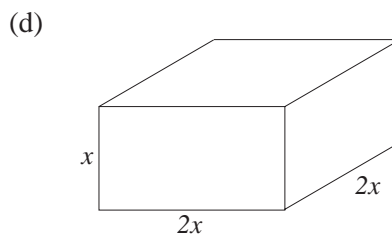
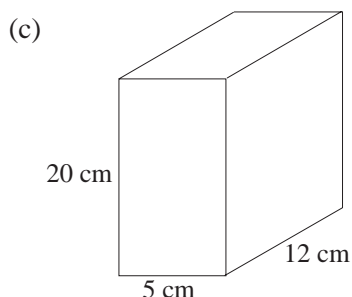
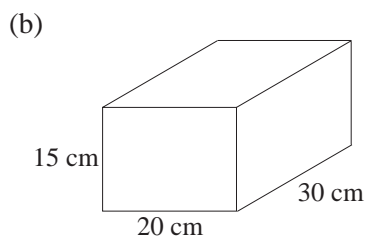
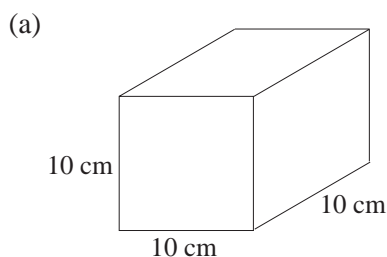


18 3-D Geometry

18.1 Using Pythagoras' Theorem and Trigonometry in Three Dimensions

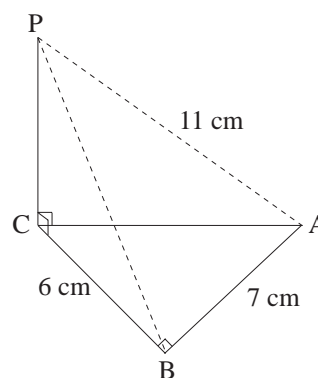
1. Find the length of the longest rod that could be placed in each box shown below.



2. A square-based pyramid is made up of a square and four isosceles triangle with sides of lengths 6, 6 and 4 cm. Find the height of the pyramid.

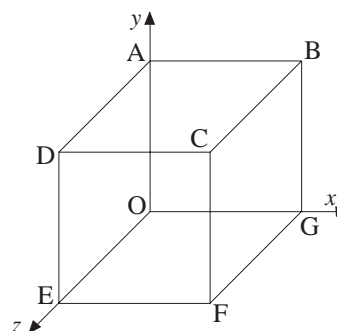
3. The figure shows a triangle ABC, right-angled at B and lying in horizontal plane. P is a point vertically above C. Given that $AB = 7$ cm, $BC = 6$ cm and $AP = 11$ cm, calculate

- the length of PC,
- \hat{PAC} ,
- The angle of elevation of P from B.



4. This shape is a cube with $OG = OE = OA = 2$. O is the origin.

- Write down the three-dimensional coordinates of point F.
- Calculate the distance AC.

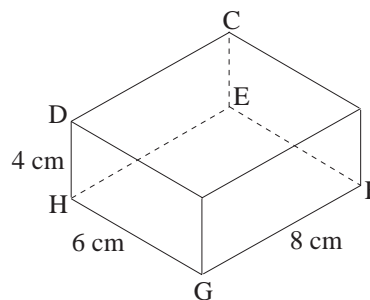


Not to Scale

5. A rectangular box has a horizontal base EFGH. The corner D is vertically above H.

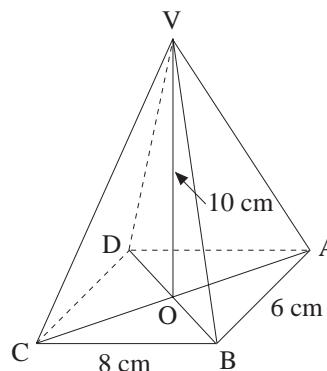
Given that $DH = 4$ cm, $HG = 6$ cm and $GF = 8$ cm, calculate

- (a) \hat{DGH} ,
- (b) the length of HF,
- (c) \hat{DFH} .

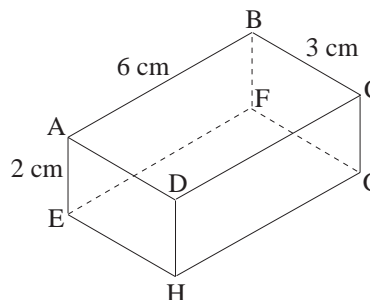


6. VABCD is a pyramid of height 10 cm. Its base is a rectangle with $AB = 6$ cm and $BC = 8$ cm. V is vertically above O, the point of intersection of the diagonals AC and BD. Find

- (a) the length of VA,
- (b) \hat{VAO} .



