

## YEAR 10 CAPACITY WITH TI NSPIRE CAS CONVERSION ASSISTANT

### Choosing a water tank

Leon owns a small farm and he needs to install a new water tank. The tank is to be built of corrugated iron which he will purchase. He has already made several decisions:

- The tank must be cylindrical, and closed at the top and bottom.
- It must hold at least 12 000 litres of water when full.
- He wants to pay as little as possible for materials.

To further complicate Leon's decision, there are four different designs for cylindrical tanks available. The dimensions of the different types of tank are set out in the table.

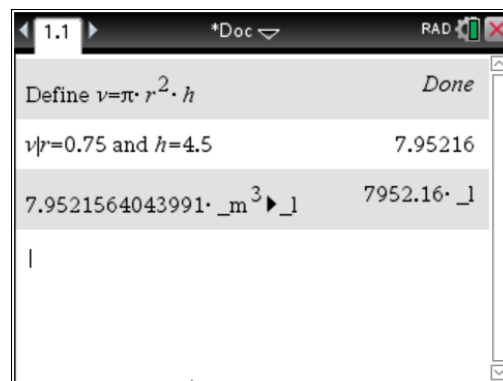
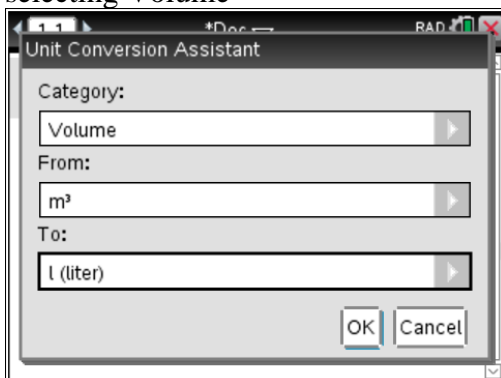
Base diameter (metres)	Height (metres)
1.5	4.5
2	4
3	3
5	1



1. Leon assumed that the tallest tank is the best option. Is he correct?
2. Is it the cheapest in terms of materials?
3. Would this tank hold enough water?

**Calculating the capacity of each tank.** Volume of a cylinder:  $V = \pi r^2 h$

Use your calculator to define the volume function, calculate the volume of each tank in  $m^3$  and then convert the capacity to litres using Conversion Assistant and selecting Volume



Repeat for the other three tanks:

Input	Output
$v r=1 \text{ and } h=4$	12.6
$12.6 \cdot \text{m}^3$	$12600 \cdot \text{l}$
$v r=1.5 \text{ and } h=3$	21.2058
$21.205750411731 \cdot \text{m}^3$	$21205.8 \cdot \text{l}$
$v r=2.5 \text{ and } h=1$	19.635

Look at the results above and determine which tank has the biggest capacity.

Calculating the cost of materials for each tank.

Recall that for a cylinder.  $SA = 2\pi r^2 + 2\pi r h$

Input	Output
Define $sa=2 \cdot \pi \cdot r^2 + 2 \cdot \pi \cdot r \cdot h$	Done
$sa r=0.75 \text{ and } h=4.5$	24.74
$sa r=1 \text{ and } h=4$	31.4159
$sa r=1.5 \text{ and } h=3$	42.4115
$sa r=2.5 \text{ and } h=1$	54.9779

Which tank would cost the least?

**Final Conclusion:** Look at the results and write down the conclusion here. Answer the three questions Leon needs to address.

Which tank should Leon choose? Justify.

As can be seen from unit conversions  $1 \text{ m}^3 = 1000 \text{ L}$

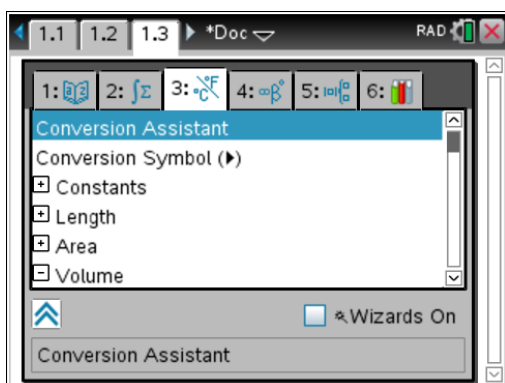
$1 \cdot \text{m}^3$	$1000 \cdot \text{l}$
$150 \cdot \text{ml}$	$0.00015 \cdot \text{m}^3$

$$1 L = 1000 \text{ cm}^3$$

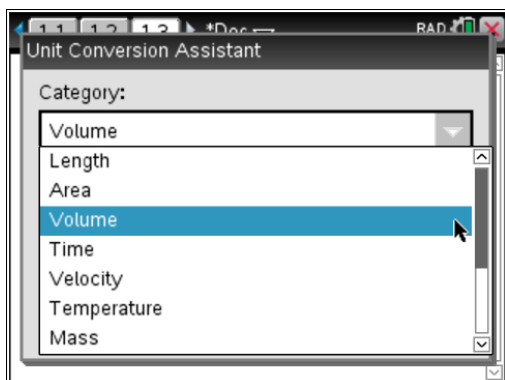
### MORE UNIT CONVERSIONS:

Many recipes give units in pints. Let's use the calculator to see what kind of capacity unit it is.

