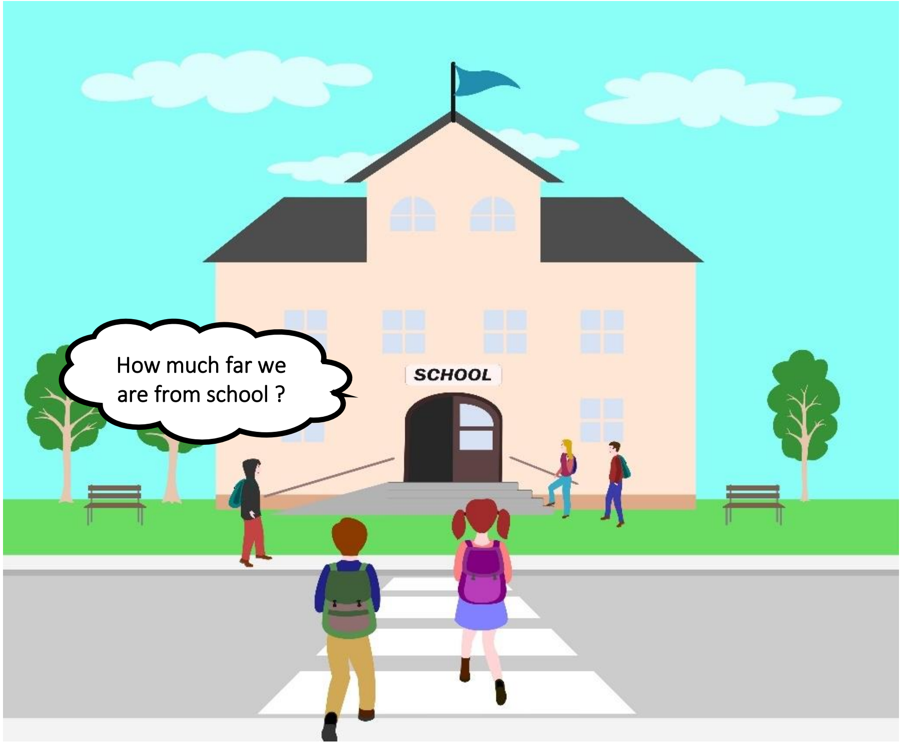
1 Measurement and Motion



"Physics is based on making measurements that tell you about size of any quantity like distance or time."

1. Introduction

Physics is about the world around you and how everything in it works. As you go about your daily life, you're doing physics all the time. But the thought of actually learning physics may sometimes feel like falling into a well, Don't worry, we will teach you how to think like a physicist. We are surrounded by principles of physics in our everyday lives. In fact, most people know much more about physics than they realise.

The word "physics" is derived from the Greek word "physika", which means natural things."

SPOT LIGHT

For example, when you buy a carton of ice cream from the store and put it in the refrigerator at home, you do so because from past experience you know enough about the laws of physics that the ice cream will melt if you leave it outside the refrigerator. Any problem that deals with temperature, size, motion, position, shape, or colour involves physics.

Publishing\PNCF\2024-25\LIVE Module\SET-1\NCERT\6th\Physics\1_Measurement and Motion

2. Measurement

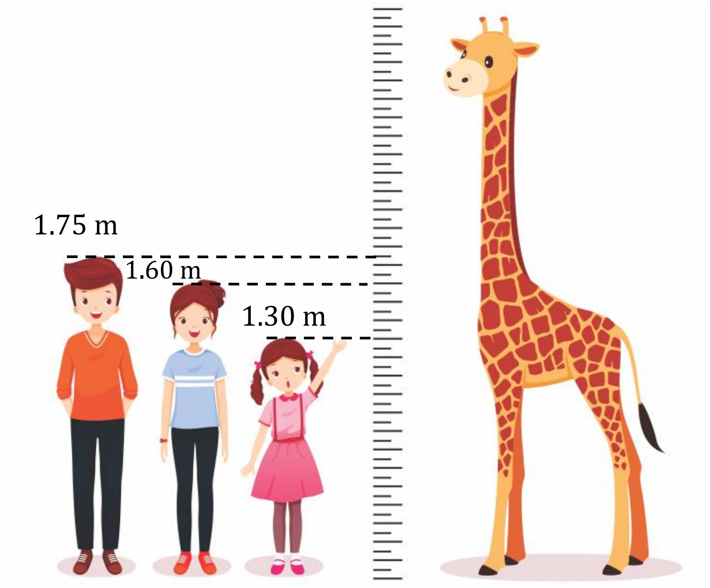
In physics, many things are described with measurements. For example, 2 metres is a measurement of length. Measurements such as length, mass, speed, temperature, etc. are important in physics because they are the 'terms' that allow us to communicate information so that everyone can understand exactly what we mean. This chapter is about length, one of the most important measurable quantity in physics. For example, you could not communicate how far away something is without having a way to measure length.

A measurement is a precise value that tells "how much". The important concept in measurement is that it communicates the amount in a way that can be understood by others.

A measurement consists of two parts :

(1) A number (2) A unit

For example, 1.75 metres, 1.60 metres and 1.30 metres are measurements because here it includes a number '1.75' and a unit 'metres' (see figure). The unit 'metre' is a standard length that is known to you. So when you measure length, you compare the unknown length with this known length. 3 metres means the length you have measured is 3 times as much as the known unit.



Measurements always include a number and a unit.

☞ A measurement is the comparison of the unknown quantity with some standard quantity of the same kind.

Units

All measurements need units. Without a unit, a measurement cannot be understood. For example, if you tell someone to walk 10, she or he would not know how much to walk as, 10 feet, 10 meters, 10 miles, 10 kilometers are all 10, but the units are different and therefore the distances are also different. Units allow people to communicate amounts. For communication to be successful, physics uses a set of units that have been agreed upon around the world.

Physical quantity in physics is that which can be quantified and measured. Example - mass, length, time etc.

