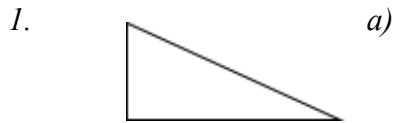
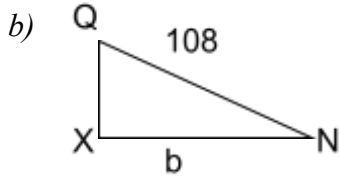


Three dimensional geometry



$$QN = \sqrt{12^2 - 6^2}$$

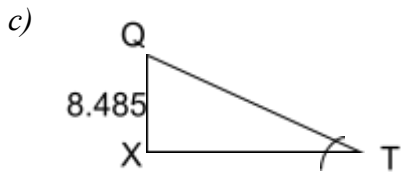
$$= 10.39$$



$$QX = (\sqrt{108})^2 - 6^2$$

$$= \sqrt{72}$$

$$= 8.485$$



$$\tan \theta = \frac{8.485}{6}$$

$$\theta = 54.73^\circ$$

d) $\tan \theta = \frac{6}{10}$

$$\theta = 30.96$$

$$\frac{6}{10} \text{ obtuse} = 180^\circ - 30.96$$

$$= 149.04^\circ$$

2. a) $\sin 36^\circ = \frac{a}{5}$

Where a is the side

$$a = \frac{5 \sin 36}{\sin 36} = 8.507$$

$$h^2 = 18.2 - 8.507$$

$$= 258.87$$

$$H = 16.09 \text{ cm}$$

b) $\frac{1}{2} ab \sin \theta$

$$\frac{1}{2} \times 8.507^2 \sin 72 \times 5$$

$$= 172.06 \text{ cm}^2$$

c) $\tan 36^\circ = \frac{x}{5}$

$$x = 6.882$$

$$\tan \theta = 16.09$$

$$6.882$$

$$\theta = 66.84^\circ$$

$$d) \frac{1}{3} \times 172.06 \times 16.09 = 922.8 \text{ cm}^3$$

$$e) \frac{S = 23.2}{\sqrt{23.2(23.2 - 18.2)(23.2 - 10)}} = 87.50 \text{ cm}^3$$

$$3. (i) \frac{1}{3} \times 4.2 \times 7.5h = 52.5$$

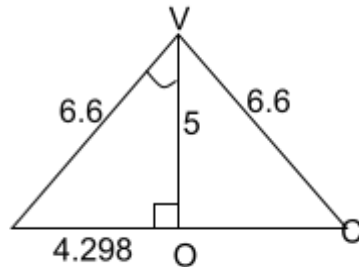
$$h = \frac{52.5 \times 3}{4.2 \times 7.5} = 5.0 \text{ cm}$$

$$(ii) AC = \sqrt{4.2^2 + 7.5^2} \\ = \sqrt{17.64 + 56.25} \\ = \sqrt{73.89} \\ = 8.596$$

$$AO = 8.596 \div 2 = 4.298$$

$$AV = \sqrt{AO^2 + OV^2} \\ = \sqrt{4.298^2 + 5^2} \\ = \sqrt{18.47 + 25} \\ = \sqrt{43.47} \\ = 6.6 \text{ cm}$$

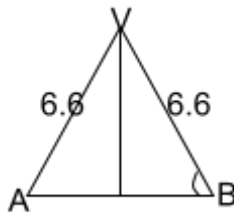
$$(iii) \tan \theta = \frac{4.298}{5} \\ = 0.8596 \\ \theta = 40.68^\circ \\ \angle AVC = 40.68 \times 2 \\ = 81.36$$



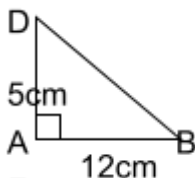
Alternative

$$\cos = \frac{5}{6.6} = 0.7576 \\ = 40.749^\circ \\ AVO = 40.749^\circ \\ AVC = 81.498^\circ$$

$$(iv) \cos \alpha = \frac{2.1}{6.6} \\ = 0.3182 \\ \alpha = 71.45^\circ \text{ Acute angle} \\ \text{obtuse angle} = 180^\circ - 71.45^\circ \\ = 108.55^\circ$$

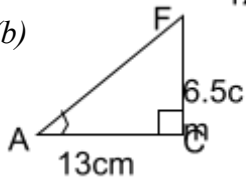


4. (a)



$$BD^2 = 12^2 + 5^2 = 144 + 25 = 169 \\ BD = \sqrt{169} = 13 \text{ m}$$

(b)



$$AF^2 = 13^2 + 6.5^2 = 169 + 42.25 \\ = 211.25 \quad AF = \sqrt{211.25} = 14.53 \text{ cm} \\ \tan \theta = \frac{6.5}{13} = 0.5 \quad MI$$

