GCSE · Edexcel · Maths

3 hours 37 questions

Exam Questions

3D Pythagoras & Trigonometry

3D Pythagoras & Trigonometry

Medium (10 questions)	/32
Hard (15 questions)	/74
Very Hard (12 questions)	/58
Total Marks	**/164**

Scan here to return to the course
or visit savemyexams.com

Medium Questions

1 $ABCD$ is a horizontal rectangular field.

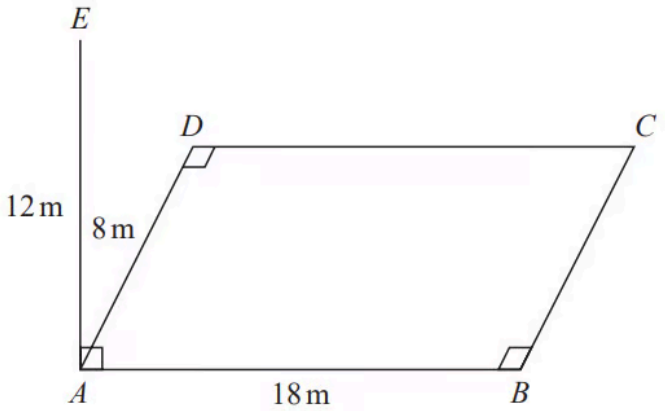


Diagram **NOT** accurately drawn

A vertical pole, AE, is placed at the corner A of the field.

$$AE = 12 \text{ m} \quad AB = 18 \text{ m} \; AD = 8 \text{ m}$$

Calculate the size of the angle between EC and the plane $ABCD$ Give your answer correct to one decimal place.

(3 marks)

2 The diagram shows a cuboid $ABCDEFGH$.

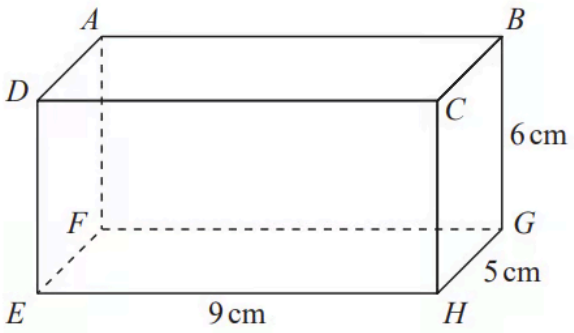


Diagram **NOT** accurately drawn

$EH = 9$ cm, $HG = 5$ cm and $GB = 6$ cm.

Work out the size of the angle between AH and the plane $EFGH$.
Give your answer correct to 3 significant figures.

(4 marks)

3 The diagram shows cuboid $ABCDEFGH$.

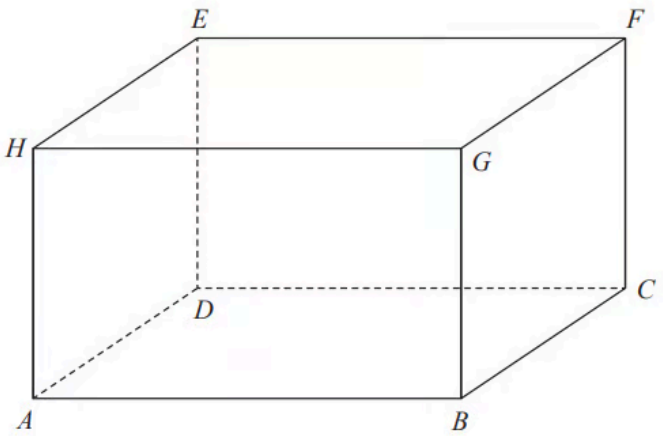


Diagram **NOT** accurately drawn

For this cuboid

the length of AB : the length of BC : the length of CF = 4 : 2 : 3

Calculate the size of the angle between AF and the plane $ABCD$.
Give your answer correct to one decimal place.

(3 marks)

4 The diagram shows a triangular prism.

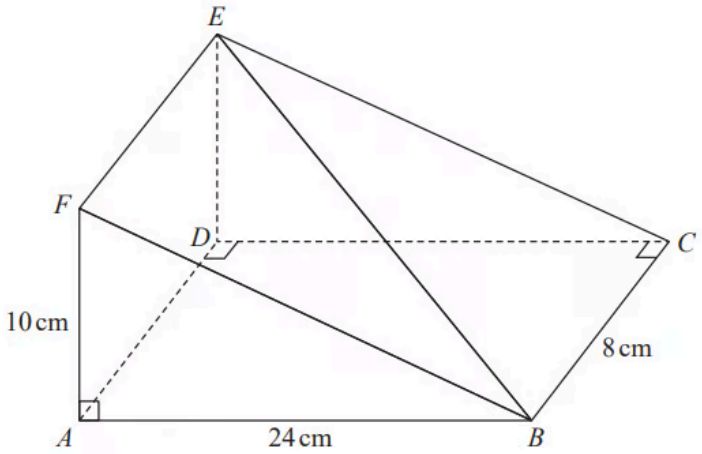


Diagram **NOT** accurately drawn

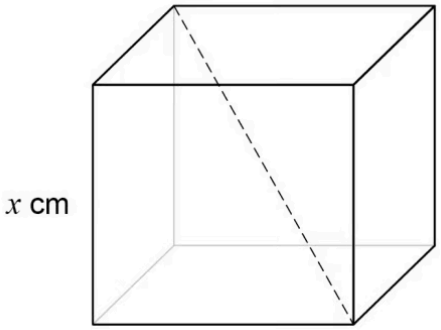
$AF = 10$ cm, $AB = 24$ cm and $BC = 8$ cm.
Angle FAB = angle ADC = angle $BCD = 90°$

Work out the size of the angle between the line BE and the plane $ABCD$.
Give your answer correct to 1 decimal place.

(3 marks)

5 Here is a cube with edge length x cm

One diagonal is shown.



Choose the length, in centimetres, of the diagonal.

