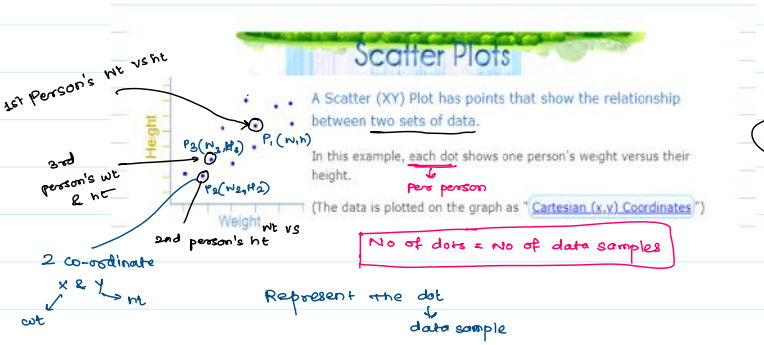
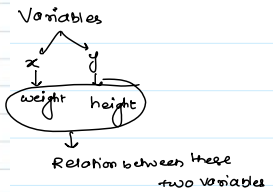
Types of graphs

09 September 2023 12:21

## 1. Scatter plot :-




Represent the dot → data sample

Example :-

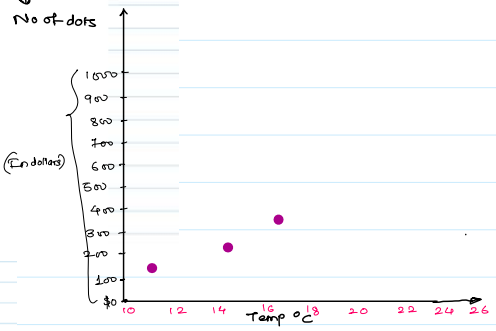
The local ice cream shop keeps track of how much ice cream they sell versus the noon temperature on that day. Here are their figures for the last 12 days:

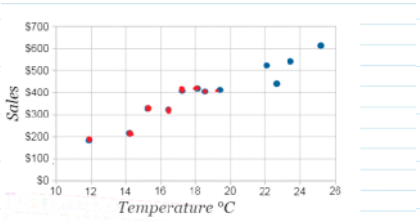
No of samples → 12 samples

No of dots

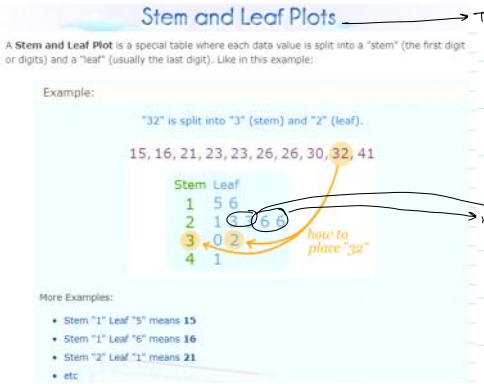
| Ice Cream Sales vs Temperature | |
|---|---|
| Temperature °C | Ice Cream Sales |
| 14.2° | $215 |
| 16.4° | $325 |
| 11.9° | $185 |
| 15.2° | $332 |
| 18.5° | $406 |
| 22.1° | $522 |
| 19.4° | $412 |
| 25.1° | $614 |
| 23.4° | $544 |
| 18.1° | $421 |
| 22.6° | $445 |
| 17.2° | $408 |

12 samples




## (2) Stem & Leaf plot




Tabular form of data

32 → 1st digit → stem; 2nd digit → leaf

In leaf section, entries can be repeated

Q Create stem & leaf plot for foll. data

01, 06, 1, 20, 25, 25, 36, 4, 5, 6, 7, 8, 92, 95, 99

| Stem | leaf |
|---|---|
| 0 | 1 6 |
| 1 | |
| 2 | 0 5 5 |
| 3 | 6 |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | 2 5 9 |


| Stem | Leaf |
|---|---|
| 2 | 3 5 5 7 8 |
| 3 | 2 6 6 |
| 4 | 5 |
| 5 | 0 |

# BOX and Whisker Plot

A box and whisker plot is defined as a graphical method of displaying variation in a set of data. In most cases, a histogram analysis provides a sufficient display, but a box and whisker plot can provide additional detail while allowing multiple sets of data to be displayed in the same graph.