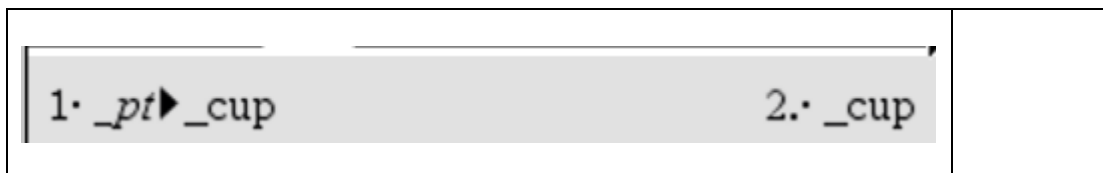
Go to Catalogue. Select 3: Conversion Assistant



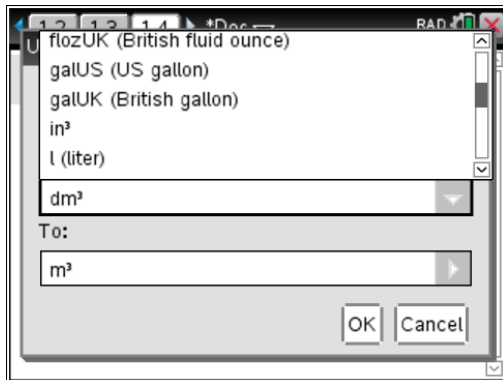
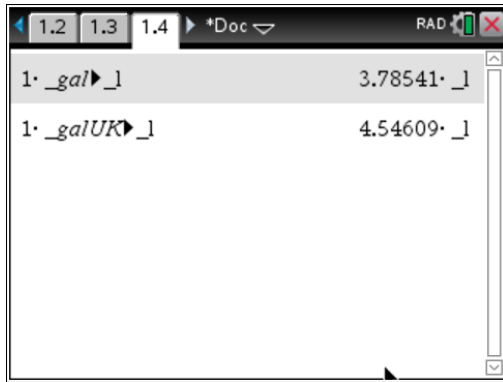
Select Volume:



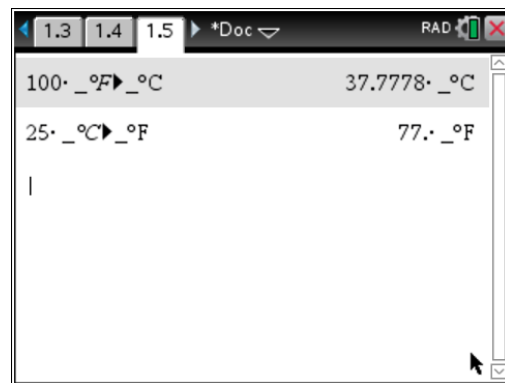
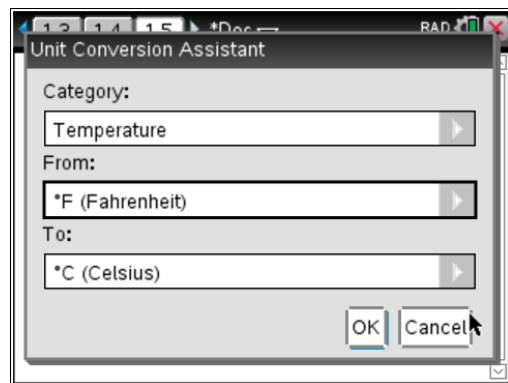
You will see on the bottom of the screen that 1 pint is about 2 cups. How many millilitres?



A few more examples are shown below. You may play with other capacity or unit conversions. For example some countries still sell petrol in gallons. Notice that Conversion Assistant lists galUS and galUK. See the comparison below:



**Temperature conversions:**



Investigate some more unit conversions of your interest.

**More ideas on converting units and using ratios:**

- Compare prices of petrol in Australia, UK and US.

The local price in New York is approximately **3.15 USD** per gallon US (April 2019)

**5.27 GBP** per gallon UK is the current price in UK.

Australia – about **1.40 AUD** per litre

Compare. Which country is most expensive?

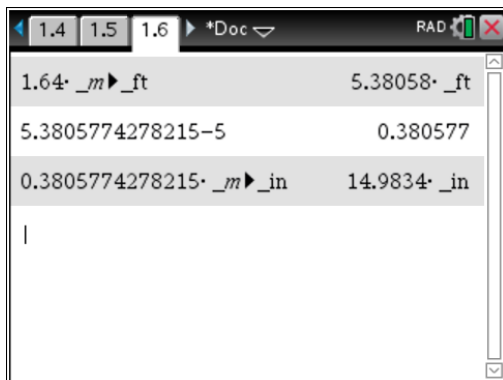
**Note:** Convert gallons to litres and convert currencies.

- Calculate your BMI index.

BMI index is defined as:

How to **calculate Body Mass Index**. **Body Mass Index** is a simple **calculation** using a person's height and weight. The **formula** is **BMI = kg/m<sup>2</sup>** where kg is a person's weight in kilograms and m<sup>2</sup> is their height in metres squared. A **BMI** of 25.0 or more is overweight, while the healthy range is 18.5 to 24.9.

- Calculate the BMI index of a US citizen who is 5 foot and 10 inches tall and weighs 196 pounds.
- Express your height in feet and inches.



1.8 · \_m ▶ \_ft

5.90551 · \_ft

1.9 · \_m ▶ \_ft

6.2336 · \_ft