A. $\sqrt{3}\ x$

B. $\sqrt[3]{3x^2}$

C. $\sqrt{x^3}$

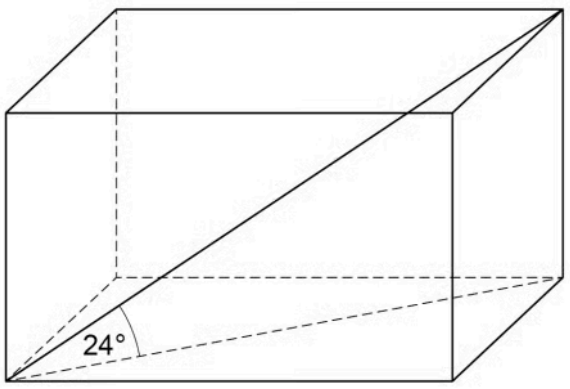
D. $\sqrt[3]{3}\,x$

(1 mark)

6 The length of a diagonal of a cuboid is 20 cm

The diagonal makes an angle of 24° with the base.

The area of the base is 150 cm^2

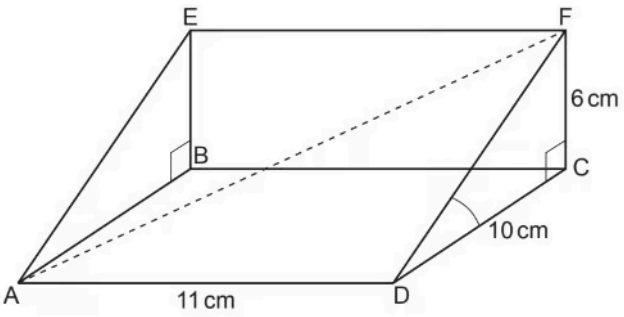


Work out the volume of the cuboid.

..... cm^3

(3 marks)

7 The diagram shows a right-angled triangular prism ABCDEF.



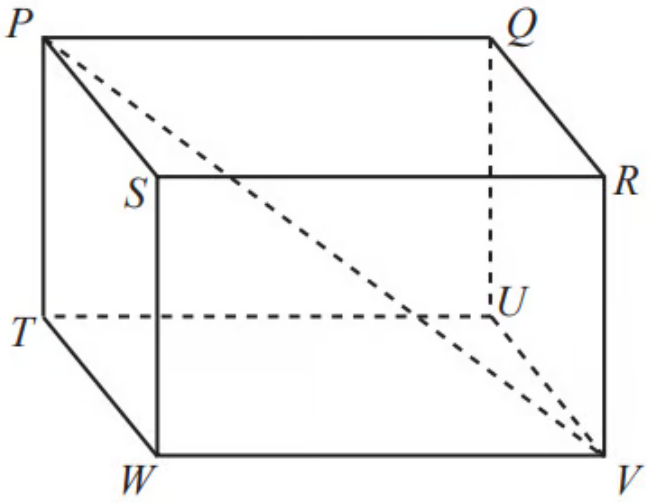
Length AD = 11 cm, length CD = 10 cm and length CF = 6 cm.

Calculate the exact length of AF.

..... cm

(4 marks)

8



NOT TO SCALE

The diagram shows a cuboid $PQRSTUVW$.

$PV = 17.2$ cm

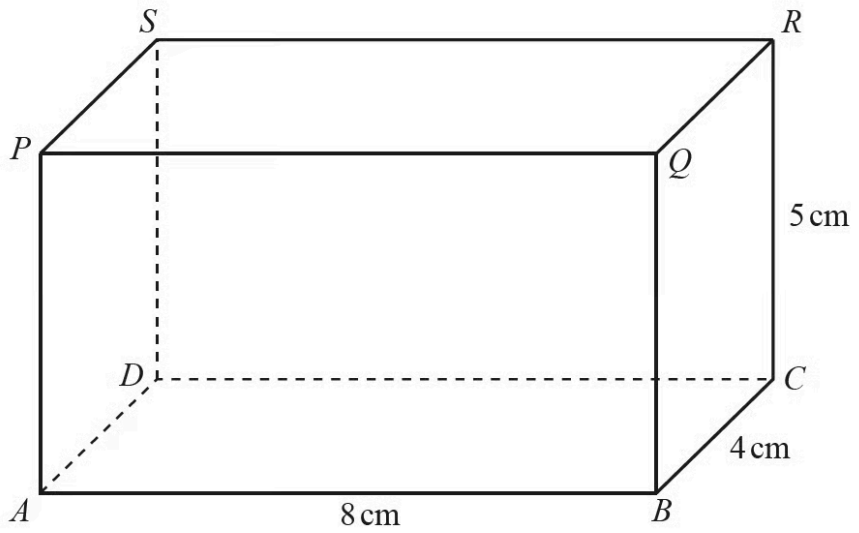
The angle between the line PV and the base $TUVW$ of the cuboid is $43°$.

Calculate PT.

$PT =$ ..... cm

(3 marks)

9



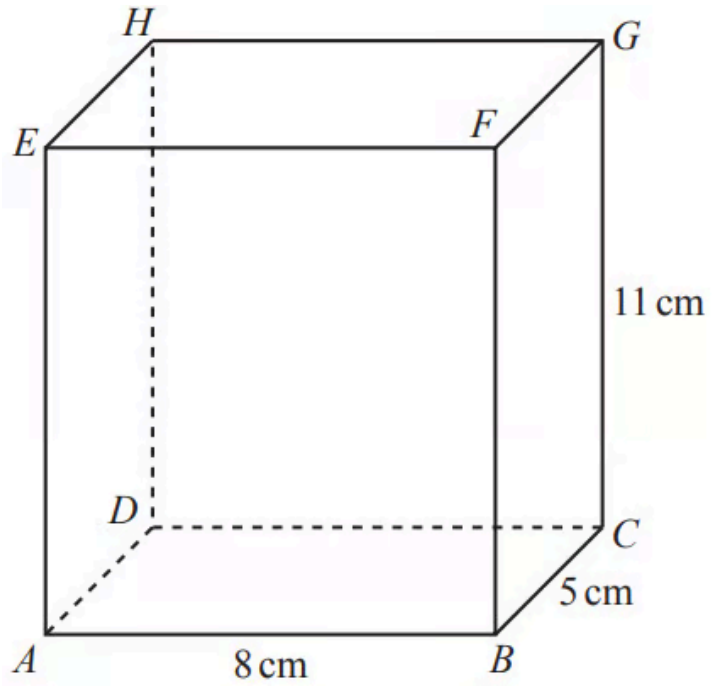
NOT TO SCALE

The diagram shows a cuboid.
AB = 8 cm, BC = 4 cm and CR = 5 cm.

