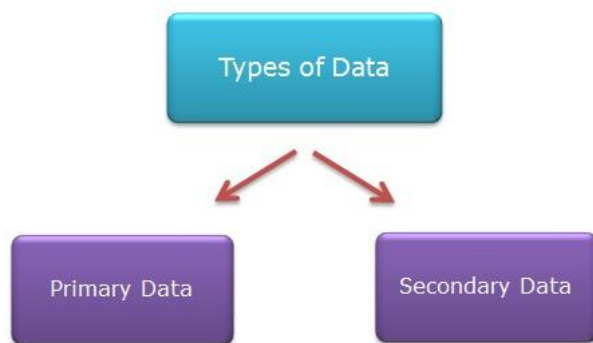
No

What is the difference between the information obtained by the second person and the remaining three persons?

The second person is the direct receiver of the information, whereas the remaining three are not direct receivers of the information.

Data gathered directly by the respective person himself/herself: **Primary data**

A person or a group using a data collected by someone else: **Secondary data**



The information peas is primary data only for the second person from left. For the remaining three, it is secondary data.

[Notes to the teacher: Teacher may ask students to give various example of primary and secondary data based on the above discussion]

Expected answers

- a. Class teacher/representative collecting height and weight of students of her class:
Primary data
- b. Taking the scores of cricket match from newspaper, rumours: Secondary data

[Notes to the teacher: Teacher may show the following data and ask questions to the students.]

Marks scored by 30 students of Class 9 in a test out of 100 marks are as follows.

62,63,70,40,32,56,75,100,90,96,84,93,100,40,45,97,96,30,25,32,96,84,82,70,60,50,98,100,58,79.

Start a questioning session with the students :

1. Is the above data primary or secondary data?
Ans: Primary data
2. Can you say quickly how many students have scored more than 80 marks? Why? Why not?
Ans: No. If the data is grouped in tabular form, we can find it easily.

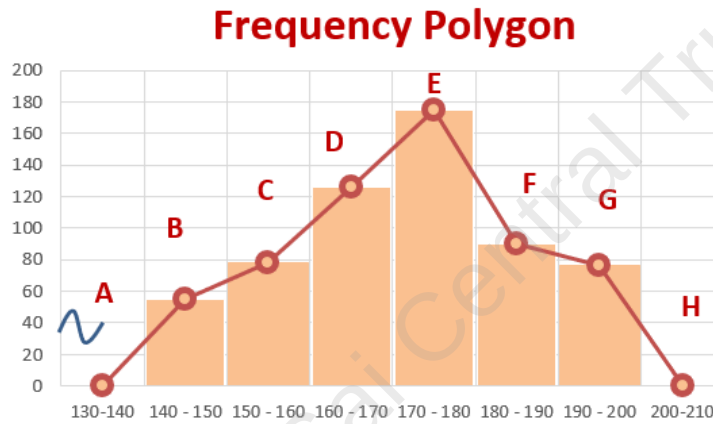
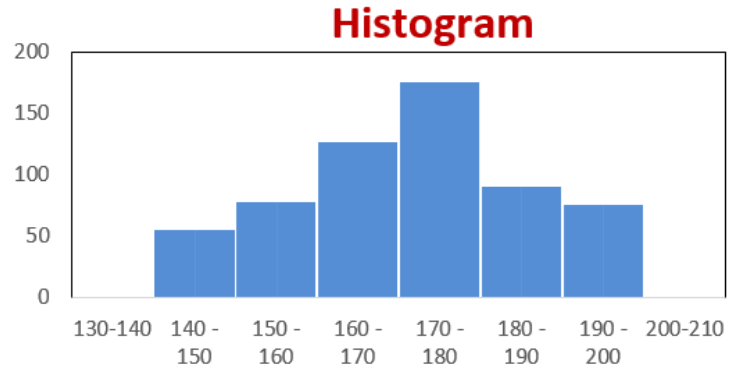
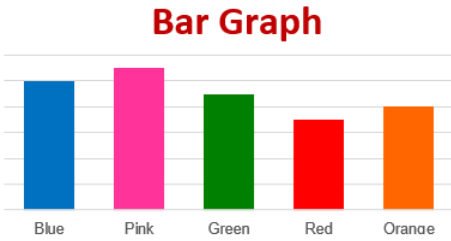
[Notes to the teacher: Teacher may show frequency distribution table for the above data and ask question no.2]

3. What are the other ways of representation which will be easy for you to interpret and answer?

Ans: Picturisation or pictorial way of representing the data will be easy to understand.

[Notes to the teacher: Teacher may show Histogram for the above data]

4. Mention some of the ways of pictorial representation of data.
Graphical representation like bar graph, histogram, pie chart, etc.



Source: Bar Graph, Histogram, Polygon – Created by using PPT graphs

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Inquisitive Questions	Statistics	Representation of data(pictograph, bar graph & double bar graph)

MS_Bar graph and Histogram

Objective: Students will be able to draw a bar graph and histogram with a given set of data and interpret a chart.

Notes to the teacher: The teacher may prepare the charts of bar graphs and histograms to explain the concepts

Bar graph

[Notes to the teacher: The teacher may start the class by giving the following example and asking the questions.]

The favourite colours of 45 students in a class are listed below.

Favourite colour	No. of students
Blue	10
Pink	11
Green	9
Red	7
Orange	8

What is a bar graph?

Expected answer: A bar graph is the graphical representation of numerical data using bars or rectangles.

What are the elements of a bar graph?

Expected answer: The elements of a bar graph are:

Bars: The bars in a bar graph display the number of items under a particular category. In the above example, the favourite colours are categories.

Axes: The bar graph is represented by two axes. Generally y – axis is used to represent the numerical values and x – axis represents the category against which the numerical data is plotted.

In the above example, the category ‘favourite colour’ is represented along x – axis and the numerical data, ‘the number of students’ is represented along the y – axis.

What are the properties of a bar graph?

Expected answer: The properties of a bar graph are:

- In a bar graph, the bars (or rectangles) are of equal width and varying height (or length). The height of the bar is related directly to the numerical value of the corresponding category
- There is a uniform gap between any two bars

[Notes to the teacher: The teacher may explain the method of representing data on a bar graph, using the above example as follows]

The following steps are used to represent numerical data in a bar graph.

Step 1: Label the vertical and horizontal axes. In order to draw a vertical bar graph, place the categorical data 'favourite colour' on x – axis and the numerical data, 'the number of students' along the y – axis.

Step 2: Decide about scale. As the maximum value is 11, we can use 1 unit = 1 student

Step 3: Draw bars for each category. For example, there are 10 students with favourite colour blue, drawing a rectangle of height 10 units, over the 'Blue' category. Similarly draw bars corresponding to each category. Taking the breadth of each rectangle, 1 unit, and a gap of 2 units, between any two bars, we get a bar graph as follows.

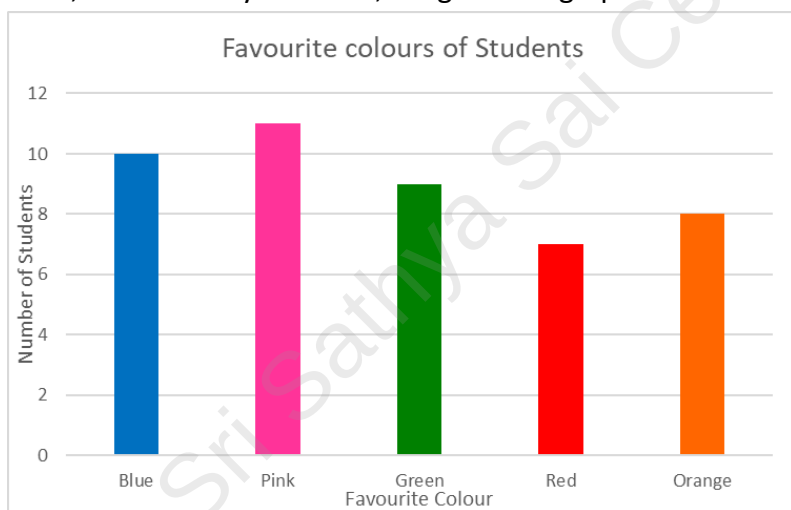


Image source: Created graphs using excel

Example: Read the following bar graph and answer the questions.

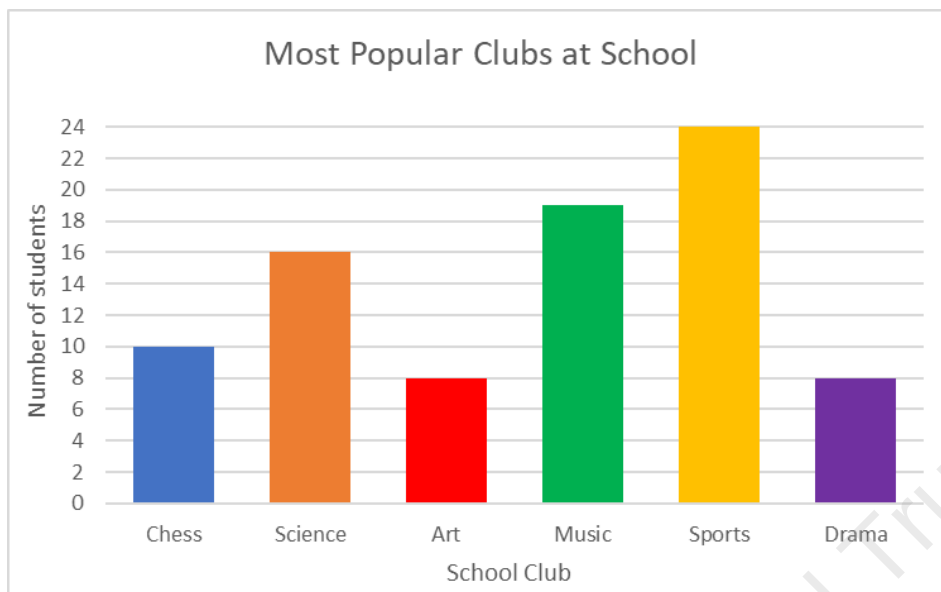


Image source: Created graphs using excel

1. Find the total number of students in various clubs.
2. How many students are there in the Science club?
3. Which is the most popular club?
4. How many more students does the sports club have than the science club?

Solution:

1. Total number of students in various clubs = $10 + 16 + 8 + 19 + 24 + 8 = 85$
2. There are 16 students in the Science club.
3. In the Sports club, we have the highest number of students, 24. The most popular club is the Sports club.
4. The number of students in the Sports club is 24. The number of students in the Science club is 16.
Sports club has $24 - 16 = 8$ students more than Science club.