SPOT LIGHT

History shows that many societies used dry grains as a unit of measurement. In due course of time, grains could absorb moisture, swell up and increase in size and affect the measurement.

Do You Remember ?

★ A unit is the smallest quantity in terms of which other quantities can be measured.

Building Concepts 1

What do we measure in physics?

Explanation

We measure physical quantities in physics. Physical quantities are building blocks of physics in terms of which the laws of physics are expressed. These quantities are measurable and represented by a number, followed by a unit.

Building Concepts 2

Why are measurements so important?

Explanation

Suppose a carpenter makes a door without taking proper measurement and tries to fit it in the door frame. You know that, the door may not get closed. Similarly, if an engineer constructs buildings and bridges without taking proper measurements, these buildings may get collapsed. If you went to grain merchant and purchased grains without being weighed, you are not sure whether you have paid more or less for the quantity received.

Thus, measurement allows us to work systematically and accurately. It also helps us make comparisons, understand one another and work together easily.

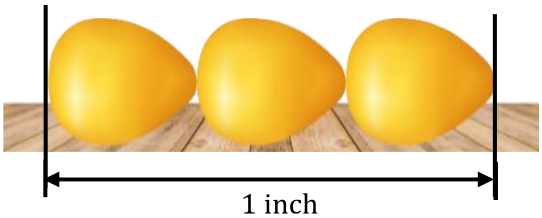
☞ A quantitative prediction can be tested against reality, and an explanation or theory can be accepted or rejected based on the results of measurements. The rapid growth and success of physics began when the idea of making precise measurements as a test was accepted.

3. Need for standard units of measurement

(1) We know that, a measurement consists of two parts, a number (also called magnitude), and a unit. Without a unit, a measurement has no meaning. For example, if you say your height is 4, it could mean 4 inches, 4 feet, 4 yards or 4 miles, etc. Thus, we require a standard unit to make a sense to the measurement. In other words, units are necessary to sensibly describe a physical quantity.

(2) It is also important that the unit must be accurate and it must not change with respect to a person or time. For example, history shows that many societies used dry grains as a unit of measurement, In due course of time, grains could absorb moisture, swell up and increase in size and affect the measurement.

(3) It is also important to have units that are understood by all. For example, the barleycorns (see figure) of the English would not be understood by an Indian, and the 'angul' of the Indian would not be understood by the Englishman.



At one time, three barley corns were used to define one inch.

- Thus, we need some standard units that must be accurately defined, does not change with time or person and must be internationally accepted.
- For the sake of uniformity, scientists all over the world have accepted set of standard units of measurement. The system of units now used is known as the **International System of Units (SI units).**

4. Measurement of length

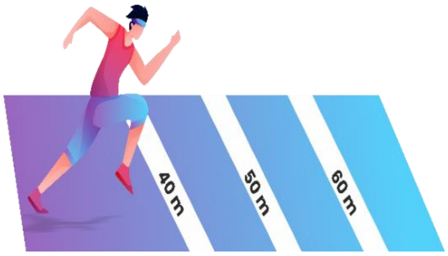
Length is a fundamental quantity and it is commonly used to measure the distance between two points.

Systems of measuring length

There are two common systems of standardised units that are used for measuring length, the English system and the metric system. The English system uses inches (in.), feet (ft), yards (yd), and miles (mi) for length. The metric system uses millimetres (mm), centimetres (cm), metres (m), and kilometres (km). You probably have contact with both systems of units every day.

For example, driving distances are sometimes expressed in miles (see figure), but races in track and field are usually expressed in metres (see figure).

Some distances are measured using British units such as miles.



Some distances are measured using metric units such as metres.

For example, a doctor will measure your height and weight in English units. The same doctor will prescribe medicine in millilitres (mL) and grams (g), which are metric units. Some of the bolts on a car have English dimensions, such as 1/2 inch. Others have metric dimensions, such as 13 millimetres.

Metric length

The SI unit of length is the **metre (m)**. We use the centimetre (cm) to measure short distances, such as the length of the book. The millimetre (mm) is used to measure very small lengths, such as the thickness of a coin. Long distances are measured in kilometres (km).

Commonly used units/conversion factors for length

Metric system

1 metre = 100 centimetre	or	1 m = 100 cm
1 metre = 1000 millimetre	or	1 m = 1000 mm
1 kilometre = 1000 metre	or	1 km = 1000 m
1 centimetre = 10 millimetre	or	1 cm = 10 mm

Metric Prefixes			
10^{-2}	Centi (c)	10^{3}	Kilo (k)
10^{-3}	Milli (m)	10^{6}	Mega (M)

A rod made of the metals platinum and iridium, is kept at the Bureau of weights and measures, at Paris. The distance between the two end marks on this rod at 0°C represents one metre. A copy of this standard metre is kept in Delhi at the National physical laboratory.

Metre rod in Paris

Do You Remember ?

★ While using a scale in your geometry box you use different units for measurement. i.e. mm, cm, inch, etc.

Publishing\PNCF\2024-25\LIVE Module\SET-1\NCERT\6th\Physics\1_Measurement and Motion

Numerical Ability 1

1. Change 25 cm to metres.

Solution

We have to convert cm to m, choose the conversion factor with cm in the denominator so that the cm units cancel each other.

$$25\ \cancel{cm} \times \frac{1\text{ m}}{100\ \cancel{cm}} = \frac{25}{100}$$

$$= \mathbf{0.25\ m}$$

Decode the problem

Here we have to convert unit from m to cm

Apply the formula

1 m = 100 cm

☞ Suppose we have to write the metric abbreviation for 36 centimetres. The symbol for the prefix centi is ‘c’. The symbol for the unit metre is ‘m’. Thus, 36 cm is the SI abbreviation for 36 centimetres. Conversely, if we have to write the SI metric unit for the abbreviation 45 km, the prefix for ‘k’ is kilo and the unit for ‘m’ is metre. Thus, 45 kilometres is the metric unit for 45 km.

