MEASUREMENT

The corresponding theme in Environmental Studies for this unit is *Water*.

Learning Outcomes

- Distinguish between standard and non-standard units of length, weight and volume
- Measure length using centimetres and metres
- Estimate the length of given objects in standard units and verify by measuring
- Use a ruler to measure length
- Convert: metre to centimetre; kilogram to gram; litre to millilitre
- Recognise that weight and volume remain the same even with change of containers

Integration

Art	Warm-up
Environmental Studies, History, Geography	Warm-up, Find Out 1, Find Out 3, Do You Know?
Wellness	Find Out 4
Heritage	Find Out 1
Life skills and values	Find Out 2, Exercise
Multiple intelligences	Maths Lab Activity 1 Maths Lab Activity 2
Digital	Weblinks, Presentation, Picture Gallery

Suggested Number of Sessions: 14

Session 1: Recall, Warm-up

Session 2: Length, Maths Lab Activity 1, *Non-standard units*

Session 3: Length (continued) *Standard units*: *Centimetre*, *Using a ruler (to measure length)*

Session 4: Do you know? Digital asset: Presentation (*How measuring the depth of water is important in irrigation*)

Session 5: Exercise questions 1 to 4

Session 6: Exercise questions 5 and 6, Length: *Standard units* (continued): *Metre*, Exercise questions 7 and 8

Session 7: Maths Lab Activity 2, Find Out 1

Session 8: Length: *Standard units* (continued): *Kilometre*, Instructions for Find Out 2, which is to be given as home assignment, Weight: *Non-standard units*, Exercise questions 9 and 10

Session 9: Weight (continued): *Standard units*: *Gram, Kilogram*, Exercise question 11, *Weighing machines*, Exercise question 12

Session 10: Weight (continued): *Standard weights*, Digital asset: Picture Gallery (*Weights*), Exercise questions 13 to 15 a, Instructions for answering question 15 b of the exercise, which is to be given as home assignment

Session 11: Volume: *Non-standard units*, Exercise questions 16 and 17, Volume (continued): *Standard units*: *Millilitre, Litre*

Session 12: Exercise questions 18 and 19, Find Out 3, Instructions for Find Out 4, which is to be given as home assignment

Session 13: Weight and volume remain the same, Instructions for Exercise question 20 a, which is to be given as home assignment, Exercise question 20 b

Session 14: Worksheets, other pending work

Teaching Guidelines

Recall

- Instruct students to complete the Recall exercise.

⑤ Ask students the question given at the beginning of the **Warm-up** section and elicit their response. Instruct students to observe the two images of the water container. Explain where the water in the container went by evening.

Ask them question 1 and elicit the answer. (They will not know the standard units of measuring height / length. So they can explain the difference in level in terms of the non-standard units like cubits or handspans. For example, if the level of water at noon was 10 handspans, the level of water in the container at 6 in the evening would be less than 10 handspans. Say, the level of water left is 7 handspans. It means the difference in water level is 3 handspans.)

There is integration with Environmental Studies as the topic of measurement is introduced through the phenomenon of evaporation.

Ask students to extend this idea to say why we should not water the plants in the afternoon. [Water evaporates quickly at noon due to more heat from the Sun and is unable to enter the soil from where the roots have to absorb it. Without enough water, the plant may wilt (the leaves start drooping).]

Students are required to think how the plants watered at noon and evening the previous day will look. They have to demonstrate their understanding of the process of evaporation by drawing pictures. This is Art integration.

Length

- Help students recall the comparison between tall and short objects and long and short objects. Show them a few objects and ask them to identify the tallest / longest / shortest among them. Explain to them that we can measure how long, short or tall an object is.
- Tell students that they will be learning about the standard and non-standard units of measuring length.

⑤ Conduct **Maths Lab Activity 1** in the class. For this arrange for the materials needed, put students in pairs and give them the instructions for doing the activity. Help students conclude that the length of their arm is not exactly the same as that of their partner's arm. The activity integrates Multiple Intelligence (Bodily-kinesthetic Intelligence) as learning happens through hand and body movement and control.

Non-standard units

- Explain what a cubit is.
- Help students conclude that they had measured cubits for the Maths Lab Activity.
- Ask them if they have seen flower vendors using cubits to measure the string of flowers.
- Explain what a handspan is.
- Compare your handspan with that of a student to show the difference between the two handspans.

- Measure the length of your table using your handspan. Then, ask the student to measure the length of your table using their handspan. Your palm being bigger, you will cover the length in fewer handspans. Let us assume that 6 handspans is the length of the table measured with your handspan. The student's palm being smaller, they will cover the length with more number of handspans. Let us assume that 12 handspans is the length of the table measured with their handspan. Point out that we cannot say for sure what the length of the table is when we measure it this way, as the handspan of different people varies.
- Explain why cubits and handspans are called non-standard units.
- Tell students that we use standard units (that remain the same) to measure length.

