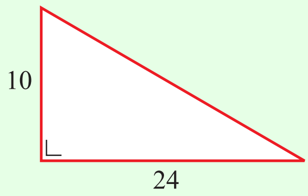
Area & Volume (Q 1, Paper 2)

2007

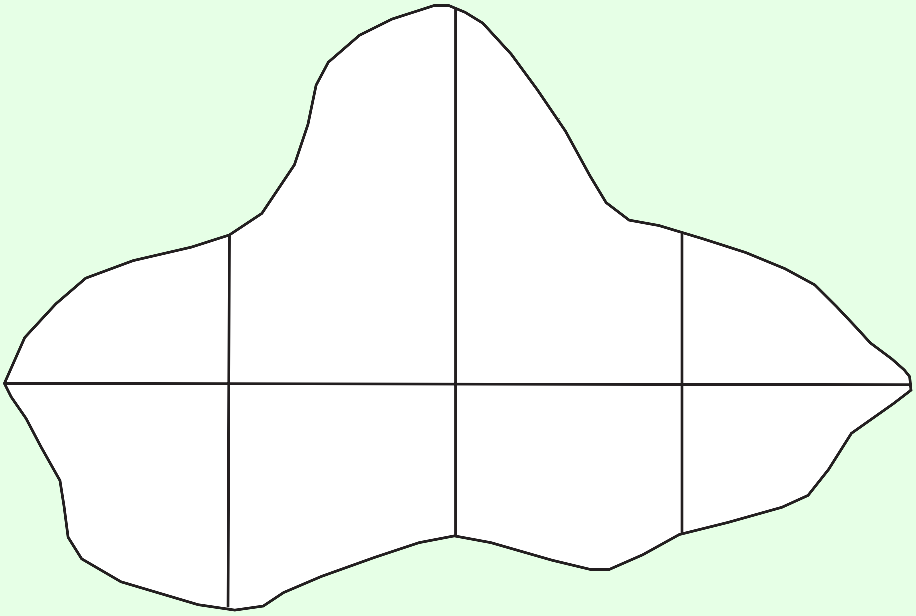
1 (a) The right-angled triangle shown in the diagram has sides of length 10 cm and 24 cm.



(i) Find the length of the third side.

(ii) Find the length of the perimeter of the triangle.

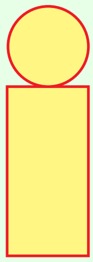
(b) In order to estimate the area of the irregular shape below, a horizontal line is drawn across the widest part of the shape and three offsets (perpendicular lines) are drawn at equal intervals along this line.



(i) Measure the horizontal line and the offsets, in centimetres.
Make a rough sketch of the shape in your answerbook and record the measurements on it.

(ii) Use Simpson's Rule with these measurements to estimate the area of the shape.

(c) A team trophy for the winners of a football match is in the shape of a sphere supported on a cylindrical base, as shown.
The diameter of the sphere and of the cylinder is 21 cm.



(i) Find the volume of the sphere, in terms of π.

(ii) The volume of the trophy is $6174\pi\ \text{cm}^3$.
Find the height of the cylinder.

SOLUTION

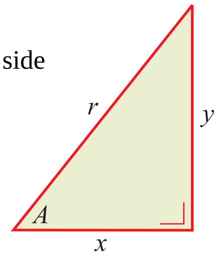
1 (a) (i)

3. **RIGHT-ANGLED TRIANGLES**

PYTHAGORAS

One of the angles in a right-angled triangle is 90°. The side opposite this angle is called the **hypotenuse**.
Pythagoras' theorem applies to right-angled triangles.

