

Length and time

Measuring length:

S.I. unit of length: meter(m)

Instrument :Measuring tape, a ruler, micrometer screw guage

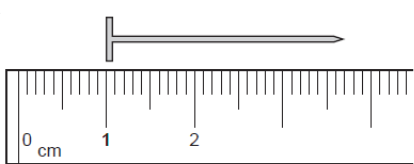
Instrument	Use	Smallest possible measurement
Measuring tape	It is a flexible rule used to measure lengths of curved objects apart from linear lengths	1mm or 0.1cm
Meter Rule	It is used to measure length of linear objects such as floor length, cloth etc	0.1cm/0.5cm or 1cm
Micrometer screw guage	It is used to measure very small lengths, example the thickness of a coin etc.	0.0001cm or 0.001mm

Method of measuring with a rule:

- Place the scale right next to the object being measured.
- Place one end of the object at zero and place your eye exactly perpendicular to the other end where the object ends to avoid parallax error.
- It is fine to place the object on any other reading other than zero but do make careful calculations.

1 The diagram shows part of a ruler. The ruler is used to find the length of a nail.

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What is the length of the nail?

A 2.2 cm B 2.7 cm C 3.2 cm D 3.7 cm

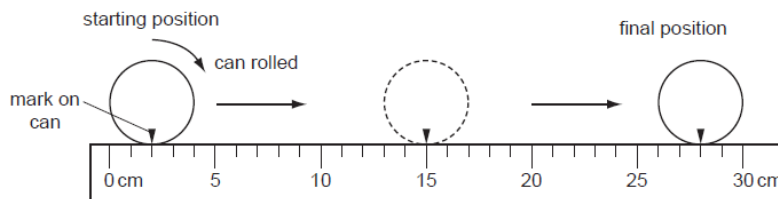
Example: In this example, the nail is placed beginning at 1cm. Hence the length of the nail will be $3.7 - 1 = 2.7\text{cm}$

This is because it is placed 1cm ahead of the zero mark.

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- 1 A cylindrical can is rolled along the ruler shown in the diagram.

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The can rolls over twice.

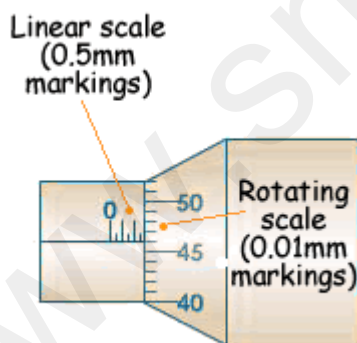
What is the circumference (distance all round) of the can?

- A 13 cm B 14 cm C 26 cm D 28 cm

In this case, the object is 2cm ahead of the zero mark, so from the final position of the arrow deduct 2cm. Hence the final reading is $28 - 2 = 26$ cm. Also the cylinder is rolled twice so it covered

2 circumferences. Hence 1 circumference = $26 / 2 = 13$ cm

Measuring smaller lengths-Screw guage:



- **Procedure:** Place the wire between the anvil and spindle end as indicated in the diagram.
- Rotate the thimble until the wire is firmly held between the anvil and the spindle.
- The ratchet is provided to avoid excessive pressure on the wire.
- It prevents the spindle from further movement and squashing the wire.

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To take a reading

- First look at the main scale. This has a linear scale reading on it. The long lines are every millimetre and the shorter ones denote half a millimetre in between.
- On the diagram this reading is 2.5 mm
- Now look at the rotating scale. That denotes 46 divisions - each division is 0.01mm so we have 0.46mm from this scale.

The diameter of the wire is the sum of these readings: $2.5 + 0.46 = 2.96$ mm

Precautions:

- If you have to measure the thickness of a sheet for example, remember to take the thickness of the sheet at several different places. Then take the average thickness.
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