1. Calculate the area of the following shapes. (All units are in centimetres.)
   (a)   (b)
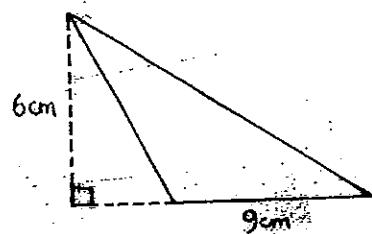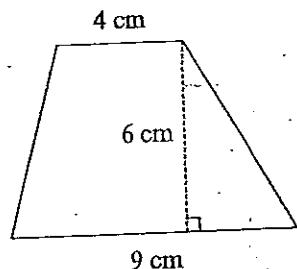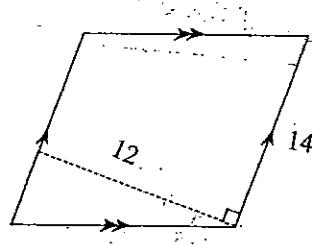
   (c)   (d)
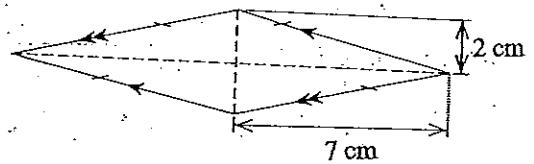
2. In the diagrams below, calculate the perimeter of each area.
   (All units are in centimetres, and use $\pi \doteqdot \frac{22}{7}$.)
   (a)   (b)
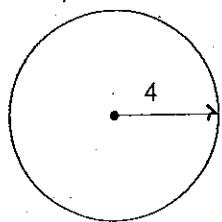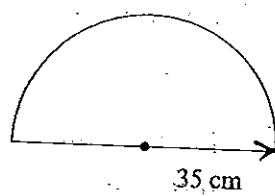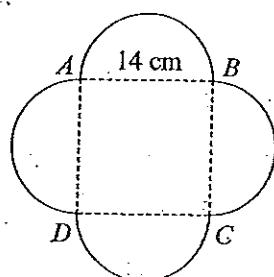
   (c)   (d)
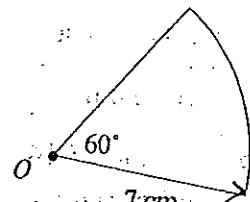
3. In the diagrams below, calculate the area of the shaded region. Leave your answer in terms of π. All units are in centimetres.

(a)

cm   6 cm

(b)

10 cm
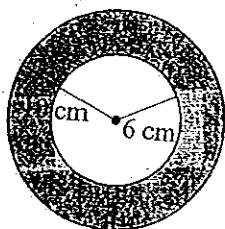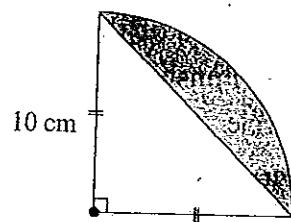
4. Calculate the volume of the following solids. (All units are in centimetres. Use $\pi = 3$.)

(a)

10 cm

3 cm

6 cm

(b)

7 cm

9 cm

(c)

8

30

3

10   3.2

(d)

8 cm

6 cm
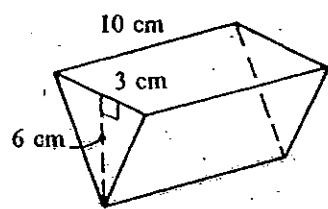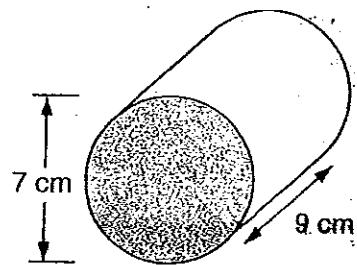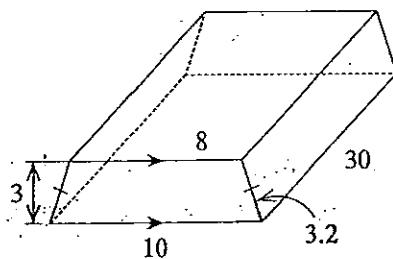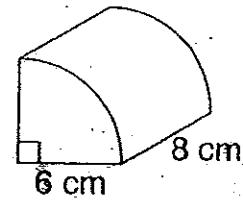
5. Calculate the surface area of the solid in the diagram below.

