

Angle between a Line and a Plane

Starter

1. **(Review of last lesson)** Consider the isosceles triangular prism in the diagram. M is the midpoint of AC and is vertically below B.

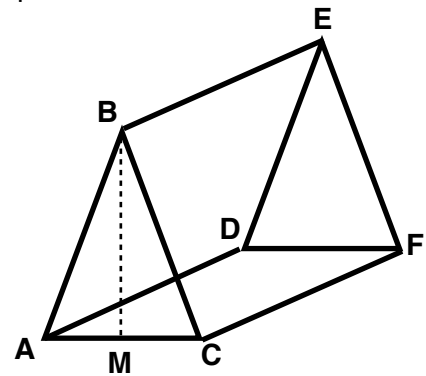
$$\angle ACB = 59^\circ$$

$$AB = 10 \text{ m}$$

$$CF = 25 \text{ m.}$$

Find

- the perpendicular height BM to 3 s.f.
- the length EM to 3 s.f.



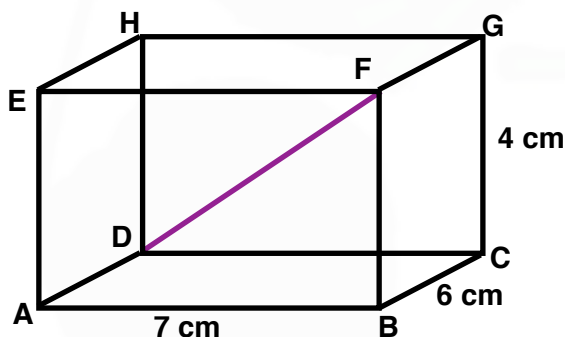
Notes

Questions asking for the angle between a line and a plane may require you to do a calculation or two before doing the one for the angle. Again, draw the relevant 2-D triangle(s).

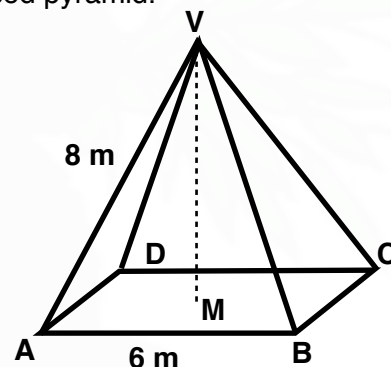
Success criteria – angle between line and plane

- Draw a 2-D right-angled triangle with the line mentioned as the hypotenuse
- Decide which other lengths of this triangle you need to calculate

E.g. 1 Find the angle between the line FD and the plane ABCD.



E.g. 2 Find the angle between the line AV and the plane ABCD in the square-based pyramid.



E.g. 1 Working:

Draw the right-angle triangle with FD as hypotenuse.

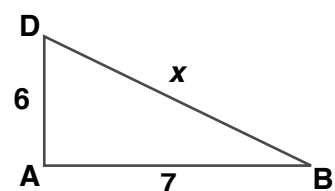
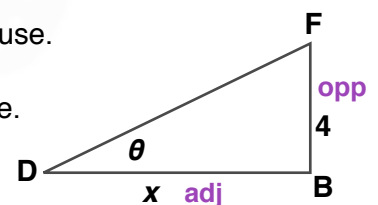
In $\triangle BDF$, we have one side, BF .

To find the required angle θ , we need another side.

The easiest one to find is BD .

Draw the right-angle triangle with BD as hypotenuse. We can calculate $x = BD$ since we have the other sides.

$$\begin{aligned} \text{By Pythagoras, } x^2 &= 6^2 + 7^2 \\ x^2 &= 85 \\ x &= \sqrt{85} \end{aligned}$$



Avoid writing the decimal as it will introduce rounding error in the next step.

Label the given sides

Choose which trig. ratio to use: tan

$$\tan \theta = \frac{4}{\sqrt{85}}$$

$$\theta = \tan^{-1}\left(\frac{4}{\sqrt{85}}\right) = 23.454^\circ$$

The angle between the line FD and the plane ABCD is 23.5° (3 s.f.)

Video: [Angle between a line and a plane](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p591 E18.6 Qu 1-10
A*-G class textbook:	p550 E18.5 Qu 1-7
9-1 homework book:	p200 E18.6 Qu 1-6
A*-G homework book:	p153 E18.5 Qu 1-4

[Homework book answers \(only available during a lockdown\)](#)