Calculate the angle between the diagonal AR and the plane $BCRQ$.

(4 marks)

10



NOT TO SCALE

ABCDEFGH is a cuboid.
AB = 8 cm, *BC* = 5 cm and *CG* = 11 cm.

i) Calculate angle *CAB*.

Angle *CAB* = ... [2]

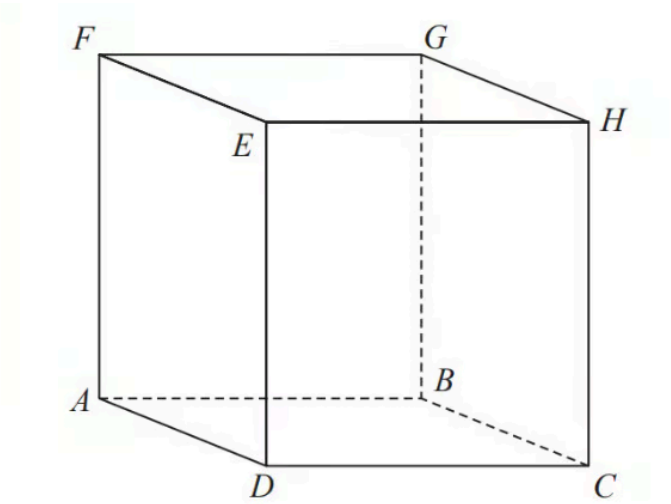
ii) Calculate angle *GAC*.

Angle *GAC* = ... [2]

(4 marks)

Hard Questions

1 $ABCDEFGH$ is a cuboid.

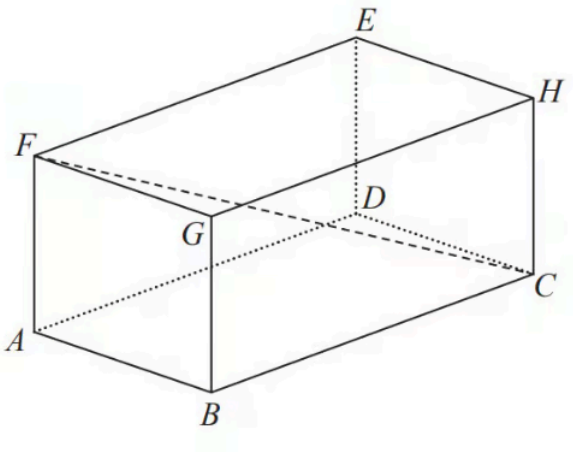


$AB = 7.3$ cm
$CH = 8.1$ cm
Angle $BCA = 48°$

Find the size of the angle between AH and the plane $ABCD$. Give your answer correct to 1 decimal place.

(4 marks)

2 The diagram shows a cuboid $ABCDEFGH$.



$AB = 7$ cm, $AF = 5$ cm and $FC = 15$ cm.

Calculate the volume of the cuboid.
Give your answer correct to 3 significant figures.

(4 marks)

3 (a) The diagram shows a pyramid.

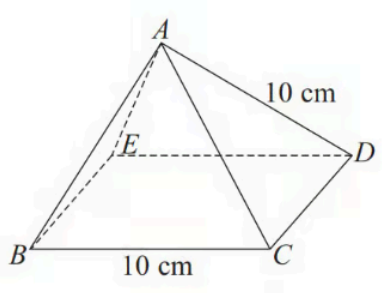


Diagram **NOT** accurately drawn

$BCDE$ is a square with sides of length 10 cm.
The other faces of the pyramid are equilateral triangles with sides of length 10 cm.

Calculate the volume of the pyramid.
Give your answer correct to 3 significant figures.

(4 marks)

(b) Find the size of angle DAB.

(2 marks)

4 ABC is an isosceles triangle in a horizontal plane.
The point T is vertically above B.

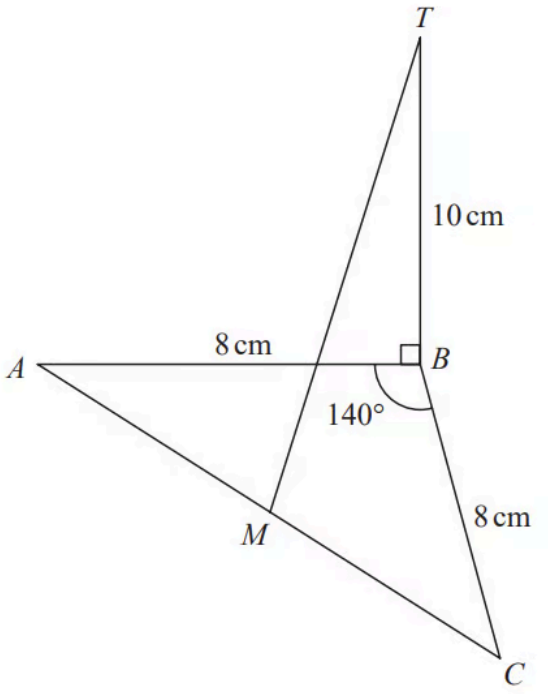


Diagram **NOT** accurately drawn

Angle $ABC = 140°$
$AB = BC = 8cm$

$TB = 10\ cm$
M is the midpoint of AC.

Calculate the size of the angle between MT and the horizontal plane ABC.
Give your answer correct to one decimal place.

(4 marks)

5 The diagram shows cuboid

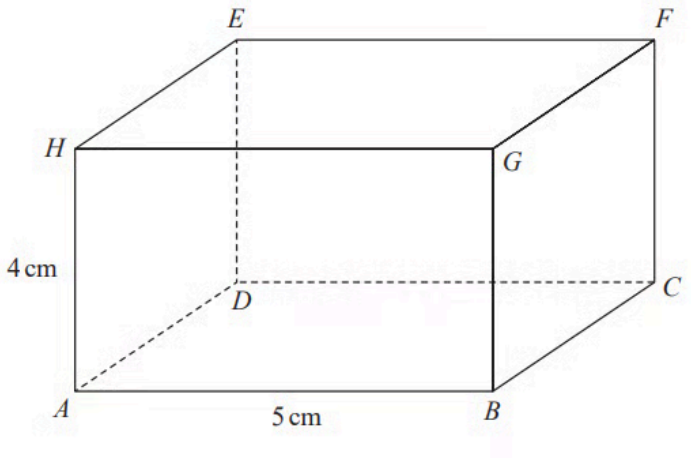


Diagram **NOT** accurately drawn

$AB = 5$ cm
$AH = 4$ cm

The size of the angle between CH and the plane $ABCD$ is $35°$

Calculate the volume of the cuboid.
Give your answer correct to 3 significant figures.

