Sorting and Ordering Units of Measurement

Overview

This is a sorting activity designed to help students and teachers clarify students' existing knowledge about metric units of measurement, such as metres, centimetres, litres, kilograms, and also the units for measuring time and temperature. The activity also allows for exploration of measurement related language and the meaning of the prefixes used in the metric system.

Skills and Knowledge

- Units of measurement for
  - Distance / Length
  - Capacity / Volume
  - Weight
  - Temperature
  - Time
- Comparison of units
- Relationships between units
- Meaning of metric prefixes

Preparation and Materials

- Photocopy Activity Sheet 1 onto card, cut and put each set in an envelope (1 set for each group of 4 students)
- Photocopy Activity Sheet 2 (1 per student)
- Collection of measuring instruments (1 of each) (optional)
  - measuring jug
  - tape measure
  - kitchen or bathroom scales
  - thermometer
  - clock
  - calendar

Suggested Procedure

Note: If you are using this activity to find out what students already know, it is important not to 'teach' them any of the information before they start. Just explain the rules of the activity and observe them as they work together and share their knowledge.

If you are using it as a revision activity after teaching the knowledge, then allow some time to elapse prior to this activity. That way you and the students will be able to see what has been retained and what needs greater coverage.

Sorting the Units of Measurement

Arrange the students in small groups of 4. Each group will need a flat surface to work on (like a table or a space on the floor).

Give each group one set of cards.

Ask students to discuss the cards, share what they know, and sort them into groups that they think will go together. One way to do this is below.

Explain:

- *This is an activity about measuring.*
- *It will help us find out what you already know and what you need to learn.*
- *I don't expect you to know all of this yet.*
- *I want you to share what you know to do the activity together.*
- *It is important to explain your ideas and listen to each other and as you do it.*

As students sort the cards, circulate, listen and watch to see how much they know and find out where the gaps are.

If it seems that their knowledge is very limited, then go straight to **'Ordering the units'** and focus only on the 'length' or the 'time' category to complete the activity.

If students have placed the majority of the cards correctly, they can try the ordering step for all the groups.

Naming the groups – what do we measure?

Students will probably already have commented that some cards are different from others: some name the property being measured, 'length', 'weight', etc. and others are the units used to measure them, 'metres', 'kilograms' etc.

If it has not yet been discussed, explain this to them before proceeding.

Explain the task:

- *Look at each group of cards; pick out the cards which name the property, or category of measurement.*
- *Decide together how you would explain what it means.*

Note: Some measurement categories have two words (e.g. capacity, volume) that describe almost the same thing. It is good if students hear both.

Formulating the meanings

When students have had a few minutes to think about this and tried to formulate their ideas, discuss their responses. The discussion should cover the following points.

> **Distance** - a term used for how far you travel or how far from one thing to another
> **Length** - a term used for measuring sides or parts of objects or buildings.

[Students may also bring up words such as 'width' and 'height' at this stage. If so, clarify the difference for them using diagrams.]

Weight and Mass – both terms are commonly used for how heavy things are – in science they are used a bit differently but it is not important in mathematics.

Volume and Capacity – both terms commonly used for how much something holds eg how much you could put in it. Some trades use them differently, but it is not important in most situations.

What do we measure with?

If students are not sure about the properties discussed above, then the discussion could include looking at the types of instruments that are used for measuring these properties, eg scales, tape measures, measuring jugs and the like.

Ordering the units

Return to the sets of cards that students grouped earlier.
Explain the task:

- *Look at the cards in one section at a time.*
- *Choose the cards that are 'units of measurement' (e.g. metre, litre).*
- *Arrange them from smallest to largest.*

Abbreviations for the units

Ask:

- *Do you know the abbreviations or symbols that are used for any of these?*
- *Write the ones you do know on a piece of paper.*

Compare responses from the groups for the order and the abbreviations and make sure there is agreement. Responses should be as follows.

Distance / Length:	millimetre (mm); centimetre (cm), metre (m), kilometres (km)
Weight / Mass	milligram (mg), gram (g), kilogram (kg)
Volume / Capacity:	millilitre (ml), litre (l), cubic metre (m^3)
Time:	Second (sec), minute (min), hour (hr), day, week, year

How the units of measurement relate

Distribute one copy of *Activity Sheet 2* to each group or pair of students. [One sheet only is given at this stage to encourage students to keep talking to one another rather than work alone.]