2. The height of a person is 1.72 m. Express it into cm and mm.

Solution

As we know 1 m = 100 cm,

1.72 m = 1.72 × 100 cm

= **172 cm**

1 m = 100 × 10

= 1000 mm,

1.72 m = 1.72 × 1000 mm

= **1720 mm**

Decode the problem

Here we have to convert units from m to cm and m to mm so we should remember the conversions

Apply the formula

1 m = 100 cm

1 cm = 10 mm

3. The distance between Rahul’s home and his school is 4125 m. Express this distance in km.

Solution

We have to convert m to km, choose the conversion factor with m in the denominator so that the m units cancel each other.

$$4125\ \cancel{m} \times \frac{1\text{ km}}{1000\ \cancel{m}} = \frac{4125}{1000} = \mathbf{4.125\ km}$$

Decode the problem

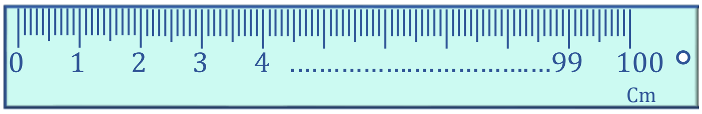
Here we have to convert unit from km to m

Apply the formula

1 km = 1000 m

A metre stick (metre ruler/metre scale)

A metre stick is a good tool to use for measuring ordinary lengths in the laboratory. It is based on metric system. A metre stick is 1 metre long and is divided into millimetres and centimetres (see figure).



Metre stick

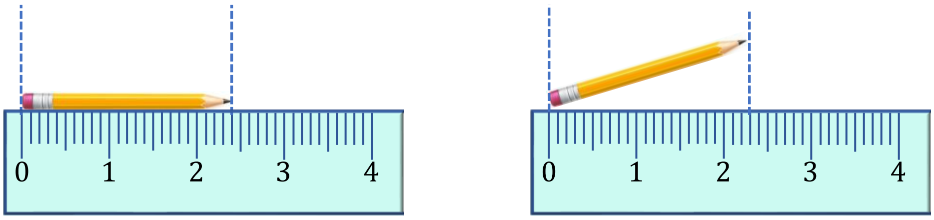
5. Correct procedure to measure length

In our daily life we use various types of measuring devices. We use a metre scale for measuring length. A tailor uses a 'measuring tape', whereas a cloth merchant uses a metre rod. For measuring the length of an object, you must choose a suitable device. You cannot measure the circumference or girth of a tree, the size of your waist using a metre scale. Measuring tape is more suitable for this.

For small measurements, such as the length of your pencil, or making a 8 cm line in your copy, you can use a '15 cm scale' from your geometry box.

Care to be taken while measuring a length

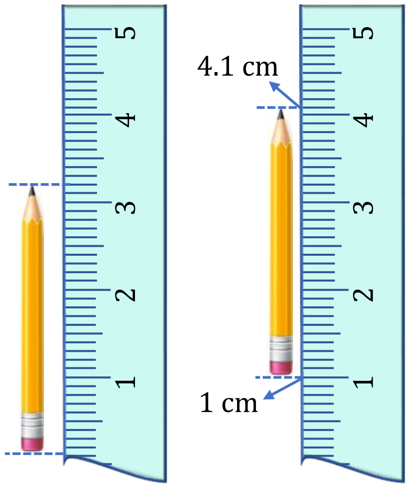
(1) Place the scale in contact with the object along its length (see figure)



(a) Correct (b) Incorrect

Placing the scale along the length to be measured.

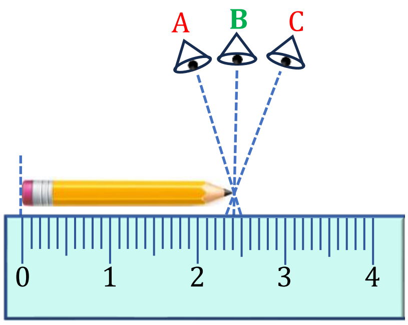
(2) In some scales, the ends may be broken. You may not be able to see the zero mark clearly [see figure (a)]. In such cases, you should avoid taking measurements from the zero mark of the scale. You can use any other full mark of the scale, say, 1.0 cm [see figure (b)]. Then you must subtract the reading of this mark from the reading at the other end. For example, the reading at one end is 1.0 cm and at the other end it is 4.1 cm. Therefore, the length of the object is (4.1 – 1) cm = 3.1 cm.



(a) Incorrect (b) Correct

Correct method of placing the scale with broken edge.

(3) Correct position of the eye is also important for taking measurement. Your eye must be exactly in front of the point where the measurement is to be taken (see figure). Position 'B' is the correct position of the eye. Note that from position 'B', the reading is 2.4 cm. From positions 'A' and 'C', the readings may be different.



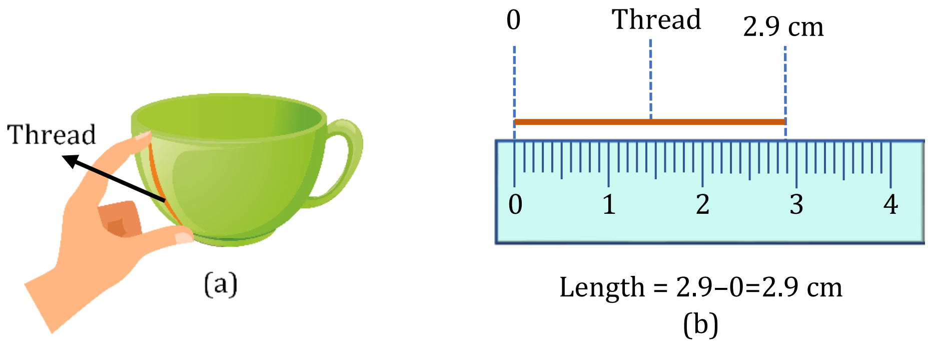
Correct position of the eye for taking reading of the scale. Here, position B is the correct position.