Histogram:

Histogram is a graphical representation like a bar graph. But histogram is used to represent grouped frequency distribution with continuous class intervals. In a bar graph, x – axis represents the category whereas in a histogram, x – axis represents the class intervals of the data.

To create a histogram for a data with uniform class intervals

[Notes to the teacher: The teacher may explain the method of representing grouped frequency distribution, on a histogram, using one example as follows]

Construct a histogram for the following frequency distribution, which gives frequencies of weights of 48 students in a class

Weight in Kg	Number of students
25-30	6
30-35	10
35-40	16
40-45	13
45-50	3

What are the parts of a histogram?

Axes: In a histogram, the class intervals are represented along x – axis and the corresponding frequencies are represented along y – axis.

Bars: Bases of the bars (or rectangles) represent class – size or class – width. The heights of bars are proportional to the frequencies.

Steps to plot a histogram

[Notes to the teacher: The teacher may explain the method of representing data on a histogram, as follows] Histogram is obtained by drawing bars (or rectangles).

What are the dimensions of these rectangles?

Bases or breadth of the bars represent class – size or class – width

In a histogram, the area of the bar represents the frequency.

I.e. frequency of a class interval = length $\times$ breadth = Height of the bar $\times$ class - width

So, $\text{Height of the bar} = \frac{\text{Frequency}}{\text{Class - width}}$

Step 1: Use a suitable scale, for the purpose of representing the class intervals along the x – axis. Generally we take 1 unit = class – width.

In the above example, class intervals are uniform. Each class – width = 5. Thus we can take, 1 unit = 5

Step 2: Next step is to calculate the height of the bar using the formula,

$$\text{Height of the bar} = \frac{\text{Frequency}}{\text{Class - width}}$$

In this example, class – width is represented by 1 unit. Thus, *Height of the bar* = *Frequency*.

Choose a suitable scale, to represent height of the bar or frequency along y – axis. In this example, we can choose 1 unit = 2 students. The histogram of the frequency distribution is given below.

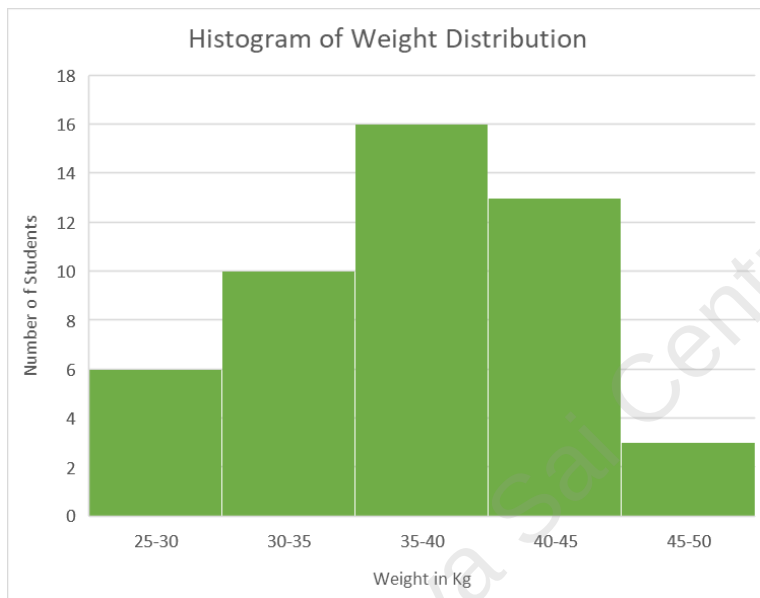


Image source: Created graphs using excel

Examples:

1) The lengths of 100 leaves of a plant are measured in millimetres and data is represented in a frequency distribution table as follows. Draw a histogram representing the data.

Length in millimetre	Number of leaves
111 – 116	6
117 - 122	17
123 - 128	22
129 - 134	20

135 - 140	24
141 - 146	11

Solution: In the given frequency distribution, class intervals are of uniform width, but not continuous.

Convert it into continuous frequency distribution.

Lower limit of the second class interval = 117

Upper limit of the first class interval = 116

Consider $\frac{117 - 116}{2} = 0.5$

Subtract 0.5 from lower limit and add 0.5 to the upper limit in each interval.

The resulting frequency distribution table,

Length in millimetre	Number of leaves
110.5 – 116.5	6
116.5 – 122.5	17
122.5 – 128.5	22
128.5 – 134.5	20
134.5 – 140.5	24
140.5 – 146.5	11

Choose the scale x – axis: 1 unit = class – width = 6

and y – axis: 1 unit = 2 leaves

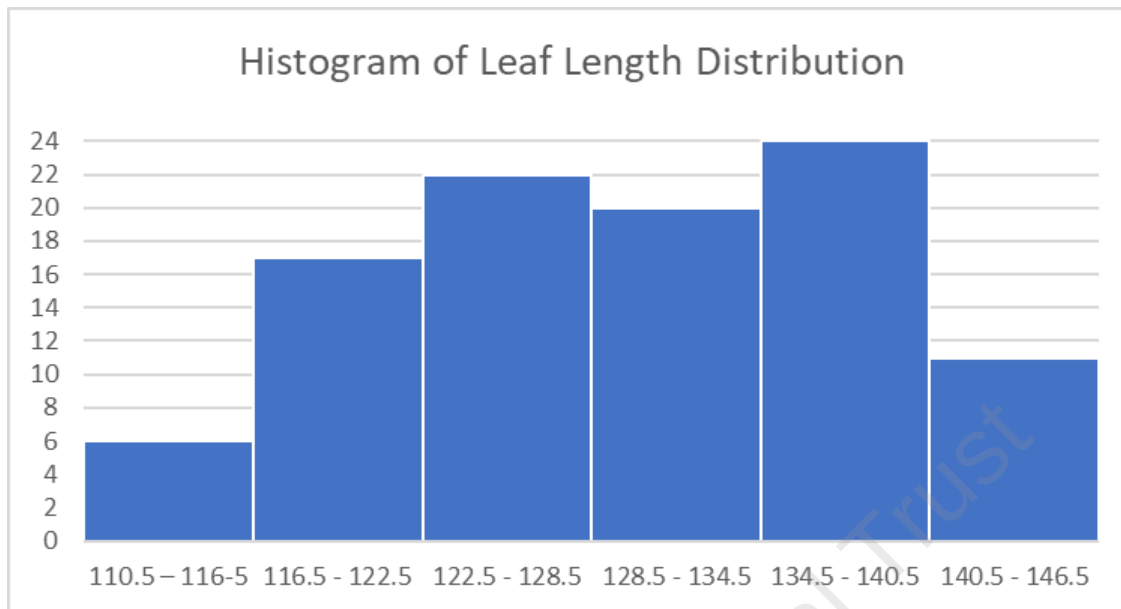


Image source: Created graphs using excel

2) A teacher wants to analyse the performance of 90 students in two sections, in Mathematics. She grouped them into intervals of varying sizes as follows. Draw a histogram for this data.

Marks	Number of students
0 - 20	6
20 - 30	7
30 - 40	12
40 - 50	15
50 - 60	24
60 - 70	11
70 and above	15

Solution: In this example, class intervals are continuous but class — widths are not uniform. We

use the following steps to find the heights or lengths of rectangles.

Step 1: Represent minimum class – width by 1 unit.

In this example 1 unit = minimum class – width = 10.

Then breadth of any other bar $b = \frac{\text{class} - \text{width}}{\text{minimum class} - \text{width}}$

Area of the bar or rectangle = $l \times b = \text{frequency}$

Length $l = \frac{\text{frequency}}{b} = \frac{\text{frequency}}{\text{class} - \text{width}} \times \text{minimum class} - \text{width}$

Marks	frequency	Class - width	$l = \frac{\text{frequency}}{\text{class} - \text{width}} \times \text{minimum class} - \text{width}$
0 - 20	6	20	$l = \frac{6}{20} \times 10 = 3$
20 - 30	7	10	$l = \frac{7}{10} \times 10 = 7$
30 - 40	12	10	$l = \frac{12}{10} \times 10 = 12$
40 - 50	15	10	$l = \frac{15}{10} \times 10 = 15$
50 - 60	24	10	$l = \frac{24}{10} \times 10 = 24$
60 - 70	11	10	$l = \frac{11}{10} \times 10 = 11$
70 - 100	15	30	$l = \frac{15}{30} \times 10 = 5$

Choose the scale x – axis: 1 unit = minimum class – width = 10

and y – axis: 1 unit = 2 students

The resulting histogram is as follows.

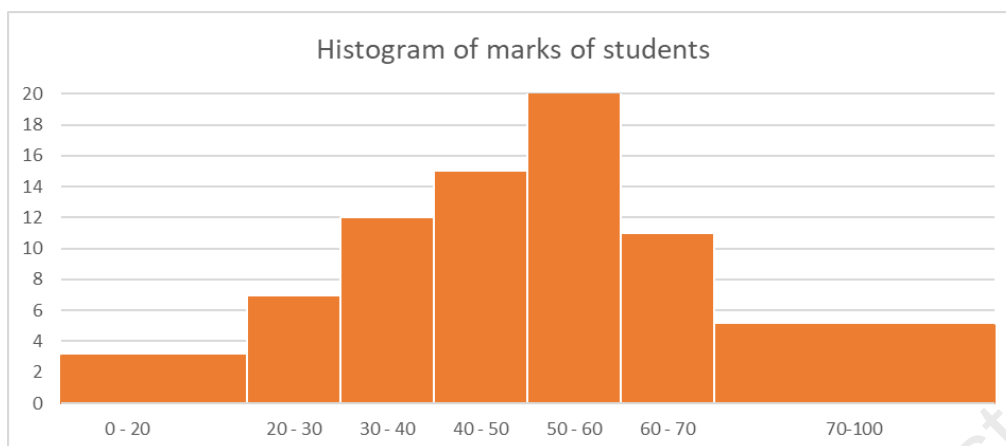


Image source: Created graphs using excel

The difference between Bar graphs and Histogram

Bar graph	Histogram
It consists of bars of equal width separated from each other with equal space.	Widths of bars may vary when class intervals are not uniform. There is no space between bars as class intervals are continuous.
In the case of a vertical bar graph, the height shows the frequency along y – axis and breadth represents the category, and it has no significance. So, it's a one – dimensional figure.	Frequency is represented by the area of each rectangle. The breadth of the bar represents class–width and height is proportional to frequency. It's a two – dimensional figure.

Time to teach	Asset type	Theme	Sub Theme
20 minutes	Main Script	Statistics	Histogram Percentage bar diagram Representation of data(pictograph, bar graph & double bar graph)

SA_Allocate Shops

Objective: Students will be able to determine the location of shops in farmer's market after analysing the data.