## WHY USE A BOX AND WHISKER PLOT?

Box and whisker plots are very effective and easy to read, as they can summarize data from multiple sources and display the results in a single graph. Box and whisker plots allow for comparison of data from different categories for easier, more effective decision-making.

## WHEN TO USE A BOX AND WHISKER PLOT

Use box and whisker plots when you have multiple data sets from independent sources that are related to each other in some way. Examples include:

- Test scores between schools or classrooms
- Data from before and after a process change
- Similar features on one part, such as camshaft lobes
- Data from duplicate machines manufacturing the same products

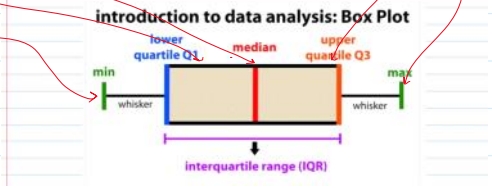
## HOW TO MAKE A BOX AND WHISKER PLOT

The procedure to develop a box and whisker plot comes from the five statistics below. You can also download the box and whisker plot template.

1. **Minimum value:** The smallest value in the data set
2. **Second quartile:** The value below which the lower 25% of the data are contained
3. **Median value:** The middle number in a range of numbers
4. **Third quartile:** The value above which the upper 25% of the data are contained
5. **Maximum value:** The largest value in the data set

(lower quartile) (upper quartile)

3 Box & Whisker Plot (Box Plot)




Q construct a box plot for foll. data

1, 1, 2, 2, 4, 6, 6, 8, 7·2, 8, 8·5, 9, 10, 10, 11·5

Soln :-

n = 15

Minimum = 1

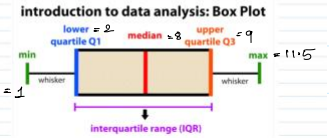
Maximum = 11·5

median = 8

Lower quartile = 2

Higher quartile = 9.

3 Box & Whisker Plot (Box Plot)




### Example: Finding the five-number summary → (Box whisker plot)

A sample of 10 boxes of raisins has these weights (in grams):

25, 28, 29, 29, 30, 34, 35, 35, 37, 38

Solution:- **Step 1:** Order the data from smallest to largest.

Our data is already in order.

25, 28, 29, 29, 30, 34, 35, 35, 37, 38

**Step 2:** Find the median.

The median is the mean of the middle two numbers:

25, 28, 29, 29, 30, 34, 35, 35, 37, 38

mean → Average

$$= \frac{30+34}{2} = 32$$

The median is 32.

**Step 3:** Find the quartiles.

The first quartile is the median of the data points to the *left* of the median.

25, 28, 29, 29, 30 (median)

25, 28, 29, 29, 30, 34, 35, 35, 37, 38

lower No | median = 32 | Higher No

$Q_1 = 29$

The third quartile is the median of the data points to the *right* of the median.

34, 35, 35, 37, 38 (median)

$Q_2 = 35$

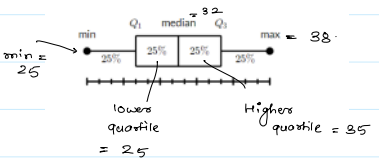
**Step 4:** Complete the five-number summary by finding the min and the max.

The min is the smallest data point, which is 25.

The max is the largest data point, which is 38.

The five-number summary is 25, 29, 32, 35, 38.