Measuring length of a curved line or surface

You can measure the length of a curved line or surface using a measuring tape. You have observed this while you visit a tailor's shop to stitch your clothes. The tailor measures the periphery or circumference of your neck or waist using the measuring tape. But you can use a string or thread and a ruler to measure the length of a curved line or surface indirectly.

Active Physics 1

Choose two points on a curved surface like that of a cup. Put a thread along the surface between these points such that it is in contact with the curve tightly [see figure (a)]. Use a sketch pen to make marks on the thread that coincide with the end points of the curve. Straighten the thread, and place it on a ruler [see figure (b)]. Note down the length of the thread between the marks. This gives the length of the curved portion of the cup.



Active physics 1

Be Alert !

★ The thread should be straight while measuring it on scale else it will not give perfect measurement.

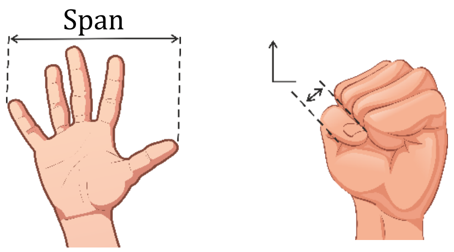
Use of our body parts for measurement of length

In ancient days, long before measuring instruments were invented, people actually used different parts of their body to measure length. But since these measurements are dependent on the size of the person, they may vary from person to person. For example, the length of the cubit depends on the arm length of the measurer. Thus, cubits had different lengths.

Some hand units which were used in many places around the world are:

(1) **Span (or hand span) :** Stretch out your hand so that the tip of your thumb is as far away as possible from the tip of your little finger. That distance is called a "span", which for most people is almost exactly half a cubit (see figure).

(2) **Thumb :** The width of a thumb, which was later used as the basis for the inch (see figure).



Body unit : Span   Body unit : Thumb

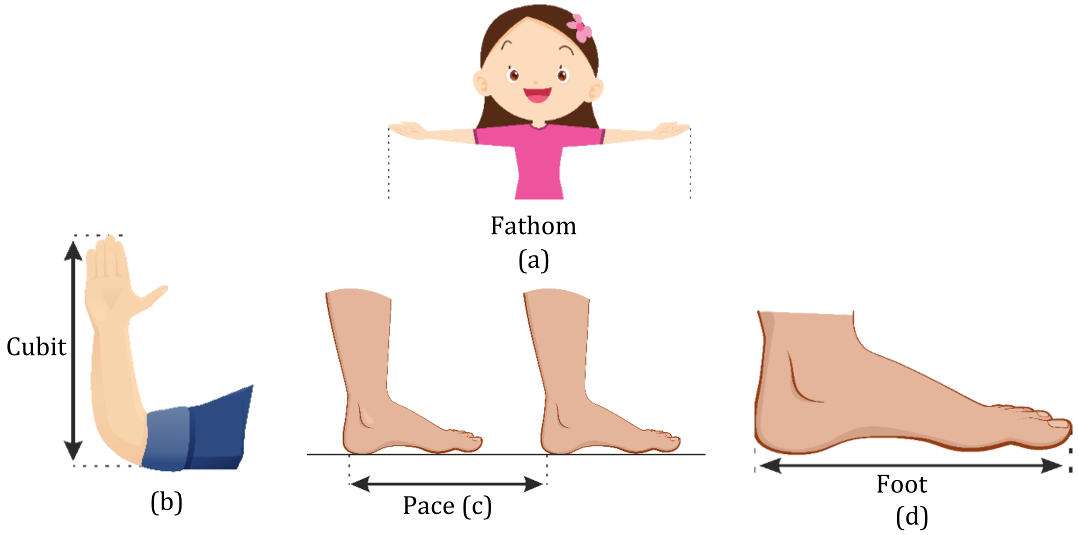
(3) **Fathom :** If you stretch out your arms to either side of your body as far as they'll go, the distance between the tips of your middle fingers is fathom [see figure(a)].

(4) **Cubit :** The cubit is the distance from a person's elbow to the tip of the extended middle finger [see figure (b)].

(5) **Pace :** It is the measure of a full stride from the position of the heel when it is raised from the ground to the point the same heel is set down again at the end of the step [see figure(c)].

Publishing\PNCF\2024-25\LIVE Module\SET-1\NCERT\6th\Physics\1_Measurement and Motion

(6) **Foot :** It is the length of a man's foot [see figure (d)].



Different body units which were used earlier to measure length

Limitations of our senses and body parts

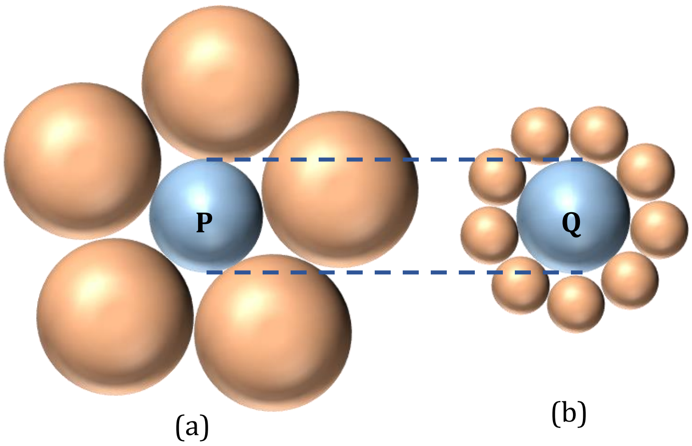
Though we use our senses and body parts for various measurements, we cannot trust them to measure exactly and accurately. Look at figure Which circle is larger P or Q? Well, both are of the same size. Larger circles around the central one make it appear smaller. Small circles around the central circle make the other appear larger. The use of senses or body parts for measurement does not provide,

(1) accuracy of measurement

(2) reliability of measurement

(3) uniformity of measurement

The limitations of the use of our senses and body parts have made us to develop some devices and instruments for accurate measurements.



