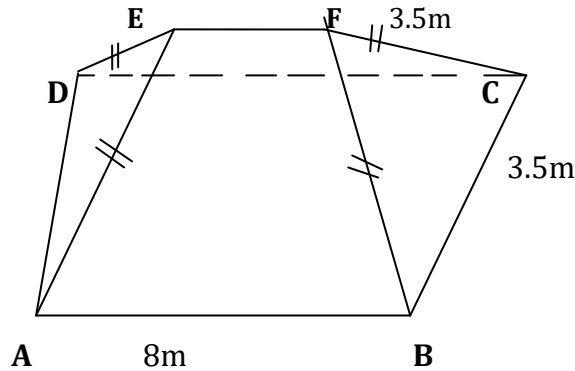


# THREE DIMENSIONAL GEOMETRY

KCSE 1989 – 2012 Form 4 Mathematics

Answer all the questions

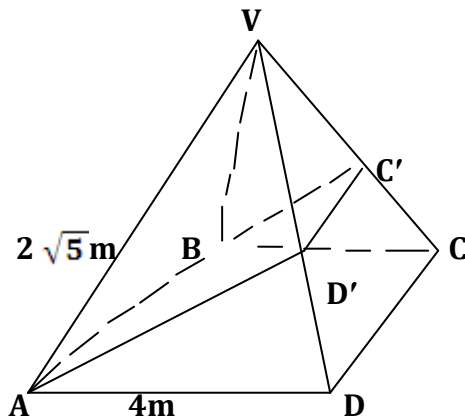
1. **1991 Q23 P2**  
 The figure below shows a shape of a roof with a horizontal rectangular base ABCD. The ridge EF is also horizontal. The measurements of the roof are AB = 8m, BC = 5m, EF = 4.5m and EA = ED = FC = 3.5m



Calculate:

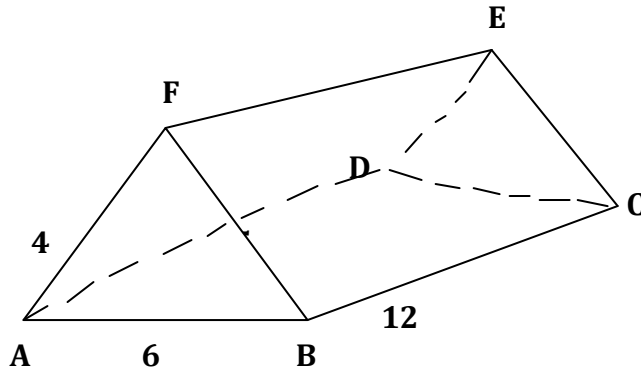
- i) the height of the ridge EF above the base ABCD (4marks)
- ii) the angle between the face and the base ABCD (4marks)

2. **1992 Q19 P2**  
 A pyramid VABD has a square base ABCD of side 4m. The slant edges VA, VB, VC and VD are  $2\sqrt{5}$  m long



- a) Calculate
  - i) The height of the pyramid (3 marks)
  - ii) The angle between the plane VAB and the base ABCD (2 marks)
- b) C' and D' are midpoints of VC and VD respectively.  
 Calculate the angle between the planes ABCD and ABC'D' (3 marks)

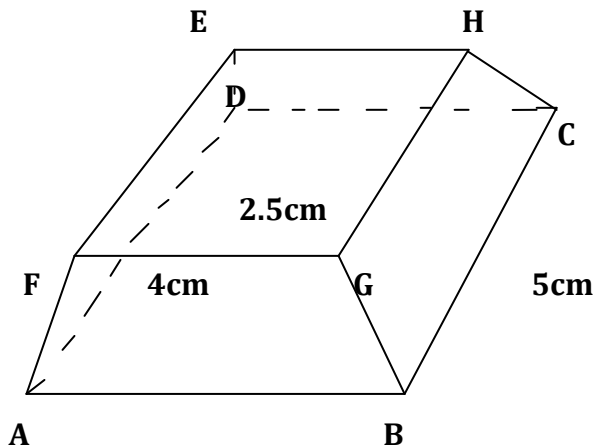
3. **1993 Q22 P2**  
The figure below shows a triangular prism with dimensions as shown



Calculate

- The angle between the faces FBCE and ABCD (2marks)
- the volume of the prism (3 marks)
- the angle between the planes DFC and ABCD (3 marks)

4. **1994 Q22 P1**  
In the figure below ABCDEFGH is a frustum of a right pyramid. The altitude of the frustum is 2cm.