Explain:

- *Together fill in as many of the spaces that you can, using the numbers in the box at the bottom of the sheet.*

Discuss responses as a class, making note of any areas that need further development.

Answers for Activity Sheet 2

1. *1 week = 7 days*
2. *60 seconds = 1 minute*
3. *1 hour = 60 minutes*
4. *1 year = 365 days*
5. *1 year = 52 weeks*
6. *1 000 metres = 1 kilometre*
7. *1 metre = 100 centimetres*
8. *1 kilogram = 1 000 grams*
9. *1 000 millilitres = 1 litre*
10. *1 tonne = 1 000 kilograms*

Meaning of the prefixes

There is a lot of possible content in this discussion. Use your judgement about how much of this to include now and what would be most effectively left until another time.

Meaning of 'kilo'

Ask students to look at their copy of Activity Sheet 2. Write the prefix 'kilo' on the board.

Ask:

- *How many times can you see 'kilo' on this sheet?*
- *Does anyone know what it means?*

Explain:

- *'Kilo' is a prefix – letters fixed or stuck on before the word.*
- *It is used a lot in the metric system.*
- *It comes from a Greek word meaning 1 000.*

So *kilo*metre (km) means 1 000 metres; *kilo*gram (kg) means 1 000 grams

Ask:

- *What would a* kilo*litre mean?*
  [Ans 1000 litres]
- *How do you say 1 000 metres?*
  [Ans kilometre - km]
- *Have you seen or heard 'kilo' used for any other things?*

It is not necessary to push this if students have not seen other uses, but if they have, it is best to make the links clear for them.

Students may volunteer **kilo**bytes, used to measure storage capacity of computers, memory sticks, etc.

Others may have seen the more recent use of **'k'** for salaries in job ads, where it means 'thousands of dollars'.

Other prefixes

Ask:

- *Do you see any other words on the sheet that look like they have 'prefixes'?*
  [centimetres, millimetres]

Discuss the meanings of these and brainstorm other words or measurements that students may have seen with these prefixes.

Centi: a prefix meaning $\frac{1}{100}$.

There are 100 centimetres in 1 metre:	1 cm is $\frac{1}{100}$ of a metre
Cent is also used also in money:	1 **cent** = $\frac{1}{100}$ of a dollar.

Milli: a prefix meaning $\frac{1}{1000}$.

1 millimetre is $\frac{1}{1000}$ of a metre:	1000 mm = 1 m.
1 millilitre is $\frac{1}{1000}$ of a litre:	1000 ml = 1 L
1 milligram is $\frac{1}{1000}$ of a gram:	1000 mg = 1g

Brainstorming 'cent'

There are many other words using the prefix '**cent**' to indicate a hundred.

If appropriate, brainstorm with students to see how many they know. Some examples are: **century** (100 years or 100 hundred runs in cricket), degrees **centigrade** (100 degrees between freezing and boiling point of water), **percent** (out of every hundred), **centipede** (supposedly 100 legs)

Follow up

The activity *'What do we use this for?'* is designed to follow from this preliminary discussion of units. It explores how the units are used in connection to students' lives or work situations.

More information about the metric system and how the units fit together in a cohesive whole is provided in the activity ' *Knowing the Metric System'*.

Sorting & ordering units of measurement Activity Sheet 1

✂ Copy onto card and cut. Place each set in a labelled envelope.

milligram	**kilometre**	**metre**
^{0} Celsius	**kilogram**	**^{0} Fahrenheit**
litre	**second**	**tonne**
minute	**millilitre**	**day**
cubic metre	**gram**	**centimetre**
hour	**cubic centimetre**	**time**
temperature	**distance**	**millimetre**
volume	**length**	**weight**
capacity	**week**	**year**

Sorting & ordering units of measurement Activity Sheet 2

Fill in as many of the spaces as you can using the numbers in the box below

1. 1 week = …… days
2. …… seconds = 1 minute
3. 1 hour = …… minutes
4. 1 year = …… days
5. 1 year = …… weeks
6. …… metres = 1 kilometre
7. 1 metre = …… centimetres
8. 1 kilogram = …… grams
9. …… millilitres = 1 litre
10. 1 tonne = …… kilograms

1 000	365	1 000	
1 000	7	60	1 000
52	60	100	