Limitations of our senses and body parts in measurement

☞ Everyone's body parts could be of slightly different sizes. This must have caused confusion in measurement. In 1790, the French created a standard unit of measurement called the metric system.

Check your Concepts 1

1. When we say that the distance between Mumbai and Kolkata is nearly 2000 kilometres, what does it mean?
2. Why are metric units preferred over other units?
3. Ashok, Rakesh and Ketan were asked by their teacher to measure the length of their geometry box. Ashok wrote : 20 ; Rakesh wrote : 20 cm; Ketan wrote : 20 m. Which one of these answers is correct?

6. Understanding motion

Consider a ball that you notice one morning in the middle of a lawn. Later in the afternoon, you notice that the ball is at the edge of the lawn, against a fence, and you wonder if the wind or some person moved the ball. You do not know if the wind blew it, or even if some children kicked it. All you know for sure is that the ball has been moved because it is at a different position after some time has passed. These are the two important aspects of motion,

> Motion can be defined as the act or process of changing position relative to some fixed point during a period of time.
>
> SPOT LIGHT

(1) a change of position, (2) the passage of time.

Moving involves a change of position during some time period.

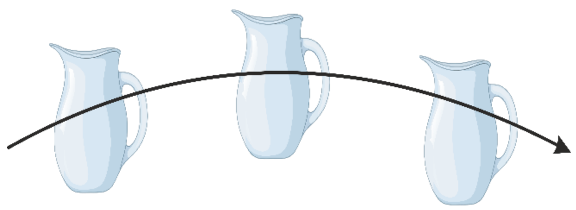
☞ **Motion** is a change in an object's position compared to a fixed point. If you ride in a car, your position changes compared to a tree or an electric pole.

☞ An object is said to be at **rest** if it does not change its position with respect to time.

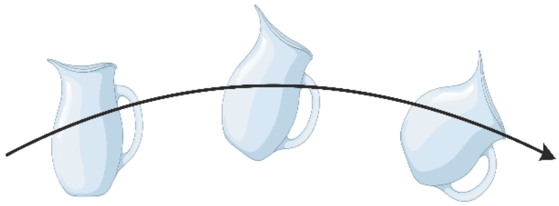
7. Different types of motion

Translational motion (or translatory motion)

Motion of a body in which all the points in the body follow parallel paths is called 'translational motion'. It is a motion in which the orientation of an object remains the same throughout the journey. The path of a translatory motion can be straight or curved. (see figure)



(a) This is a translational motion because the orientation of the object remains the same.



(b) This is not a translational motion because the orientation of the object change during the motion.

In a translational motion the orientation of an object remains same throughout the journey.

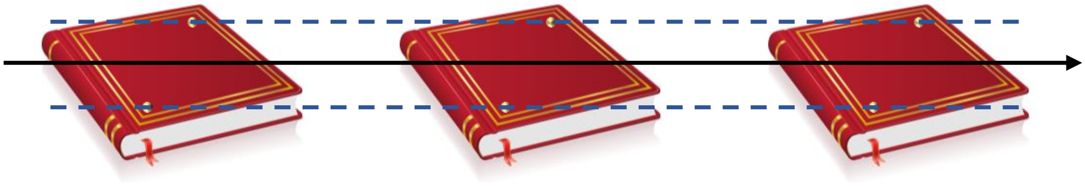
Publishing\PNCF\2024-25\LIVE Module\SET-1\NCERT\6th\Physics\1_Measurement and Motion

Examples of translational motion

(1) A car moving down a highway.
(2) A person walking on the road.
(3) An athlete running on the track.
(4) Motion of piston in the cylinder.
(5) A train running on the rails.

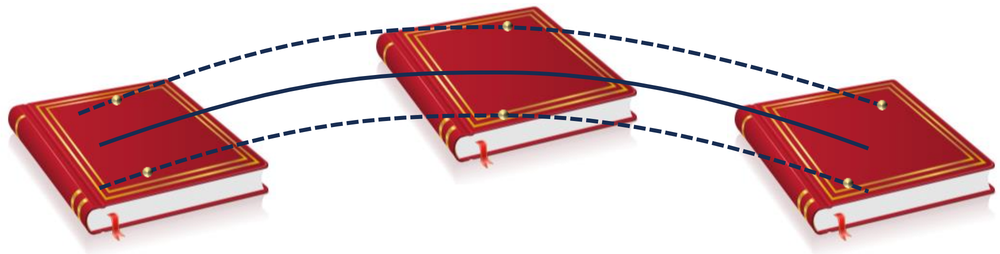
On the basis of the path travelled by an object, the translational motion can classified as :

(1) Rectilinear motion : If an object moves in a straight line, its motion is called rectilinear motion or one dimensional motion. Motion of a car along a straight path, motion of a piston in the cylinder are examples of rectilinear motion. [see figure (a)]



(a) Rectilinear motion

(2) Curvilinear motion : If an object moves along a curved path without change in its orientation, its motion is called curvilinear motion. Motion of a car along a curved or circular path, motion of an athlete on a circular track are examples of curvilinear motion. [see figure (b)]



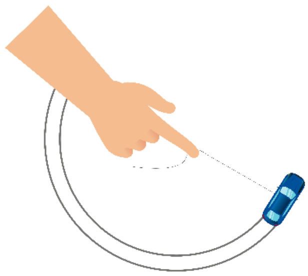
(b) Curvilinear motion

Translational motion: Rectilinear and curvilinear motion

Active Physics 2

1. Take a motorised toy car and tie it to one end of a string. Hold the other end of the string with your finger on a table top as shown in figure.

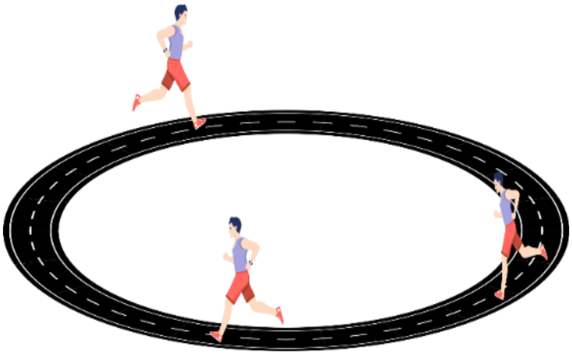
2. Now, 'turn on' the car's motor, so that the car starts moving. You will observe that the car travels in a circle with your finger at the centre. This type of motion is called 'circular motion'.