Teaching Aids: Handout with Data & Project Report Template

Notes to the Teacher: Students will be able to apply data accumulated (from purchase history), to decide how to allocate shops in a farmer's market. They will write their proposal, explaining why the store should be placed together, and/or in the front or back of the market.

Aim: Students will be able to write a proposal for arrangement of shops based on the analysis of data provided.

Resources Required: A4 size sheets, Stationery items, Handouts with Data & Project Report Template

Setting for the Activity: Indoor

Type of Activity: Discuss among team members and come up with a business proposal

Preparation of Activity: [Form teams of Students]

- Keep the handouts ready with the information or data provided in the 'Handout Document'
- Form teams with 6 students in each team
- Distribute one handout per team

Role of the Teacher: [Facilitator/ Observer]

Procedure: Students are provided with data collected from purchase history at the farmer's market.

Following pointers can be given as guidance to help the students get started with project

- Study the data
- Organise the data into a presentable format
- Represent it graphically
- Using the graph, analyse the data
- Choose the shop best suited for each item based on your analysis and reasoning

Using the data, they would analyse to figure out which products are sold most and are sold together.

The students would build a business proposal to suggest what shops would be allotted for the items.

Observation: The students will be able to study data collection and apply the concepts of graphical representation. The pattern of sale of products is observed and analysed with the help of the graph.

Conclusion: Students will write a business proposal to allocate shops in the farmer's market. They have to describe their reasoning behind making those decisions.

Follow-up activity: Students Presentations - Students may present their ideas and explain how they arrived at that decision.

Notes to the teacher:

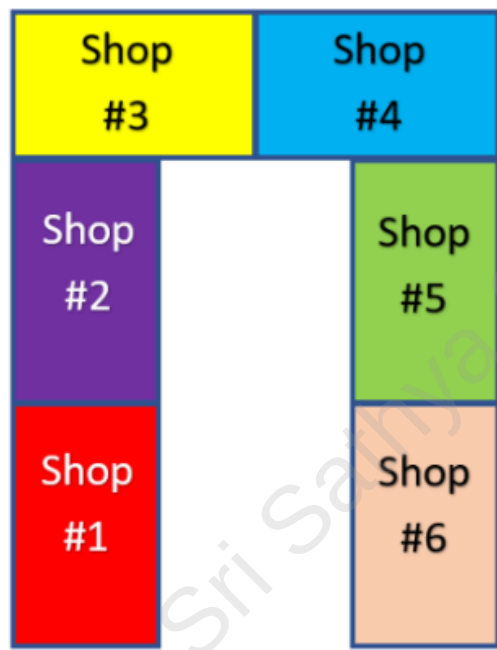
We have given below a sample shop placement design. The tables below show a purchase history - the data of the number of times an item was purchased .

Note that each item will have a shop for itself. For example: Shop 1- Onion - shop 2- Milk etc..

The students can organise the data item wise, plot the graph, analyse the data and suggest the most appropriate shop allocation design (Order of shop placement and the market design)

The handout contains the following information and the template for students to work out and record their conclusion and justification.

Farmer's Market Architecture



Purchase History: Number of times, an item was purchased monthly:

Jan 2022 Items	#
Onions	30
Potatoes	28
Milk	54
Cooking Oil	45
Tomatoes	27
Sugar	18

Feb 2022 Items	#
Onions	36
Potatoes	27
Milk	45
Cooking Oil	50
Tomatoes	12
Sugar	10

Mar 2022 Items	#
Onions	20
Potatoes	21
Milk	36
Cooking Oil	35
Tomatoes	12
Sugar	36

Apr 2022 Items	#
Onions	45
Potatoes	40
Milk	42
Cooking Oil	38
Tomatoes	40
Sugar	10

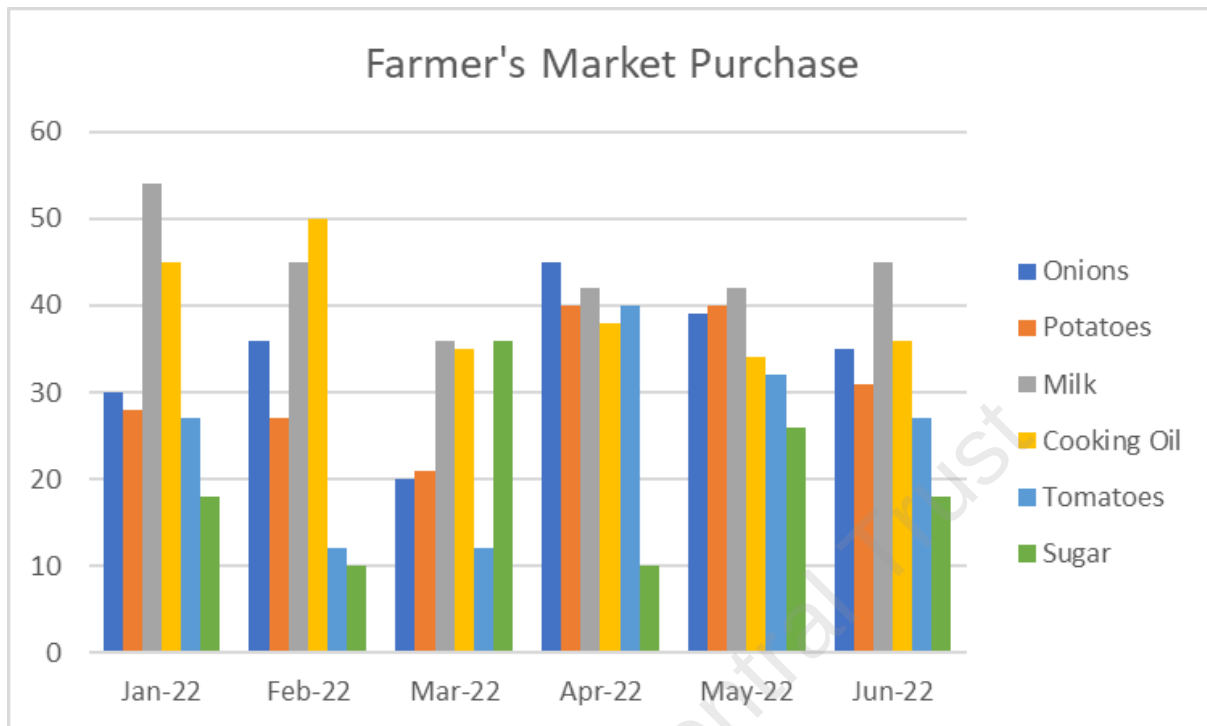
May 2022 Items	#
Onions	39
Potatoes	40
Milk	42
Cooking Oil	34
Tomatoes	32
Sugar	26

Jun 2022 Items	#
Onions	35
Potatoes	31
Milk	45
Cooking Oil	36
Tomatoes	27
Sugar	18

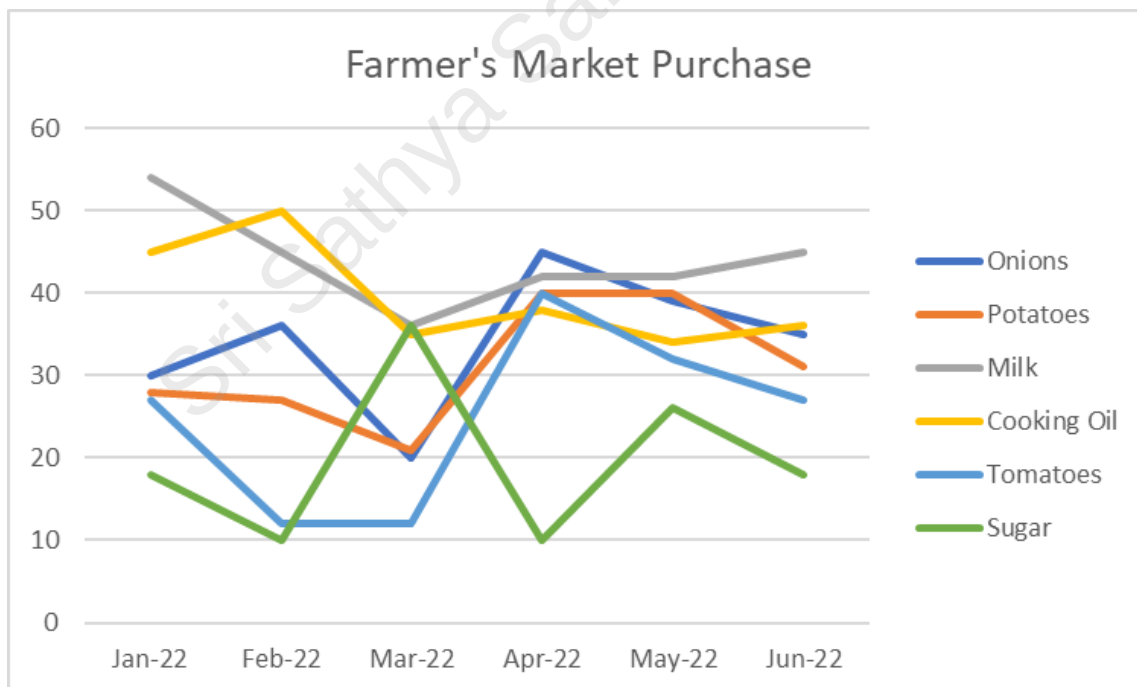
Notes to the teacher:

The following graphs are just for teacher's reference only. Please do not open it or reveal it to students as this activity will give an indication on how well the students have grasped. It will give an opportunity for students to think beyond their textbooks to be able to design a market space based on data analysis.

The students may build a graph with the data presented above to understand what are the topmost selling items at the farmer's market.



Or something like:



Suggested Solution

It may be noted that Milk and Cooking Oil are mostly bought most of the time, and have almost the highest demand every month. Potatoes and onions are the next most sought item.

While designing a marketplace, it is better to place the most sought items at the back of the market. This will encourage people to support other vendors. So, Milk and Cooking Oil would probably be allotted to Shop #3 and #4. Shop #2 and #5 may be occupied for Potatoes and Onions.

Please allow the students to explain their logic, if they have come up with a different solution.

Time to teach	Asset type	Theme	Sub Theme
20 minutes	Suggested Activity	Statistics	Frequency distribution table Graphical representation of cumulative frequency distribution Mean, median and mode

Objective: Students will be able to construct a frequency polygon for a given data.

Teaching Aids: PPT

[Notes to the teacher: The teacher can start the class by posing a question, and giving any one example of data and asking students to draw the histogram for the data.]

In Statistics, how do you represent data in pictorial form?