.....cm^3

(5 marks)

6 Here is a cube $ABCDEFGH$.

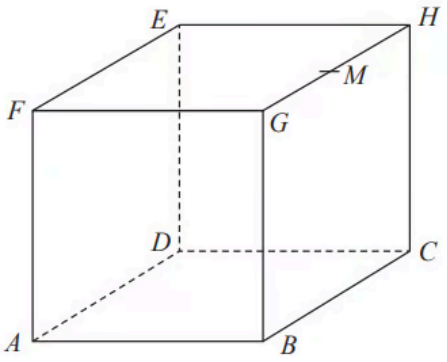


Diagram **NOT** accurately drawn

M is the midpoint of the edge GH.

Find the size of the angle between the line MA and the plane $ABCD$.
Give your answer correct to 1 decimal place.

(4 marks)

7 The diagram shows a triangular prism $ABCDEF$ with a horizontal base $ABEF$.

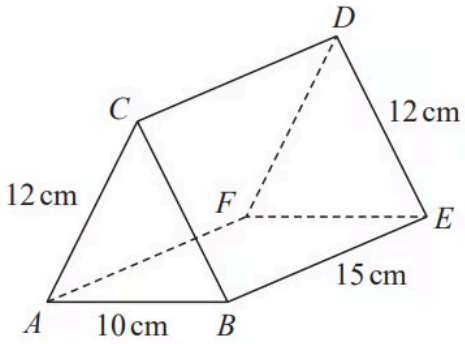


Diagram **NOT** accurately drawn

$AC = BC = FD = ED = 12$ cm $\quad AB = 10$ cm $\quad BE = 15$ cm

Calculate the size of the angle between AD and the base $ABEF$.
Give your answer correct to 3 significant figures.

(4 marks)

8 (a) The diagram shows a prism $ABCDEFGH$ with a horizontal base.

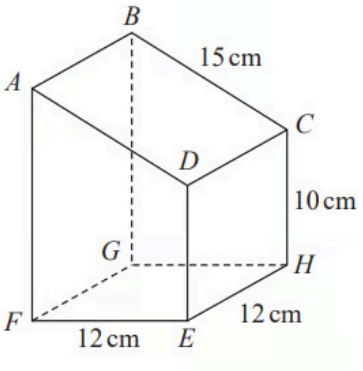


Diagram **NOT** accurately drawn

The base of the prism, $EFGH$, is a square of side 12cm. Trapezium $ADEF$ is a cross section of the prism where AF and DE are vertical edges.

$DE = CH = 10\,\text{cm}$
$AD = BC = 15\text{cm}$

Work out the size of the angle between CF and the base $EFGH$. Give your answer correct to one decimal place.

(3 marks)

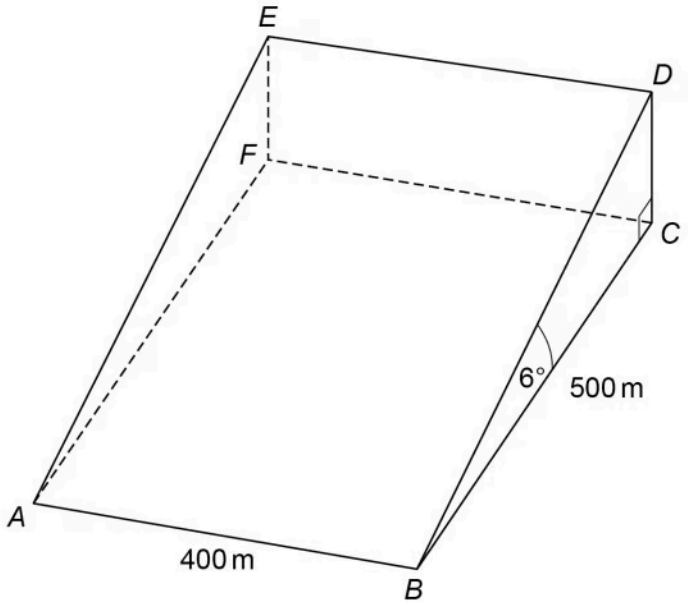
(b) Work out the length of BE.
Give your answer correct to one decimal place.

..... cm

(3 marks)

9 (a) $ABCDEF$ is a triangular prism which represents part of a hill.

$ABCF$ is the horizontal rectangular base.
D is vertically above C.

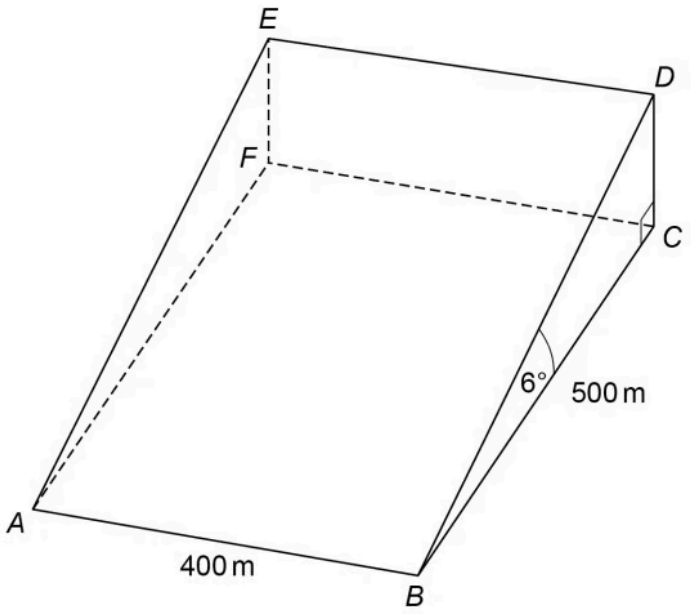


Work out the height CD.

.....m

(2 marks)

(b) Jamil walks in a straight line from A to D.



Work out the size of angle .
You **must** show your working.

