Problem of the Week
Problem A and Solution
The Wooden Spoon

Problem

Thomas wants to make his grandfather's famous wooden spoon drink. He has a list of the ingredients and needs to know if he has a pot that is big enough to fit the entire recipe contents.

Ingredient	Amount
vanilla pudding	0.25 L
apple sauce	150 mL
milk	1 L
lemon juice	1500 mL
pumpkin see oil	350 mL
cream of tartar	100 mL

He has a 3 L container, a 3.25 L container and a 4 L container. Which one should he use? Explain your thinking.

Remember that 1 L equals 1000 mL.

Solution

It is probably easier to figure out the solution if all of the amounts are shown in the same units. This table shows everything in mL.

Ingredient	Amount
vanilla pudding	$0.25 \text{ L} = 0.25 \times 1000 = 250 \text{ mL}$
apple sauce	150 mL
milk	$1 \text{ L} = 1 \times 1000 = 1000 \text{ mL}$
lemon juice	1500 mL
pumpkin see oil	350 mL
cream of tartar	100 mL

Now we can calculate the total amount of the recipe in mL:

$$250 + 150 + 1000 + 1600 + 350 + 100 = 3350 \text{ mL}$$

This is equal to $3450 \div 1000 = 3.35$ L.

So, the 3 L and the 3.25 L containers are not big enough. Thomas needs to use the 4 L container to hold all of the ingredients.

Teacher's Notes

The metric system is a system of measurement which allows for easy conversions between different measurement units with the same base. There are a standard set of prefixes that indicate a multiple or fraction of the base unit. When measuring every day items, the prefixes *kilo* meaning 1000 or 10^3, *centi* meaning $\frac{1}{100}$ or 10^{-2}, and *milli* meaning $\frac{1}{1000}$ or 10^{-3}, are very useful.

Since today's technology is so small and so powerful, we often use other metric system prefixes to measure its size and speed. Here are some examples of these very large and very small values.

giga $1\,000\,000\,000$	In 2017, a common size of SD cards for digital cameras is 32 or 64 gigabytes (GB). An individual pixel of an image would typically require 3 bytes of storage space. The size of an image taken by the camera depends on many factors, but would normally be described in terms of *megapixels*. (The prefix *mega* means $1\,000\,000$.) Suppose you have a camera that takes pictures that take up 32 megabytes of storage space. This means you could save 1000 pictures on a 32 GB card or 2000 pictures on a 64 GB card.
tera $1\,000\,000\,000\,000$	In 2017, an external hard drive for your home computer would normally be between 1 and 4 terabytes (TB). A single character in text would take up 1 or 2 bytes (depending on how the computer represents the character). According to *Wikipedia*, in 1989 the second edition of the Oxford English Dictionary (OED) was published, containing approximately 59 million words in 20 printed volumes. The second edition can be stored in approximately 540 megabytes (MB). This means a 1 TB external hard drive could contain over 1800 copies of the second edition of the OED. As of 2017, the third edition has not been completed.
nano $\frac{1}{1\,000\,000\,000}$	In a vacuum, light or electricity can travel at a speed of approximately 30 cm in one nanosecond. Remember that it takes approximately 8 minutes for light to travel from the sun to the Earth, and the sun is approximately 150 million kilometres away. Computer scientist Grace Hopper (1906 - 1992) famously carried a bundle of "nanoseconds" with her. These were wires cut to lengths of 30 cm each. She would use these as visual aids to explain, among other things, why it took so long for messages to be sent via satellite.
pico $\frac{1}{1\,000\,000\,000\,000}$	A computer has an internal clock that coordinates all of its processes. That clock beats very fast. The speed of the clock is usually described in gigahertz (GHz). Suppose your computer had a clock speed of 4 GHz. This means the clock beats $4\,000\,000\,000$ times per second. Looking at it another way, a single beat of the clock takes 250 picoseconds. Grace Hopper also had a way of visualizing picoseconds. She would take a packet of pepper as an illustration of many picoseconds, where the size of an individual pepper grain is the maximum distance light can travel in 1 picosecond.