Active Physics 2

Circular motion

When an object moves along a circular path, this type of curvilinear motion is called 'circular motion'. For example, motion of an athlete along a circular track is a circular motion. [see figure (a)]



(a) An athlete running on a circular path is an example of circular motion not the rotational motion.

(b) A ballet dancer rolling on her toe is an example of rotational motion not the circular motion.

Circular motion and rotational motion are different.

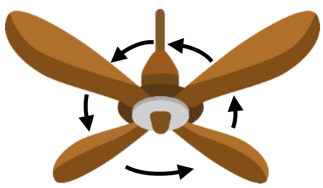
Quick Tips

★ A circular motion around an axis located outside the object is called revolution. Example revolution of the Earth around the sun. Here the Earth undergoes both circular and rotatory motion at a same time.

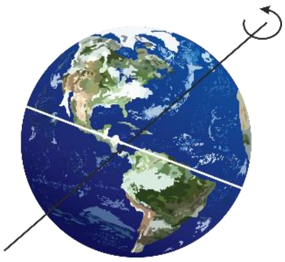
Rotational motion (Rotatory motion)

Motion of a body turning about an axis is called rotational motion. In other words, 'a motion in which an object spins about a fixed axis is called rotational motion'.

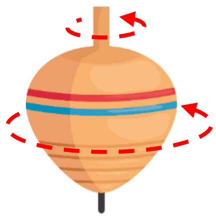
It is a motion in which the orientation of an object continuously changes throughout the motion [see figure (b)]. The path of an object in a rotational motion is always circular. (see figure)



(a) Motion of a ceiling fan



(b) Motion of Earth about its axis



(c) Motion of a spinning top

Examples of Rotational Motion

Examples of rotational motion

(1) The Earth's spin on its axis.

(2) Motion of a fan or motor.

(3) Motion of blades of windmill.

(4) Motion of a spinning top.

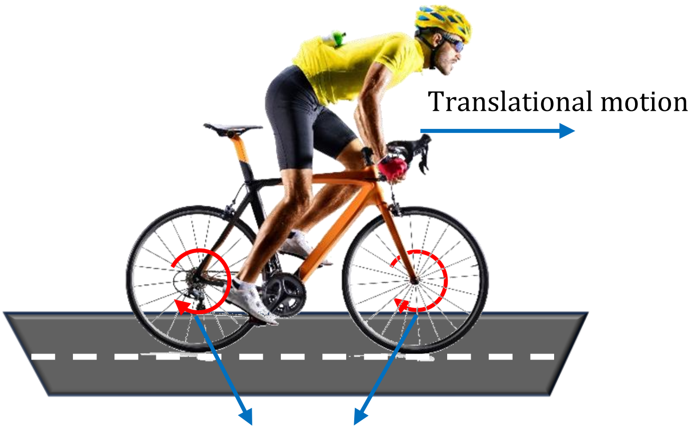
(5) Motion of a grinding stone.

Publishing\PNCF\2024-25\LIVE Module\SET-1\NCERT\6th\Physics\1_Measurement and Motion

Be Alert !

★ Sometime the situation is confusing between rotational and circular motion, check for definitions and also axis.

☞ Motion of a car or cycle wheels is a combination of translational and rotational motion (see figure).



Motion of a cycle wheel is a combination of translational and rotational motion.

Motion of a wheel is also called 'rolling motion'.

☞ The path of an object in a rotational motion is always circular.

Be Alert !

★ The main difference between rotatory motion and circular motion is that, in rotatory the body rotates about a fixed axis which in inside the body while in circular motion the body rotates about a fixed axis which is out side the body.

Periodic motion

A motion that occurs when an object moves in a repeated pattern (a cycle) over equal periods of time is called a periodic motion.

Examples :

(1) Motion of a pendulum

(2) Rotational motion of Earth

(3) Revolution of Earth around the Sun

Oscillatory motion

A motion that occurs when an object moves to and fro about its mean position over equal periods of time is called an oscillatory motion or **vibratory motion**.

Examples :

(1) Motion of a simple pendulum (see figure)

(2) Motion of a vibrating stretched string

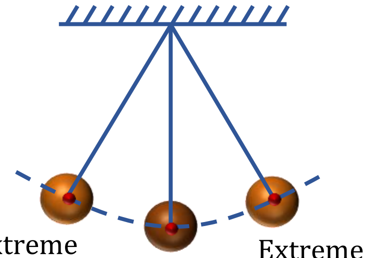
(3) Motion of an oscillating spring

(4) A child swinging on a swing (see figure)

☞ Commonly, the term 'vibratory motion' is used when an object oscillates very fast. For example, motion of an oscillating (vibrating) string is very fast and thus, its motion is usually called vibratory motion.

The vibration (or oscillation) of an object is a cycle or a motion that is repeated over and over with the same time interval each time.

SPOT LIGHT



Motion of simple pendulum

A girl swinging on a swing is an oscillatory motion.

☞ A circular motion or a rotational motion can be a periodic motion. For example, a car moving with a constant speed on a circular track is an example of periodic circular motion. A fan rotating with constant speed is an example of periodic rotational motion.

Be Alert !

★ All oscillatory motions are periodic but not all periodic motions are oscillatory.

Building Concepts 3

Rotation of the Earth about its axis is a periodic motion but it is not an oscillatory motion. Why?

Explanation

A rotational motion and an oscillatory motion both can be periodic but a rotational motion is not an oscillatory motion. In an oscillatory motion, an object moves to and fro about its mean position i.e., it reverses its direction of motion in regular intervals. But, the Earth does not reverses its direction of motion in regular intervals, it always rotates in a fixed direction. Thus, rotation of the Earth is not an oscillatory motion.