Standard units

- List the standard units of length given in the Coursebook.

Centimetre

- Explain what 'centimetre' is and what it is used for. Give the short form of centimetre.

Using a ruler

- With the help of the illustrations given for the topic, explain how we measure length using a ruler.

> Play the video in the link to help students learn how to measure lengths using a ruler. This is digital integration. Students learn with the help of digital technology.

- Guide students to use a ruler and measure the length of their pencils. Encourage them to measure some more objects like matchstick, ice-cream sticks, notebooks and so on, using a ruler.
- Explain what a line segment is. Using the illustrations given, explain the steps for drawing a line segment with the help of a ruler.

> ⑤ Read out / Ask students to read the extract from a diary given in the **Do you know?** box.
> Explain the words 'irrigation' (the process by which the required amount of water is supplied to crops in a field) and 'paddy' (rice crop). This is integration with Geography as students learn about irrigation.
> Describe what Rohan learnt from the farm workers. Ask students to note the water levels given in centimetres. Tell them that the water levels are changed between 2 cm and 10 cm as the crops grow. Ask them to use the link given at the end of the page to understand this better.
> Encourage students to measure / adjust the levels of water in a glass according to the instructions given in the box.

> ⑤ Encourage students to watch the presentation to understand how measuring the depth of water is important in irrigation. This is digital integration. Students learn the real-life application of mathematics, with the help of digital technology.

- Instruct students to attempt questions 1 to 6 of the Exercise. (*Note:* For question 5, students must compare the length of the box with the length of the different tools to know which ones will fit into the box.)
- To answer the second part of question 6, students must focus on the line that says 4 cm of the cloth was used up to join the pieces of cloth together. Explain that two pieces of cloth are joined

at their edges by folding these edges inwards and stitching them together. In the sum, 4 cm of cloth get folded inwards (used up) for joining the pieces. This means that 4 cm are _____ (added to / reduced from) the length of the cloth. So the total length of the new cloth will be _____ than the total length of the original cloth.

Metre

- Explain what 'metre' is and what it is used for. Ask students to memorise the short form of metre.
- Instruct them to look at the pictures given to get an idea of things that are measured in metres.
- Explain the difference between metre and centimetre. Ask students to complete this table for distinguishing between the two units.

Metre	Centimetre
Standard unit for measuring length	Standard unit for measuring length
Used for measuring _____ lengths.	Used for measuring smaller lengths.
Usually measured using a measuring tape	Usually measured using a _____
Short form _____	Short form _____

- Tell students that we can change metres to centimetres and centimetres to metres. Tell them that they will be learning to convert metres to centimetres this year.
- Use the example given in the Coursebook to explain the longer method of converting metres to centimetres (multiplying by 100) and also the shorter method (adding two zeros to the right of the number).
- Give them a few more sums of this nature to check understanding and retention.

⑤ Arrange for a few measuring tapes. Put students in pairs. Give students the instructions for doing **Maths Lab Activity 2**. Guide them where required. As given in the note, ask students to consider only the full centimetres for length and ignore the parts of a centimetre. (This is because they have not been taught millimetres.) The activity integrates Multiple Intelligences (Bodily-kinaesthetic intelligence)as students learn through hand and body movement(physical movement). The activity also facilitates experiential learning.

- Instruct students to attempt questions 7 and 8 of the Exercise.

⑤ Read out / Ask students to read the information about Kallanai given in **Find Out 1.**

Help students appreciate the fact that the dam was originally built in the 2nd century (We are in the 21st century now, which means the dam is about 1900 years old.). Tell students that the dam was constructed to help the farmers get water for irrigation. Explain that the Chola rulers are remembered for the work they did to help their people. This is integration with History.

The information about the location and the purpose for which the Kallanai Dam is used is integration with Geography.

The information about the Kallanai Dam also integrates Heritage. Students learn that it is the oldest dam in India and one of the oldest dams in the world. Help them appreciate the fact that the dam

built 1900 years ago is being used till now. They can be inspired by the fact that great experts in construction lived in India such a long time ago.

Instruct students to work out the answers to the sums given in **Find Out 1**. Initiate a discussion on the question: Why are certain lengths measured in metres and some in centimetres? (The discussion should lead to the conclusion that some lengths are much smaller than a metre. So, we use centimetres to measure them. Some lengths measure 100 cm or more. It is easier to measure such lengths in metres.)

