Chapter – 10

Motion and Measurement of Distances

Story of Transport

☆ **Story of Transport:**

Walking/Running

First mode of transport used by humans to cover small distances

Animals

Humans started the use of animals to cover long distances and carry heavy weights

Wheel

Around 3000 years ago , the invention of wheel changed the way of transport.

Cart

Animals were used to pull vehicles that moved on wheels such as chariot, bullock cart.

Water

Also, people started to use the simple logs of wood in which the hollow cavity could be made to travel through the water bodies. In the 15th century the ships were made to travel from one continent to other.

Engine

Invention of steam engine in the beginning of 19th century introduced the new mode of transport. Thereafter the trains were powered by electricity and diesel fuel.

Air

Early 20 th century started travel by air. Invented airplanes. And also started visiting space with spacecrafts.
Now we are seeing the advancements in the drones.

Tip: To cover a larger distance in the least time we choose the fastest mode of transport.

Example: Manish is planning to travel from Delhi to Bangalore. Which mode of transport should he choose from aeroplane, train, rocket and car to reach his destination in the least possible time?

Solution: Although, a rocket is the fastest among all transport modes which are given, but it is used for space travelling and not for ordinary travelling on earth.

After the rocket, the fastest mode of transport is the aeroplane as compared to trains and cars. So, the aeroplane is the correct choice.

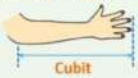
Measurement of Distance/Length

☆ **Measurement of Distance/Length:**

Unit: Measuring an unknown physical quantity to compare it with a known quantity having fixed value and of same kind. This known fixed quantity is called a unit.

Some units which are used but they are not standard unit:

- **Cubit:** A cubit is the length of the arm from the elbow to the tip of the middle finger.



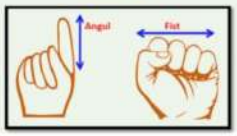
- **Handspan:** The length measured by a human hand, from the tip of the thumb to the tip of the little finger is called handspan.

- **Yard:** The yard is the distance between the end of the outstretched arm and the chin of a human being.

- **Foot Span:** The length of the foot (foot span) is the distance between the tip of the toe to the hill of the foot.

- **Angul (finger) and Mutthi (fist):**

  This unit are used in ancient time for small measurements.



Standard Units of Measurement: Metre(m), Centimetre(cm), Millimetre(mm), Kilometre(km) are some standard units of measurement.

Metre is the SI unit of measurement.

Conversion of Units:

- 1 km = 1000 m
- 1 m = 100 cm
- 1 cm = 10 mm

Example: Richa told her friend that the distance between her house and the playground is 1.5 km. Can you help her find the distance of her house and playground in centimetres?

Solution: Richa told her friend that the distance between her house and the playground is 1.5 km

We know,

1 km = 1000 m

Therefore, 1.5 km = 1.5 × 1000 m = 1500 m

Now, we know 1 m = 100 cm

Therefore, 1500 m × 100 = 150000 cm

So, the distance between her house and playground in meters is 150000 cm.

Example: Which unit is appropriate to measure the distance between two cities? Kilometre or metre.

Solution: Kilometre is the correct choice to measure the distance between two cities because kilometre is the bigger unit as compared to metre and the distance between two cities is also large.

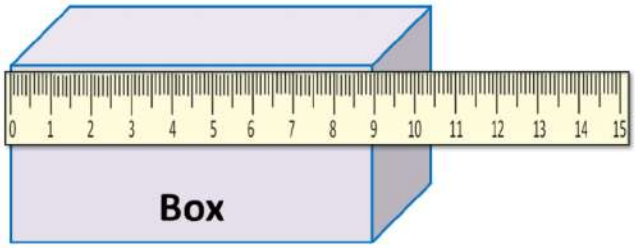
Correct Measurement of Length

Correct Measurement of Length:

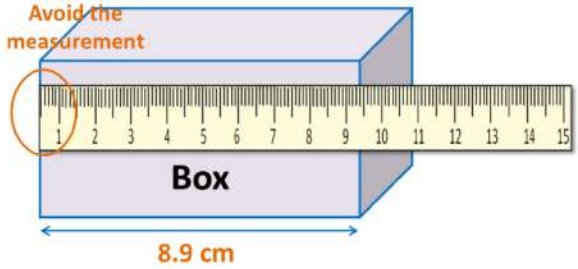
In taking a measurement of a length, we need to take care of the following:

1) Place the ruler in contact with the box along its length in a straight line.