Calculate

- The altitude of the pyramid (2marks)
- The volume of the frustum (3marks)
- The angle between the base of the frustum and the face ABGF (3marks)

6. **1996 Q 13 P2**  
The base of a right pyramid is a square ABCD of side  $2a$  cm. The slant edges VA, VB, VC and VD are each of length  $3a$  cm.

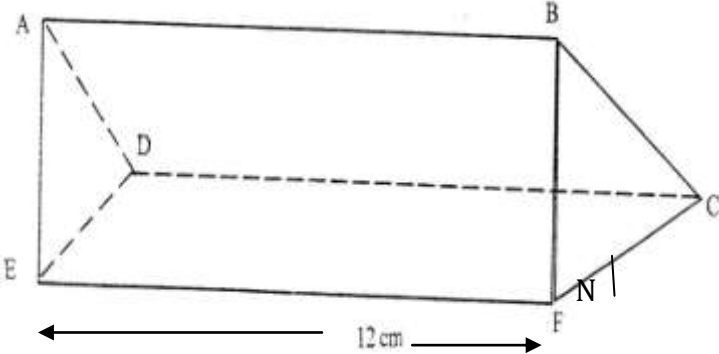
- Sketch and label the pyramid (1 mk)
- Find the angle between a slanting edge and the base (3 mks)

7. **1997 Q 6 P2**  
 A pyramid of height 10cm stands on a square base ABCD of side 6 cm

(a) Draw a sketch of the pyramid (1mark)

(b) Calculate the perpendicular distance from the vertex to the side AB (1mark)

8. The triangular prism shown below has sides  $AB = DC = EF = 12$  cm.



The ends are equilateral triangle of sides 10cm. The point N is the midpoint FC.

(a) Find the length of

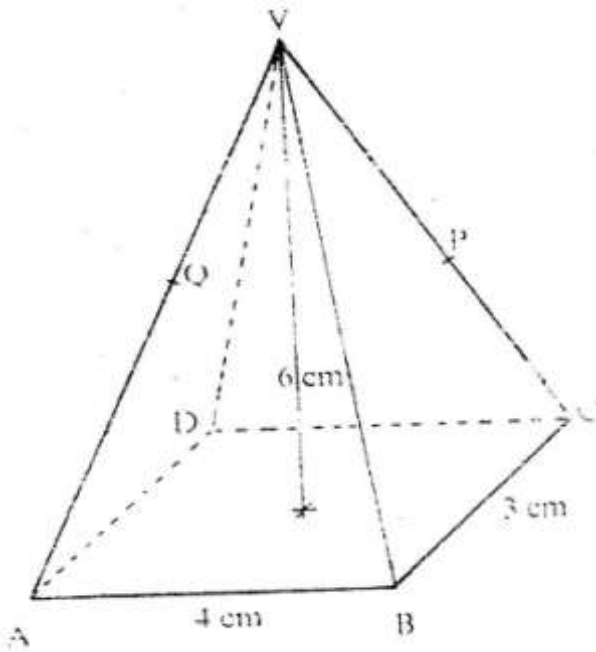
(i) BN (1mark)

(ii) EN (1mark)

(b) Find the angle between the line EB and the plane CDEF (2mark)

9. **1999 Q 14 P1**  
 An equilateral triangle ABC lies in a horizontal plane, A vertical flag AH stand at A. If  $AB = 2 AH$  find the angle between the planes ABC and HBC (3mark)

10. **1999 Q 24 P2**  
 The diagram below shows a right pyramid VABCD with V as the vertex. The base of the pyramid is rectangle ABCD, WITH  $ab = 4$  cm and  $BC = 3$  cm. .  
 The height of the pyramid is 6cm



(a) Calculate the

(ii) length of the projection of VA on the base (2mark)

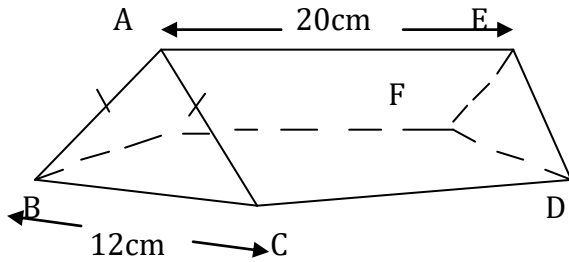
(iii) Angle between the face VAB and the base (2mark)

(b) P is the mid-point of VC and Q is the mid-point of VD. Find the angle between the planes VAB and the plane ABPQ (4marks)

11. **2000 Q 11 P1**  
 A pyramid VABCD has a rectangular horizontal base ABCD with AB= 12 cm and BC = 9cm. The vertex V is vertically above A and VA = 6cm. calculate the volume of the pyramid. (2mark)

12. **2002 Q 18 P1**  
 The figure below represents a right prism whose triangular faces are isosceles. The base and height of each triangular face are 12cm and 8cm respectively.