Kilometre

- Explain what 'kilometre' is and what it is used for.
- Explain the conversion of kilometre to metre.
- Give the following sums for students to work out:
  - 2 km = _____
  - 9 km = _____

⑤ **Find Out 2** integrates Life Skills. Students understand how long 1 km is. Such knowledge is useful in estimating distances. They apply this knowledge to estimate the distances of a few places from their home. (The purpose is not to find the exact distance between the places and their home but to estimate whether these places are at a distance of more than or less than 1 km.)

Weight

- Tell students that, like length, weight can be measured using non-standard and standard units. Explain that heavier objects have more weight than lighter objects.

Non-standard units

- Explain and give examples of non-standard units of weight with the help of the Coursebook.
- Instruct students to attempt questions 9 and 10 of the Exercise.

Standard units

- Instruct students to look at the pictures given at the beginning of the topic and read the conversation happening between the boy and the shopkeeper.
- Explain that the boy is asking for sugar and salt in grams and kilograms respectively.

Gram

- Explain what 'gram' is and what it is used for.
- Give the short form of gram.
- Ask students to compare an ice-cream stick and a mobile phone and say which is heavier. (You may ask them to do this at home and tell you what they found out.)
- Give them the approximate weights of an ice-cream stick and a mobile phone. Help students conclude that a thing that weighs 200 g is heavier than the one that weighs 2 g.

Kilogram

- Explain what kilogram is and what it is used for.
- Instruct students to observe the pictures of things that are measured in kilograms.
- Tell them how many grams make a kilogram.
- Explain the conversion from kilograms to grams using the example given in the Coursebook.
- Explain the longer method (multiplying by 1000) and the shorter method (adding 3 zeroes to the right of the number) of conversion.
- Instruct students to attempt question 11 of the Exercise.

Measuring weights

- Explain what weighing machines are. Explain the use of standard weights. List the standard weights given in the Coursebook on the board.

Open the link with the Picture Gallery on weights. Ask students if and where they have seen the weights. (*They are commonly seen in small shops. Vendors on the roadside use them to measure the weight of vegetables and fruits*.)

Explain how these weights are used by recreating some situations from real-life. For example, you may say: I go to a shop to buy vegetables. I want to buy 50 g of ginger, 500 g of cabbage, 100 g of garlic, 1 kg of onion and 300 g of tomatoes.

Ask students to identify from the picture gallery (or from the list on the board) which standard weights would be used to weigh the things that you want to buy. Students must be able to say that for measuring 300 g of tomatoes, the vendor will have to use 200 g and 100 g weights. This is digital integration. Students learn with the help of digital technology.

- Instruct students to attempt question 12 of the Exercise.

Play the video in the link from which students can learn to measure in kilograms and grams.
This is digital integration. Students learn with the help of digital technology.

- Instruct students to complete questions 13 and 14 of the Exercise.

Instruct students to attempt question 15 a of the Exercise. Tell them that it is difficult to carry things that weigh a lot as they are heavy. When we offer to carry things for someone, we are reducing the weight they have to carry. It becomes easier for them to carry the remaining weight. The question integrates the Value of caring for and helping others.

Instruct students to attempt question 15 b of the Exercise at home. Ask them to bring their lists to class and show them to you. Students may lift a 1 kg packet of some grocery item. They can then estimate the weight of 10 things (different household items) and sort them into two categories— more than 1 kg and less than 1 kg. (*Note*: Ask students to only guess or estimate the weights of heavy things like pieces of furniture, kitchen appliances and so on. They must not lift them.) Estimation of weight is an important Life Skill that is integrated in this question.

Volume

- Explain what 'volume' is in terms of measurement.

- Tell students that like length and weight, volume is also measured using non-standard and standard units.

Non-standard units

- Help students recall that water and other liquids take the shape of the container they are in. Explain what volume is.
- Instruct students to attempt question 16 of the Exercise.
- Question 17 of the Exercise also involves critical thinking.
- To help students arrive at the answer, ask them:
    - What else does the 1 kg packet have to hold other than 5 × 200 g = 1000 g (or 1 kg) of dal? (*The five packets in which the dal has been packed*)
    - If the 1 kg package was just enough to hold 1000 g, can it hold five packets also? (*No*)

Standard units

- List the commonly used standard units of volume.

Millilitre

- Explain what 'millilitre' is and what it is used for. Ask students to memorise its short form.

Litre

- Explain what 'litre' is and what it is used for. Instruct students to memorise its short form.
- Ask them to attempt questions 18 and 19 of the Exercise.