6 cm

12 cm

8 cm
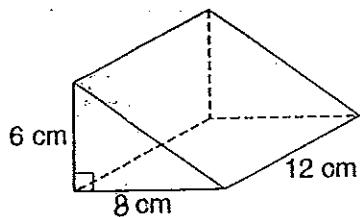
6.
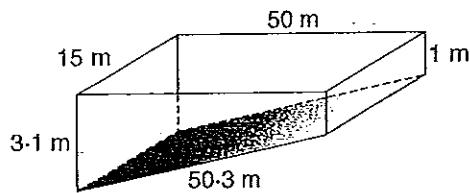
A swimming pool has the shape of a trapezoidal prism as shown in the diagram.

(a) Calculate the volume of the pool in cubic metres.

(b) Find how far the water level will be from the top of the pool if the pool is three quarters full.

7.
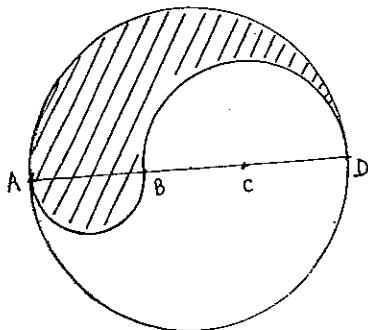
$ABCD$ is a diameter of a circle. All arcs are semi-circles and $AB = BC = CD$. If $AD = x$ cm, find the perimeter of the shaded figure.
(Give your answer in terms of x and π.)

8.
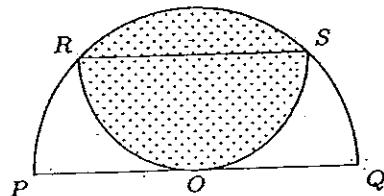
In the figure above, the curves $PRSQ$ and ROS are both sem-circles. RS is parallel to PQ and $\angle ROS = 90°$. If the radius of the larger semi cicle is 1 metre, find the area of the shaded region in terms of π.

QUESTION 1

(a) $A = \frac{1}{2}bh$ ✓

$= \frac{1}{2} \times 6 \times 9$

$= 27\ cm^2$ ✓

(b) $A = lb$ ✓

$A = 12 \times 14$

$A = 168\ cm^2$ ✓

(c) $A = \frac{h}{2}(a+b)$ ✓

$A = \frac{6}{2}(4+9)$

$A = 39\ cm^2$ ✓

(d) $A = \frac{1}{2}xg$ ✓

$A = \frac{1}{2} \times 4 \times 14$ ⟨8⟩

$A = 28\ cm^2$ ✓

QUESTION 2

(a) $P = 2\pi r$

$P = 2 \times \frac{22}{7} \times 4$ ✓

$P = \frac{176}{7}$

$P = 25\frac{1}{7}\ cm$ ✓

(b) $P = \pi r + 2r$ ✓

$P = \frac{22 \times 35}{7} + 70$

$P = 110 + 70$

$P = 180\ cm$ ✓

(c) $P = 4\pi r$

$P = \frac{4 \times 22 \times 7}{7}$ ✓

$P = 88\ cm$ ✓

(d) $P = 2r + \frac{60}{360} \times 2\pi r$ ✓

$P = 14 + \frac{1}{6} \times 2 \times \frac{22}{7} \times 7$

$P = 14 + \frac{44}{6}$

$P = 14 + 7\frac{1}{3}$ ⟨8⟩

$P = 21\frac{1}{3}\ cm$ ✓

QUESTION 3

(a) $A = \pi(R^2 - r^2)$ ✓

$A = \pi(100 - 36)$

$A = 64\pi\ cm^2$ ✓

(b) $A = \frac{\pi r^2}{4} - \frac{1}{2}bh$ ✓   ⟨4⟩

$A = \frac{100\pi}{4} - \frac{1}{2} \times 10 \times 10$

$A = 25\pi - 50\ cm^2$ ✓

QUESTION 4

(a) $A = \frac{1}{2}bh$

$A = \frac{1}{2} \times 3 \times 6$ ✓

$A = 9\ cm^2$

$V = Ah$

$V = 9 \times 10$

$V = 90\ cm^3$ ✓

(b) $V = \pi r^2 h$

$\simeq \pi \times (3.5)^2 \times 9$ ✓

$= 110.25\pi$

$V = 330.75\ cm^2$ ✓

Q4 ...