Expected answer: Pictograms, Pie charts, bar graphs, histograms etc.

Let us consider the following example.

On the occasion of World Diabetes day, 14 November 2022, a reputed hospital in Bangalore, organised a diabetes prevention and control campaign. It conducted a free blood sugar test camp. The fasting sugar test reports of 600 diabetic patients are listed in a frequency distribution table as follows.

Sugar in mg/dL	Number of patients
140 - 150	55
150 - 160	78
160 - 170	126
170 - 180	175
180 - 190	90
190 - 200	76
Total	600

Construct a histogram for the information given.

[Notes to the teacher: The teacher can ask students to draw the histogram using the following steps]

- The fasting sugar values as mg/dL are represented on the horizontal axis on a suitable scale
In this case, it's 1 unit = class width = 10 mg/dL
- The number of patients is represented on the vertical axis on a suitable scale
We can take it as 1 unit = 20 patients
- Now rectangular bars of widths equal to the class-size and the length of the bars

corresponding to a frequency of the class interval are drawn as shown

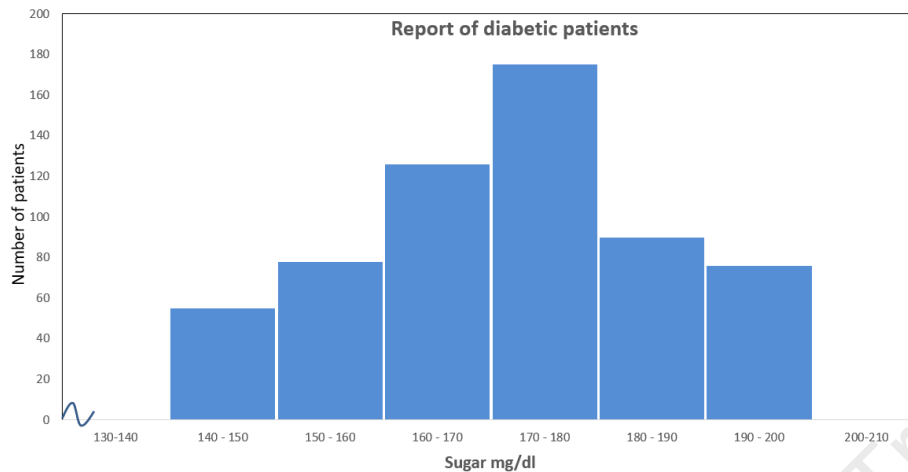


Image Source: PPT chart

In a histogram, the area of the bar represents the frequency.

I.e. frequency of a class interval = length $\times$ breadth = Height of the bar $\times$ class width

So, height of the bar =

$\frac{\text{Frequency}}{\text{Class width}}$

If the scale on the horizontal axis is such that class width is represented by one unit, height of the bar represents frequency as in the above example.

Note that,

Area of histogram = sum of the areas of bars = sum of frequencies.

In the above example, area of the first bar = 55, area of the second bar = 78... and so on.

Area of histogram = sum of the areas of bars = $55 + 78 + 126 + 175 + 90 + 76 = 600$

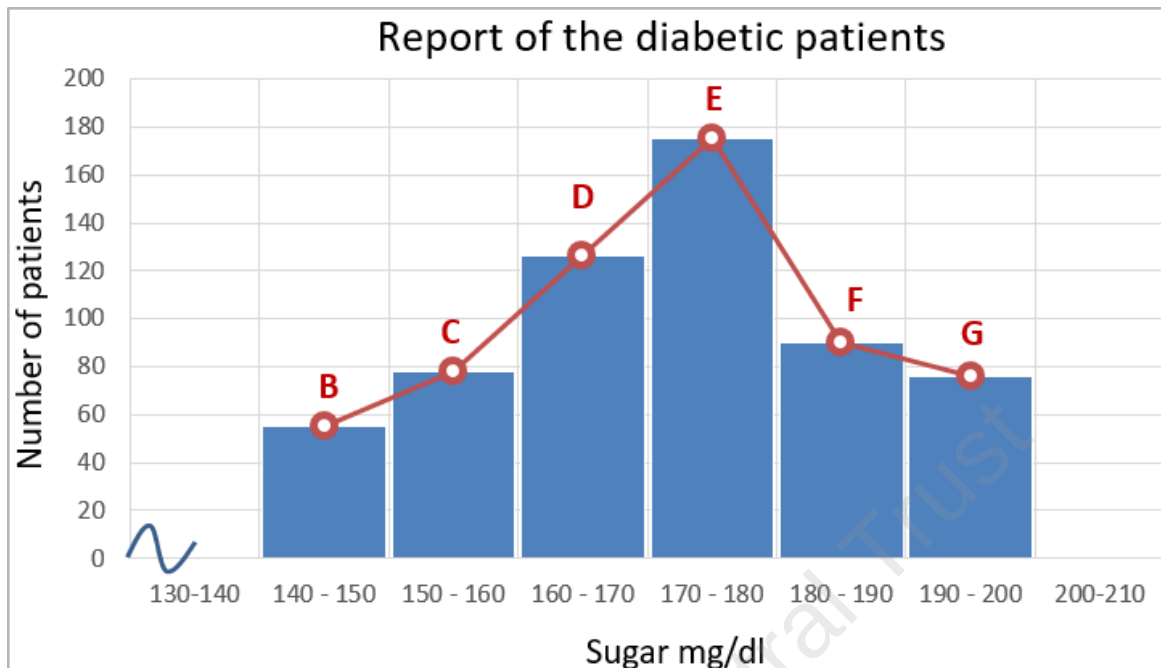
[Note to the teacher: The teacher can explain about frequency polygon and construction of frequency polygon using histograms, as follows]

Frequency polygon: A frequency polygon is a straight line graph used to represent the frequency of data.

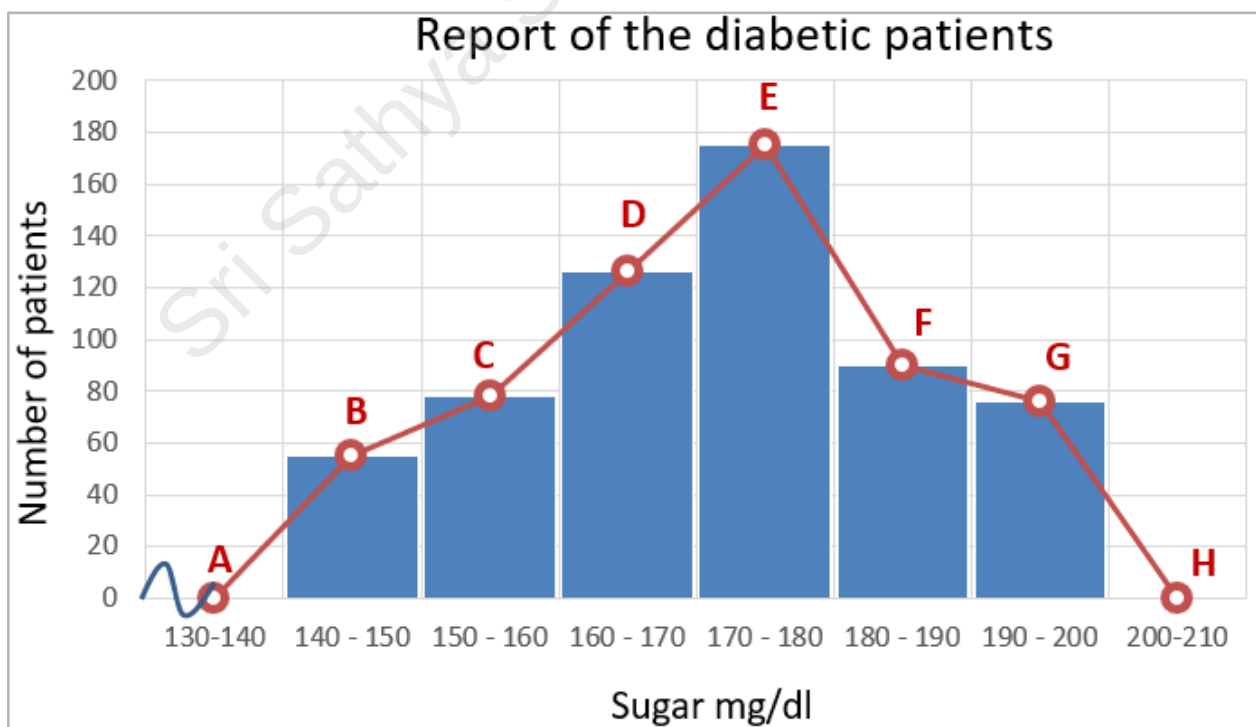
Drawing of frequency polygon using histogram:

We can draw the frequency polygon using the histogram of the given data as follows.

- In the above histogram, mark the mid - points of the upper sides of the adjacent rectangles and join them



- To complete the polygon, i.e. in order to get a closed shape, assume a class interval of frequency 0 before 140 -150 and one more class interval after 190-200. Mark their mid-points as A and H respectively. Now ABCDEFGH is the frequency polygon of the given data.

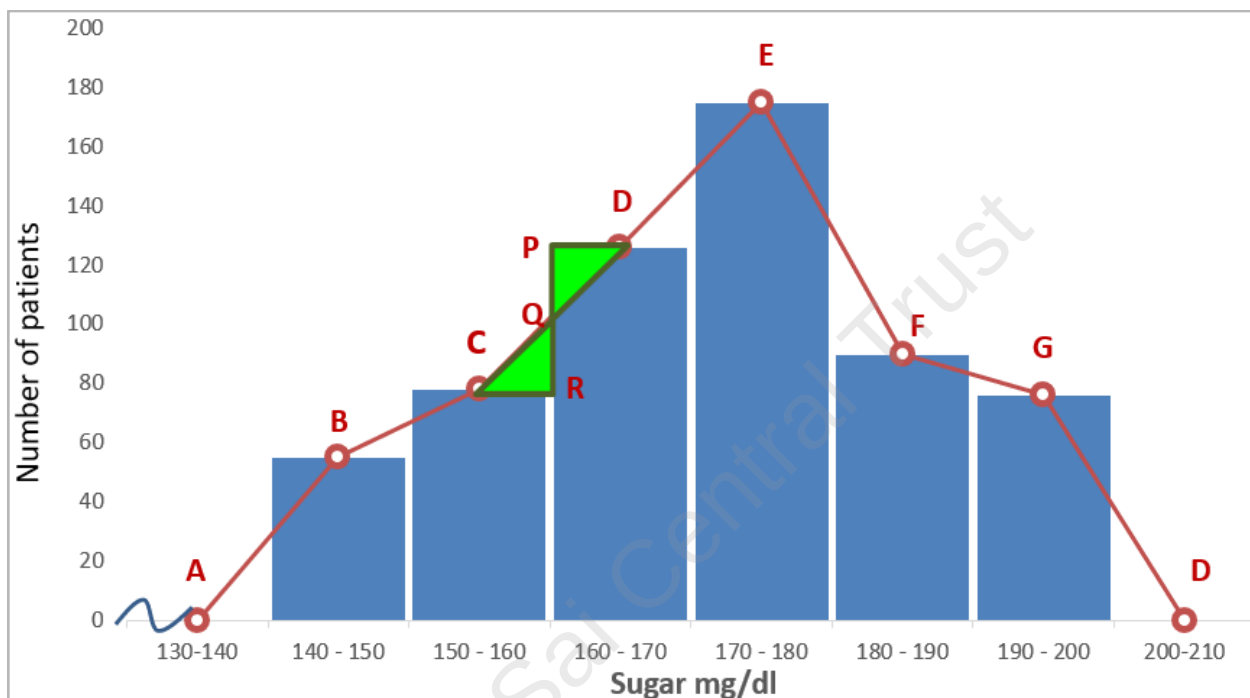


What is the area of a frequency polygon?