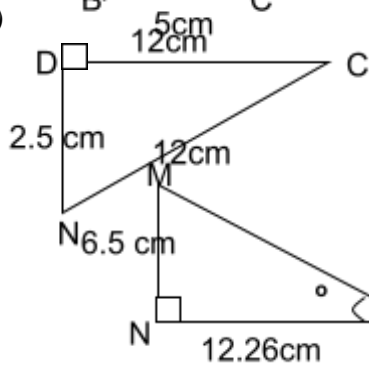
BI

$$\theta = 26.57^\circ \quad A1$$

(c) $\tan \alpha^\circ = \frac{6.5}{5} = 1.3 \quad M1$

$$\alpha^\circ = 52.43 \quad A1$$

(d)



$$NC^2 = 2.5^2 + 12^2 = 150.25$$

$$NC = \sqrt{150.25} = 12.26 \quad B1$$

$$MC^2 = 6.5^2 + 150.25$$

$$= 42.25 + 150.25$$

$$= 192.5$$

$$MC = \sqrt{192.5} = 13.87$$

$$\tan \beta^\circ = \frac{6.5}{12.26} = 0.5302$$

$$\beta^\circ = 27.93^\circ \quad B1$$

Ba

5.

i) Or = $16^2 - 5^2$

$$= \sqrt{256 - 25}$$

$$= 15.198 \text{ cm}$$

ii) $\tan \theta = \frac{5.066}{4} = 1.2665$

$$\therefore \theta = 51.71^\circ$$

6.

a) Height

$$AC = \sqrt{AB^2 + BC^2}$$

$$= \sqrt{10^2 + 10^2}$$

$$= \sqrt{200}$$

$$= 14.142$$

$$\therefore OA = \frac{1}{2} AC = \frac{14.14^2}{2} = 7.71$$

$$OE = \sqrt{AE^2 - AO^2}$$

$$= \sqrt{64 - 59.44} = 4.56$$

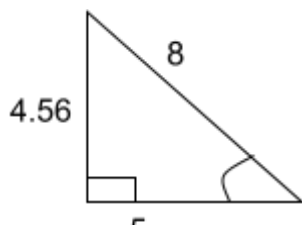
b)i) $\tan \theta = \frac{4.56}{5.00} = 0.912$

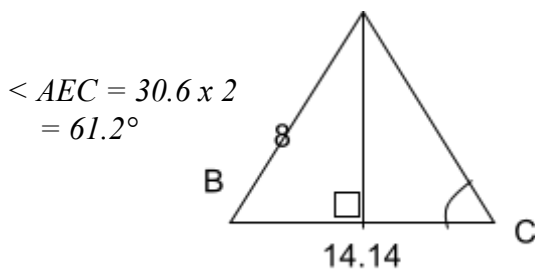
$$\theta = 65.78^\circ$$

ii) $\tan \theta = \frac{4.56}{7.71} = 0.5914$

$$\theta = 30.6^\circ$$

c)





7. Let length of cut off pyramid be meters

$$\frac{7+h}{H} = \frac{5.5}{2.1}$$

$$14.7 + 2.1h = 5.5H$$

$$3.4h = 14.7$$

$$h = 4.3$$

Slant height of big pyramid

$$= \sqrt{11.3^2 + 2.75^2} = 11.6$$

Slant height of the pyramid cut off

$$= \sqrt{4.3^2 + 1.05^2} = 4.4m$$

$$\text{Area of EFCD} = \frac{1}{2} \times 11.6 \times 5.5 - \frac{1}{2} \times 4.4 \times 2.1$$

$$= 27.28 m$$

$$\text{Total surface area} = 4 \times 27.28 + 2.1 \times 2.1 = 113.5$$

b) $\frac{1}{2}$ litre paint $10m^2$

4 litres paints $80m^2$

$\therefore 113.5m^2$ requires 2 tins

$$2 \times 650 = \text{Kshs. } 1300/=$$

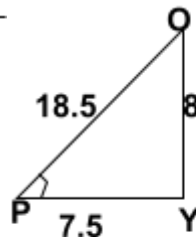
8. (a) $PR = \sqrt{12^2 + 9^2} = \sqrt{144 + 81} = \sqrt{225} = 15cm$

$$h = \frac{19.52 - 7.52}{\sqrt{380.25 - 56.25}}$$

$$= 18$$

(b) $\tan \theta = \frac{18}{7.5} = 2.4$

$$\theta = \tan^{-1} 2.4 = 67.38^\circ$$



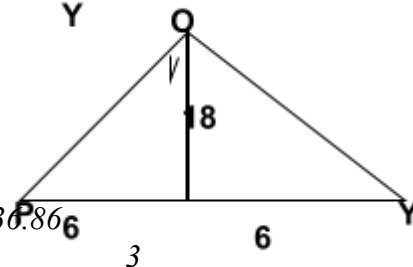
(c) $\tan \alpha = \frac{6}{18} = \frac{1}{3}$

