I.G.C.S.E. Area & Volume

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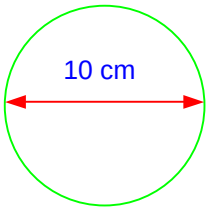
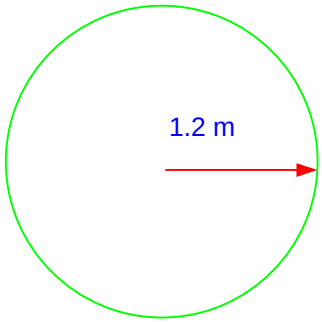
Question 1

1. Find for the following circles

a. the circumference

b. the area.





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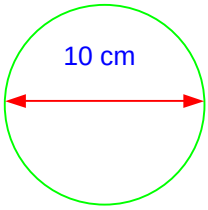
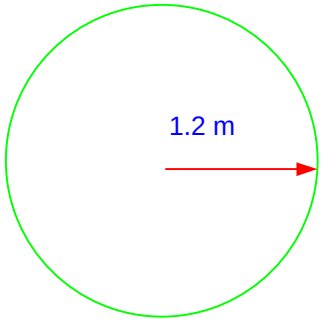
Solution to question 1





a.

The circumference of the circle is given by $C = \pi d$, where d is the diameter and $\pi = 3.142$.

$$C = \pi d$$
$$= \pi \times 10$$
$$= 31.4\,\text{cm}$$

The circumference of the circle is given by $C = 2\pi r$, where r is the radius and $\pi = 3.142$.

$$C = 2\pi r$$
$$= 2 \times \pi \times 1.2$$
$$= 7.54\,\text{m}$$

b.

The area of a circle is given by $A = \pi r^2$, where $r = \frac{d}{2}$.

$$r = \frac{d}{2} = \frac{10}{2} = 5\,\text{cm}$$
$$A = \pi r^2 = \pi \times 5 \times 5$$
$$= 78.5\,\text{cm}^2$$

The area of a circle is given by $A = \pi r^2$.

$$A = \pi r^2$$
$$= \pi \times 1.2 \times 1.2$$
$$= 4.52\,\text{m}^2$$

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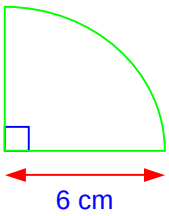
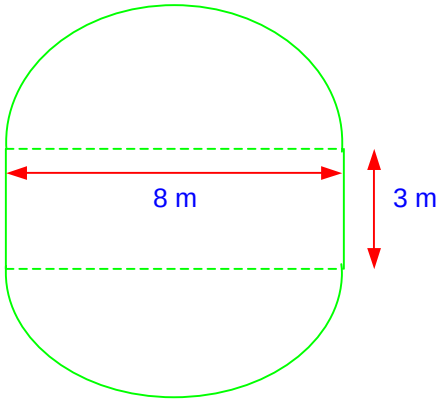
Question 2

2. For the following shapes find:

a. the perimeter

b. the area.





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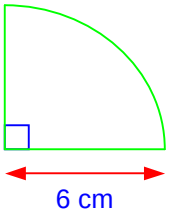
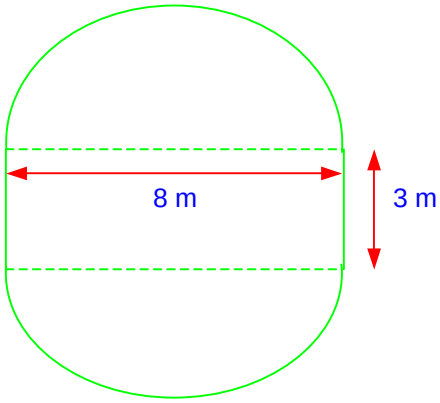
Solution to question 2





a. The perimeter is given by

$$P = 6 + 6 + \frac{1}{4} \text{ of circumference}$$
$$= 6 + 6 + \frac{1}{4} \times 2\pi r$$
$$= 12 + \frac{1}{4} \times 2 \times \pi \times 6$$
$$= 21.4\,\text{cm}$$

The perimeter is given by

$$P = 3 + 3 + \text{ circumference of circle}$$
$$= 3 + 3 + \pi d$$
$$= 6 + \pi \times 8$$
$$= 31.1\text{m}$$

b. The area is given by

$$A = \frac{1}{4} \times \pi r^2$$
$$= \frac{1}{4} \times \pi \times 6 \times 6$$
$$= 28.3\,\text{cm}^2$$

The area is given by

$$A = \text{ area of rectangle } + \text{ area of circle}$$
$$= bh + \pi r^2$$
$$= 8 \times 3 + \pi \times 4 \times 4 \quad \text{(Note: } r = 4\text{)}$$
$$= 74.3\,\text{m}^2$$

