Name:

Level 2 Further Maths

3D Pythagoras
3D Trigonometry

Corbettmaths

Ensure you have: Pencil or pen

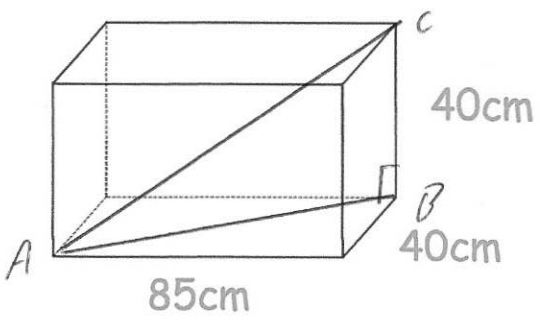
Guidance

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.

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

$AB^2 = 8825$

$AB = 93.94...cm$

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

$AC^2 = 8825 + 1600$

$AC^2 = 10425$

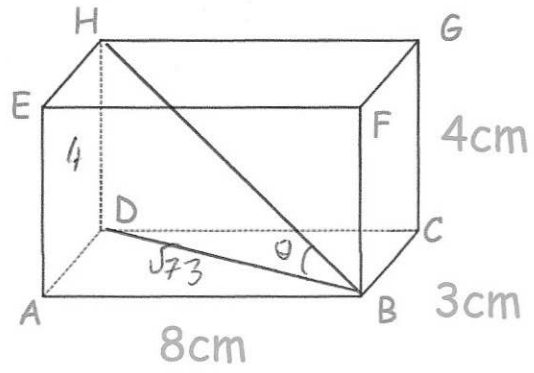
$AC = 102.103\ cm$ (to 3 dp)

Yes

(4)

2. ABCDEFGH is a cuboid

AB = 8cm
BC = 3cm
CG = 4cm



(a) Work out the length of BH

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

$BD^2 = 9 + 64$

$BD^2 = 73$

$BD = \sqrt{73}$

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

$BH^2 = 16 + 73$

$BH^2 = 89$

$BH = \sqrt{89}$

9.434 .....cm

(3)

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

$\angle DBH$

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

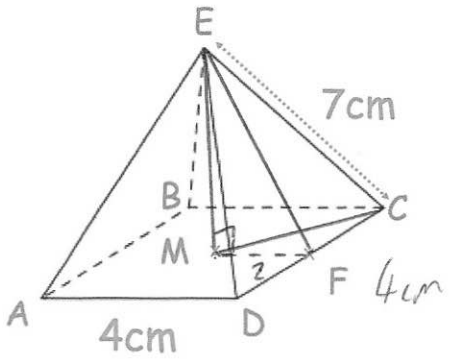
$\theta = 25.087$

25.087 .....°

(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

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

$AC^2 = 32$

$AC = \sqrt{32}$

$AC = 4\sqrt{2}$

$MC = 2\sqrt{2}$

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

$7^2 = 8 + EM^2$

$49 = 8 + EM^2$

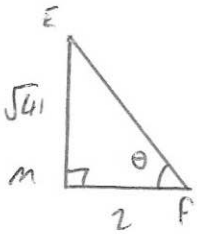
$EM^2 = 41$

$EM = \sqrt{41}$

6.403 .....cm

(4)

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



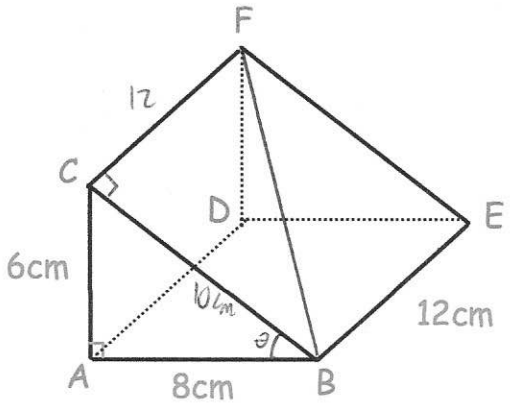
$\tan\theta = \frac{\sqrt{41}}{2}$

$\theta = 72.65$

72.65 .....°

(3)

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



(a) Work out the length of BF

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

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

$= 100 + 144$

$BF^2 = 244$

$BF = 2\sqrt{61}$

15.62 .....cm

(4)

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

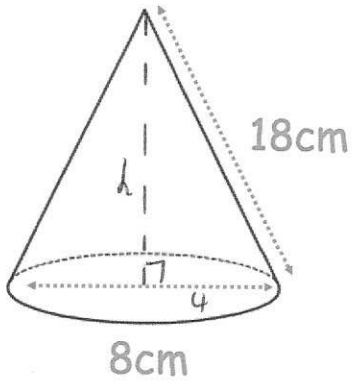
$\tan\theta = \frac{6}{8}$

$\theta = 36.87$

36.87 .....°

(2)

5.



