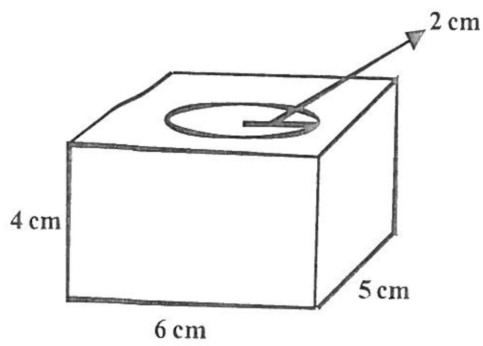
Worksheet 2015-11ƐI-00003(2)

(1) The sketch is an illustration of a wooden block, that forms part of a set of toys, with a cylindrical hole in the middle. The block should be painted with one layer of lead-free paint
Calculate: (Correct to 1 dec.)
(a) The volume of wood needed for this block expressed in mm^3.
(b) The total surface area of the block that should be painted.



(a) Volume prism $= L \times B \times H$
$= 6 \times 5 \times 4$
$= 120 \text{ cm}^3$
Volume cylinder $= \pi r^2 H$
$= \pi (2)^2 (4)$
$= 50{,}265\text{---} \text{ cm}^3$
$\therefore$ Volume block $= 120 - 50{,}265\text{---}$
$\approx 69{,}7 \text{ cm}^3$

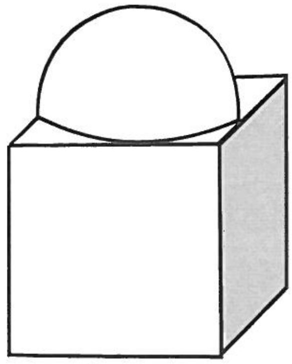
(b) Surf. area prism $= 2LH + 2LB + 2BH$
$= 2(6)(4) + 2(6)(5) + 2(5)(4)$
$= 148 \text{ cm}^2$
Surf. area cylinder $= 2\pi r(r + H)$
$= 2\pi(2)(4+2)$
$= 75{,}398\text{---} \text{ cm}^2$
$\therefore$ Total surf. area to be painted:
$= 148 + 75{,}398\text{---} - (2 \times \pi r^2) \rightarrow$ 2 circles
$= 223{,}398\text{---} - (2 \times \pi \times 2^2)$
$= 198{,}265\text{---}$
$\approx 198{,}3 \text{ cm}^2$

(2) A semi sphere is mounted on a cube, with sides 8 cm each.
[Correct to the nearest integer.]

(a) Determine the maximum diameter that the sphere can possibly have.

(b) Calculate the total surface area of the solid body.

(c) Calculate the volume of the solid body.



(a) Maximum diameter is 8cm $\therefore r = 4$cm
[Sidelenght of cube = diameter]

(b) Surf. area cube $= 6L^2 = 6(8)^2$
$= 384\text{ cm}^2$

Cube - area circle $= 384 - \pi r^2$
$= 384 - \pi(4)^2$
$= 333{,}734\ldots$

Surf. area halve sphere $= \frac{1}{2}(4\pi r^2)$
$= \frac{1}{2}(4\pi(4)^2)$
$= 100{,}530\ldots$

$\therefore$ Total surface area
$= 333{,}734\ldots + 100{,}530\ldots$
$\approx 434\text{ cm}^2$

(c) Volume cube

$= l^3$

$= 8^3$

$= 512 \text{ cm}^3$

Volume $\frac{1}{2}$ sphere

$= \frac{1}{2} \times \left(\frac{4}{3}\pi r^3\right)$

$= \frac{1}{2} \times \left(\frac{4}{3}\pi \times 4^3\right)$

$= 134,041 \ldots \text{ cm}^3$

$\therefore$ Total volume

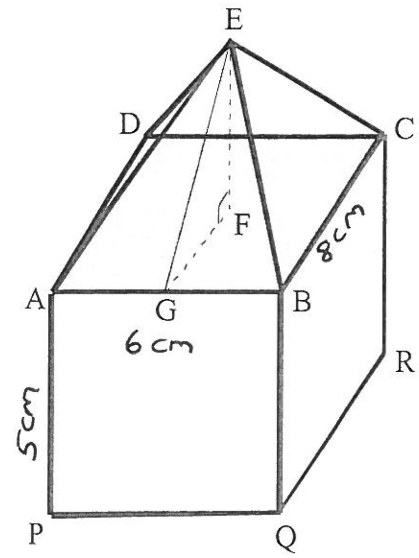
$= 512 \text{ cm}^3 + 134,041 \ldots \text{ cm}^3$

$= 646,041 \ldots$

$\approx 646 \text{ cm}^3$

(3) As seen in the diagram, ABCD is a common base of both the pyramid and the prism.
ABCD is a rectangle with AB = 6 cm and BC = 8 cm. The height of the prism is 5 cm.
EF = 4 cm is the perpendicular height of the pyramid.

Calculate: [Correct to 1 dec.]
(a) the length of FG.
(b) the length of the slant height of the pyramid.
(c) the total surface area of the solid body.



(a) $FG = \frac{1}{2}BC$ [$EF \perp$ on ABCD]
$\therefore FG = 4$ cm

(b) In $\triangle EFG$:
$EG^2 = EF^2 + FG^2$ [Pythagoras]
$= 4^2 + 4^2$
$EG^2 = 16 + 16$
$EG^2 = 32$
$EG \approx 5{,}7$ cm

(c) Surf. area prism
$= 2LH + 2BH + 2LB - [1\,LB]$ → contact area with pyramide
$= 2(8)(5) + 2(6)(5) + 2(8)(6) - (8)(6)$
$= 188\text{ cm}^2$

Area pyramide
$= A + \frac{1}{2}pH - A$ → contact area with prism
$= \frac{1}{2}pH$
$= \frac{1}{2}(2\times6 + 2\times8)(4)$
$= \frac{1}{2}(28)(4)$
$= 56\text{ cm}^2$

Total surface area

$= 188\ cm^2 + 56\ cm^2$

$= 244\ cm^2$