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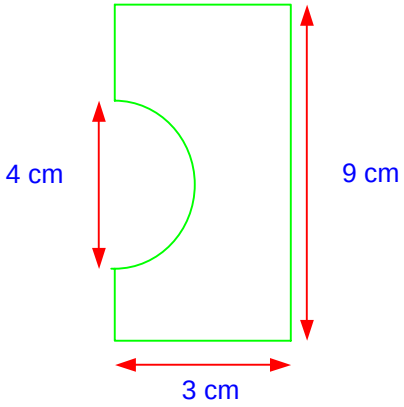
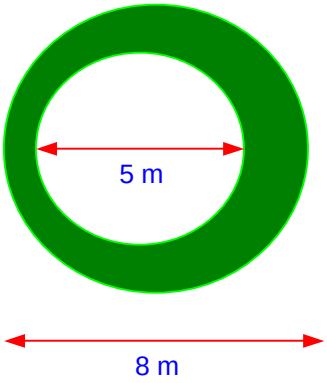
Question 3

3. **a.** Find the area. **b.** Find the shaded area





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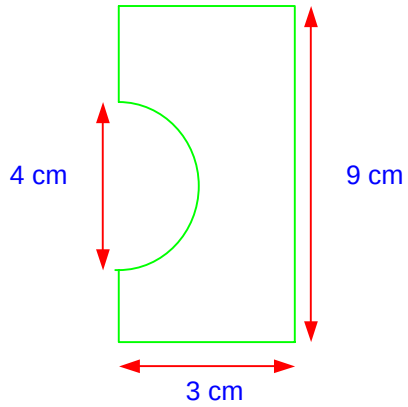
Solution to question 3

a.



The area is given by

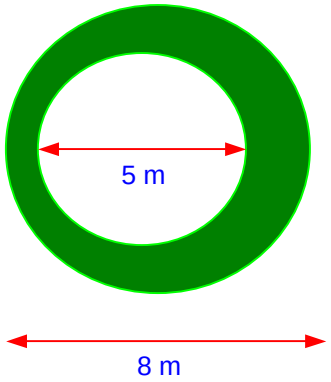
$A =$ area of rectangle - area of semicircle

$= bh - \frac{1}{2} \times \pi r^2$

$= 3 \times 9 - \frac{1}{2} \times \pi \times 2 \times 2$ (Note: $r = 2$)

$= 20.7\,\text{cm}^2$

b.



The shaded area is given by

$A =$ area of large circle

- area of small circle

$= \pi R^2 - \pi r^2$ (Note: $R = 8, r = 5$)

$= \pi \times 8 \times 8 - \pi \times 5 \times 5$

$= 123\,\text{m}^2$

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Question 4

4. The circumference of a circular pond is 44 m long.
Find:

a. the diameter of the pond
b. the radius of the pond
c. the area of the pond.

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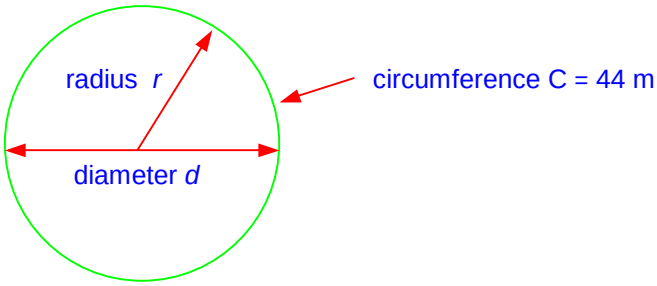
Solution to question 4



a. $C = \pi d$

$44 = \pi d$

$\frac{44}{\pi} = d \quad d = 14.0\,\text{m}$

b. $r = \frac{d}{2}$

$= \frac{14.0}{2}$

$= 7\,\text{cm}$

c. $A = \pi r^2$

$= \pi \times 7 \times 7$

$= 154\,\text{cm}^2$

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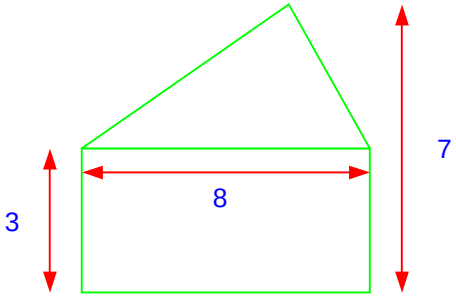
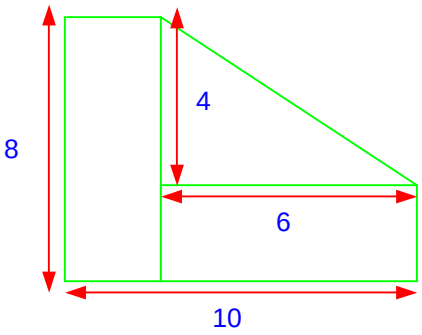
Question 5

5. Find the area of the following shapes. All lengths are in cm.

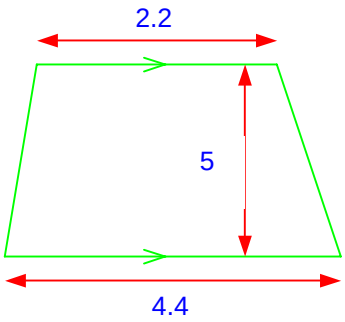
a.