.....degrees

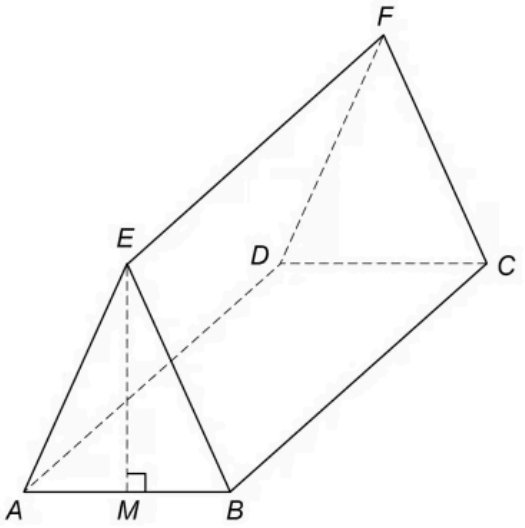
(4 marks)

10 (a) Rectangle $ABCD$ is the horizontal base of a triangular prism $ABCDEF$.

$AE = BE$

E is vertically above M, the midpoint of AB.

$AB = 16$ cm $\quad AE = 17$ cm $\quad BC = 30$ cm



Show that $EM = 15$ cm

(2 marks)

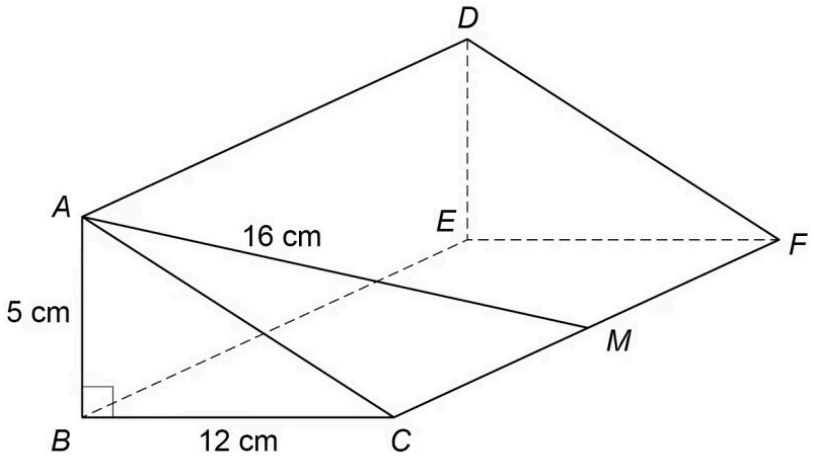
(b) Work out the size of angle ECM.

.....degrees

(4 marks)

11 Right-angled triangle ABC is the cross section of a prism.

$AB = 5$ cm $BC = 12$ cm
M is the midpoint of CF.
$AM = 16$ cm

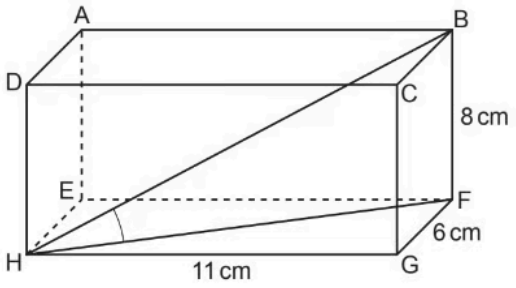


Work out the volume of the prism.

.....cm^3

(4 marks)

12 The diagram shows a cuboid ABCDEFGH.



Calculate angle BHF.

(5 marks)

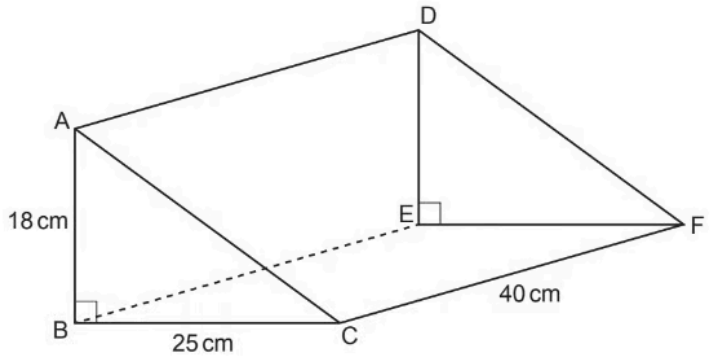
13 The length of the longest diagonal of a cube is 25cm.

Calculate the total surface area of the cube.

..... cm^2

(5 marks)

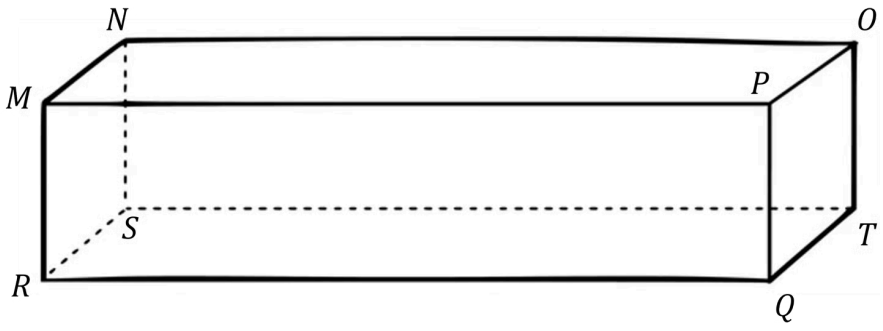
14 The diagram shows a right-angled triangular prism ABCDEF.



Calculate angle AFB.

(6 marks)

15 $MNOPQRST$ is a cuboid.



$MP = 11\text{cm}$

$RP = 17\text{cm}$

Angle $STR = 54°$

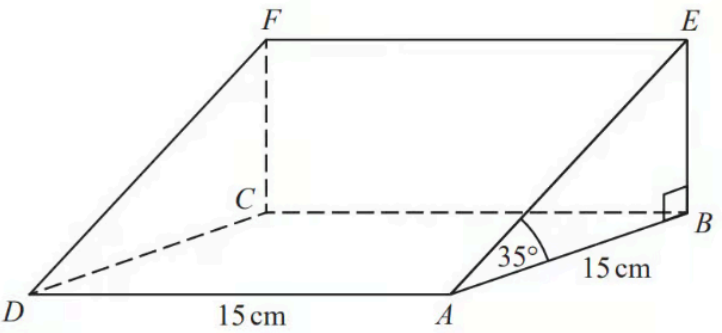
Work out the size of Angle RMT.