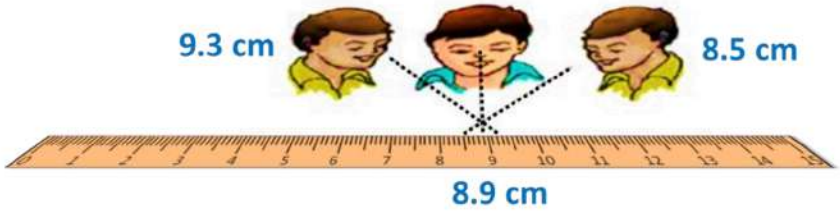
2) Place the ruler in such a way that the zero mark on the ruler is placed on one of the ends of the object.



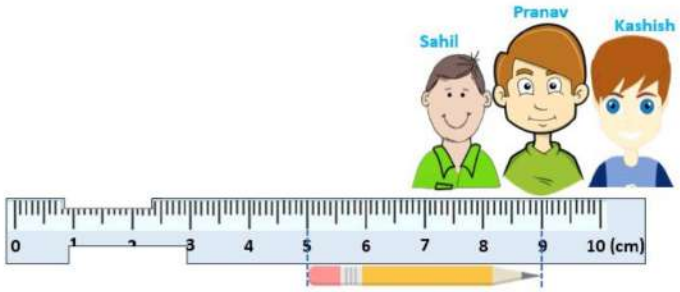
3) If zero mark is not seen properly avoid the measurement from the zero mark of the ruler. Use any other full mark of the scale for measurement.



4) While reading the measurement, our eye must be exactly in front of the point where the measurement is to be taken.



Example: Three students Pranav, Sahil and Kashish are measuring the length of a pencil with the broken scale as shown in the figure. During measurement, who should take the reading among three so that the reading is accurate? Also, find the length of the pencil?



Therefore, the student who can take the reading precisely is Pranav.

Now, for the length of a pencil

The length of the pencil = Reading on a scale for one end of the pencil - Reading on a scale for the other end of the pencil.

The length of pencil = 9 cm - 5 cm

The length of pencil = 4 cm

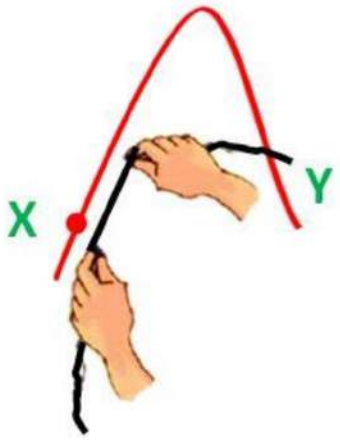
Measuring the Length of a Curved Line

Measuring the Length of a Curved Line: Curved line cannot be measured using the scale, we use thread to measure the length of a curved line.

Procedure:

1) Suppose XY be the curved line to measure the length of this curved line we use thread.

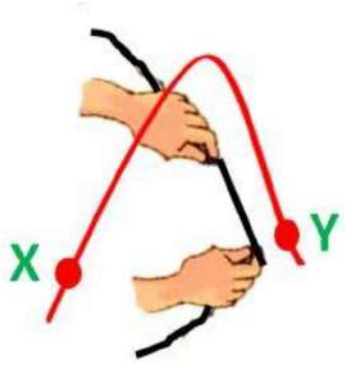
2) Put a knot on the thread near one of its ends. Place this knot on point X.