Box & whiskers plot :-




# Dot Plot

A dot plot, also known as a strip plot or dot chart, is a simple form of data visualization that consists of data points plotted as dots on a graph with an x- and y-axis. These types of charts are used to graphically depict certain data trends or groupings. The most famous dot plot is perhaps the Federal Reserve's projections for interest rates that are published each quarter.[1] A dot plot is similar to a histogram in that it displays the number of data points that fall into each category or value on the axis, thus showing the distribution of a set of data.

Example: Minutes To Eat Breakfast

A survey of "How long does it take you to eat breakfast?" has these results:

| Minutes: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| People: | 6 | 2 | 3 | 5 | 2 | 5 | 0 | 0 | 2 | 3 | 7 | 4 | 1 |

Which means that 6 people take 0 minutes to eat breakfast (they probably had no breakfast!), 2 people say they only spend 1 minute having breakfast, etc.

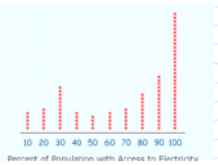
And here is the dot plot:


Q Draw a dot plot for the given data

| Access to Electricity (% of population, nearest 10%) | Number of Countries |
|---|---|
| 10 | 5 |
| 20 | 6 |
| 30 | 12 |
| 40 | 5 |
| 50 | 4 |
| 60 | 5 |
| 70 | 6 |
| 80 | 10 |
| 90 | 15 |
| 100 | 34 |

plot in the form of dots

Sol:




## (5) Histogram:

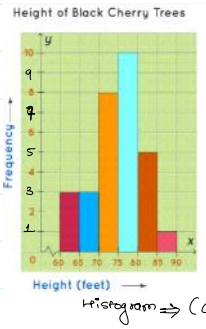
A **histogram** is the graphical representation of data where data is grouped into continuous number ranges and each range corresponds to a vertical bar.

- The horizontal axis displays the number range.
- The vertical axis (frequency) represents the amount of data that is present in each range.

The number ranges depend upon the data that is being used.

Uncle Bruno owns a garden with 30 black cherry trees. Each tree is of a different height. The height of the trees (in inches): 61, 63, 64, 66, 68, 69, 71, 71.5, 72, 72.5, 73, 73.5, 74, 74.5, 76, 76.2, 76.5, 77, 77.5, 78, 78.5, 79, 79.2, 80, 81, 82, 83, 84, 85, 87. We can group the data as follows in a frequency distribution table by setting a range:

| Height Range (ft) | Number of Trees (Frequency) |
|---|---|
| 60 - 65 | 3 |
| 66 - 70 | 3 |
| 71 - 75 | 8 |
| 76 - 80 | 10 |
| 81 - 85 | 5 |
| 86 - 90 | 1 |

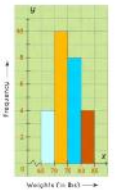



Histogram ⇒ (Grouping of data)

**Example:** Construct a histogram for the following frequency distribution table that describes the frequencies of weights of 25 students in a class.

| Weights (in lbs) | Frequency (Number of students) |
|---|---|
| 65 - 70 | 4 |
| 70 - 75 | 10 |
| 75 - 80 | 8 |
| 80 - 85 | 4 |

Sol:



## Histograms vs Bar Graphs

Bar Graphs are good when your data is in **categories** (such as "Comedy", "Drama", etc).

But when you have continuous data (such as a person's height) then use a Histogram.

It is best to leave gaps between the bars of a Bar Graph, so it doesn't look like a Histogram.