> **⑤** Read out / Ask students to read the information about the *taankas* of Rajasthan given in **Find Out 3**. Describe the basic structure of a *taanka* and explain how rainwater is collected in it. Students learn a way of saving rainwater. This is a life skill.
>
> Saving rainwater and not allowing it to go waste is a value that helps or benefits everyone. Thus **Find Out 3** integrates Life Skills and Values.
>
> Ask students to find out if their families save rainwater. Encourage them to speak to the elders at home about the importance of saving rainwater.

> **⑤ Find Out 4** integrates Wellness. Students find out how much water they drink in a day, first by guessing and then by measuring. They find out how much water they should drink in a day and say if they drink enough water. Clap for the students who drink sufficient amount of water and encourage them to continue this habit. Urge students who do not drink enough water to start doing so immediately if they want to stay healthy.

Weight and volume remain the same

- Using the example given in the Coursebook, explain that the weight of items do not change when we put them in different containers.
- Instruct students to make buttermilk at home by following the instructions. Doing the experiment using buttermilk will help them answer question 20 a of the Exercise and understand that the volume of things does not change when we put them in different containers.

- Question 20 b of the Exercise involves critical thinking.
- To help students arrive at the answer, ask them:
  - Is some amount of water lost when it is used for making ice cubes and when those ice cubes are melted back to water? (*No*)
  - Is some amount of water lost when the water is boiled in a vessel with a lid on? (*No*)
- For answering 20 c of the Exercise, ask students if the water that goes up (evaporates) comes down. If yes, what does it come down as? Then, what happens to the water that has come down? Students should be able to conclude that the same water that goes up, comes down as well. The water that does not evaporate stays on the Earth. So, this means that water on Earth neither_____ nor _____. It has remained the _____ for many years.

QUESTION BANK WITH ANSWERS

Measurement

A. Fill in the blanks.

1. _____ measurements change from person to person.

2. To convert metres to centimetres, we add _____ zeros to the right of the number.

3. To convert kilograms to grams, we add _____ zeros to the right of the number.

4. Millilitre is a unit of _____ .

Ans: 1. Non-standard   2. two   3. three   4. volume

B. Match.

A	B
1. Length	a. grams
2. Weight	b. kilometres
3. Volume	c. centimetres
4. Distance	d. litres

Ans: 1. length   c. centimetres   2. Weight   a. grams   3. Volume   d. litres
4. Distance   b. kilometres

C. Solve.

1. Mr Roy walks 2 km to his office in the morning and 2 km to his home in the evening. What distance does he walk in a day? Write the answer in metres.

Ans:

Distance Mr Roy walks in the morning	2 km
Distance Mr Roy walks in the evening	+ 2 km
Total distance he walks in a day	4 km
Total Distance in metres	4000 m

2. Kini buys 3 kg of rice, 2 kg of wheat and 2 kg of sugar. What is the weight of all the things she buys in grams?

Ans:

Weight of rice that Kini buys	3 kg
Weight of wheat that Kini buys	+ 2 kg
Weight of sugar that Kini buys	+ 2 kg
Total weight of things Kini buys	7 kg
Total weight in grams	7000 g

3. Minu bought 3 ℓ of milk yesterday but only 1 ℓ of milk today. How much milk did she buy less today compared to yesterday? Write the answer in millilitres.

Ans:

Volume of milk Minu bought yesterday	3 ℓ
Volume of milk Minu bought today	− 1 ℓ
Volume of milk Minu bought less today	2 ℓ
Volume of milk in millilitres	2000 mℓ

A. Convert metres into centimetres.

1. 3 m _____   2. 6 m _____

B. Tick the suitable unit to measure these things.

1. Length of your diary   metres / centimetres

2. Length of a room in your house   metres / centimetres

3. Your height   metres / centimetres

4. Length of your pencil box   metres / centimetres
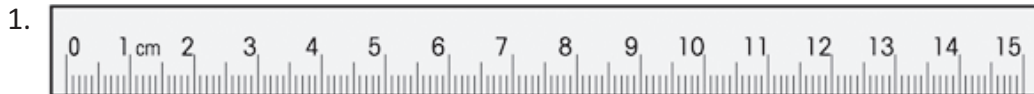
C. Convert kilograms into grams.

1. 5 kg _____   2. 7 kg _____

D. Convert litres into millilitres.

1. 6 ℓ _____   2. 4 ℓ _____

E. Tick the correct unit of weight.

1.

gram [ ]   kilogram [ ]

2.

gram [ ]   kilogram [ ]

3.

gram [ ]   kilogram [ ]

MEASUREMENT

A. 1. 300 cm   2. 600 cm

B. 1. Centimetres   2. Metres   3. Centimetres   4. Centimetres

C. 1. 5000 g   2. 7000 g

D. 1. 6000 mℓ 2. 4000 mℓ

E. 1. gram   2. kilogram   3. gram