3) Place a small portion of the thread along the line, keeping it tight using your fingers and thumb.

4) Hold the thread at this endpoint with one hand. Using the other hand, stretch a little more portion of the thread along the curved line.

5) Go on repeating this process till the other end Y of the curved line is reached. Make a mark on the thread where it touches the end Y.



6) Now stretch the thread along a meter scale. Measure the length between the knot at the beginning and the final mark on the thread. This gives the length of the curved line XY.

Moving Things Around Us

Motion: A body or an object is said to be in motion when a body or an object changes its position with respect to time.

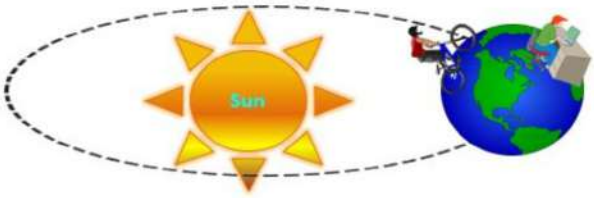
Rest: A body or an object said to be in motion when a body or an object changes its position with respect to time.

Tip: Remember that the state of motion of a body is always relative.

Example: A person or object on earth at rest or in motion is always in motion with respect to the sun. Justify this statement?

Solution: we know that the earth is continuously revolving around the sun which means the earth is always in the state of motion with respect to the sun, therefore everything on the surface of the earth is also in motion with respect to the sun.

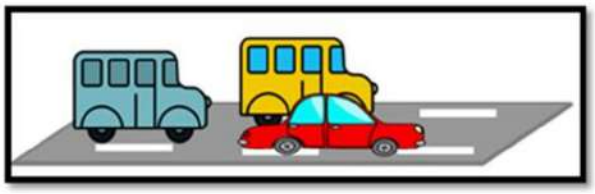
Like in this figure, the person who is travelling on a bicycle (that is, in motion) and the person who is working on a computer (that is, at rest) both are in motion with respect to the sun.



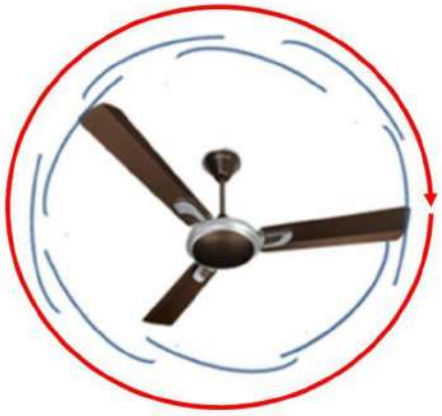
Types of Motion

Types of Motion:

1) Rectilinear Motion: Motion in a straight line is called rectilinear motion.



2) Circular Motion: In a circular motion, an object moves such that its distance from a fixed point remains the same.

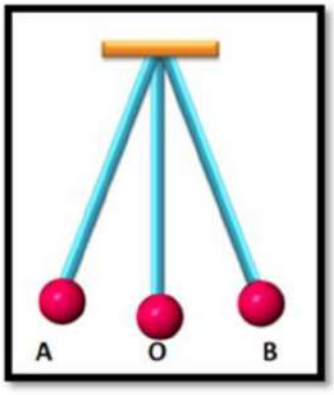


Motion of blades of a fan

3) Rotational Motion: When an object moves around its axis such a motion is called rotational motion.

4) Periodic Motion: Motion that repeats itself after a period of time is called periodic motion.

For example: Motion of pendulum.



Example: A girl is skating along a straight road. Identify the type of motion of the girl and the wheels of his skates.

Solution: Circular motion: In a circular motion, an object moves such that its distance from a fixed point remains the same.

The motion of the wheels of skates is in circular motion.

Rectilinear motion: Motion in a straight line is called rectilinear motion.

In the below figure, the girl skated along a straight road hence it is a straight-line motion.

Therefore, the wheels of the skates are in circular as well as in rectilinear motion.