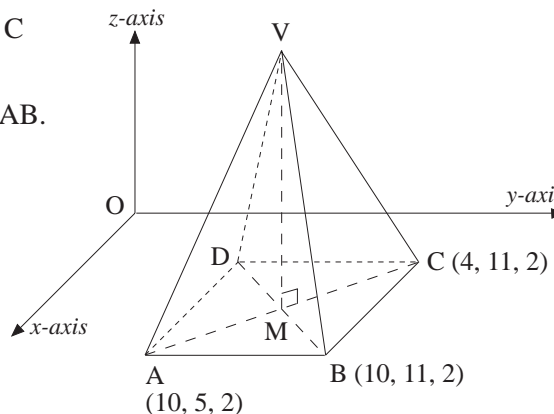
7. The diagram represents a rectangular box. Given that $AB = 6$ cm, $BC = 3$ cm and $AE = 2$ cm, calculate the length of the diagonal AG.



8. ABCDV is a right square-based pyramid. M is the centre of the square base ABCD.

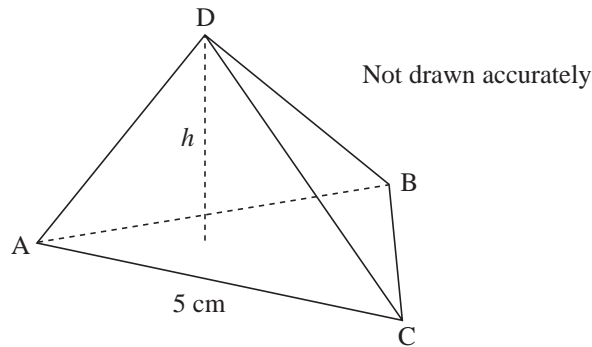
The (x, y, z) coordinates of A, B, and C are shown on the diagram.

- (a) (i) Write down the length of AB.
(ii) Write down the coordinates of D.
- (b) Calculate the coordinates of M.
- (c) The z coordinate of V is 9. What is the height of the pyramid?



(NEAB)

9. ABCD is a triangular based pyramid. The base ABC is an equilateral triangle with side 5 cm. The volume of the pyramid is 36 cm^3 .



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

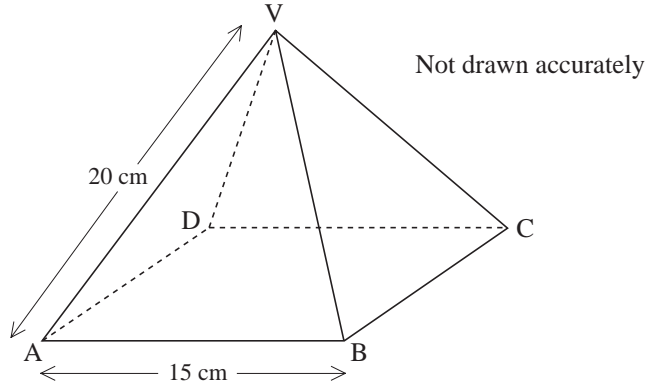
Calculate the perpendicular height, h , of the pyramid.

(AQA)

10. VABCD is a right pyramid on a square base. V is vertically above the centre of the square.

$$VA = VB = VC = VD = 20 \text{ cm}$$

$$AB = 15 \text{ cm}$$



Calculate the angle between the edge VA and the base ABCD.

(AQA)

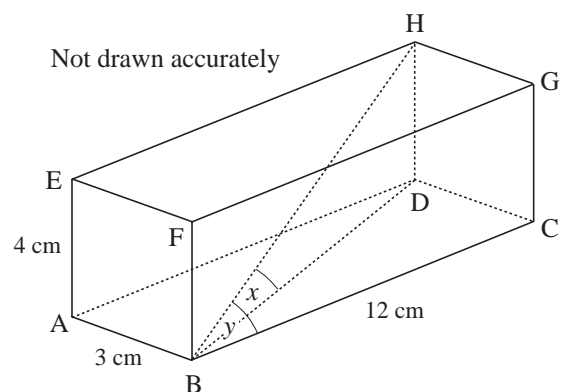
11. The diagram shows a cuboid.

$$AB = 3 \text{ cm}, AE = 4 \text{ cm},$$

$$BC = 12 \text{ cm}$$

- (a) Find the length of BH.
- (b) The angle between BH and BD is x and the angle between BH and BC is y .

