

Mathematical Formulae*Compound Interest*

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$



$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

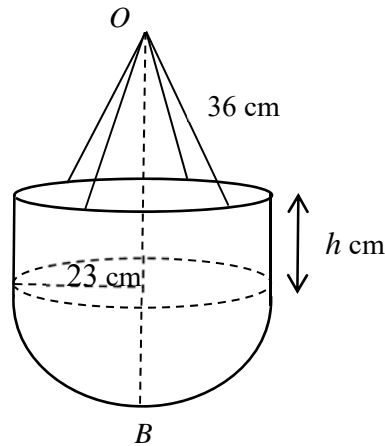
$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

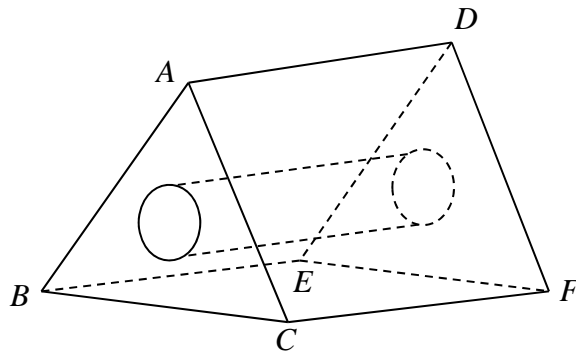
6. (a) The diagram below shows a container which is made by attaching an open hemisphere of internal radius 23 cm to the rim of a hollow cylinder with the same internal radius and a height of h cm.



The container is suspended from O by four wires, each of length 36 cm, fastened symmetrically to the rim of the cylinder.

It is given that 43.7 litres of water is needed to completely fill the container.

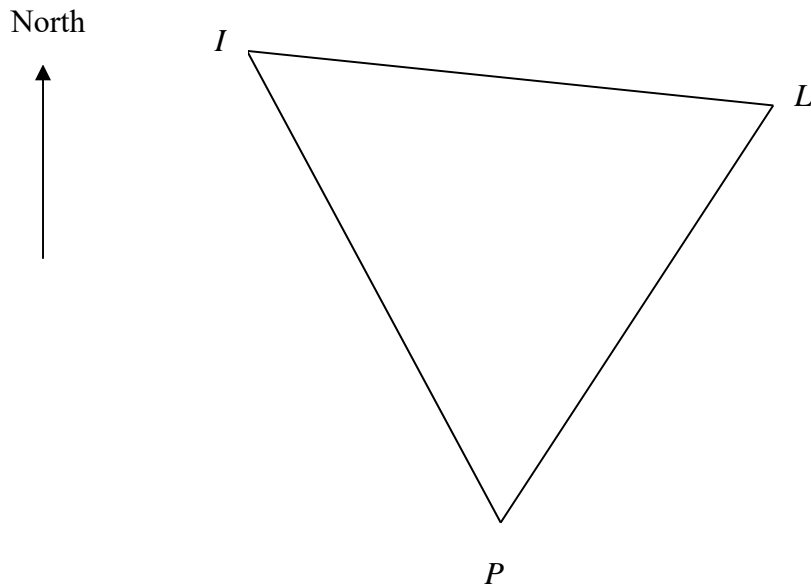
- (i) Show that $h = 10.96$ cm, corrected to 4 significant figures. [2]
- (ii) Hence, find the vertical distance OB . [2]
- (b) The figure below shows a solid triangular prism where the cross section ABC and DEF are equilateral triangles. It has a cylindrical hole in the centre and a square base $BCFE$ of area 36 m^2 . The volume of the cylindrical hole is 75.36 m^3 .



1 can of paint covers 9 m^2 of the area. Find the number of cans of paint to purchase in order to paint the entire solid.

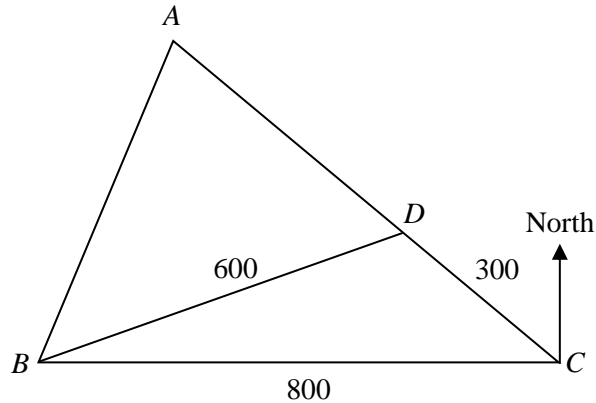
[5]

10. A ship leaves a port at P and sails 21 km towards a lighthouse, L . It then sails 28 km towards an island, I . It is given that the bearing of L from I is 116° and the bearing of P from I is 163° .



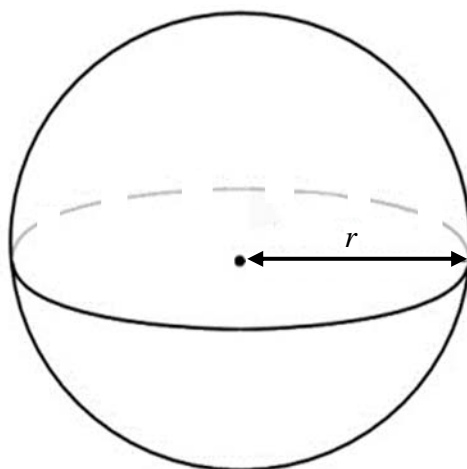
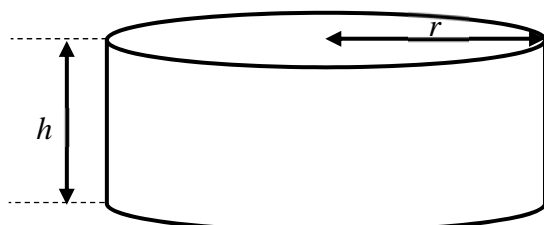
- (a) Find the bearing of I from L . [1]
- (b) Calculate the distance IP . [3]
- (c) The ship then returns to the port P , travelling along the route IP . Calculate the distance from P when the ship is closest to the lighthouse, L . [2]
- (d) Given that the height of the lighthouse is 500 m, calculate the angle of depression of P from the top of the lighthouse. [2]

- 6 A, B, C and D are four coastal guard posts on the Indian Ocean. C is 800 m due east of B and $AC = BC$. D is on line AC such that $CD = 300$ m and $BD = 600$ m.



- (a) Calculate
- (i) angle BCD , [2]
 - (ii) the bearing of A from B . [2]
- (b) Find AB . [2]
- (c) A ship sailing along AC stops at a point X , which is nearest to B .
- (i) Find BX . [2]
 - (ii) The ship at point X sends a distress signal by shooting a red flame vertically up into the sky. It was spotted from point B when the red flame reached a height of 250 m.
Find the angle of elevation of the red flame from B . [2]

- 16** A solid cylinder has radius r cm and height h cm.
 A solid sphere has radius r cm.
 The total surface areas of the solid cylinder and the sphere are equal.



Work out, in terms of r , the total volume of the cylinder.

Answer [3]