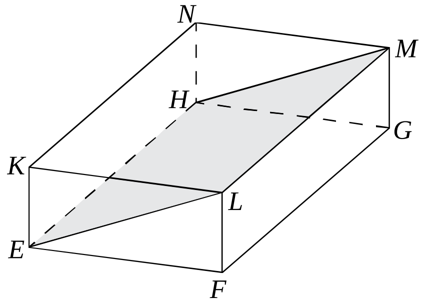
CHAPTER 11: LINES AND PLANES IN 3-DIMENSIONS

Cloned SPM Question (2006, Paper 1)

The diagram shows a cuboid with a horizontal base *EFGH*.



Name the angle between the plane *ELMH* and the plane *EHNK*.

A $\angle MEN$
B $\angle MEK$
C $\angle MHN$
D $\angle MHK$

Solution
The planes *ELMH* and *EHNK* intersect at *EH*.
EH is a normal to the plane *HGMN*.
Therefore, $\angle EHM = 90°$

NH is a vertical edge to the horizontal base.
Therefore, $\angle EHN = 90°$

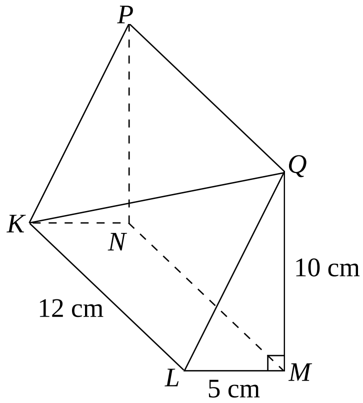
Thus, angle between the plane *ELMH* and the plane *EHNK* = $\angle MHN$

Answer: **C**

Pointers
- First, identify the line of intersection of the two planes *ELMH* and *EHNK*, which is the line *EH*.
- Then, identify one line on the plane *ELMH* and one line on the plane *EHNK* which are at right angle to the line *EH* at the same point. Thus, the angle is $\angle MHN$ (or $\angle LEK$).

Cloned SPM Question (2006, Paper 2)

The diagram shows a right prism. The base *KLMN* is a horizontal rectangle. The right-angled triangle *LMQ* is the uniform cross section of the prism.



Identify and calculate the angle between the line *KQ* and the base *KLMN*.

Solution

The angle between the line *KQ* and the base *KLMN* is $\angle QKM$.

Using Pythagoras' theorem on ΔKLM,

$$\begin{aligned} KM^2 &= 12^2 + 5^2 \\ &= 169 \\ KM &= \sqrt{169} \\ &= 13 \text{ cm} \end{aligned}$$

In the right-angled triangle *QKM*,

$$\tan \angle QKM = \frac{10}{13}$$

$$\angle QKM = 37° \ 34'$$

Pointers

- *QM* is a normal to the base *KLMN*. Thus, the orthogonal projection of *KQ* on the base *KLMN* is *KM*. By definition, $\angle QKM$ is the required angle.
- In the right-angled *QKM*, the opposite side *QM* and the adjacent side *KM* are involved. Thus, use $\tan \theta = \frac{\text{opposite side}}{\text{adjacent side}}$ to determine the required angle.