Perimeter area and volume

volume - L × W × H

= 5 × 5 × 5

= 125

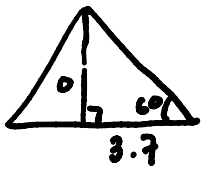
Perimeter = Add all 4 sides

12+12+6+6= 36

Area = Multiply 2 touching sides

12 × 6=72

22 Find the area of a regular hexagon with side length 7.4 cm.



$\tan 60 = \frac{o}{3.7}$

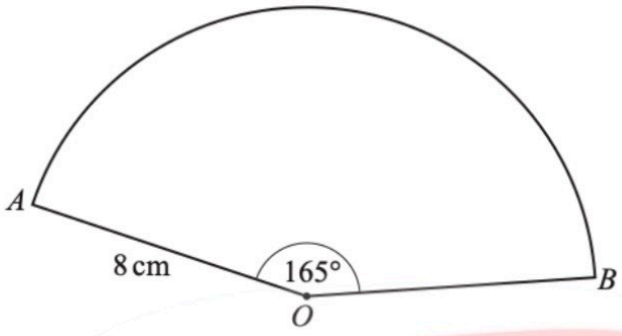
$o = 6.41$ cm

Area $\Delta = \frac{1}{2} \times 7.4 \times 6.41$

$= 23.717 \times 6$

142.3 ..... cm^2 [3]

9



NOT TO SCALE

The diagram shows a sector of a circle with centre O, radius 8 cm and sector angle 165°.

(a) Calculate the total perimeter of the sector.

$\frac{165}{360} \times 2\pi r = 23.04$

39.04 ..... cm [3]

(b) The surface area of a sphere is the same as the area of the sector.

Calculate the radius of the sphere.
[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

$4\pi r^2 = \frac{165}{360} \times \pi r^2$

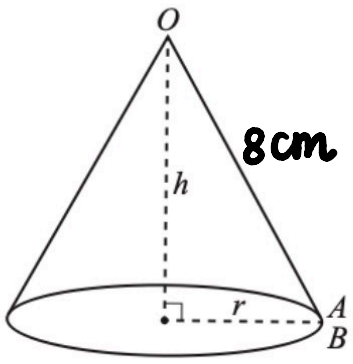
$r^2 = \frac{88}{3}\pi \div 4\pi$

$= \frac{22}{3}$

$r = 2.71$

2.71 ..... cm [4]

(c)



NOT TO SCALE

A cone is made from the sector by joining OA to OB.

(i) Calculate the radius, r, of the cone.

$2\pi r = 23.04$

$r = 3.67$ cm

$r =$ 3.67 cm [2]

(ii) Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$h = \sqrt{64 - 3.67^2}$

$= 7.11$ cm

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times 3.14 \times 3.67^2 \times 7.11 = 100.2\ cm^3$

100.2 cm^3 [4]

(b) A cylinder with radius 6 cm and height h cm has the same volume as a sphere with radius 4.5 cm.

Find the value of h.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$\pi r^2 h = \frac{4}{3}\pi r^3$

$36h = \frac{4}{3} \times (4.5)^3$

$h = 3.375$

$h =$ 3.375 cm [3]

(c) A solid metal cube of side 20 cm is melted down and made into 40 solid spheres, each of radius r cm.

Find the value of r.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

40 sphere = V of cube = $8000\ cm^3$

1 sphere = $\frac{8000}{40} = 200\ cm^3$

$\frac{4}{3}\pi r^3 = 200$

$\pi r^3 = \frac{600}{4}$

$r^3 = \frac{150}{\pi}$

$r = 3.63$

$r =$ 3.63 cm [3]

(d) A solid cylinder has radius x cm and height $\frac{7x}{2}$ cm.

The surface area of a sphere with radius R cm is equal to the total surface area of the cylinder.

