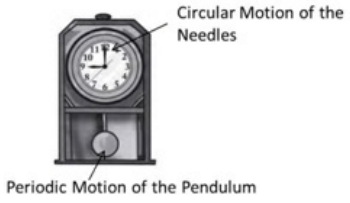
Class 7 Physics Motion and Time Motion

Motion

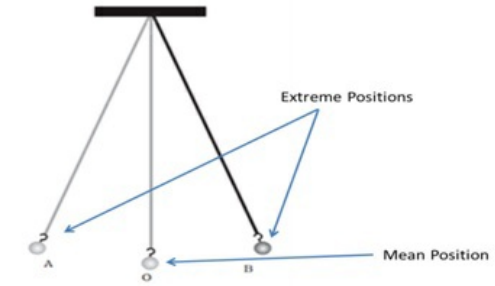
Motion is a ***change in position*** of an object ***with respect to time***.If the position of a body is not changing with respect to time, the body is said to be at rest, motionless, immobile or stationary.Any moving body is said to be in motion.Some types of motions are show below:



Motion is based on **Frame of Reference**.When a person standing outside the bus is considered as a reference, the bus is in motion. When a person sitting inside the bus is considered as a reference, the bus appears to be stationary.

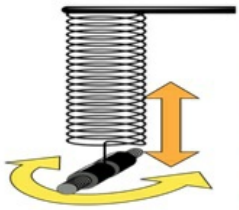
Oscillatory Motion:

- An oscillatory motion is a motion where a body moves between two**extreme positions**.
- The center of these extreme positions is called**mean position**.
- Time taken to complete one oscillation is called**Time Period**.
- When an oscillatory motion repeats itself in equal intervals of time it is called**Periodic Motion**.
- All periodic motions could not be oscillatory, but all oscillatory motions are periodic in nature.



To and Fro Motion of a Pendulum bob

Examples of oscillatory motion pendulum, swings, object attached to a spring, etc.


Object suspended through spring results in up-down motion of spring


Back and forth motion of a park swing

Examples of periodic motion pendulum, revolution of earth on its axis, rotation of earth around sun etc.

Uniform and Non-Uniform Motion:An object having uniform motion travels**equal distances in equal intervals of time**and An object having non-uniform motion travels **unequal distances in equal intervals of time**

Class 7 Physics Motion and Time — Speed

Speed

Speed is the rate of change of position of an object with time.The**average speed** of an object in an interval of time is the distance travelled by the object divided by the duration of the intervalHence,

$$Speed = \frac{\text{Total Distance Covered}}{\text{Total Time Taken}}$$

Unit of Distance is meter or Kilometer and that of time is second or hour. Common units of speed are therefore metre/second o**m/s** or Kilometer/Hour or **km/h.**Units are always written in singular, that is, km/h and not kms/hrs.

If a car takes 30 Mins to travel a Distance of 20 KM, Speed will be:
Speed = Distance / Time
Speed = 20 KM / 30 Min or 20 KM / (30/60) Hr
Speed = 40 KM/Hr

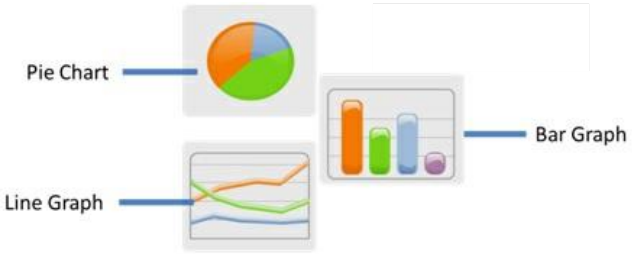
Fast and Slow Motion/Speed:Speed can be fast or slow depending upon the distance covered by them in a given interval of time. Since a***motorbike*** covers more distance in a given interval of time than a ***bicycle***, the bicycle is said to be in***slower motion*** and motorbike in ***faster motion***.

Class 7 Physics Motion and Time

Graphs

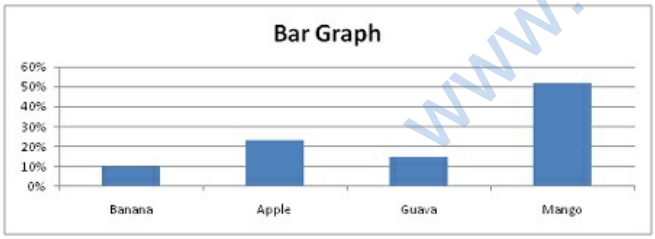
Graphs

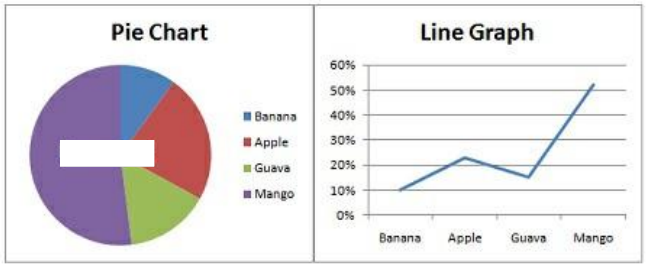
- A graph is a **picture** or **diagram** that shows relation between two or more variable quantities.
- A simple graph usually shows the connection between two numbers or measurements in the form of a grid.
- A graph or a chart can be of different types based on number of quantities and representation method.