Which angle is bigger, x or y ? You **must** show your working.

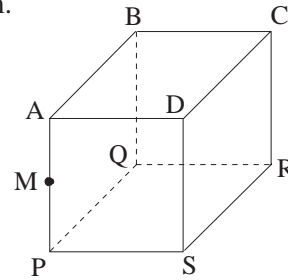


(AQA)

18.2 Angles and Planes

1. The cube shown in the figure has edges of length 20 cm. M is the mid-point of AP. Calculate

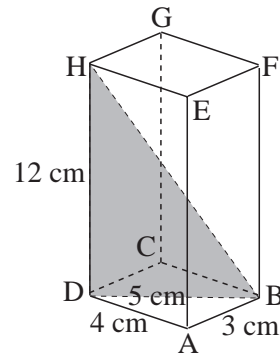
- the length of CM,
- the angle CMR,
- \hat{MSP} .



2. The diagram shows a rectangular box in which $AB = 3$ cm, $AD = 4$ cm, $BD = 5$ cm and $DH = 12$ cm.

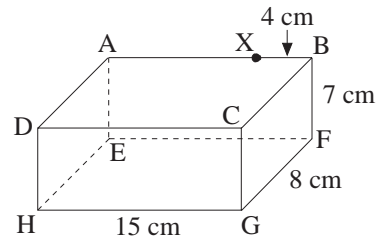
Calculate the length of the straight line BH and

- \hat{BDC}
- \hat{BHC}
- \hat{HBD}



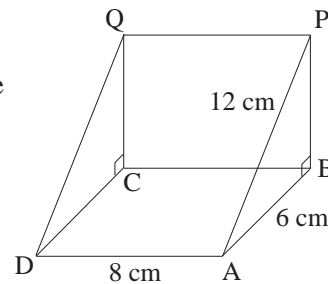
3. The diagram shows a rectangular box which has a horizontal base EFGH where $HG = 15$ cm, $GF = 8$ cm and $BF = 7$ cm. X is a point on AB such that $XB = 4$ cm.

Calculate the angles CEG and GXF.



4. The diagram shows a right triangular prism with $\hat{ABP} = 90^\circ$ and ABCD lying on a horizontal table. If $AB = 6$ cm, $AD = 8$ cm and $AP = 12$ cm, calculate

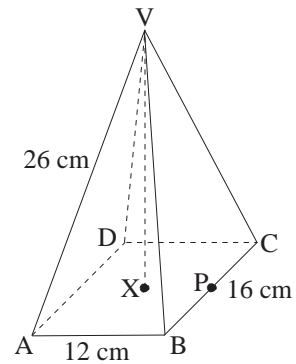
- \hat{PAB} ,
- the length of PB,
- \hat{PDB} .



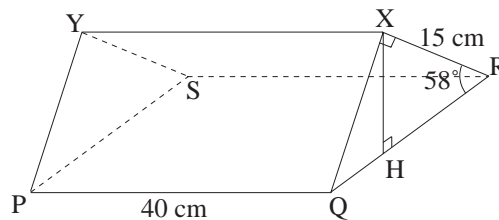
5. The diagram shows a right pyramid on a horizontal rectangular base ABCD.

Given that $AB = 12$ cm, $BC = 16$ cm and $VA = 26$ cm, calculate:

- the length of AX, where X is the mid-point of AC,
- the vertical height, VX, of the pyramid,
- the angle AVC,
- the length of VP where P is the mid-point of BC.



- 6.

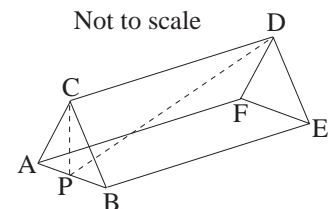


The diagram shows a triangular prism.

The two triangular faces PSY and QRX are vertical. Two of the three rectangular faces PQXY and SRXY are at right angles, i.e. $\widehat{R\hat{X}Q} = 90^\circ$, while the face PQRS is horizontal.

Given that the angle between the faces SRXY and PQRS, i.e. $\widehat{X\hat{R}Q}$, is 58° , $\widehat{X\hat{H}R} = 90^\circ$, $RX = 15$ cm and $PQ = 40$ cm, calculate

- QX,
 - $\widehat{X\hat{P}H}$.
7. ABCDEF is a triangular prism, 10 cm long.
ABC is an equilateral triangle of side 3 cm.
P is the foot of the perpendicular from C to AB.



- Calculate the length of PD.
- Calculate the size of the angle between CE and PE.

(SEG)