$x^2 + y^2 = r^2$ 3



$r^2 = 10^2 + 24^2$

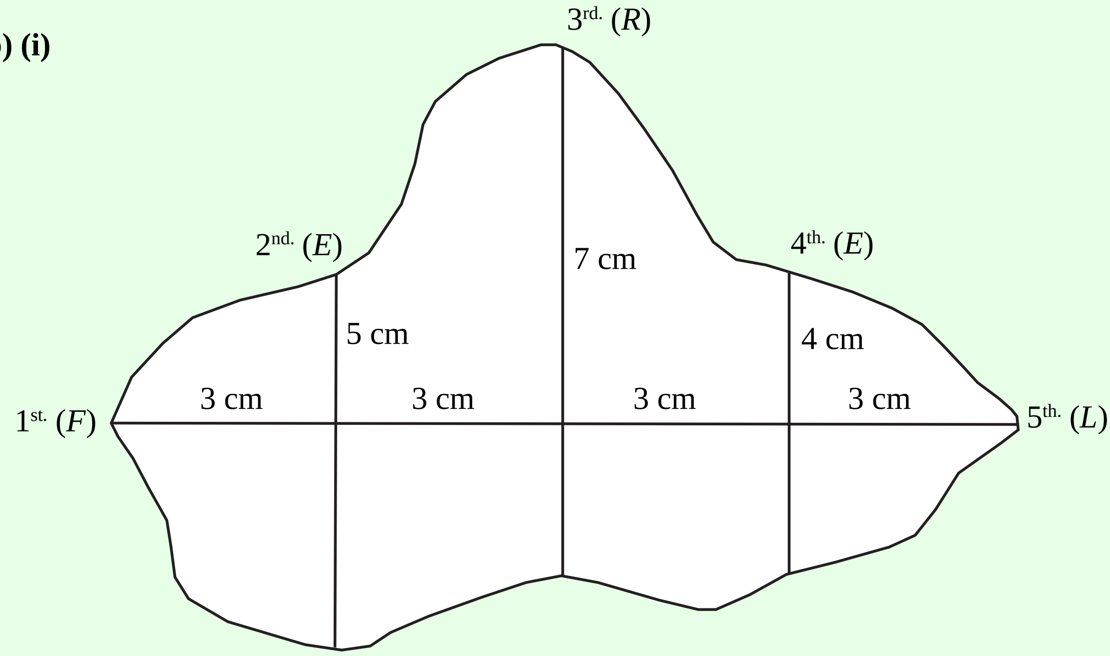
$\Rightarrow r^2 = 100 + 576 = 676$

$\therefore r = \sqrt{676} = 26$

1 (a) (ii)

Perimeter P = 10 cm + 24 cm + 26 cm = 60 cm

1 (b) (i)



1 (b) (ii)

$A \approx \frac{h}{3}$ [(First + Last) + 4(Evens) + 2(Remaining Odds)]...... 11

h = 3 cm

First = Last = 0 cm

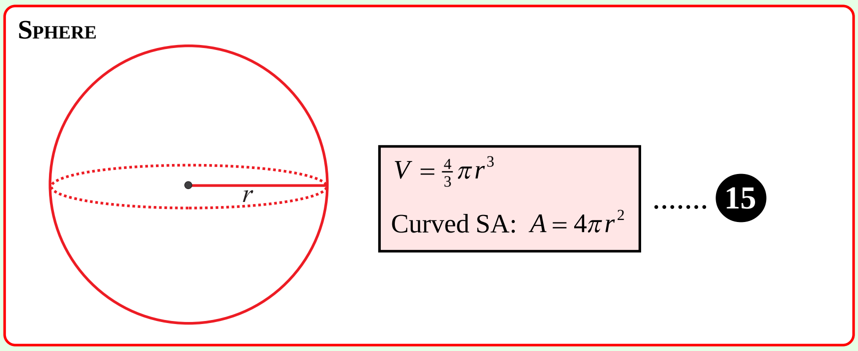
$A = \frac{3}{3}[(0+0)+4(5+4)+2(7)]$

$\Rightarrow A = 1[4(9)+2(7)]$

$\Rightarrow A = [36+14]$

$\therefore A = 50 \text{ cm}^2$

1 (c) (i)

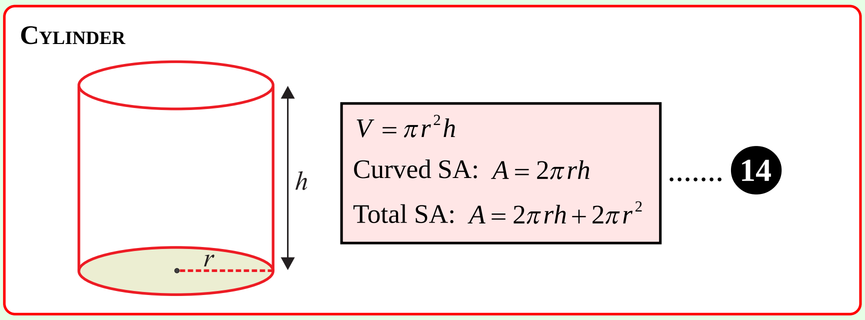


$r = \frac{21}{2}$ cm

$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(\frac{21}{2})^3$

$\therefore V = 1543.5\pi \text{ cm}^3$

1 (c) (ii)



Volume of trophy = Volume of sphere + Volume of cylinder

$\therefore$ Volume of sphere = Volume of trophy – Volume of cylinder

$= 6174\pi - 1543.5\pi = 4630.5\pi \text{ cm}^3$

CYLINDER:

$V = 4630.5\pi \text{ cm}^3$

$r = \frac{21}{2}$ cm

$V = \pi r^2 h \Rightarrow h = \dfrac{V}{\pi r^2}$

$\therefore h = \dfrac{4630.5\pi}{\pi(\frac{21}{2})^2} = 42 \text{ cm}$