Give your answer correct to the nearest degree.

(5 marks)

Very Hard Questions

1 The diagram shows a triangular prism.



The base, $ABCD$, of the prism is a square of side length 15 cm. Angle ABE and angle CBE are right angles.
Angle EAB = 35°

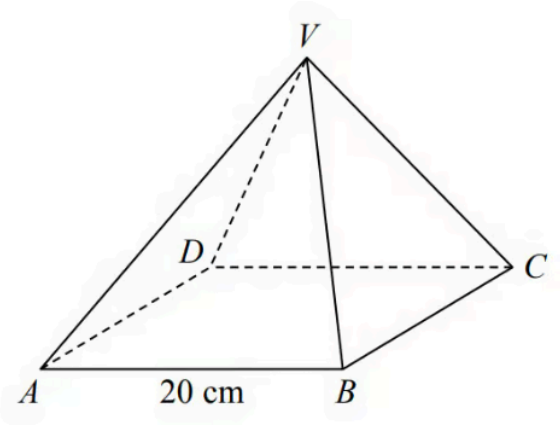
M is the point on DA such that

$$DM:MA = 2:3$$

Calculate the size of the angle between EM and the base of the prism.
Give your answer correct to 1 decimal place.

(4 marks)

2 $VABCD$ is a solid pyramid.



$ABCD$ is a square of side 20 cm.

The angle between any sloping edge and the plane $ABCD$ is 55°

Calculate the surface area of the pyramid.
Give your answer correct to 2 significant figures.

(5 marks)

3 The diagram shows the prism $ABCDEFGHJK$ with horizontal base $AEFG$

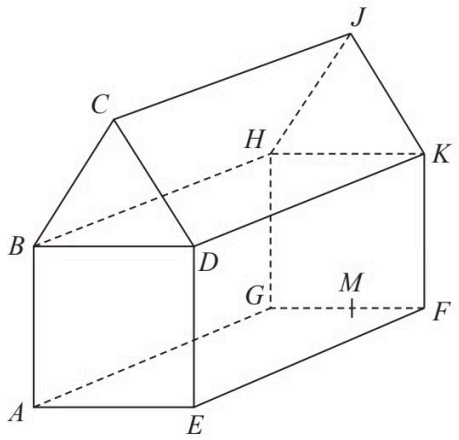


Diagram **NOT** accurately drawn

$ABCDE$ is a cross section of the prism where

$ABDE$ is a square
BCD is an equilateral triangle

$EF = 2 \times AE$
M is the midpoint of GF so that JM is vertical.

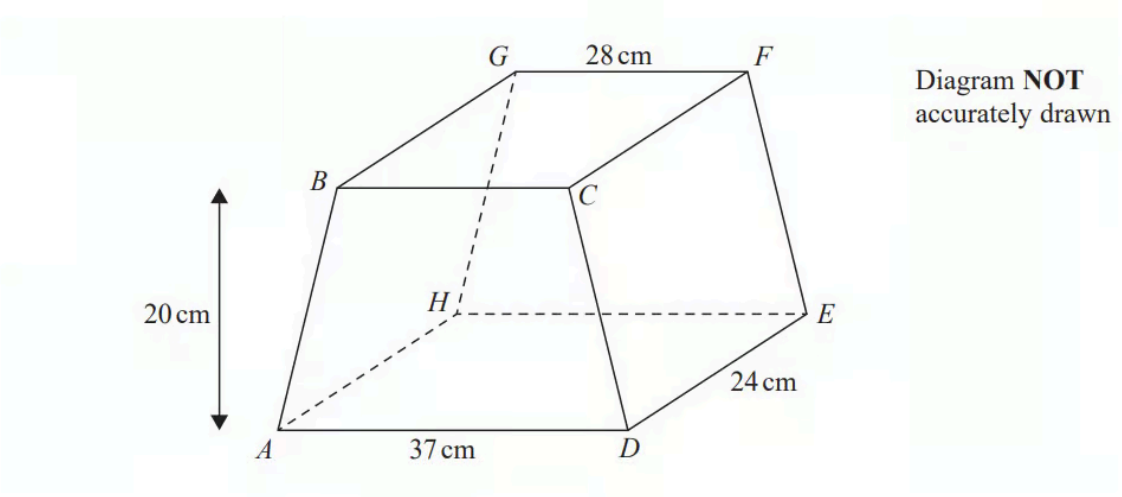
Angle $MAJ = y°$
Given that $\tan y° = T$

find the value of T, giving your answer in the form $\frac{\sqrt{p} + \sqrt{q}}{17}$ where p and q are integers.

T = ...

(5 marks)

4 The diagram shows a solid prism $ABCDEFGH$.



The trapezium $ABCD$, in which AD is parallel to BC, is a cross section of the prism.
The base $ADEH$ of the prism is a horizontal plane.
$ADEH$ and $BCFG$ are rectangles.
The midpoint of BC is vertically above the midpoint of AD so that $BA = CD$.

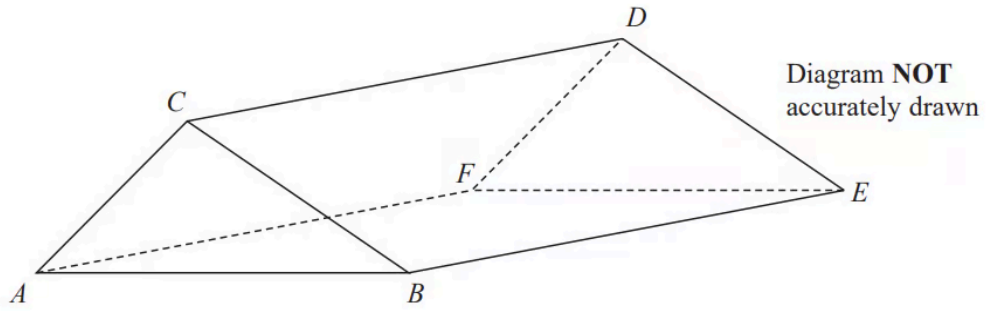
$AD = 37\text{ cm}$ $GF = 28\text{ cm}$ $DE = 24\text{ cm}$

The perpendicular distance between edges AD and BC is 20 cm.