$$\alpha = \tan^{-1} 0.3333$$

$$= 18.43^\circ$$

$$\therefore \angle x OY = 2 \times 18.43 = 36.86^\circ$$

(d) $\text{Volume} = \frac{1}{3} \times 12 \times 9 \times 18$
 $= 648cm^3$



9. a) $AC^2 = 12^2 + 12^2 = 288$

$$\therefore AC = \sqrt{288} = 16.97$$

$$VO^2 = h^2 = 24^2 - \frac{(16.97)^2}{2} = 504$$

$$h = \sqrt{504} = 22.45cm$$

b) $\text{Base area} = 12 \times 12 = 144 \text{ cm}^2$

$$\therefore \text{Volume} = \frac{1}{3} \times 144 \times 22.45$$

$$= 1077.6 \text{ cm}^3$$

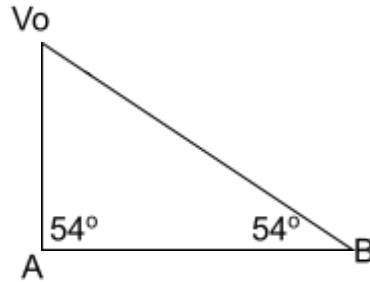
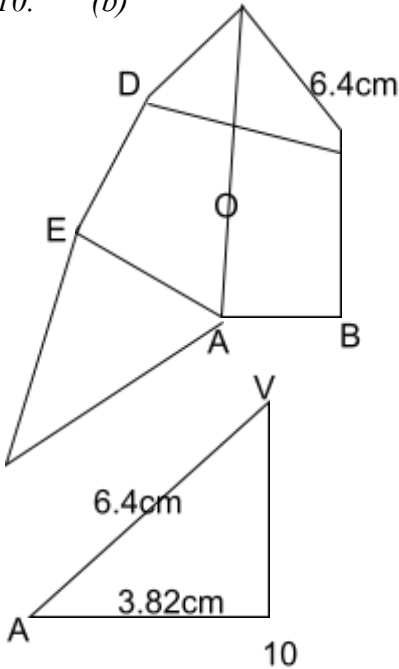
c) $\text{Slanting surface} = \sqrt{30(30-24)(30-24)(30-12)}$

$$= 139.44 \text{ cm}^2$$

$$\text{Total curved S.A} = 139.44 \text{ cm}^2 \times 4 + 144 \text{ cm}^2$$

$$= 701.6 \text{ cm}^2$$

10. (b)



$$AO = \frac{4.5 \times \sin 54^\circ}{\sin 72^\circ} = 3.82 \text{ cm}$$

$$= \cos^{-1} \left(\frac{3.82}{6.4} \right) = 53.35^\circ$$

(c) $VO = \sqrt{6.4^2 - 3.82^2}$

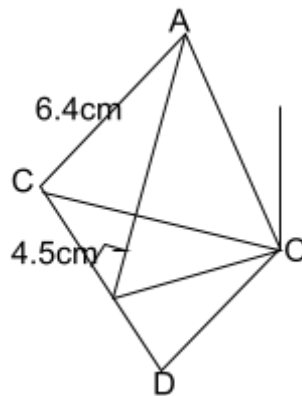
$$= 5.13$$

$$VX = \sqrt{6.4^2 - 2.55^2}$$

$$= 5.99 \text{ cm}$$

$$\propto = \sin^{-1} \left(\frac{VO}{VX} \right) = \sin^{-1} \left(\frac{5.13}{5.99} \right)$$

$$\propto = 58.91^\circ$$



11. a) $\text{Longitude difference} = 139^\circ + 41^\circ$

$$= 180^\circ$$

b) $\text{Distance along latitude} = \frac{\theta}{360} \times 2\pi r \cos \theta$

$$= \frac{180}{360} \times 2 \times \frac{22}{7} \times 6370 \cos 60^\circ$$

$$= 22 \times 910 \times 0.5$$

$$= 10,010 \text{ Km}$$

Or via north pole (great circle)

$$\text{Latitude difference} = 60^\circ$$

$$\begin{aligned} \text{Distance} &= \frac{60}{360} \times 2 \times \frac{22}{7} \times 6370 \\ &= 6673.33 \text{ Km} \end{aligned}$$

$$\begin{aligned} c) \text{ Distance} &= \frac{\text{long diff}}{360} \times 2\pi R \cos 60^\circ \\ 420 &= \frac{\theta}{360} \times 2 \times \frac{22}{7} \times 6370 \cos 60^\circ \\ \theta &= \frac{420 \times 360 \times 7}{2 \times 22 \times 6370 \cos 60^\circ} \\ &= 7.552^\circ \end{aligned}$$

$$\text{Longitude of C} = 41^\circ - 7.55^\circ = 33.45^\circ \text{N}$$