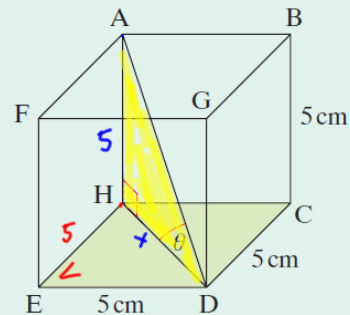


Section 2.6 Problems in three dimensions

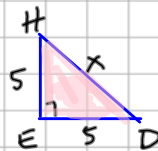
Example 1

The given figure shows a cube of side 5 cm.

Find the measure of the angle between the diagonal [AD] and the base of the cube.



$$a^2 = b^2 + c^2$$



$$\begin{aligned}x^2 &= 5^2 + 5^2 \\x^2 &= 50 \\x &= \sqrt{50} \\x &= 5\sqrt{2}\end{aligned}$$

$$\tan \theta = \frac{O}{A}$$

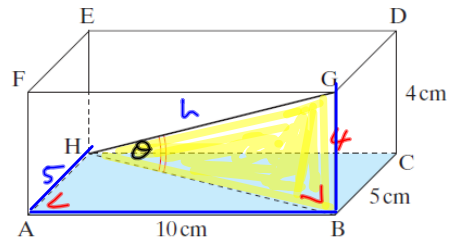


$$\tan \theta = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$$\begin{aligned}\theta &= \tan^{-1}\left(\frac{1}{\sqrt{2}}\right) \\ \theta &= 35.3^\circ\end{aligned}$$

Exercise 2.6

1. An open rectangular box has dimensions 10 cm by 5 cm by 4 cm, as shown.
 - (i) Find the length of the diagonal [GH].
 - (ii) Find the measure of the angle between GH and the base of the box.



3 D Pythagoras

$$a^2 = b^2 + c^2 + d^2$$

$$h^2 = 4^2 + 5^2 + 10^2$$

$$h = \sqrt{141}$$

$$h = 11.87$$

Let $\angle GHB = \theta$

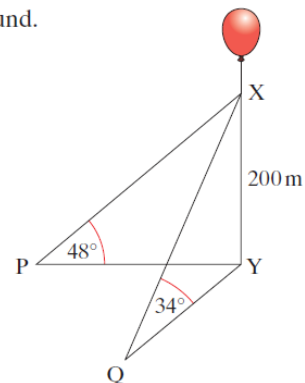
$$\sin \theta = \frac{4}{h}$$

$$\theta = \sin^{-1}(4/11.87)$$

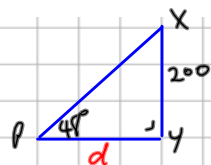
$$\theta = 19.7$$



3. A balloon X is 200 metres vertically above a point Y on level ground. Two points P and Q are also on level ground. The angle of elevation of X from P is 48° . The angle of elevation of X from Q is 34° .
 - (i) Find |PY| and |QY| correct to the nearest metre.
 - (ii) If $\angle PYQ = 84^\circ$, find |PQ| correct to the nearest metre.

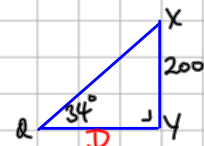


SOH CAH TOA



$$\tan 48^\circ = 200/d$$

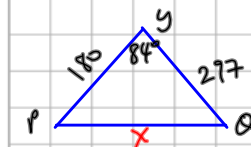
$$\Rightarrow d = 200 / \tan 48^\circ = 180 \text{ m}$$



$$\tan 34^\circ = 200/D$$

$$\Rightarrow D = 200 / \tan 34^\circ = 297 \text{ m}$$

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



$$X = \sqrt{180^2 + 297^2 - 2(180)(297)\cos 84^\circ}$$

$$= 331 \text{ m}$$