Calculate the size of the angle between AF and the plane $ADEH$.
Give your answer correct to one decimal place.

(3 marks)

5 The diagram shows the prism $ABCDEF$ with cross section triangle ABC.



Angle BEC = 40° and angle ACB is obtuse.
AC = 6 cm and CE = 13cm

The area of triangle ABC is 22 cm^2

Calculate the length of AB.
Give your answer correct to one decimal place.

.....cm

(6 marks)

6 The diagram shows a solid pyramid $ABCDE$ with a horizontal base.

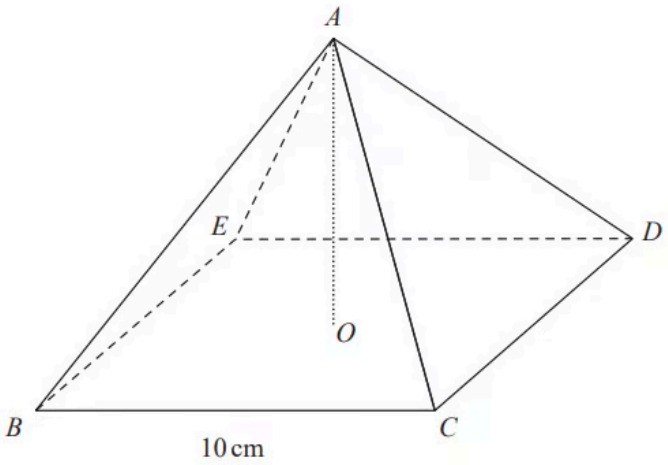


Diagram **NOT** accurately drawn

The base, $BCDE$, of the pyramid is a square of side 10 cm.

The vertex A of the pyramid is vertically above the centre O of the base so that $AB = AC = AD = AE$

The **total** surface area of the pyramid is 360 cm^2

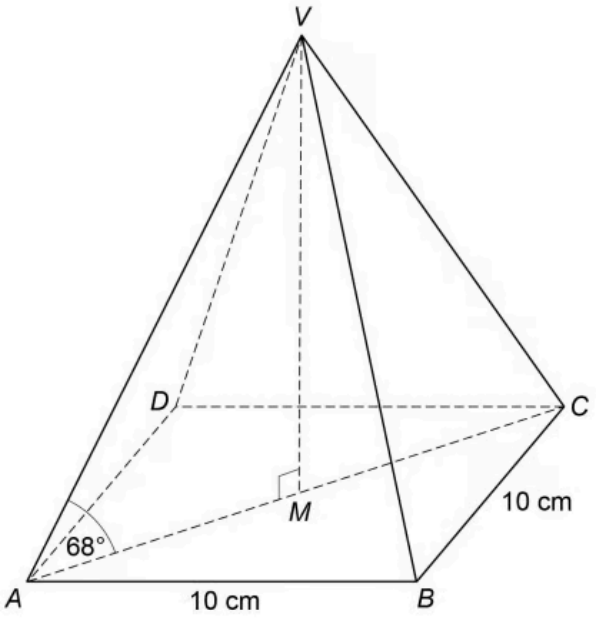
Work out the size of the angle between AC and the base $BCDE$. Give your answer correct to 3 significant figures.

(6 marks)

7 $VABCD$ is a square-based pyramid.

The horizontal base $ABCD$ has side length 10 cm and centre M.

Angle VMA is 90°
Angle VAM is 68°



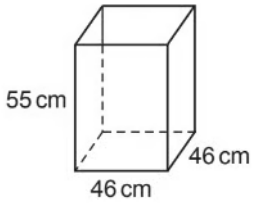
Volume of pyramid $= \frac{1}{3} \times$ area of base $\times$ perpendicular height

Work out the volume of the pyramid.

.....cm^3

(6 marks)

8 (a) Alvin has a crate in the shape of a cuboid.
The crate is open at the top.
The internal dimensions of the crate are 46cm long by 46cm wide by 55cm high.



Alvin has a stick of length 95cm.
Alvin places the stick in the crate so that the shortest possible length extends out above the top of the crate.

Calculate the length of the stick that extends out of the crate.

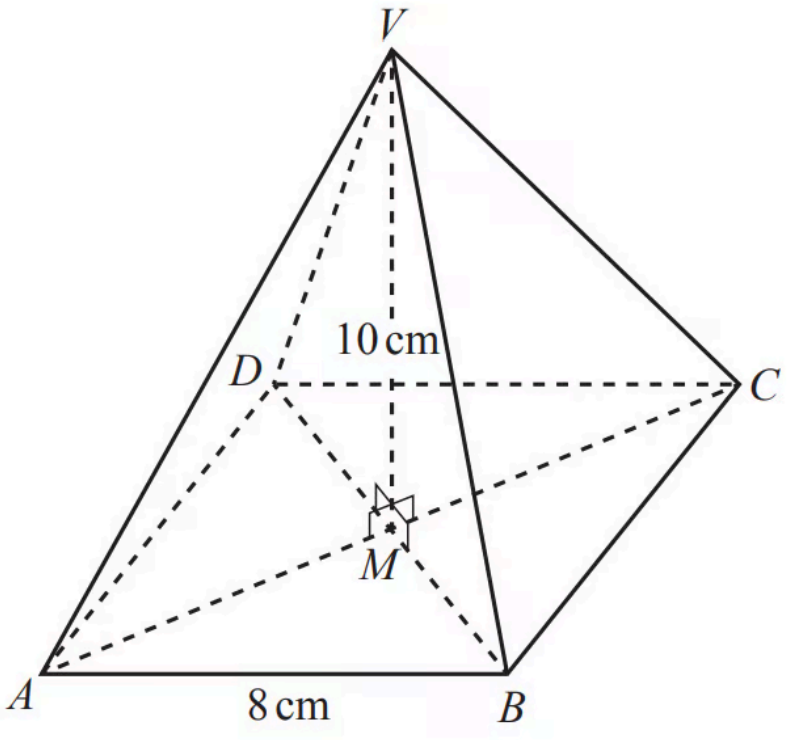
..... cm

(4 marks)

(b) Calculate the angle the stick makes with the base of the crate.

