

Name: _____

Level 2 Further Maths

3D Pythagoras

3D Trigonometry



Corbettmaths

Ensure you have: Pencil or pen

Guidance

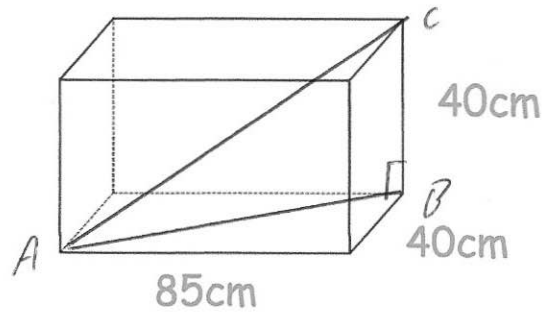
1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/



1.



Can a one metre rod fit inside of the box?
Explain your answer.

$$AB^2 = 40^2 + 85^2$$

$$AB^2 = 8825$$

$$AB = 93.94...cm$$

$$AC^2 = AB^2 + 40^2$$

$$AC^2 = 8825 + 1600$$

$$AC^2 = 10425$$

$$AC = 102.103 cm \text{ (to 3 dp)}$$

Yes

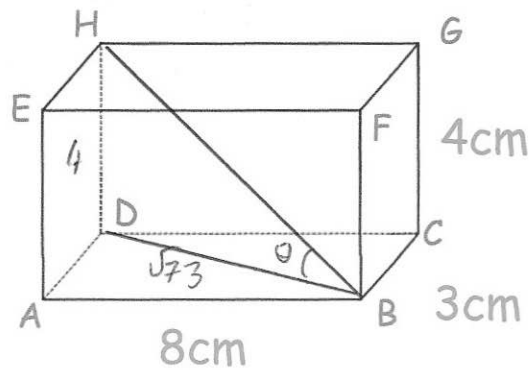
(4)

2. ABCDEFGH is a cuboid

$$AB = 8\text{cm}$$

$$BC = 3\text{cm}$$

$$CG = 4\text{cm}$$



(a) Work out the length of BH

$$BD^2 = 3^2 + 8^2$$

$$BD^2 = 9 + 64$$

$$BD^2 = 73$$

$$BD = \sqrt{73}$$

$$BH^2 = 4^2 + BD^2$$

$$BH^2 = 16 + 73$$

$$BH^2 = 89$$

$$BH = \sqrt{89}$$

$$\dots\dots\dots 9.434 \dots\dots \text{cm}$$

(3)

(b) Work out the size of the angle between BH and the plane ABCD

$$\angle DBH$$

$$\tan \theta = \frac{4}{\sqrt{73}}$$

$$\theta = 25.087$$

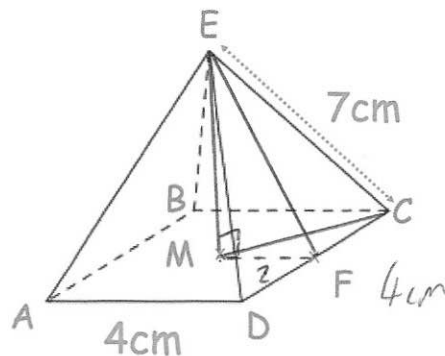
$$\dots\dots\dots 25.087 \dots\dots^\circ$$

(3)

3. Shown below is the square based pyramid ABCDE.

F is the midpoint of CD.

M is the point on the base directly below the vertex E.



- (a) Work out the length of EM

$$AC^2 = 4^2 + 4^2$$

$$AC^2 = 32$$

$$AC = \sqrt{32}$$

$$AC = 4\sqrt{2}$$

$$MC = 2\sqrt{2}$$

$$EC^2 = CM^2 + EM^2$$

~~From~~

$$7^2 = 8 + EM^2$$

$$49 = 8 + EM^2$$

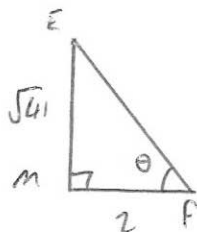
$$EM^2 = 41$$

$$EM = \sqrt{41}$$

$$6.403$$

.....cm
(4)

