

Measurement of Length

► GOAL

Measure the length of an object, using the International System of Units (SI) and convert between units of measurement.

You will need

- a metre stick or measuring tape
- a ruler
- common classroom objects to be used for measurement

Learn about the Math

The International System of Units (SI) uses the metre as the base unit for measuring the length of an object. Prefixes are then used to form other units of measurement.

The chart below shows the equivalents for these units of measurement.

1 km (kilometres) =	1000 m (metres)
1 m =	10 dm (decimetres)
1 dm =	10 cm (centimetres)
1 cm =	10 mm (millimetres)

kilo-	1000
deci-	$\frac{1}{10}$
centi-	$\frac{1}{100}$
milli-	$\frac{1}{1000}$

This chart can be used to convert from one unit of measurement to another. If you want to change from a larger unit to a smaller unit, you multiply by the conversion factor. If you want to change from a smaller unit to a larger unit, you divide.

For example, to change from metres to centimetres (a larger unit to a smaller unit), you will multiply by the conversion factor. To find the conversion factor, use the chart to determine how many centimetres it takes to equal 1 m. A centimetre is $\frac{1}{100}$ of a metre; therefore, it takes 100 cm to equal 1 m. This means you will multiply by 100 to change from metres to centimetres.

If you want to change from metres to kilometres (smaller unit to larger unit), you divide by the conversion factor. The chart shows there are 1000 m in 1 km, so you will divide by 1000 to change from metres to kilometres.

Chandra wants to measure several objects in the classroom to determine the length of each. She is not certain which SI unit is most appropriate to use in order to measure each object.

? How can Chandra measure the length of various classroom objects, using the SI system of measurement?

- A.** Choose the most appropriate unit of measurement to measure the length of each of the following objects.
- 1) student desk
 - 2) front classroom wall
 - 3) teacher's desk
 - 4) pen
 - 5) width of a pencil eraser
 - 6) chalkboard
 - 7) width of a piece of chalk
 - 8) piece of writing paper
 - 9) small paper clip
 - 10) stapler
 - 11) staple
 - 12) chalk eraser
- B.** Make a table on a sheet of paper, using the headings shown below. Estimate the length of each object, using the unit of measure that you selected in step A. Record your estimates in the table.

Object	Estimate	Actual Measurement
--------	----------	--------------------

- C.** Now try to locate each object in your classroom and measure it with a ruler or metre stick to check your estimates.
- D.** Explain how you chose the most appropriate units of measure for each object.
- E.** Discuss the results of your estimates compared to the actual measurements.

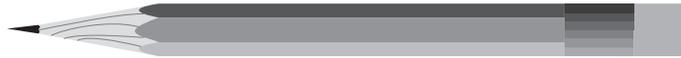
Reflecting

1. What is the base unit for measuring length in the SI system of measurement?
2. Give an example of something you would measure in kilometres and something you would measure in millimetres.
3. How many centimetres are in 1 km?

Work with the Math

Example 1: Measuring length

Find the length of this object to the nearest centimetre.



Kurt's Solution

I used a metric ruler to measure this pencil. After placing the tip of the pencil on 0, I found that the eraser end stretched nearest 9 cm.

Solution: 9 cm



Example 2: Converting units of length

Copy and complete each of the following.

- a) $2000 \text{ m} = \underline{\quad} \text{ km}$
- b) $3 \text{ m} = \underline{\quad} \text{ cm}$
- c) $4000 \text{ mm} = \underline{\quad} \text{ m}$

Qi's Solution

- | | |
|------------------------------------|--|
| a) $2000 \div 1000 = 2 \text{ km}$ | a) I determined that metres are a smaller unit of measurement than kilometres; therefore, to change from metres to kilometres, I need to divide. There are 1000 m in 1 km, so I divided by 1000. |
| b) $3 \times 100 = 300 \text{ cm}$ | b) I determined that I need to multiply in order to change from metres to centimetres, because metres are a larger unit than centimetres. There are 100 cm in 1 m; therefore, I multiplied by 100. |
| c) $4000 \div 1000 = 4 \text{ m}$ | c) I determined that millimetres are smaller than metres, so this time I will divide. I divided by 1000, because there are 1000 mm in 1 m. |



A Checking

4. Choose the most appropriate unit of measurement for the length of each of the following objects.

- a) automobile
- b) distance between Québec and Montréal
- c) horse
- d) tack
- e) football field
- f) book

5. Copy and complete.

- a) $5000 \text{ mm} = \underline{\hspace{1cm}} \text{ m}$
- b) $8 \text{ m} = \underline{\hspace{1cm}} \text{ cm}$
- c) $14 \text{ km} = \underline{\hspace{1cm}} \text{ m}$
- d) $200 \text{ cm} = \underline{\hspace{1cm}} \text{ m}$
- e) $2 \text{ m} = \underline{\hspace{1cm}} \text{ mm}$
- f) $9000 \text{ m} = \underline{\hspace{1cm}} \text{ km}$

B Practising

6. Choose the most appropriate unit of measurement for each of the following.

- a) width of a thimble
- b) distance between your school and the library
- c) height of your classroom ceiling
- d) length of a pencil
- e) height of a student in your class
- f) length of a flea

7. Copy and complete.

- a) $700 \text{ mm} = \underline{\hspace{1cm}} \text{ cm}$
- b) $360 \text{ m} = \underline{\hspace{1cm}} \text{ mm}$
- c) $26 \text{ km} = \underline{\hspace{1cm}} \text{ m}$
- d) $244 \text{ cm} = \underline{\hspace{1cm}} \text{ mm}$
- e) $25 \text{ m} = \underline{\hspace{1cm}} \text{ mm}$
- f) $2580 \text{ m} = \underline{\hspace{1cm}} \text{ km}$

8. Find the length of this object to the nearest millimetre.



9. Use a ruler to sketch a line segment equal to each of the following measurements.

- a) 33 mm
- b) 8 cm
- c) 10.5 cm
- d) 1 dm
- e) 3.5 cm
- f) 52 mm

10. Determine which of the following is longer.

- a) 2 km or 1000 m
- b) 9 dm or 1 m
- c) 200 cm or 1 m
- d) 7 cm or 1 dm
- e) 15 cm or 1 m
- f) 2000 m or 1 km

11. Determine which of the following is shorter.

- a) 2 km or 2500 m
- b) 4 m or 40 cm
- c) 5000 m or 4 km
- d) 3 km or 30 000 mm
- e) 8 dm or 1 m
- f) 9 mm or 1 cm

12. Determine whether each of the following is true.

- a) $200 \text{ m} = 2 \text{ km}$
- b) $4000 \text{ mm} = 4 \text{ m}$
- c) $2 \text{ m} = 2000 \text{ km}$
- d) $4 \text{ km} = 40\,000 \text{ cm}$
- e) $800 \text{ cm} = 8000 \text{ mm}$
- f) $3000 \text{ m} = 30 \text{ km}$