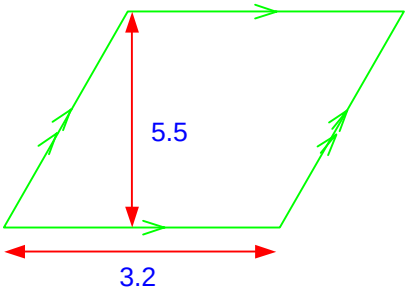
b.



c.



d.



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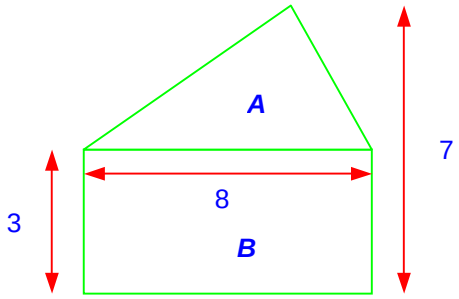
Solution to question 5

a.



Area of triangle A is given by

$$A=\frac{1}{2}bh=\frac{1}{2}\times 8\times(7-3)$$

$$=\frac{1}{2}\times 8\times 4=16\,\text{cm}^2$$

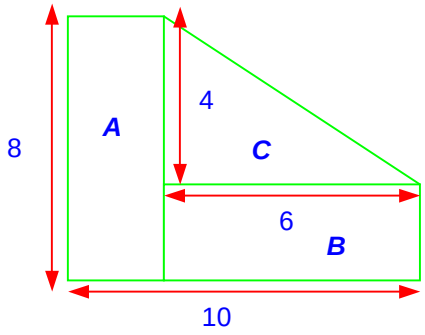
Area of rectangle B is given by

$$A=bh=8\times 3=24\,\text{cm}^2$$

Total area = area A + area B

$$=16+24=40\,\text{cm}^2$$

b.



Area of rectangles A and B

$$A=(10-6)\times 8+6\times(8-4)$$

$$=4\times 8+6\times 4=56\,\text{cm}^2$$

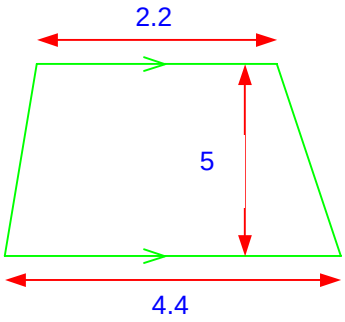
Area of triangle C is given by

$$A=\frac{1}{2}bh=\frac{1}{2}\times 6\times 4=12\,\text{cm}^2$$

Total area = area A + area B + area C

$$=56+12=68\,\text{cm}^2$$

c.

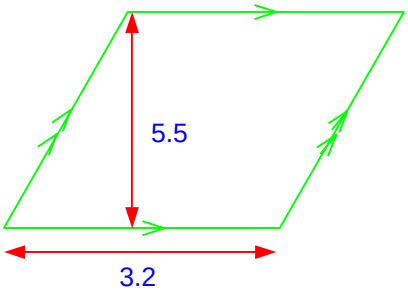


Area of a trapezium $=\frac{1}{2}(a+b)h$

$$=\frac{1}{2}\times(2.2+4.4)\times 5$$

$$=16.5\,\text{cm}^2$$

d.



Area of parallelogram $=bh$

$$=3.2\times 5.5$$

$$=17.6\,\text{cm}^2$$

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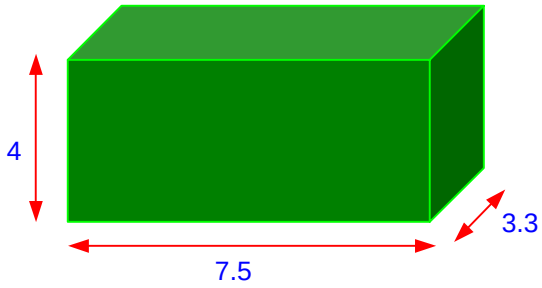
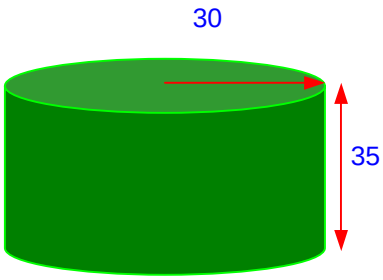
Question 6

6. Find the volume of the following shapes. All lengths are in m.

a.



b.