(3 marks)

9



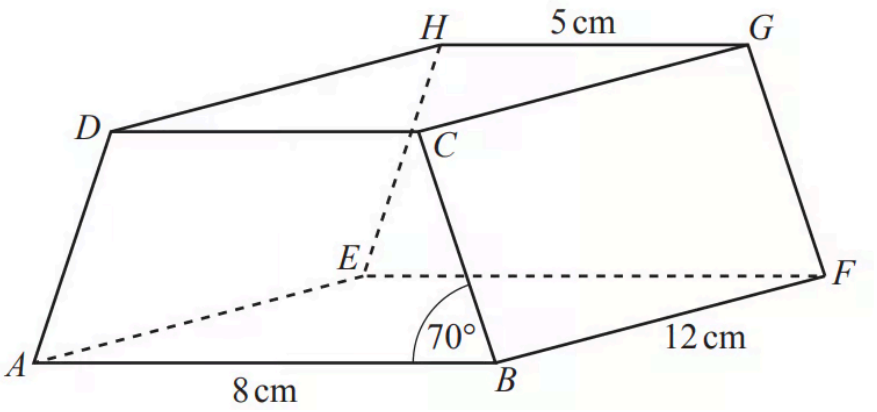
NOT TO SCALE

The diagram shows a pyramid with a square base *ABCD* of side length 8cm.
The diagonals of the square, *AC* and *BD*, intersect at *M*.
V is vertically above *M* and *VM* = 10 cm.

Calculate the angle between *VA* and the base.

(4 marks)

10



NOT TO SCALE

The diagram shows a prism with a rectangular base, *ABFE*.
The cross-section, *ABCD*, is a trapezium with *AD* = *BC*.
AB = 8 cm, *GH* = 5 cm, *BF* = 12 cm and angle *ABC* = 70°.

The perpendicular from *G* onto *EF* meets *EF* at *X*.

i) Show that *EX* = 6.5 cm.

[1]

ii) Calculate *AX*.

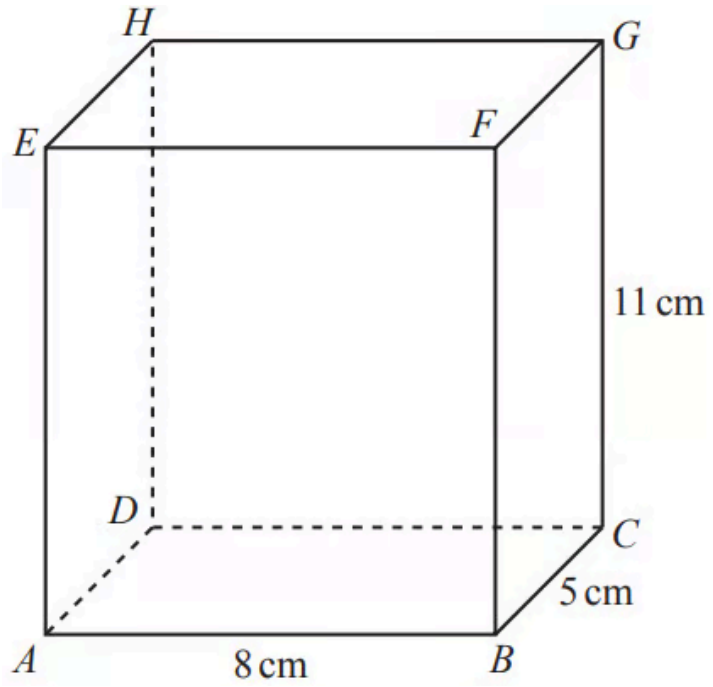
AX = ... cm [2]

iii) Calculate the angle between the diagonal *AG* and the base *ABFE*.

[2]

(5 marks)

11



NOT TO SCALE

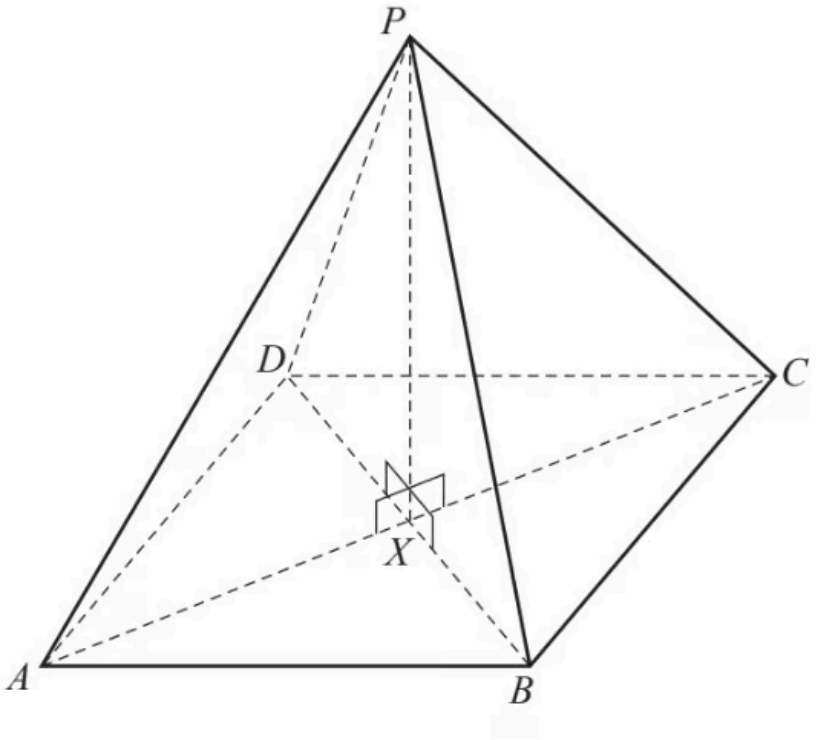
ABCDEFGH is a cuboid.
AB = 8 cm, *BC* = 5 cm and *CG* = 11 cm.

Ivana has a pencil of length 13cm.

Does this pencil fit completely inside the cuboid?
Show how you decide.

(4 marks)

12



NOT TO SCALE

The diagram shows a pyramid with a square base *ABCD*.
DB = 8 cm.
P is vertically above the centre, *X*, of the base and *PX* = 5 cm.
Calculate the angle between *PB* and the base *ABCD*.

(3 marks)