We know that,

Area of histogram = Sum of frequencies.

A simple inspection of histogram and frequency polygon will tell you that the area of histogram and frequency polygon will be almost the same. How?



In the figure, consider $\triangle PQD$ and $\triangle RQC$. We can prove that the triangles are congruent.

Thus, Area of $\triangle PQD$ = Area of $\triangle RQC$.

Area of $\triangle PQD$ in the histogram is left out by the frequency polygon, but area of $\triangle RQC$ is added to the frequency polygon. Thus, wherever some part of histogram is left out by frequency polygon, approximately an equal area gets added to the frequency polygon at a later point.

Thus, Area of frequency polygon = Sum of frequencies.

Drawing of frequency polygon without using histogram:

Frequency polygons can also be drawn independently without drawing histograms. Instead of drawing a bar, a point is placed in the mid-point of each interval at height equal to the frequency. (When the class interval is represented by a unit on the horizontal axis) These points are connected with straight lines to emphasize the distribution of the data.

Thus to draw the frequency polygons, we need mid-points of class-intervals used in data. These numbers are called class-marks. Class-mark of a class interval is the mean of its lower limit and upper limit.

Thus, $\text{Class - mark} = \frac{\text{Upper limit} + \text{Lower limit}}{2}$

E.g. Construct the frequency polygon for the following frequency distribution table, that describes the frequencies of marks obtained by 48 students in a class.

Class Interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	1	2	5	10	12	7	5	4	2

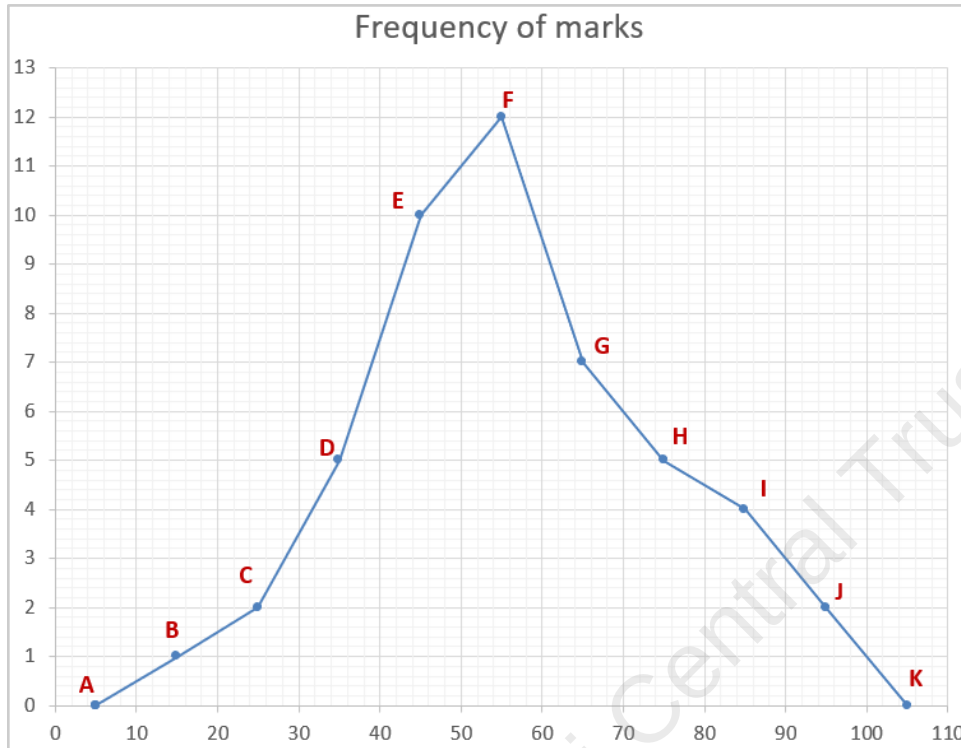
Solution:

- 1) We mark the class intervals along the x-axis taking one unit = class-width = 10. Then the heights or y - coordinates of points are the frequencies as in the case of a histogram.
- 2) We consider the class interval 0-10 before 10-20 and 100-110 after 90-100 with frequencies 0.
- 3) We calculate class-marks of each class interval and list the points with class-mark as x-coordinate and frequency as y-coordinate.

Class Interval	Class marks	Frequency	Points
0 - 10	5	0	A(5, 0)
10 - 20	15	1	B(15, 1)
20 - 30	25	2	C(25, 2)
30 - 40	35	5	D(35, 5)
40 - 50	45	10	E(45, 10)
50 - 60	55	12	F(55, 12)
60 - 70	65	7	G(65, 7)
70 - 80	75	5	H(75, 5)
80 - 90	85	4	I(85, 4)
90 - 100	95	2	J(95, 2)
100 - 110	105	0	K(105, 0)

4) Plot the points and join

the points to obtain the frequency polygon.



Time to teach	Asset type	Theme	Sub Theme
20 minutes	Main Script	Statistics	Frequency Frequency distribution table Histogram Lower class and upper class limit

DD_Uses of Graphs

Objective: Students will be able to relate to uses of different types of graph in day to day life.

Teaching Learning Material (TLM): Newspaper Cuttings

What do you need?: Cut outs of different types of graphs from newspapers or magazines

Get Ready: Keep the cut outs ready in advance

Notes to the teacher: Teacher may introduce the asset by asking questions on different types of graphs and why graphs are appealing than written data

Picturisation is one of the effective tools of understanding and analysing data. One of them is graphical representation of data. There are various types of graphs through which data can be represented, like

- 1) Bar Graph
- 2) Histogram
- 3) Pie chart
- 4) Line graph and many more

A few day to day situations where some of the graph forms play a vital role.

[Notes to the teacher: Ask students where they have seen or come across the above types of graphs. They can mention the situations and contexts and why that type of graph was used there. Allow maximum participation from students. After eliciting answers, the TLM of paper cuttings may be displayed and discussed further.]

Some examples could be:

- 1) Comparing scores in a cricket match
- 2) Weather forecast
- 3) Census data
- 4) Election results
- 5) Survey results
- 6) Trends in stock market

Students could be asked to bring clippings of graphs they have seen and the same may be displayed in the class noticeboard.

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Day-to-day Relevance	Statistics	Histogram Pie chart/circle graph Representation of data (pictograph, bar graph &

			double bar graph)
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IA_Graphs for TRP

Objective: Students will be able to appreciate how graphs can be used to interpret TRP for TV shows and advertisements.

Teaching aids: PPT

Notes to the teacher: This is to briefly introduce the students to how statistical data may be applied in understanding the demographics of TV viewers.

What is TRP (Target or Television Ratings Point)

TRP is a metric used in marketing and advertising to compare the target audience's opinion about a show or advertisement. For example, in order to calculate TRP for TV shows, a device is attached to the TV set in a certain number of houses. The device then records information about the time and programme that the viewer watches on a particular day. This data is then analysed to create a national TRP data for various channels and TV programmes.

How is data tracked in India and Introduction to BARC India

In India, BARC (Broadcast Audience Research Council) India is set up to design, commission, supervise and own an accurate, reliable and timely television audience measurement system for India. It currently measures TV viewing habits of 210 million TV households in the country, using 50,000+ devices. This will go up to 55,000 in 2023, as mandated by the Ministry of Information & Broadcasting.

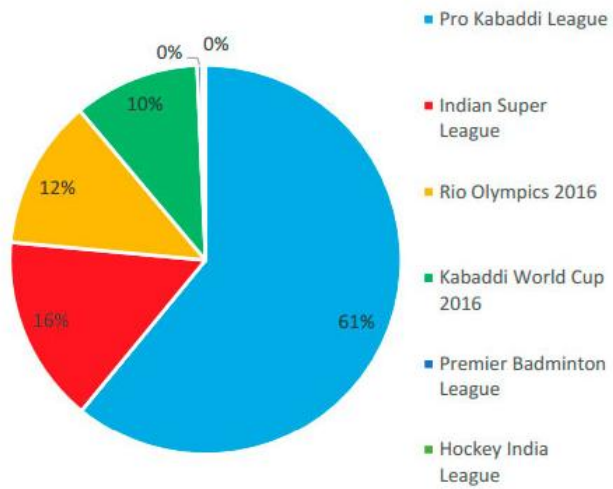
[Source: Malvania, Urvi (2018-12-13). "TV ratings provider BARC aims to have 50,000 panel homes, make use of AI". Business Standard India. Retrieved 2018-12-14.]

Under BARC India, data would be available for age parameters like – children & tweens (2–14 years), youth (15–21 years), young adults (22–30 years), adults (31–40 years), peak (41–50 years), mature (51–60 years) and seniors (61+ years).

Analysis of Kabaddi TRP Ratings

Let us look at how the TRP ratings help us understand viewership of *Kabaddi* (a sport common to India) sport. From the data collected as shown below, we understand that the Kabaddi viewership has gone up 61%. This can help the TV channels get more advertisers and sponsors for the next Kabaddi tournament.