(c)

$$A = \frac{h}{2}(a+b)$$

$$A = \frac{3}{2}(10+8) \checkmark$$

$$A = 27 \text{ cm}^2$$

$$V = A \cdot l$$

$$V = 27 \times 30$$

$$V = 810 \text{ cm}^3 \checkmark \quad \text{⑧}$$

(d)
$$V = \frac{1}{4}\pi r^2 l$$

$$V = \frac{1}{4}\pi \times 36 \times 8 \checkmark$$

$$V = 72\pi$$

$$V \doteq 216 \text{ cm}^3 \checkmark$$

QUESTION 5

$$SA = 10 \times 12 + 12 \times 8$$
$$+ 6 \times 12 + \frac{1}{2}bh \checkmark\checkmark$$

$$= 12(10+8+6) + \frac{1}{2} \times 8 \times 6 \times 2$$
$$= 288 + 48 \checkmark$$
$$= 336 \text{ cm}^2 \checkmark \quad \text{④}$$

QUESTION 6

(a)

$$A = \frac{h}{2}(a+b)$$

$$A = \frac{50}{2}(3.1+1) \checkmark$$

$$A = 25 \times 4.1$$
$$A = 102.5$$
$$V = A \times 15$$
$$V = 1,537.5 \text{ m}^3 \checkmark$$

(b) Let the level be x m from the top of the pool.
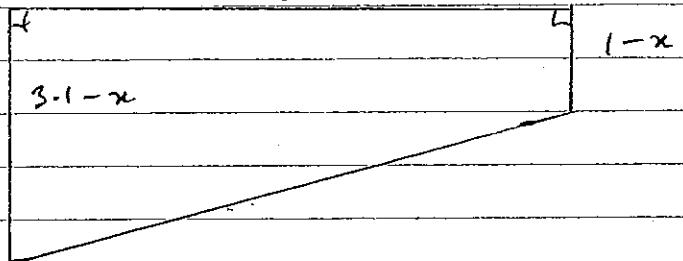
$$A = 25(3.1-x+1-x)$$
$$V = 25(4.1-2x) \times 15$$

now

$$\frac{3}{4}V = 25(4.1) \times 15 \times \frac{3}{4} \checkmark$$

$$25(4.1-2x) \times 15 = \frac{3 \times 15 \times 25(4.1)}{4}$$

$$4(4.1-2x) = 3(4.1)$$
$$4 \times 4.1 - 8x = 3 \times 4.1$$
$$4.1 = 8x$$
$$x = 0.5125 \checkmark \quad \text{④}$$

The water level is 51.25 cm from the top of the pool.

QUESTION 7

$$\text{Perimeter} = \pi R_1 + \pi R_2 + \pi R_3$$
$$= \pi \left(R_1 + R_2 + R_3 \right) \checkmark$$
$$= \pi \left(\frac{x}{2} + \frac{x}{3} + \frac{x}{6} \right)$$
$$= \pi \left(\frac{(3 + 2 + 1)x}{6} \right)$$
$$= \pi x \quad \text{cm.} \checkmark \quad \textcircled{2}$$

QUESTION 8

Area of segment:
$$= \text{quadrant} - \triangle$$
$$= \frac{\pi r^2}{4} - \frac{1}{2} bh$$
$$= \frac{\pi}{4} - \frac{1}{2} \quad m^2 \checkmark$$
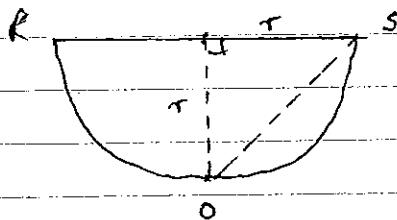
$$r^2 + r^2 = 1 \quad (\text{Pythagoras'})$$
$$2r^2 = 1$$
$$r^2 = \frac{1}{2}$$
$$r = \frac{1}{\sqrt{2}}$$
$$r = \frac{\sqrt{2}}{2} \, m.$$

Now area of semi-circle
$$ORS = \frac{\pi r^2}{2}$$
$$= \frac{\pi}{2} \times \frac{1}{2}$$
$$= \frac{\pi}{4} \, m^2$$

Total area =
A segment + A semi-circle
$$\frac{\pi}{4} - \frac{1}{2} + \frac{\pi}{4}$$
$$= \frac{\pi}{2} - \frac{1}{2}$$
$$= \frac{1}{2} (\pi - 1) \quad m^2 \checkmark \quad \textcircled{4}$$