① Any variable is present on x axis Not necessary a no

② discrete values

① only Numbers are present on x axis

② Continuous Data (grouping of data)

# Pie chart

## Pie Chart

**Pie Chart**: a special chart that uses "pie slices" to show relative sizes of data.

Imagine you survey your friends to find the kind of movie they like best:

*Table: Favorite Type of Movie*

| Comedy | Action | Romance | Drama | SciFi |
|---|---|---|---|---|
| 4 | 5 | 6 | 1 | 4 |

You can show the data by this Pie Chart:

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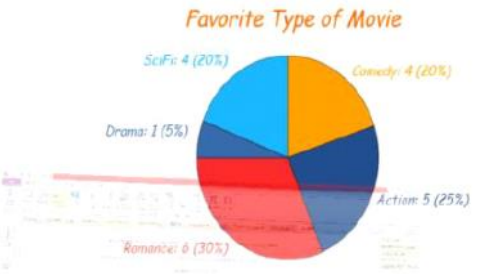



Given table No of movies

*Table: Favorite Type of Movie*

| Comedy | Action | Romance | Drama | SciFi | TOTAL |
|---|---|---|---|---|---|
| 4 | 5 | 6 | 1 | 4 | 20 |

← Type of movie

Next, divide each value by the total and multiply by 100 to get a percent:

| Comedy | Action | Romance | Drama | SciFi | TOTAL |
|---|---|---|---|---|---|
| 4 | 5 | 6 | 1 | 4 | 20 |
| 4/20 = 20% | 5/20 = 25% | 6/20 = 30% | 1/20 = 5% | 4/20 = 20% | 100% |

Now to figure out how many degrees for each "pie slice" (correctly called a sector):

A Full Circle has 360 degrees, so we do this calculation:

Pie slice ⇒ Type of movie

| Comedy | Action | Romance | Drama | SciFi | TOTAL |
|---|---|---|---|---|---|
| 4 | 5 | 6 | 1 | 4 | 20 |
| 20% | 25% | 30% | 5% | 20% | 100% |
| 4/20 x 360° = 72° | 5/20 x 360° = 90° | 6/20 x 360° = 108° | 1/20 x 360° = 18° | 4/20 x 360° = 72° | 360° |

Value of degree

Q. Draw pie-chart for given data.

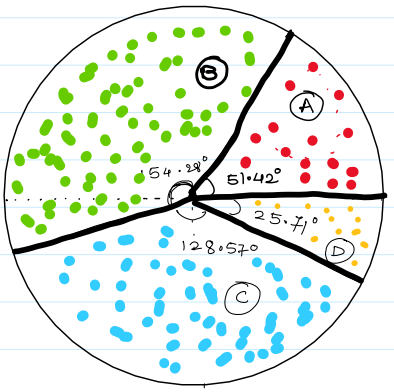
Example: Student Grades

Here is how many students got each grade in the recent test:

| A | B | C | D |
|---|---|---|---|
| 4 | 12 | 10 | 2 |

| Grade | No of students | percentage | Angle |
|---|---|---|---|
| A | 4 | $\frac{4}{28} \times 100 = 14.28\%$ | $\frac{4}{28} \times 360^\circ = 51.42^\circ$ |
| B | 12 | $\frac{12}{28} \times 100 = 42.85\%$ | $\frac{12}{28} \times 360^\circ = 154.28^\circ$ |
| C | 10 | $\frac{10}{28} \times 100 = 35.71\%$ | $\frac{10}{28} \times 360^\circ = 128.57^\circ$ |
| D | 2 | $\frac{2}{28} \times 100 = 7.14\%$ | $\frac{2}{28} \times 360^\circ = 25.71^\circ$ |

Total = 28




# Line Graphs/ Line Chart

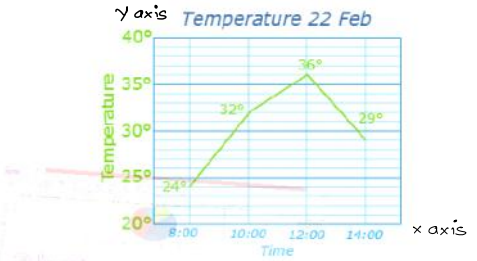
**Line Graph**: a graph that shows information connected in some way (usually as changes over time).