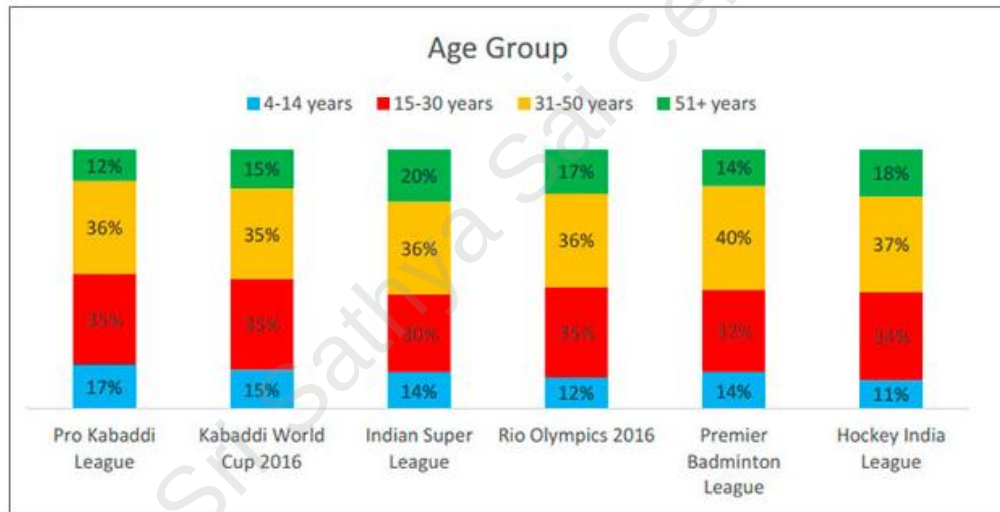
Analysis that Kabaddi viewership has gone up, based on BARC analysis



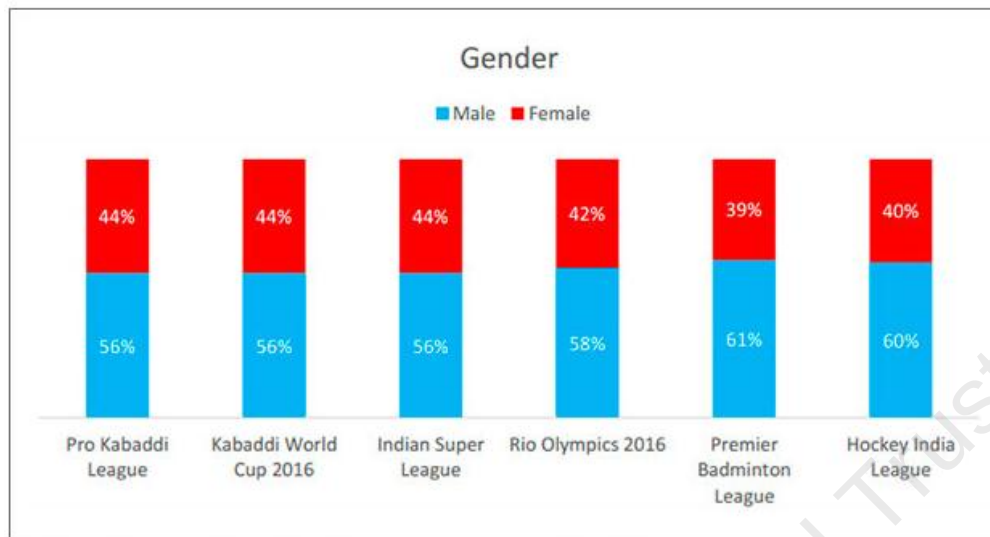
* % share of Sum of Normalised Impressions'000

Source: bestmediainfo.com/2017/05/pro-kabaddi-is-back-barc-analysis-on-india-s-biggest-non-cricket-league

Age group data for Kabaddi viewership:



Gender based analysis for viewership:



[source: bestmediainfo.com/2017/05/pro-kabaddi-is-back-barc-analysis-on-india-s-biggest-non-cricket-league]

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Interesting Asides	Statistics	Graphical representation of cumulative frequency distribution

QA_Graphical representation

Objective: Students will be able to examine different scenarios in which the collected data can be represented graphically and inferences could be drawn.

Notes to the teacher: Teacher may present the questions and allow the students to write or say the answers before revealing them.

I) Choose the correct option

1) Let m be the class mark and l be the lower class limit in a continuous frequency distribution. The upper limit of the class is

- a. $m + l$ b) $2m + l$ c) $2m - l$ d) $m - l$

2) In the histogram of the frequency distribution

15 – 20 5

20 – 25 9

25 – 30 3

30 – 45 12

The adjusted frequency of the class 30 – 45 is

- a) 4 b) 3 c) 6 d) 12

3) For drawing frequency polygons of a continuous frequency distribution, we plot the points, whose ordinates are the frequency of the respective classes and abscissa are....

- a) Lower limit of the classes b) upper limit of the classes c) class - mark of the classes
d) none of these

4) The class - marks of a distribution are 3.5, 7, 10.5, 14...The width of the class is....

- a) 3.5 b) 7 c) 3 d) 14

Solutions:

1. c) $2m - l$

We have $\frac{\text{upper limit} + l}{2} = m$, upper limit = $2m - l$

2. a) 4

The adjusted frequency = $\frac{\text{Frequency of the class}}{\text{class width}} \times \text{minimum width} = \frac{12}{15} \times 5 = 4$

3. c) class - mark of the classes

4. a) 3.5

The class—marks are uniformly distributed.

Therefore, the width of the class intervals is the difference between any two consecutive class—marks. I.e. $7 - 3.5 = 10.5 - 7 = \dots = 3.5$

II) Answer the following questions

1) a) The class—marks of a continuous frequency distribution are 1.25, 1.5, 1.75, 2.0, 2.25. Find the last interval (The interval with class—mark 2.25)

Solution:

The class—marks are uniformly distributed. Therefore, the size of the class intervals is the difference between any two consecutive class—marks.

Class - size = $1.5 - 1.25 = 1.75 - 1.5 = \dots = 0.25$

$$\frac{\text{Class - size}}{2} = \frac{0.25}{2} = 0.125$$

Last class—mark = 2.25

Last class - interval is $(2.25 - 0.125) - (2.25 + 0.125)$. I.e. 2.125 – 2.375

b) The frequency distribution of marks obtained by 45 students, has been represented graphically as follows.

Marks	0-10	10-20	20-30	30-50
Number of students	5	7	13	20

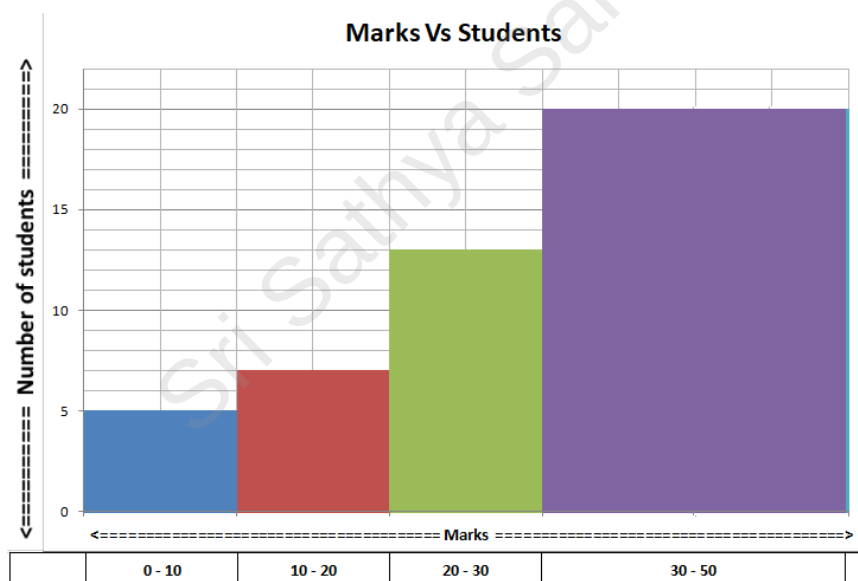


Image Source: Created graphs using excel

Is the representation correct? Justify your answer.

Solution: No, here classes are of varying width. So, adjustment is to be done before graphical representation.

The adjusted frequency of the class 30 – 50 = $\frac{\text{Frequency of the class}}{\text{class width}} \times \text{minimum width} = \frac{20}{20} \times 10 = 10$

Draw the histogram by taking frequency of the class interval 30 – 50 as 10

[Notes to the teacher: The teacher may ask students to draw the histogram with adjusted frequency of the class interval 30 – 50.]

2) In a survey, 1000 adults were asked about specific environmental issues that can spoil human health. The number of people who indicated that they worried about some selected issues are summarised below.

Serial No.	Environmental issues	Number of adults (to the nearest tens)
1	Pollution of drinking water	650
2	Air pollution	460
3	Climate changes and natural disasters	100
4	Diseases caused by microbes	760
5	Contamination of soil and water by toxic waste	370
6	Lack of access to health care	450
7	Dangerous chemicals in the environment(E.g. harmful pesticides)	570

a) Represent the data graphically in a bar chart.

b) According to the data of the survey, which environmental condition is the major cause of ill health?

c) Try to find out any two factors which play the major role in the cause (b) above being the major cause.

Solution: a) Draw the bar graph using the following steps

Step 1: Draw the axes and label them. Write Environmental issues along x – axis and number of adults along y – axis.

Step 2: Choose scale.

Along x - axis, represent environmental issues by their serial numbers.

Along y - axis let 1 unit = 100 adults.

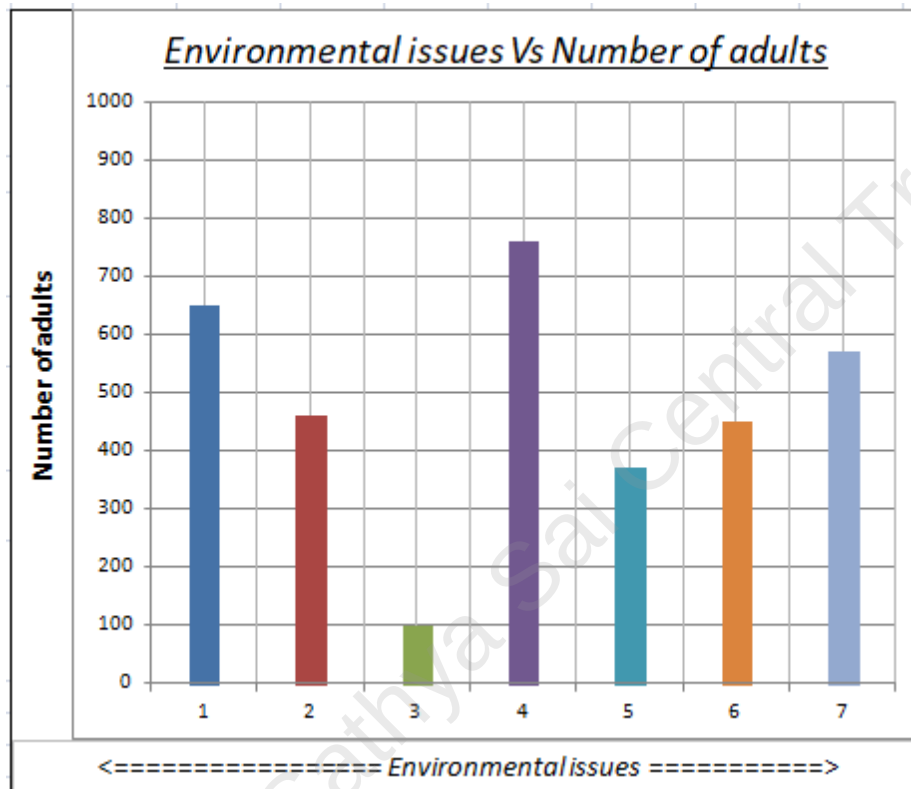


Image Source: Created graphs using excel

b) 4) Diseases caused by microbes

c) i) Diseases spread by microorganisms are largely due to not maintaining proper sanitisation, hygienic practices.

ii) Immune system not working properly.