Example of Different types of Graphs. Suppose we have the data for fruits liked by percentage of students (out of 100) as below:

Fruit Name	Percentage of Students who like the fruit
Banana	10%
Apple	23%
Guava	15%
Mango	52%



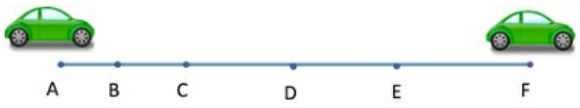


Class 7 Physics Motion and Time — Distance-Time Graph

Distance-Time Graph

This is usually drawn as a line graph as it taken two variable quantities – Distance and Time. In a Distance-Time graph, Distance is considered on the Y-axis (Vertical) and Time is considered on the X-axis (Horizontal).

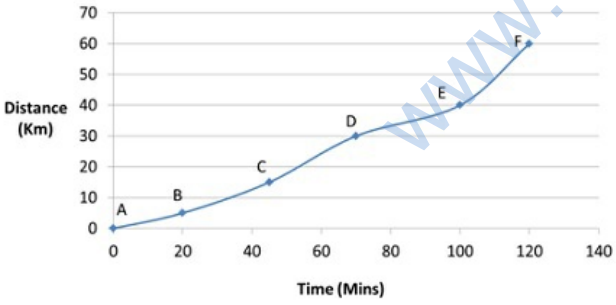
Below is an example of how to prepare a Distance-Time graph based on data



Car moving from point A to Point F through B,C,D and E

Points	Distance (Km)	Time (Mins)	Speed (Km/Hr)
A	0	0	0
B	5	20	15
C	15	45	20
D	30	70	25.7
E	40	100	24
F	60	120	30

Table showing the distance travelled by car to reach every point and the corresponding time taken. Speed shown is the average speed at that particular point.

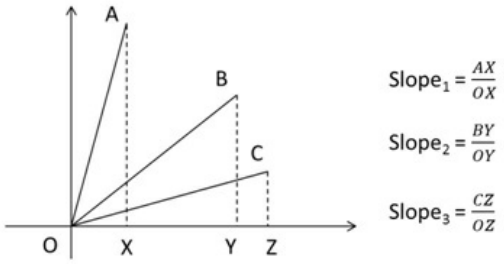


Distance-Time or D-T Graph

Some of the points to be kept in mind while choosing the most suitable scale for drawing a graph are:

- Determine the maximum quantity to be taken on each axis.
- Divide this maximum quantity in smaller equal parts, so that it is easy to mark the points. The number of equal parts to be taken depends upon the data available. For eg, in the above diagram, distance quantity is 10 whereas time quantity is 20.
- Try to draw the graph so that it covers maximum paper space which will make it look clean.

Slopecalculation using D-T Graph:Slope of a Distance-Time graph (From point A to F) is also the speed at every instant. Higher the slope greater is the speed of that object. Below is a diagram to calculate slope.



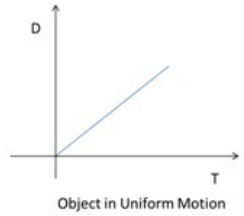
$\text{Slope}_1 = \frac{AX}{OX}$

$\text{Slope}_2 = \frac{BY}{OY}$

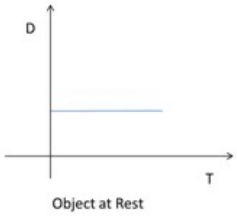
$\text{Slope}_3 = \frac{CZ}{OZ}$

Slope/Speed of 3 objects A, B and C
Since, $\text{Slope}_1 > \text{Slope}_2 > \text{Slope}_3$,
So, $\text{Speed}_1 > \text{Speed}_2 > \text{Speed}_3$

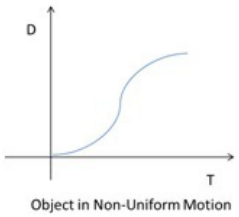
Types of Motions using D-T Graph



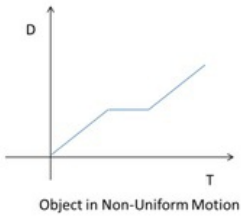
Object in Uniform Motion



Object at Rest



Object in Non-Uniform Motion



Object in Non-Uniform Motion

Class 7 Physics Motion and Time

Measurement Devices in Vehicles

Measurement Devices in Vehicles and other instruments

Speedometer: Measures and displays instantaneous speed of the vehicle.

Odometer: Measures and displays distance travelled by the vehicle.

Tachometer: Measures and displays the revolutions per minute or the rotation speed of a shaft or disk.

Tachometer

Speedometer