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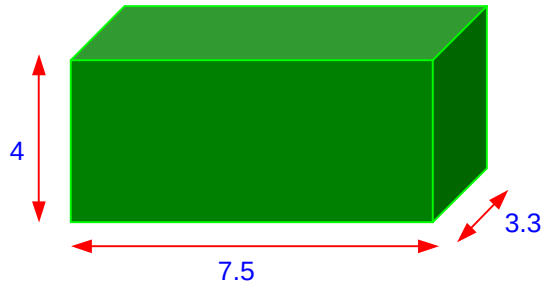
Solution to question 6

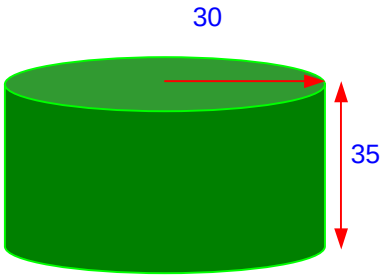
a.



Volume of cuboid is given by

$$V = lbh$$
$$= 7.5 \times 3.3 \times 4$$
$$= 99\,\text{m}^3$$

b.



Volume of a cylinder is given by

$$V = \pi r^2 h$$
$$= \pi \times 30 \times 30 \times 35$$
$$= 98960 \approx 99000\,\text{m}^3 \text{ (to 3 s.f.)}$$

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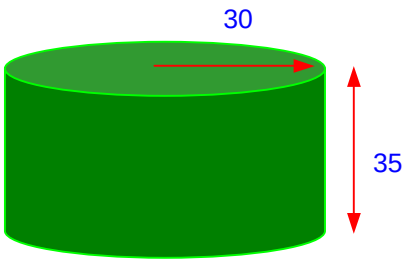
Question 7

7. The cylinder of **6**, part **b** is to be made from cardboard.



a. Draw the net needed to make the shape

b. Calculate the surface area. The surface area is the area of cardboard needed to make the shape.

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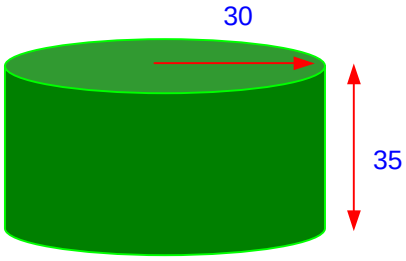
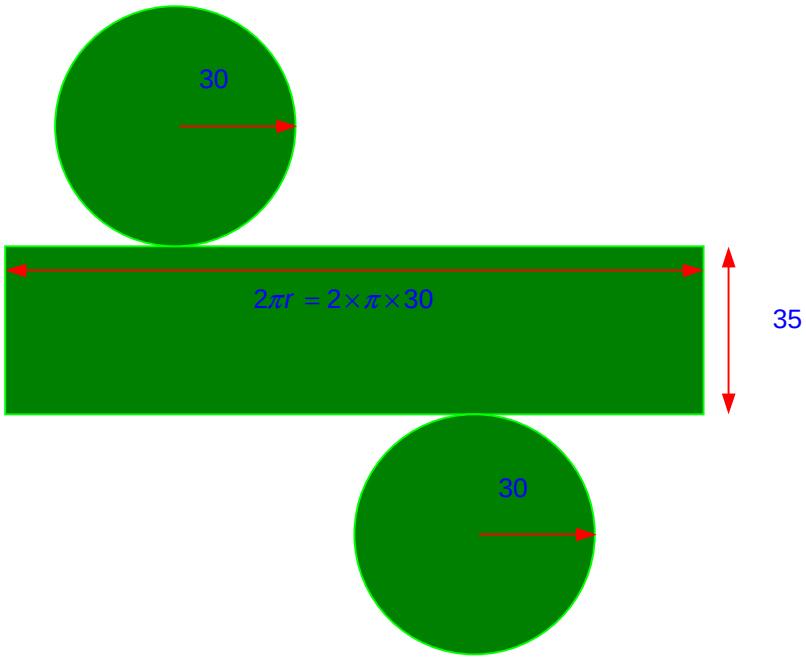
Solution to question 7



Drawing the net



The area of the net is $2\times$ area of a circle + area of the rectangle.

The length of the rectangle is the same as the circumference $= 2\pi r$

$$\begin{aligned} SA &= 2\pi r^2 + 2\pi rh \\ &= 2\times\pi\times 30\times 30 + 2\times\pi\times 30\times 35 \\ &= 12252\,\text{m}^2 \approx 12300\,\text{m}^2 \quad \text{(to 3 s.f.)} \end{aligned}$$

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