Calculate the volume of this cone.

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

$h^2 = 308$

$h = 2\sqrt{77}$

$h = 17.55\text{ cm}$

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

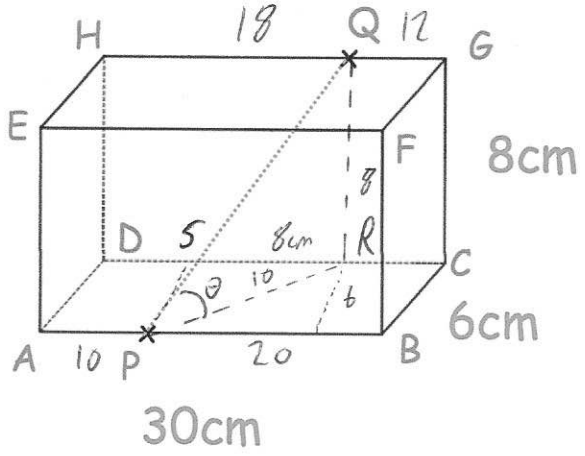
$= \frac{1}{3} \times \pi \times 4^2 \times (2\sqrt{77})$

$= 294.05\text{ cm}^3$

294.05 .....cm³

(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.

$PR = 10cm$ since $PS = 6cm$ & $RS = 8cm$

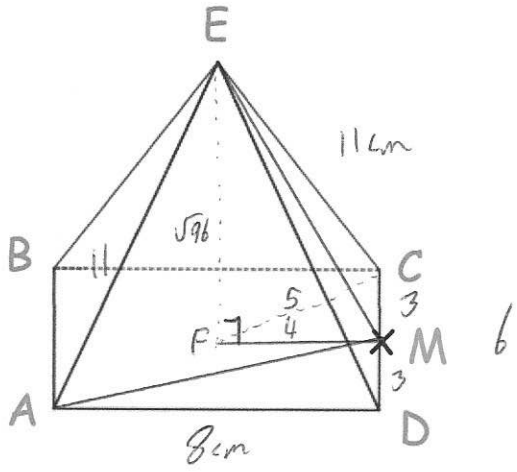
$\tan\theta = \frac{8}{10}$

$\theta = 38.66°$

38.66 °

(5)

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



AD = 8cm CD = 6cm CE = 11cm

M is the midpoint of the line CD.

Work out the size of angle AME

$AE = 11\text{cm}$

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

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

$AC^2 = 100$

$AC = 10$

$CF = 5$

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

$EM^2 = 16 + 96$

$EM^2 = 112$

$EM = \sqrt{112}$

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

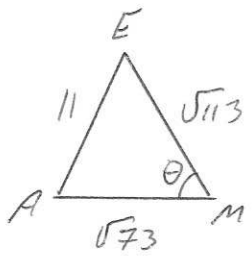
$EF^2 = 96$

$EF = \sqrt{96}$

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

$AM^2 = 73$

$AM = \sqrt{73}$



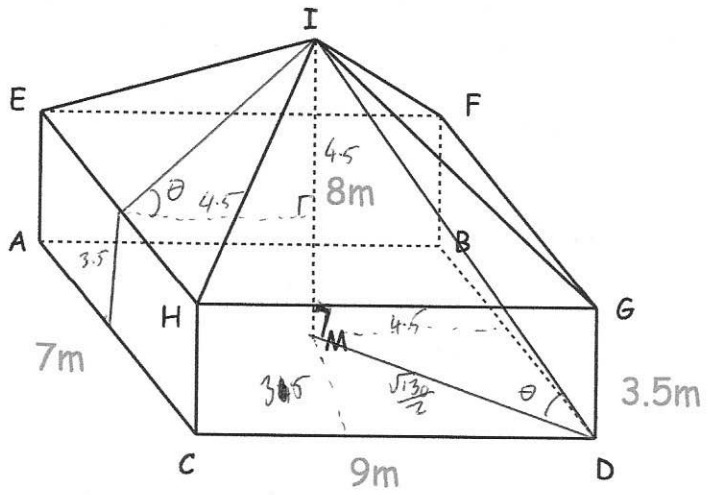
$\cos\theta = \dfrac{(\sqrt{113})^2 + (\sqrt{73})^2 - 11^2}{2 \times \sqrt{113} \times \sqrt{73}}$

$\cos\theta = \dfrac{65}{181.64\ldots}$

69.03 .....°

(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

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

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

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

$\theta = 54.5\ldots$

54.5 ..... °

(4)

(b) Calculate the angle between planes EHI and ACHE

$90 + 45 = 135°$

135 ..... °

(4)