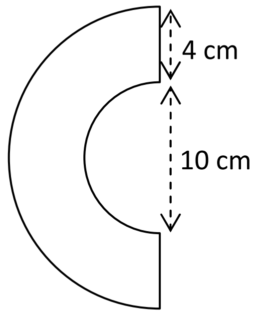
Extension Measurement Practice #1

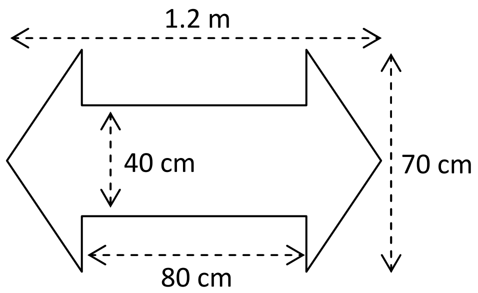
1. Calculate the area and perimeter of the C shape.
Include limits of accuracy in your calculations.



Area = ...

Perimeter = ...

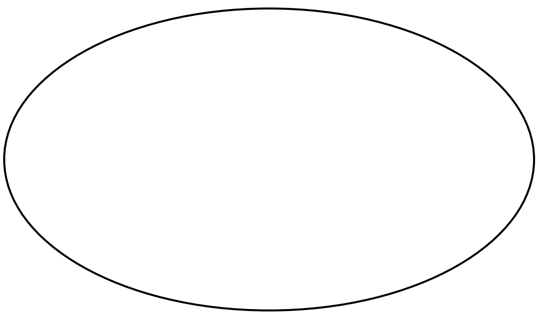
2. Calculate the area and perimeter of the double arrow shape.



Area = ...

Perimeter = ...

3. Measure the oval below and **estimate** its area.
Give an estimate of likely error.



Area = ...

4. A cuboid swimming pool is going to be made with a long side of 10 metres, a width of 6 metres and a depth of 1.8 metres. If the walls and floor are all to be 15 cm thick concrete, how much concrete will need to be poured in total?

Volume of concrete = ...

Answers: Extension Measurement Practice #1

	Area	Perimeter
1.	outer semicircle – inner semicircle	2 straight bits + outer and inner half circles
	$\frac{1}{2} \times \pi \times r_o^2 - \frac{1}{2} \times \pi \times r_i^2$	$4 + 4 + \frac{1}{2} \times \pi \times d_o + \frac{1}{2} \times \pi \times d_i$
	$\frac{1}{2} \times \pi \times 9^2 - \frac{1}{2} \times \pi \times 5^2 =$ **87.96 cm²**	$4 + 4 + \frac{1}{2}\pi \times 18 + \frac{1}{2}\pi \times 10 =$ **51.98 cm**

Max A and P when **outer** circle is max: $r_o = r_i + 4 \pm 0.5$ and $r_i = \frac{1}{2}(10 \pm 0.5) = 5 \pm 0.25$

Note: if $r_o = 9.75$, then $r_i = 5.25$ – it cannot be its minimum of 4.75 and still give maximum r_o.

$\frac{1}{2} \times \pi \times 9.75^2 - \frac{1}{2} \times \pi \times 5.25^2 = 106.03$ cm²	$4.5 + 4.5 + \frac{1}{2}\pi \times 19.5 + \frac{1}{2}\pi \times 10.5 = 56.12$ cm
$\frac{1}{2} \times \pi \times 8.25^2 - \frac{1}{2} \times \pi \times 4.75^2 = 71.47$ cm²	$3.5 + 3.5 + \frac{1}{2}\pi \times 16.5 + \frac{1}{2}\pi \times 9.5 = 47.84$ cm
71.5 < area < 106 cm²	**= 52.0 ± 4.2 cm**

	Area	Perimeter
2.	rectangle + 2 triangles	2 horizontals + 4 verticals + 4 angle lengths
	$b \times h + 2 \times \frac{1}{2} \times b \times h$	$2 \times 80 + 4 \times 15 + 4 \times \sqrt{a^2 + b^2}$ (Pythagoras)
	$80 \times 40 + 2 \times \frac{1}{2} \times 70 \times \frac{1}{2}(120 - 80)$	$2 \times 80 + 4 \times 15 + 4 \times \sqrt{20^2 + 35^2}$
	= **4600 cm²**	= **381.2 cm**

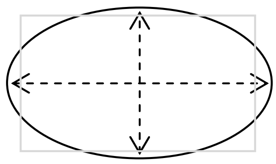
3. Long axis = 7 cm and short axis is 4 cm.

We could average a circle of the large diameter and a circle of the small diameter.

Area $= \frac{1}{2} \times (\pi \times r_L^2 + \pi \times r_S^2) = \frac{1}{2} \times (\pi \times 3.5^2 + \pi \times 2^2) = 25.5$ cm²

We could average a rectangle big enough to fit the circle and a diamond that fits inside.

Area $= \frac{1}{2} \times (7 \times 4 + \frac{1}{2} \times 7 \times 4) = 21$ cm²



We could draw a rectangle by eye that averages out what is left in and what is left out (as for light grey one shown)

Allowing for measurement errors as well, **area = 23 ± 3 cm²**

(The actual answer is $\pi \times r_L \times r_S = \pi \times 3.5 \times 2 =$ **22 cm²**)

4. Easiest way is to take the inner volume away from outer (it avoids the duplication at the corners if you take all the surface areas and multiply them by 15 cm thickness).

Outside volume $= (10 + 2 \times 0.15) \times (6 + 2 \times 0.15) \times (1.8 + 1 \times 0.15) = 126.5$ m²

Inside volume $= 10 \times 6 \times 1.8 = 108$ m³ volume

Difference = **18.5 m³ of concrete**