- (b) Work out the angle between the line EF and plane ABCD



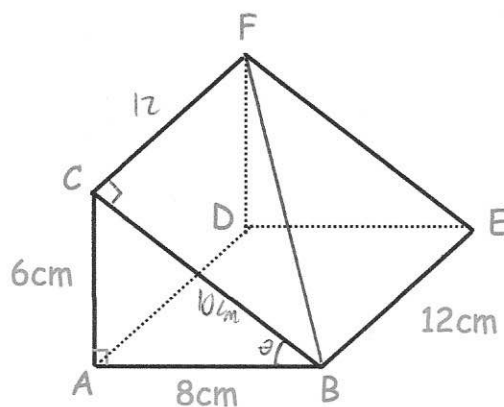
$$\tan \theta = \frac{\sqrt{41}}{2}$$

$$\theta = 72.65$$

$$72.65$$

.....°
(3)

4. Shown below is a triangular prism.
Triangle ABC is a right angle triangle.



- (a) Work out the length of BF

$$BC = 10 \text{ cm} \quad (\text{pythagorean triple } \dots 6/8/10)$$

$$BF^2 = BC^2 + CF^2$$

$$= 100 + 144$$

$$BF^2 = 244$$

$$BF = \sqrt{244}$$

$$\dots\dots\dots 15.62 \text{ cm}$$

(4)

- (b) Work out the angle between the plane BEFC and plane ABED

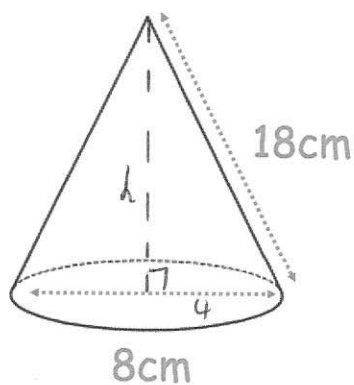
$$\tan \theta = \frac{6}{8}$$

$$\theta = 36.87$$

$$\dots\dots\dots 36.87^\circ$$

(2)

5.



Calculate the volume of this cone.

$$4^2 + h^2 = 18^2$$

$$h^2 = 308$$

$$h = 2\sqrt{77}$$

$$h = 17.55\text{cm}$$

$$V = \frac{1}{3} \pi r^2 h$$

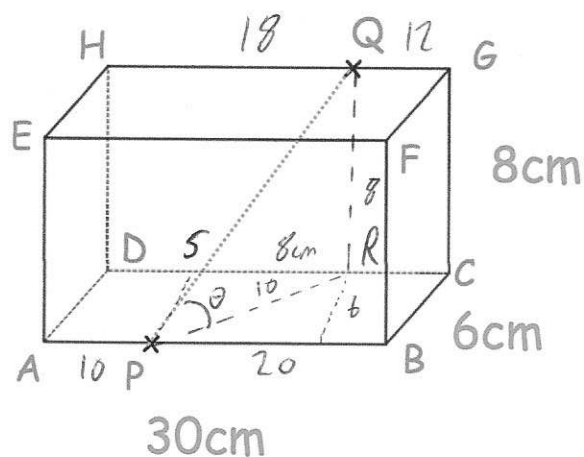
$$= \frac{1}{3} \times \pi \times 4^2 \times (2\sqrt{77})$$

$$= 294.05\text{cm}^3$$

$$\underline{\underline{294.05\text{cm}^3}}$$

(4)

6.



ABCDEFGH is a cuboid.