3) 100 senior citizens were surveyed on the number of hours of sleep they get (on average) in a week. The information is given in the table below.

Hours of Sleep	Number of adults
20 –24	7

25 –29	13
30 –34	20
35 –39	27
40 –44	11
45 –49	14
50 –54	8

- Construct a histogram for this information.
- Construct a frequency polygon using the histogram.
- Construct the frequency polygon without using histogram.

Solution:

- Step 1: Convert the given frequency distribution into continuous frequency distribution.

Lower limit of the second class interval = 25

Upper limit of the first class interval = 24

Consider $\frac{25 - 24}{2} = 0.5$

Subtract 0.5 from lower limit and add 0.5 to upper limit in each interval

The resulting frequency distribution table,

Hours of Sleep	Number of adults
19.5 – 24.5	7
24.5 – 29.5	13
29.5 – 34.5	20
34.5 – 39.5	24

39.5 – 44.5	15
44.5 – 49.5	11
49.5 – 54.5	10

Step 2: Hours of sleep along x – axis and number of adults along y – axis

Scale x – axis, 1 unit = class width = 5

y – axis, 1 unit = 2 adults

The resulting histogram

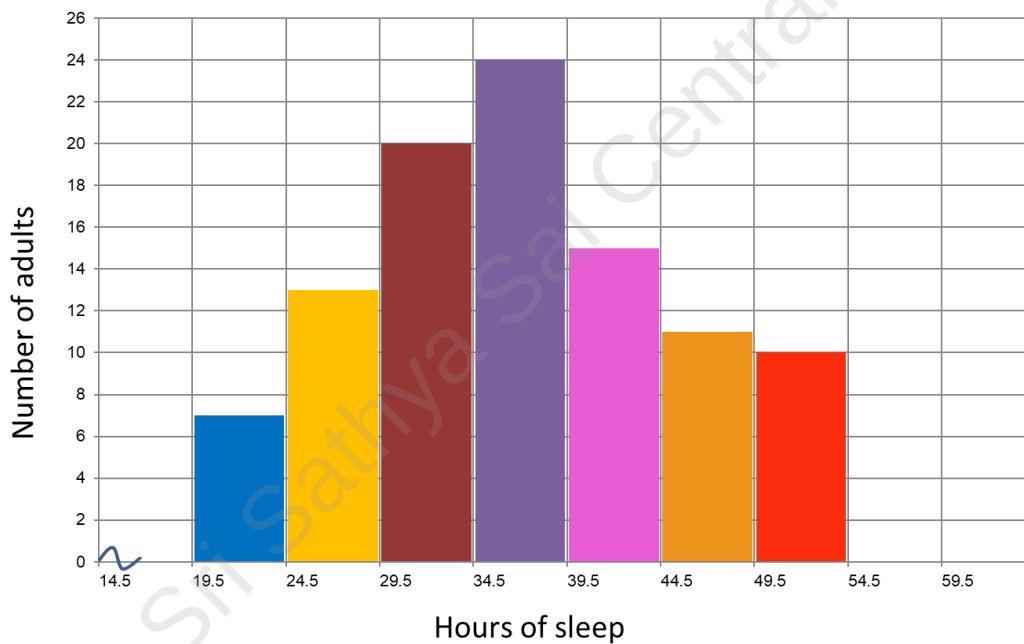


Image Source: Created graphs using excel

b) Step 1: Mark the mid - points of the upper sides of the adjacent rectangles and join them.

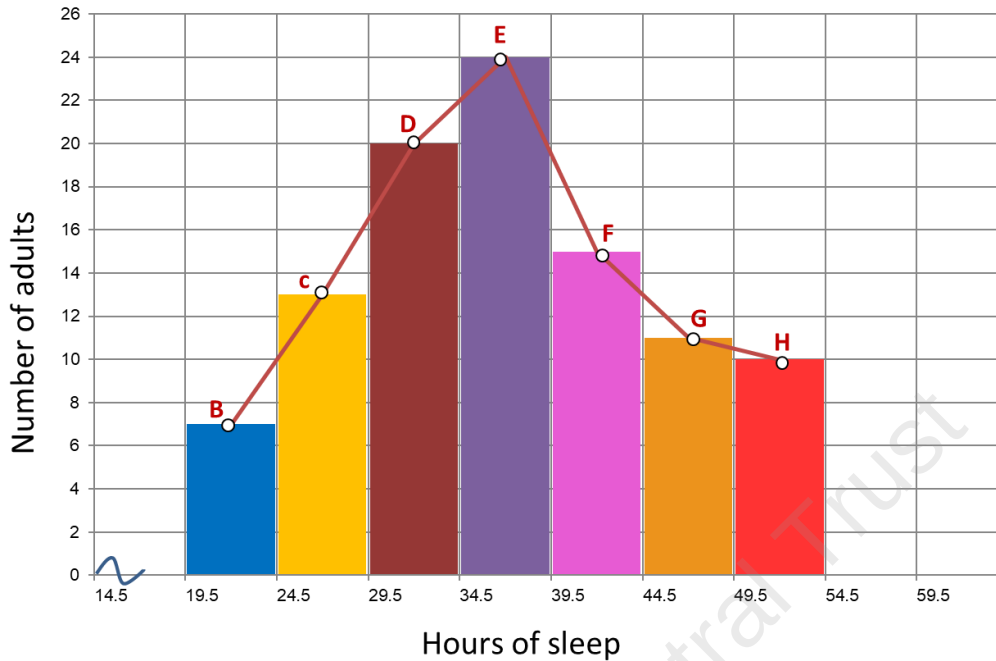


Image Source: Created graphs using excel

Step 2: In order to get a closed shape, assume a class interval of frequency 0 before 19.5 –24.5 and one more class interval after 49.5 –54.5. Mark their mid-points as A and I respectively. Now ABCDEFGHI is the frequency polygon of the given data.

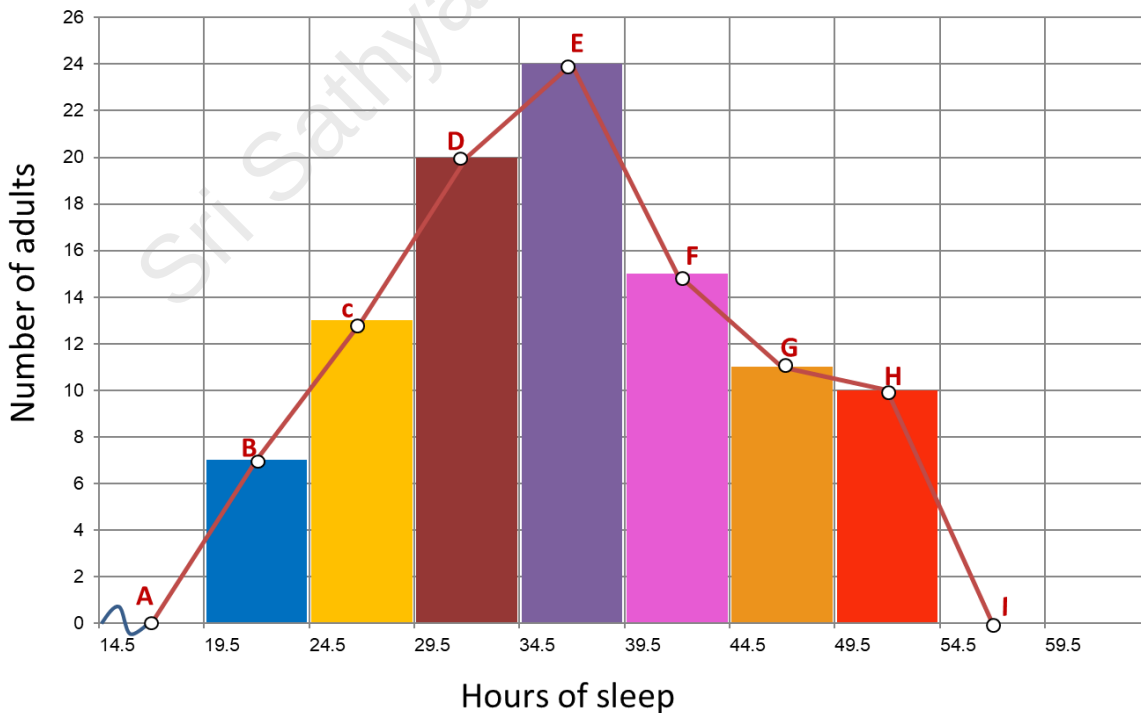


Image Source: Created graphs using excel

c) Step 1: Mark the class intervals along the x-axis taking one unit = class-width = 5. Then the heights or y-coordinates of points are the frequencies.

Step 2: Consider the class interval 14.5 –19.5 before 19.5 –24.5 and 54.5 –59.5 after 49.5 –54.5 with frequencies 0.

Step 3: Calculate class-marks of each class interval and list the points with class-mark as x-coordinate and frequency as y-coordinate.

Class interval	Class-mark	Frequency	Point
14.5-19.5	17	0	A(17, 0)
19.5-24.5	22	7	B(22, 7)
24.5-29.5	27	13	C(27, 13)
29.5-34.5	32	20	D(32, 20)
34.5-39.5	37	24	E(37, 24)
39.5-44.5	42	15	F(42, 15)
44.5-49.5	47	11	G(47, 11)
49.5-54.5	52	10	H(52, 10)
54.5-59.5	57	0	I(57, 0)

Step 4: Plot the points and join them. ABCDEFGHI is the required histogram.