Check your Answers 1

1. When we say that the distance between Mumbai and Kolkata is nearly 2000 kilometres, we are comparing this unit with a basic unit in mind, called a kilometre. That is, 2000 kilometres means, a length or distance which is 2000 times as much as the known unit 'kilometre'.
2. The main advantage of the metric system is its use of standard prefixes to represent multiples of 10, making unit conversion within the system quite easy. The fact that a kilometre (km) is 1000 metres and a centimetre (cm) is 1/100 of a metre, and that the prefixes kilo and centi always mean 1000 and 1/100, makes these conversions easy to remember.
3. The first one has no units. Therefore, we do not know what it means. The third is also not correct because length of geometry box cannot be 20 metres. The second one is the only correct answer. A geometry box can be 20 cm long. Thus, the reading taken by Rakesh is correct.

8. Story of transportation

The first form of transport was, of course, the human foot. However people eventually learned to use animals for transport. Donkeys and horses were probably domesticated between 4,000 and 3,000 B.C. (obviously the exact date is not known). Camels were domesticated slightly later between 3,000 and 2,000 B.C.

Meanwhile about 3,500 B.C. the wheel was invented in a place what is now known as Iraq. At first wheels were made of solid pieces of wood lashed together to form a circle but after 2,000 B.C. they were made with spokes. The earliest boats were dug out canoes. People lit a fire on a big log then put it out and dug out the burned wood.

About 3,100 B.C. the Egyptians invented the sailing boat. They had simple square sails made of sheets of papyrus or later of linen. However, the sail could only be used when sailing in one direction. When travelling against the wind the boat had to be rowed.

About 2,700 B.C. the Egyptians began using wooden ships for trade by sea. Early ships were steered by a long oar (a pole with a blade).

People were experienced in using the heat energy produced by combustion of wood or coal. But they did not develop methods to convert this energy into the movement of a wheel. A deciding step in this direction was the steam engine, of which the first rather efficient version was invented by James Watt in 1769. Between 1810 and 1850 steamboat services were successfully established on the Mississippi river.

In parallel, the rail system developed. Diverse engineers developed machines for engine driven individual transport. But it took until the end of the 19th century that convenient cars were developed. Two key dates were the development of the four-cycle Otto engine in 1876 and of the first petrol driven car by Carl Benz in 1886. After 1900 the design became optimised and more cars began to appear on the streets.

Motorised boats and ships were also came in use as means of transport on water. The early years of 1900 saw the development of aeroplanes. These were later improved to carry passengers and goods. Electric trains, monorail, supersonic aeroplanes and spacecraft are some of the 20th century contributions. (see figure)

(a) Animals were used as mode of transport. They are used till today.