You record the temperature outside your house and get these results:

**Table: Temperature 22 Feb**

| Time → | 8:00 | 10:00 | 12:00 | 14:00 |
|---|---|---|---|---|
| Temperature → | 24° | 32° | 36° | 29° |

You are interested to see how it rises and falls, so decide to make a line graph:

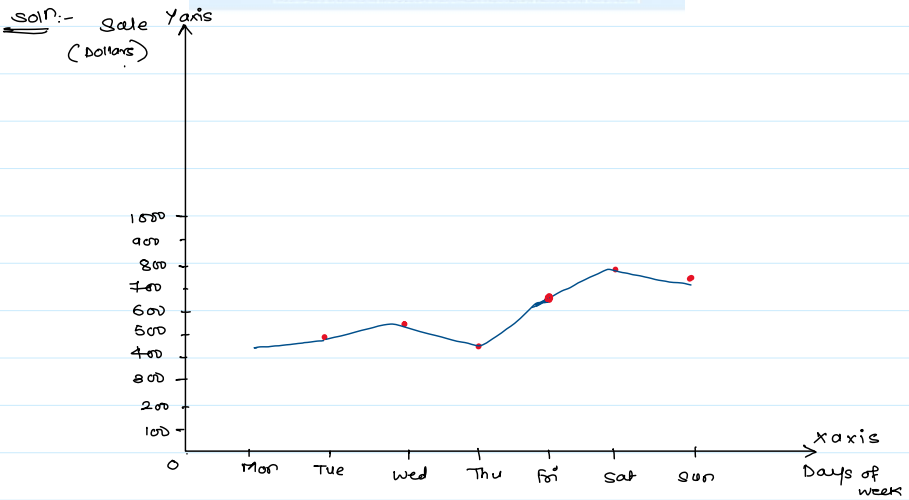



**Draw the line chart of the given data**

Example: Ice Cream Sales

**Table: Ice Cream Sales**

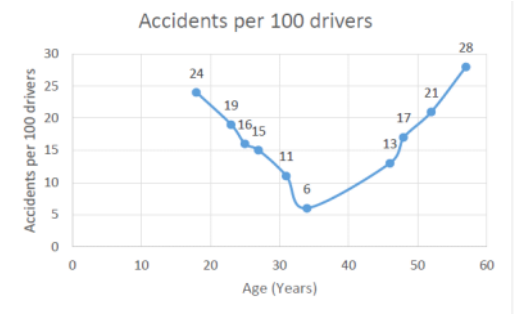
| Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|
| $410 | $440 | $550 | $420 | $610 | $790 | $770 |




# Scatter Plot

1. Create a Scatter Plot for the following data

| Age (Years) | Accidents per 100 drivers |
|---|---|
| 18 | 24 |
| 23 | 19 |
| 25 | 16 |
| 27 | 15 |
| 31 | 11 |
| 34 | 6 |
| 46 | 13 |
| 48 | 17 |
| 52 | 21 |
| 57 | 28 |




| Weight (kg) | Cost (Rs.) |
|---|---|
| 10 | 2000 |
| 14 | 2563 |
| 25 | 3216 |
| 35 | 3362 |
| 37 | 3872 |
| 46 | 4278 |
| 58 | 4863 |
| 59 | 4489 |
| 69 | 5289 |
| 80 | 6782 |

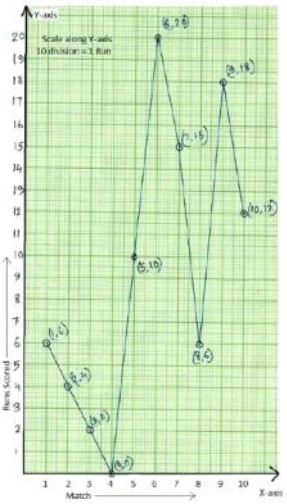

# Time Graph/ Time series Graph

1. Draw a line graph

The following are the runs scored by a team in the first 5 overs:

| Match | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Runs Scored | 6 | 4 | 2 | 0 | 10 | 20 | 15 | 6 | 18 | 12 |

