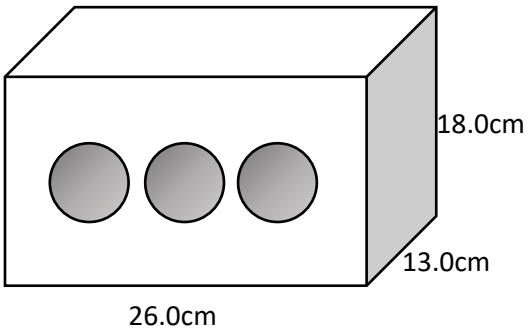
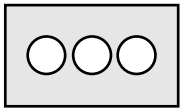
MEASUREMENT SENSE – SET 8 – PART 1

(A) *Can find the volume of a complex prism / cylinder by finding the end area.*

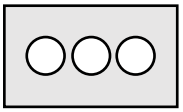
First find the area of the cross section, and then times by the depth

A concrete block has three equally sized holes, radius 4cm, drilled though it. Find the volume of the concrete



Volume =  x 

Area Depth

 =  18cm $-3 \times$  (πr^2)

Area 26cm r = 4cm

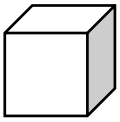
$= 468 - 3 \times \pi \times 4^2$
$= 468 - 150.796$ (3dp)
$= 317.204$ cm^2

Volume = Area × 13
= 4120 cm^2 (3sf)

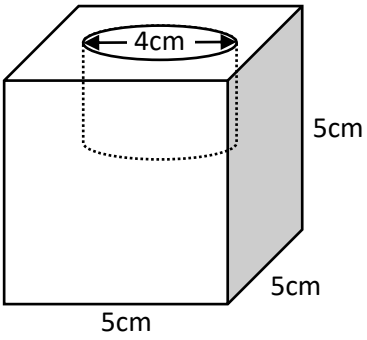
Note: final answer is rounded to 3sf as the original measurements were to 3sf
This is not the only valid reasoning, see section D for more on this.

(B) *Can find the volume of compound solids*

A 3d printer is creating a tea-light candle holder from polymer. It was in the shape of a cube with all sides 5cm. A circular hole of diameter 4cm and depth 2cm is removed for the candle to be placed. What is the volume of the polymer used to create the candle holder?

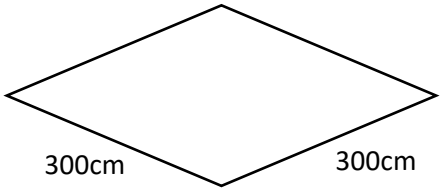
Volume =  - 

= Cube – Cylinder
= $5^3 - 2 \times \pi \times 2^2$
= 85.73 cm^2

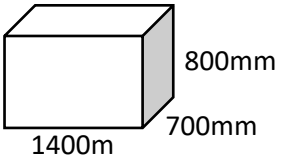


(C) *Can use area and volume conversions*

Know that when you are doing area conversions the multiplier is squared, volume the multiplier is cubed.



Area = 300cm × 300cm
= 90,000 cm^2
= 9 m^2 (90,000 ÷ 100^2) – as 100cm in 1m



Volume = 1400mm × 700mm × 800mm
= 784,000,000 mm^2
= 784,000 cm^3 (784,000,000 ÷ 10^3) – as 10mm in 1cm
= 784,000 mL = 784L (784,000 ÷ 1000) – as 1000mL in 1L
= 0.784 m^3 (784,000,000 ÷ 1000^3) – as 1000mm in 1m

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MEASUREMENT SENSE – SET 8 – PART 2

Know what appropriate rounding is required for solving contextual problems

Option 1: Rule of Thumb
Round to the next unit down… eg:
67.389cm would round to 67.4cm (674mm)
but 67.389m would round to 67.39m (6739cm)

Option 2: Accuracy of the measurements given
Answers found using students' own measurements are unlikely to be accurate for very small and very large measurements. Think about how accurate their measuring is likely to be. Also, if a question is given to the nearest whole number then it makes sense to give the solution to the same accuracy.

Option 3: Round so that sufficient quantity is given
If 39.463m^3 of concrete is required, then the student could use 40m^3 to make sure sufficient is ordered, or 39.5^3.

Option 4: Rounding due to earlier rounding
If part-way steps are rounded, then subsequent steps cannot be given to a higher level of precision than the step in the middle.

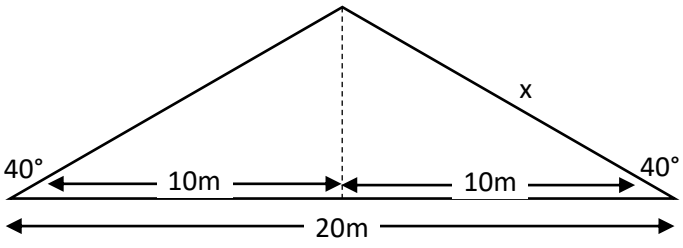
Students need to be able to justify their choice of rounding.

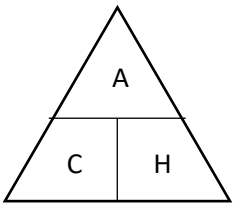
Use trigonometrical ratios in context

Many Marae use a pitched roof design. The maihi are the barge boards that come down each side. The tikotiko is where the maihi meet, and the Raparapa are the end of the maihi.

The design is symmetrical with each maihi (barge boards) being the same length. If the Raparapa (ends of the barge boards) are 20m apart, and they make a 40° angle to the horizontal, how long are the maihi?

Need to create two right angle triangles using





Maihi is the hypotenuse

$$M = \frac{10}{\cos 40°}$$

$$M = 13.05m\ (2dp)$$

Note: final answer is to 2dp as this would be the cm unit. It is unlikely to be any more accurate than this when measuring. This is not the only valid reasoning, see section D for more on this.

Photo of Marae from W. Bulach

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