(b) A Bicycle

(c) A sail boat

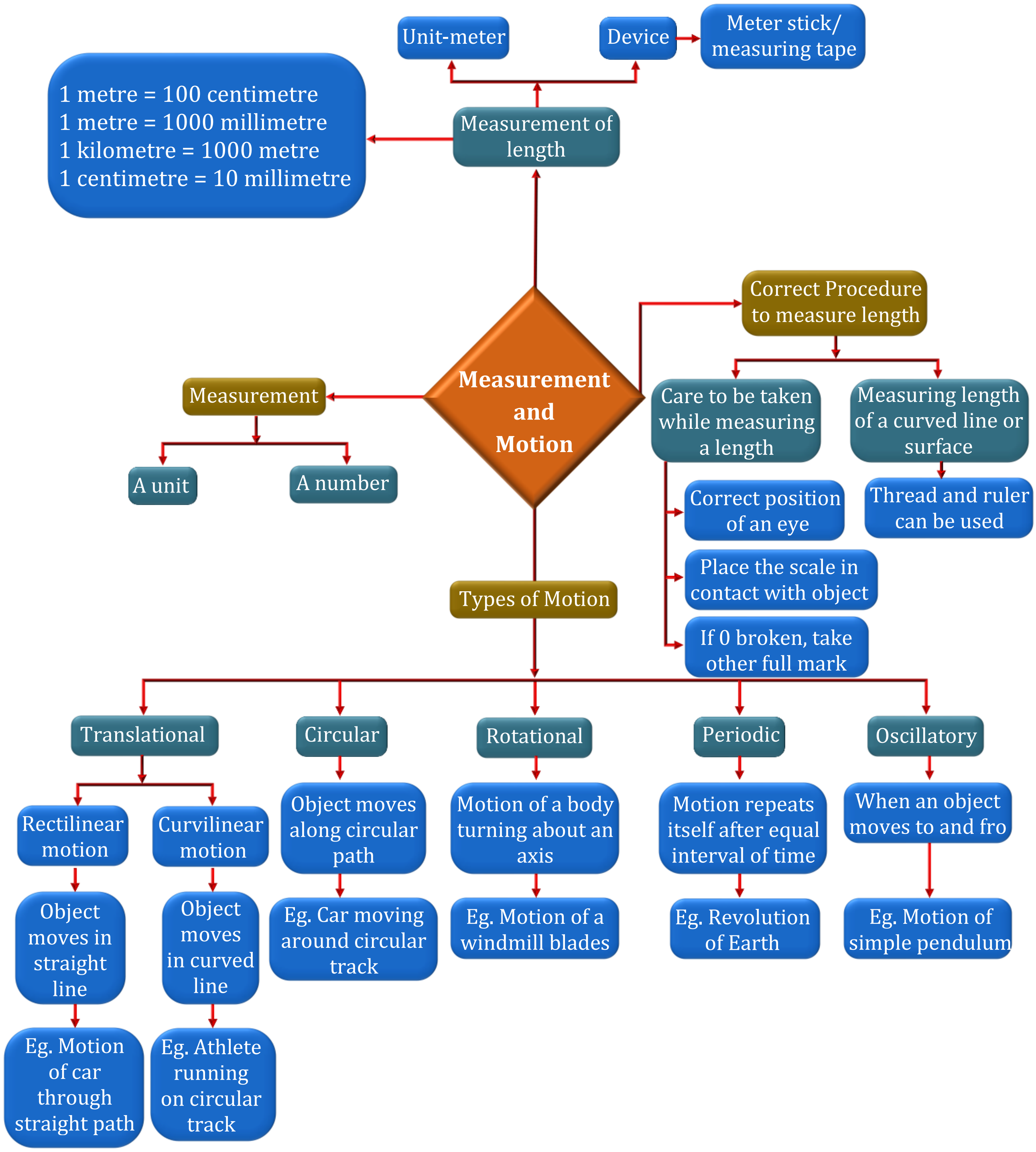
(d) A car

(e) A Bus

(f) An aeroplane

Different modes of transport

Concept Map


Measurement and Motion
Measurement of length
Unit-meter
Device
Meter stick/ measuring tape
1 metre = 100 centimetre
1 metre = 1000 millimetre
1 kilometre = 1000 metre
1 centimetre = 10 millimetre
Measurement
A unit
A number
Correct Procedure to measure length
Care to be taken while measuring a length
Measuring length of a curved line or surface
Correct position of an eye
Place the scale in contact with object
If 0 broken, take other full mark
Thread and ruler can be used
Types of Motion
Translational
Rectilinear motion
Object moves in straight line
Eg. Motion of car through straight path
Curvilinear motion
Object moves in curved line
Eg. Athlete running on circular track
Circular
Object moves along circular path
Eg. Car moving around circular track
Rotational
Motion of a body turning about an axis
Eg. Motion of a windmill blades
Periodic
Motion repeats itself after equal interval of time
Eg. Revolution of Earth
Oscillatory
When an object moves to and fro
Eg. Motion of simple pendulum

Some Basic Terms

1. **Precise** – Clear and accurate.
2. **Collapsed** – To fall down or break into pieces suddenly.
3. **Systematically** – Organized plan.
4. **Accurately** – Exact and without any mistakes.
5. **Barley corns** – A grain of barley (jau).
6. **Fundamental quantities** – Those quantities that cannot be expressed in terms of other quantities.
7. **Prefix** – A letter or group of letters that put at the beginning of a word to change its meaning.
8. **Girth** – The measurement around something.
9. **Periphery** – The outer edge of particular area.
10. **Reliability** – Something that can be trusted or believed.
11. **Orientation** – The direction of an object.
12. **Piston** – A piece of metal that fits tightly inside a cylinder.
13. **Eventually** – Finally.
14. **Domesticated** – (of animals) Brought under human control in order to provide food.
15. **Optimised** – Make the best or most effective use of.
16. **Uniformity** – The quality or fact of being the same.
17. **Supersonic** - speed more than speed of sound.

SOLVED EXAMPLES

1. If the length of a wooden board is 7 m. Express this height in centimetre.

Solution

Length of wooden board = 7 m

1 m = 100 cm

7 m = 7 × 100 cm = 700 cm

Hence, the length of wooden board is 700cm.

2. If the length of your science book is 35 cm. Express this length in metre.

Solution

Length of science book = 35 cm

1 m = 100 cm

$$\Rightarrow \frac{1}{100}\text{ m} = 1\text{ cm} \Rightarrow 1\text{ cm} = \frac{1}{100}\text{ m}$$

$$\Rightarrow 35\text{ cm} = 35 \times \frac{1}{100}\text{ m} = 0.35\text{ m}$$

Hence, the length of science book in metre is 0.35 m.

3. If the length of a cloth is 2 metre. Convert this length in milimetre.

Solution

Length of the cloth = 2 metre

1 m = 1000 mm

2m = 2 × 1000 mm = 2000 mm

Hence, the length of the cloth is 2000 mm.

4. How many metre is in 2000 mm?

Solution

$$1\text{ mm} = \frac{1}{1000}\text{ m}$$

$$2000\text{ mm} = 2000 \times \frac{1}{1000}\text{ m} = 2\text{ m}$$

Hence, the answer is 2 metre.

5. The distance between Kota and Delhi is 518 km. Express this distance in metre.

Solution

Distance between Kota to Delhi=518 km.

1 km = 1000 metre

518 km = 518 × 1000 metre

= 518000 metre

Hence, distance between Kota to Delhi is 518000 metre.

6. If the distance between your school and your home is 4.5 km. Express this in metre.

Solution

Distance between school and home= 4.5 km.

1 km = 1000 metre

4.5 km=4.5×1000 metre = 4500 metre

Hence, distance between school and home is 4500 m.

7. Convert 25 cm into millimetre.

Solution

1 cm = 10 mm

25 cm = 25 × 10 mm = 250 mm.

Hence 25 cm is equal to 250 mm.

8. If the length of a rice grain is 10 mm. What will be its length in cm.

Solution

Length of a rice grain = 10 mm

$$1\text{ mm} = 10 \times \frac{1}{10}\text{ cm.}$$

$$10\text{ mm} = 10 \times \frac{1}{10}\text{ cm} = 1\text{ cm}$$

Hence, length of a rice grain is 1 cm.

9. If the height of your friend is 128 cm. Express this height in metre.

Solution

Height of friend = 128 cm

1 cm = $\frac{1}{100}$ metre

therefore 128 cm = 128 × $\frac{1}{100}$ metre

= $\frac{128}{100}$ metre

= 1.28 m.

Hence, the height of friend is 1.28 m.

10. Convert the following :

(i) 25 km into metre

(ii) 2000 mm into metre

Solution

(i) 1 km = 1000 m.

therefore 25 km = 25 × 1000 m

= 25000 m

Hence the answer is 25000 m.

(ii) 1 mm = $\frac{1}{1000}$ m

therefore 2000 mm= 2000 × $\frac{1}{1000}$

m = 2 m, Hence, the answer is 2 m