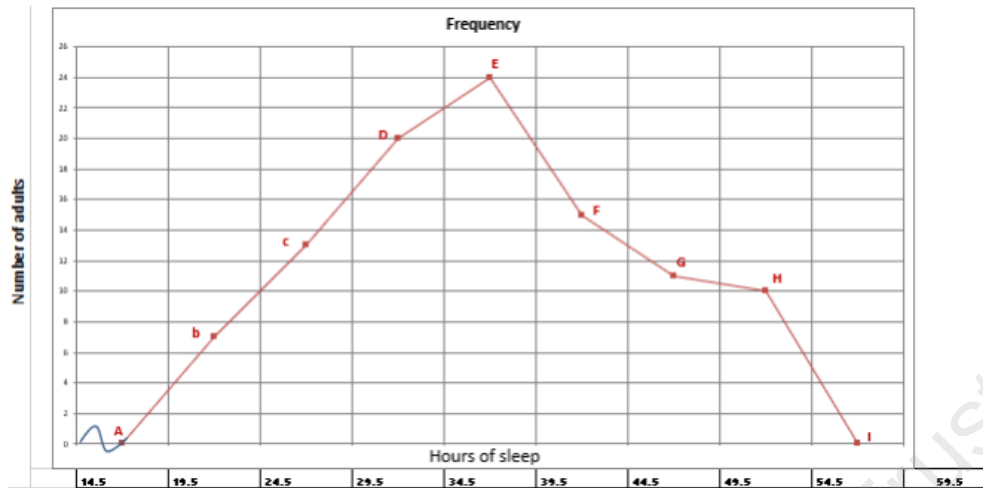


Image Source: Created graphs using excel

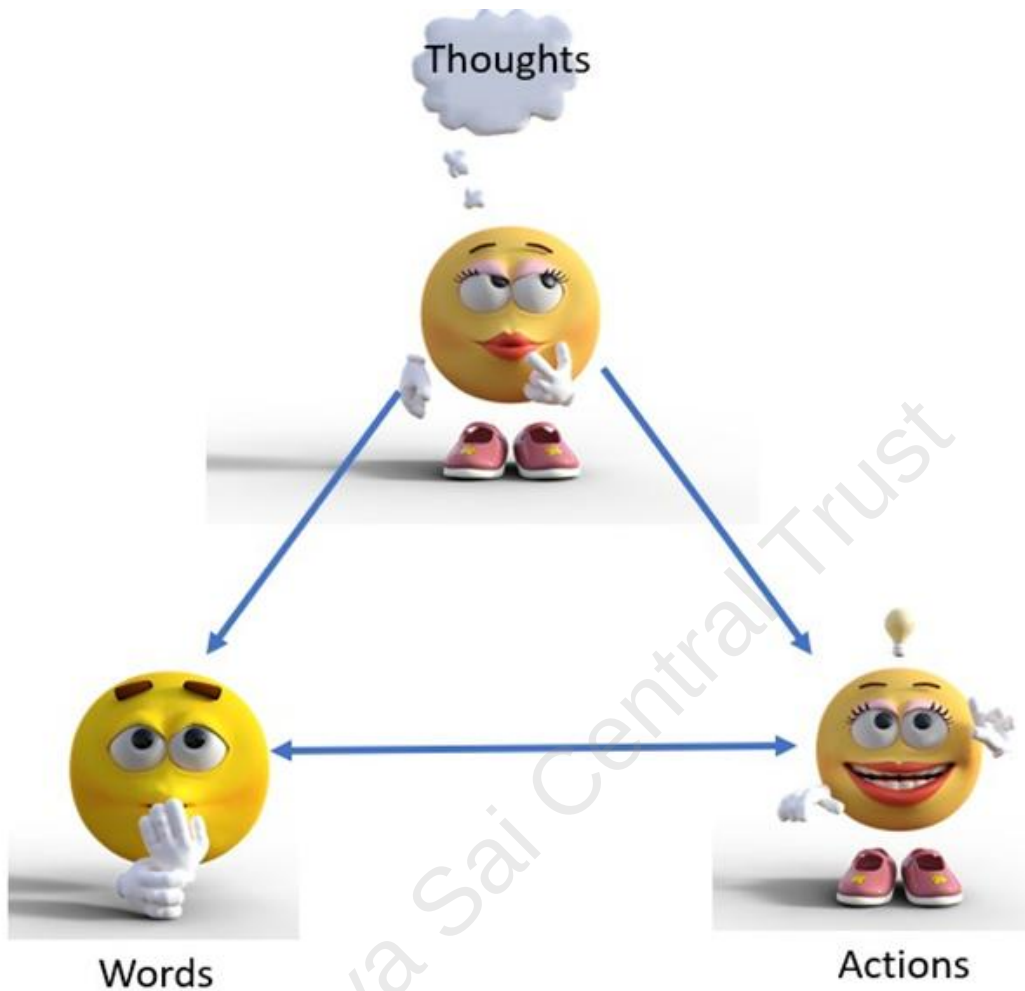
Time to teach	Asset type	Theme	Sub Theme
20 minutes	Questions to Assess	Statistics	Frequency distribution table Graphical representation of cumulative frequency distribution Histogram Percentage bar diagram Presentation of data Representation of data (pictograph, bar graph & double bar graph)

VC_Actions speak Louder

Objective: The students will be able to appreciate the importance of unity in thought, word and deed.

Concept- Value Connection: A picture is said to be more effective than a thousand words.

Graphical presentation aids understanding of the information being conveyed. Let us extrapolate this further; actions speak louder than words, don't they? A graphical representation aids complete and correct understanding, while exemplary action promotes inculcation and internalisation. If everyone backs up her/his words with actions, and the words with thoughts, we can expect easy compliance and genuine following.



Expression: pixabay.com/illustrations/emoticon-smiley-emoji-expression-4853487/ - Attribution: sergeitokmakov
Joy: pixabay.com/illustrations/smiley-emoticon-emoji-yellow-joy-4836204/ - Attribution: sergeitokmakov
Idea: pixabay.com/illustrations/emoticon-idea-smiley-emoji-4853484/ - Attribution: sergeitokmakov

Introduction: The teacher may please narrate the two situations described below, one at a time, and invite students to consider the discussions questions.

Situation 1:

Rahul was walking back home after school. One issue weighed on him heavily. His town remained the same, congested, dirty and disorganised. Come election time, the candidates make speeches promising to turn the town into a model town, if elected. Once the dust of the election settles down, the promises are forgotten.

Discussion question:

Who should be blamed for the situation, the gullible people of the town or the dishonest



Sri Sathya Sai
VIDYA VAHINI
श्री सत्यसाई विद्या वाहिनी

Sri Sathya Sai Central Trust

Annexure to Master Lesson Plan

What is the purpose of this Master lesson Plan?	This Master Lesson Plan (MLP) prepared by Sri Sathya Sai Vidya Vahini (SSSVV), covers the entire chapter for the given board. The MLP for the chapter given in the textbook is broken down into smaller modules known as assets. Any chapter can be taught using the 7 asset types in SSSVV methodology. Several different assets together complete the entire chapter. Depending on the requirement, each asset is supported by teaching aids such as animated presentation, audio, video, and learning aids such as worksheets. The MLP is for the teacher's preparation and the teaching aids are for use in the classroom.
How to use it?	You can prepare for your class with this MLP by following 3 simple steps: 1. Read your textbook; 2. Go through the information given in the assets (document & multimedia); 3. Prepare your teaching notes. Great! Now you are ready to transact the chapter.
Duration	Kindly note the duration given for each asset. Due care has been taken in planning the assets, to ensure the chapter is completed within the time specified by the Board. Note: Preparation time is not included in the asset duration. The teaching time depends on the duration of the teaching aids and is not impacted by the length of the MLP.
What is a 'Main Script' (MS) Asset?	The Main Script asset is there for explaining the main concepts of the chapter clearly. The information given in the textbook is simplified, organised and structured to give more clarity. Additionally, you may find a video or mnemonics or a graphic organiser to deepen the understanding of the concept.
How to teach using the MS asset?	Please use the blackboard, slides and interaction to develop the concept.
What is an 'Inquisitive Questions' (IQ) asset?	The Inquisitive Questions asset uses questions to promote higher order thinking like the n th why, what-if, new perspectives, cause-effect, and others, creating curiosity.
How to teach using the IQ asset?	You may use the questions to connect with the students, encourage exploration to engage them in the learning process. You may allow multiple responses and instead of rejecting any of the responses, ask why, before revealing the suggested answer or hints.
What is a 'Day to day Relevance' (DD) Asset?	The Day to Day Relevance asset helps students understand the practical relevance of every topic, making them eager participants in the classroom. If students connect the concepts to their environment, they would learn meaningfully without dislike or simply memorizing for exams.
How to teach using the DD	You may use the asset by asking questions about their experience and use it to establish why they are learning the topic. If necessary you may substitute with a

asset?	recent or local example.
What is an 'Interesting Aside' (IA) asset?	The Interesting Aside asset uses attention grabbing titbits or anecdotes to bring joy and satisfy the child's hunger to know more. This is a quick/short asset intended to bring attention back to the main concept being taught.
How to teach using the IA asset?	You may use this asset to give a piece of interesting information relevant to the topic, without prolonged explanation/discussion. You may suggest appropriate books for further reading.
What is a 'Suggested Activity' (SA) Asset?	The Suggested Activity asset provides a detailed step by step procedure for the teacher to conduct a hands-on activity. This promotes Activity Based Learning.
How to teach using the SA asset?	You may use this asset to energise your students to learn by doing simple, fun-filled activities based on the topic. The asset includes - preparation, activity, and follow-up. You may engage the students in the preparation and follow-up stages to develop collaboration and responsibility. You could try it once, yourself, before the actual delivery to be more comfortable with it. Note: The duration mentioned in the asset is usually for the activity part only.
What is a 'Value Content' (VC) Asset?	The Value Content asset integrates Universal Human Values (such as empathy, inclusivity, respect for nature that translates into responsible behaviour) seamlessly into the curriculum, as the "End of education is character".
How to teach using the VC asset?	You may use this asset to engage with the students to bring out their innate values and connect with the intrinsic values in the topic/concept. The asset includes pointers on the specific pedagogical technique followed.
What is a 'Questions to Assess' (QA) asset?	The Questions to Assess asset uses an interactive approach to check learning of different types of learners, and provides feedback to the teacher for appropriate action. The questions cater to all the levels of Bloom's Taxonomy. Questions from 'Apply' level and above enable students to reflect on their learning.
How to teach using the QA asset?	You may go through the slides to understand its flow and know when to click for the answer (slides include suggested answers). While presenting in the class, you may display the question and encourage multiple responses, before revealing the answer. In some cases, this asset may include extra questions/worksheet that can be given as homework.