Notes for parents (1).

The purpose of the activity is to help your child to:

- Apply measurement to solve a real-life problem
- Perform calculations and conversions accurately

sHere is what to do:

You may need a calculator, ruler, and household containers for this task.

Ask your child to read the problem and decide on a household product that interests them. It may be because they find running out of the product annoying or they find the product interesting.

Let them devise a plan for finding out the 'life' of the product. They need to recognise that they cannot simply use up the whole container until there is none left. Using it will result in the situation that the problem is trying to avoid.

First, they will need to take a sample, that is a small part of the whole product. For example, they might squeeze a single blob of toothpaste or rip off a single sheet of toilet paper.

Second, they will need to find a way to measure the sample. In most cases the sample will be too small to use weight as the attribute to measure. However, volume, capacity or length are viable options. If volume or capacity is used, they might need to use a trusted measure. For example, a squirt of dishwashing liquid or hand soap might fill one third of a teaspoon. A teaspoon holds 5 millilitres of liquid. Therefore, three squirts is equivalent to five mLs, a rate of 3:5

Children might need to model the blob or squirt with a known shape, like a cylinder of sphere. They can measure the dimensions of the cylinder or sphere, and use a volume formula. A blob of toothpaste might have a length of 1.0 cm (10 mm) but a diameter of 0.8 cm (8 mm). The volume will need to be calculated with the same measures, such as $0.4^2 \times \pi \times 1.0 = 0.502$. What unit is the volume measured in? (cm^3)

Third, your child will need to figure out how many of the sample will fit into the whole product. In many cases this will be easy as the contained will state the capacity, such as 700 mL or 1 L. Then division can be used to find out how many of the sample fit in. For example, if the dishwashing liquid bottle holds 700 mL then 700 ÷ 5 = 140 gives the number of teaspoonfuls it holds. So, the bottle will hold 140 x 3 = 420 squirts in total.

Notes for parents (2).

With other products the calculation will be more difficult. For example, a toothpaste tube will hold a weight of paste, e.g. 190 grams. Since the size of the sample is measured by volume or capacity your child will need to find a way to measure the volume of the tube. Usually this involves thinking of it as a known solid, such as a rectangular prism (allowing for pluses and minuses), then using a volume formula.

Finding out how many pieces are in a toilet roll is challenging. Often the number of 'sheets' is given on the packaging. If not, your child will need to find a way to estimate the length of the roll. They might find the depth of several layers of sheet and use this to work out how many layers are around the roll. But how long is the roll in total. Taking an average diameter (d) then calculating the circumference (π x d) is one way to do that.

Finally, having worked out how many of the sample fit in the whole your child will need to allow for the consumption rate, and allow for it. How many of the sample are used each day, or week. For example, four people using the same tube of toothpaste will brush at least twice per day, so 4 x 2 = 8 blobs are used each day. Is there wastage? How many lots of 8 blobs fit into the whole tube. How long will the tube last in days or weeks?

Points to note:

Several important measurement concepts are involved in this task; attribute, conversion of measurements, and rate.

An attribute is a characteristic of an object or person. In this problem, your child needs to choose which attribute is the most useful. While weight might be useful it may not be practical unless you have a very sensitive set of scales. Even the choice of volume or capacity (for volumes of liquids) is not easy as the amount of one sample can be very small and prone to error as the measure of one sample is multiplied.

Measures are way to name the size of an attribute. A measure of 0.5 cm^3 is only useful if the person using it understands the size of the unit and how that unit fits with others for the same attribute or related attributes like capacity. The cubic centimetre (cm^3) is very small and is the same volume as one millilitre (mL). The next unit up, the cubic decimetre is not used in New Zealand and the cubic metre holds 100 x 100 x 100 = 1 000 000 cm^3.

To make calculations easier it is common to convert between related measures. This is particularly tricky for volume which has three dimensions. For example, the volume of a blob of toothpaste might have been calculated in cubic millimetres (mm^3) because your child chose to measure the lengths in mm. The calculation is 4^2 x π x 10 = 50.24 mm^3. But how much is that volume in cm^3? Since 1000mm^3 = 1cm^3 the measure needs to be divided by 1000 to get 0.502 cm^3.

Notes for parents (3). Activity next page.

With simpler measures such as length the conversions are much easier and your child should know how to change a length in millimetres into centimetres and vice versa.

A rate is a connection of two different measures. Converting between measures is using ratios (e.g. 1cm : 100cm) which is a similar concept. A rate might connect volume and weight, such as 1cm³: 1 g meaning one cubic centimetre of water weighs one gram.
In this task rates are needed when one attribute is converted to another. Measuring capacity in teaspoons, e.g. 3 blobs : 1 teaspoon, creates a rate that can then be used to convert blobs into standard measures of capacity, e.g. 3 blobs: 5 mLs.

There is nothing worse than getting to the end of the toothpaste tube, toilet roll, dishwashing liquid bottle, or other important household product. That is especially true when there is no replacement!

Choose a product from your household. Avoid something that might be harmful to you, like bleach.

Work out how long the product will last for in your household, therefore how often you will need to replace it.

Try to do this without using much of the product up.