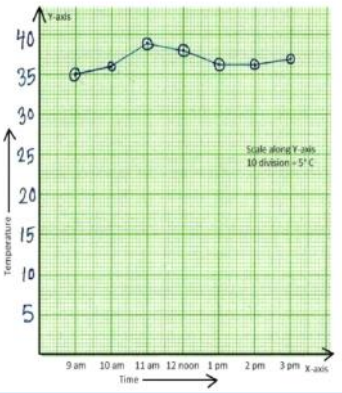
**Sol:**




2. The following tables give the information about a patient's body temperature recorded in the hospital every hour.

| Time | 9 am | 10 am | 11 am | 12 noon | 1 pm | 2 pm | 3 pm |
|---|---|---|---|---|---|---|---|
| Temperature | 35° C | 36° C | 39° C | 38°C | 36.5° C | 36.5° C | 37° C |

**Sol:**

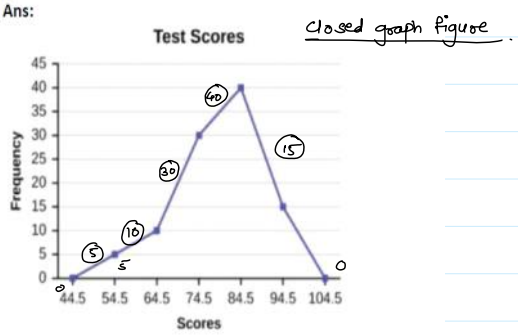



# Frequency Polygon

Construct a frequency polygon using the data given below

| Test Scores | Frequency |
|---|---|
| 49.5-59.5 | 5 |
| 59.5-69.5 | 10 |
| 69.5-79.5 | 30 |
| 79.5-89.5 | 40 |
| 89.5-99.5 | 15 |

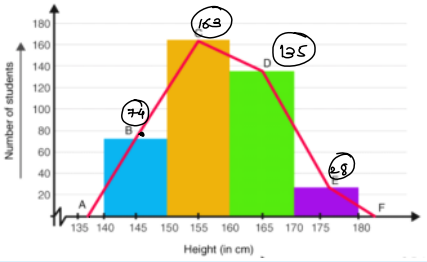
Ans:




closed graph figure

2. In a batch of 400 students, the height of students is given in the following table. Represent it through a frequency polygon.

| Height (in cm) | Number of Students(Frequency) |
|---|---|
| 140 – 150 | 74 |
| 150 – 160 | 163 |
| 160 – 170 | 135 |
| 170 – 180 | 28 |
| Total | 400 |




# Exponential graph

1. Find the equation which fits the data

| X | Y |
|---|---|
| 2 | 28 |
| 3 | 62 |
| 4 | 110 |
| 5 | 161 |

$y = ax^b$

$\log_{10} y = \log_{10} a + b * \log_{10} x$

The Normal equations are

$\Sigma y = nA + B\Sigma X$

$\Sigma xy = A\Sigma X + B\Sigma X^2$

Sol:

| x | y | log10x | log10y | xsquare | xy |
|---|---|---|---|---|---|
| 2 | 28 | 0.30103 | 1.447158 | 0.090619 | 0.435638 |
| 3 | 62 | 0.477121 | 1.792392 | 0.227645 | 0.855188 |
| 4 | 110 | 0.60206 | 2.041393 | 0.362476 | 1.229041 |
| 5 | 161 | 0.69897 | 2.206826 | 0.488559 | 1.542505 |
| | Total | 2.079181 | 7.487768 | 1.169299 | 4.062372 |

$A = 0.8320$, $B = 2.0005$

$\log_{10} a = 0.8716$ (0.8320)

$b = 1.9244$ (1.9244)

$a = 10^{0.8716} = 7.4404$

$y = ax^b = 7.4404\, x^{1.9244}$