P is a point on AB such that AP:PB is 1:2

Q is a point on GH such that GQ:QH is 2:3

Calculate the angle between the line PQ and the plane ABCD.

$$PR = 10 \text{ cm} \quad \text{since } PS = 6 \text{ cm} \text{ \& } RS = 8 \text{ cm}$$

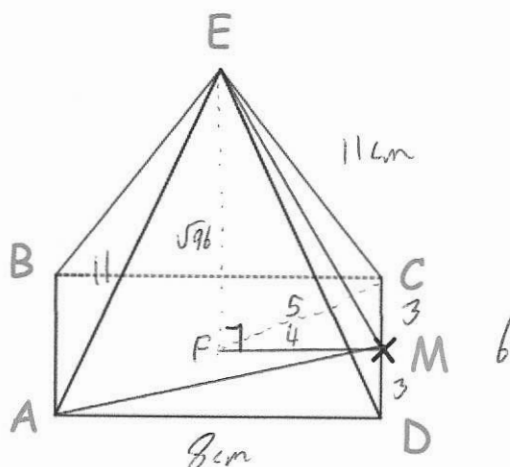
$$\tan \theta = \frac{8}{10}$$

$$\theta = 38.66^\circ$$

$$\dots\dots\dots 38.66^\circ$$

(5)

7. Shown below is a rectangular-based pyramid.
The apex E is directly over the base of the pyramid.



$$AD = 8 \text{ cm}$$

$$CD = 6 \text{ cm}$$

$$CE = 11 \text{ cm}$$

M is the midpoint of the line CD.

Work out the size of angle AME

$$AE = 11 \text{ cm}$$

$$EM^2 = 4^2 + (\sqrt{96})^2$$

$$EM^2 = 16 + 96$$

$$EM^2 = 112$$

$$EM = \sqrt{112}$$

$$AM^2 = 3^2 + 8^2$$

$$AM^2 = 73$$

$$AM = \sqrt{73}$$

$$AC^2 = AD^2 + CD^2$$

$$AC^2 = 8^2 + 6^2$$

$$AC^2 = 100$$

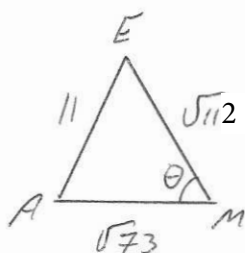
$$AC = 10$$

$$CF = 5$$

$$EF^2 = 11^2 - 5^2$$

$$EF^2 = 96$$

$$EF = \sqrt{96}$$



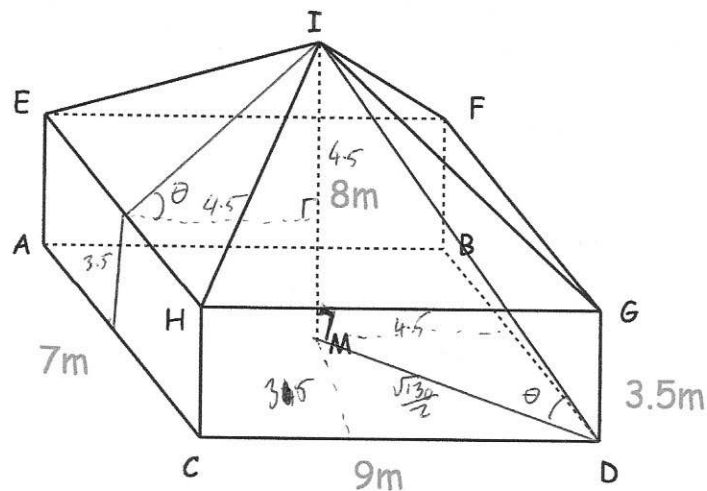
$$\cos \theta = \frac{(\sqrt{112})^2 + (\sqrt{73})^2 - 11^2}{2 \times \sqrt{112} \times \sqrt{73}}$$

$$\cos \theta = \frac{64}{180.842...}$$

$$69.27$$

(6)

8. The diagram shows a cuboid and a pyramid.
The apex of the pyramid, I, is directly above the centre, M, of ABDC.



- (a) Calculate the angle between the line DI and the plane ABDC

$$MD^2 = 3.5^2 + 4.5^2$$

$$MD = \frac{\sqrt{130}}{2}$$

$$\tan \theta = \frac{8}{\left(\frac{\sqrt{130}}{2}\right)}$$

$$\theta = 54.5^\circ$$

$$\frac{54.526}{(4)}^\circ$$

- (b) Calculate the angle between planes EHI and ACHE

$$90 + 45 = 135^\circ$$

$$\frac{135}{(4)}^\circ$$