Find an expression for R in terms of x.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

$4\pi R^2 = 2\pi x^2 + 2\pi x \times \frac{7x}{2}$

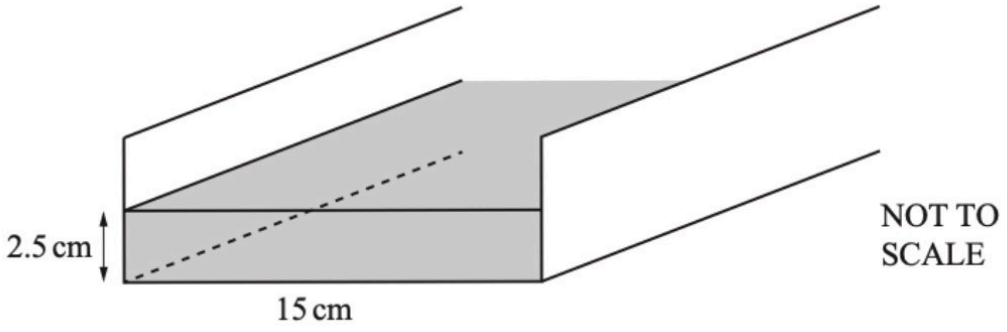
$4R^2 = 2x^2 + 7x^2$

$R = \frac{9x^2}{4}$

$R = \frac{3}{2}x$

$R =$ $\frac{3x}{2}$ cm [3]

(b)



Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
The width of the channel is 15 cm.
The depth of the water is 2.5 cm.

Calculate the amount of water that flows from the channel into the lake in 1 hour.
Give your answer in litres.

V for 1 sec = $20 \times 15 \times 2.5$
$= 750 \text{ cm}^3$

1 hour = 750×3600
$= 2700000 \text{ cm}^3$
$= 2700 \text{ l}$

2700 ..... litres [4]

4 A solid metal cone has radius 1.65 cm and slant height 4.70 cm.

(a) Calculate the **total** surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

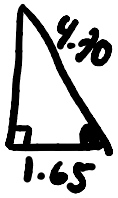
$\pi r^2 + \pi rl$

$= \pi \times (1.65^2 + 1.65 \times 4.70)$

$= 32.9$

32.9 ..... cm^2 [2]

(b) Find the angle the slant height makes with the base of the cone.



$\cos\theta = \frac{1.65}{4.7}$

$\theta = 69.4$

69.4 ..... [2]

(c) **(i)** Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$h = \sqrt{4.7^2 - 1.65^2}$

$= 4.4$

$V = \frac{\pi r^2 h}{3} = \frac{\pi \times 1.65^2 \times 4.4}{3}$

$= 12.5$

12.5 ..... cm^3 [4]

(ii) A metal sphere with radius 5 cm is melted down to make cones identical to this one.

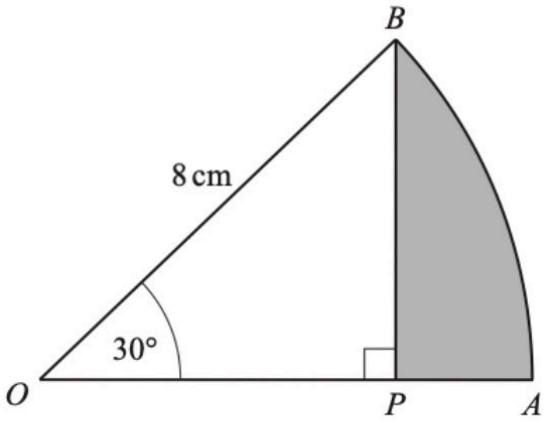
Calculate the number of complete identical cones that are made.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$V_{sphere} = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 5^3$

$= 523.6$

no of cones = 41 cones

21



NOT TO SCALE

OAB is the sector of a circle, centre *O*.
OB = 8 cm and angle *AOB* = 30°.
BP is perpendicular to *OA*.

(a) Calculate *AP*.

$\cos 30° = \frac{OP}{8}$

$OP = 6.93$

$AP = 8 - 6.93$

$= 1.07$

AP = 1.07 cm [3]

(b) Work out the area of the shaded region *APB*.

A of $\triangle = \frac{30}{360} \times \pi r^2$

$= \frac{1}{12} \times \pi \times 8^2$

$= 16.76 \text{ cm}^2$

A of $\triangle = \frac{1}{2} \times a \times b \times \sin C$

$= \frac{1}{2} \times 6.93 \times 8 \times \sin 30°$

$= 13.86$

2.9 cm² [3]

shaded = 2.9