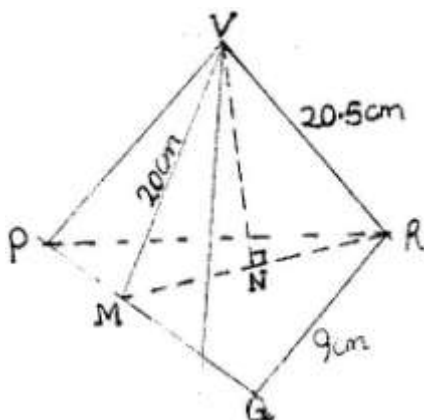
The length of the prism is 20cm



Calculate the:

- a) Angle CE (2mark)
- b) Angle between
  - i) The line CE and the plane BCDF (2mark)
  - ii) The plane EBC and the base BCDF (2mark)

13. **2002 Q 20 P2**  
 The figure VPQR below represents a model of a top of a tower. The horizontal base PQR is an equilateral triangle of side 9cm. The lengths of edges are VP = VQ = VR = 20.5cm. Point M is the midpoint of PQ and VM = 20cm. Point N is on the base and vertically below V.



Calculate:

- a) i) Length of RM (2mark)
- ii) Height of model (2mark)
- iii) Volume of the model (2mark)

b) The model is made of material whose density is 2,700 kg/m<sup>3</sup>. Find the mass of the model. (2mark)

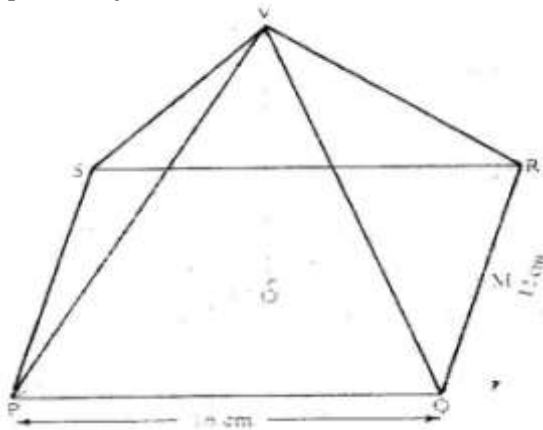
14. **2003 Q 15 P1**  
 Three points O, A and B are on the same horizontal ground. Point A is 80 metres to the north of O. Point B is located 70 metres on a bearing of  $060^\circ$  from A. A vertical mast stands at point B.

The angle of elevation of the top of the mast from O is  $20^\circ$ .

Calculate: a) The distance of B from O. (2mks)

b) The height of the mast in metres (2mks)

15. **2003 Q 24 P2**  
 The figure below represents a right pyramid with vertex V and a rectangular base PQRS.  $VP = VQ = VR = VS = 18\text{cm}$  and  $QR = 16\text{cm}$  and  $QR = 12\text{cm}$ . M and O are the midpoints of QR and PR respectively.



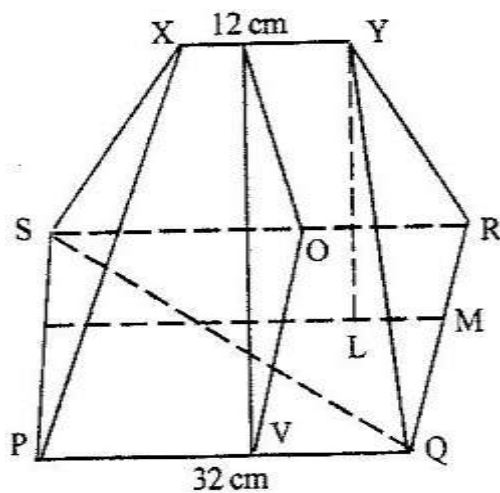
Find:

a) The length of the projection of line VP on the plane PQRS (2mks)

b) The size of the angle between line VP and the plane PQRS. (2mks)

c) The size of the angle between the planes VQR and PQRS. (2mks)

16. **2004 Q 24 P2**  
 The figure below shows a model of a roof with a rectangular base PQRS  $PQ = 32\text{ cm}$  and  $QR = 14\text{ cm}$ .



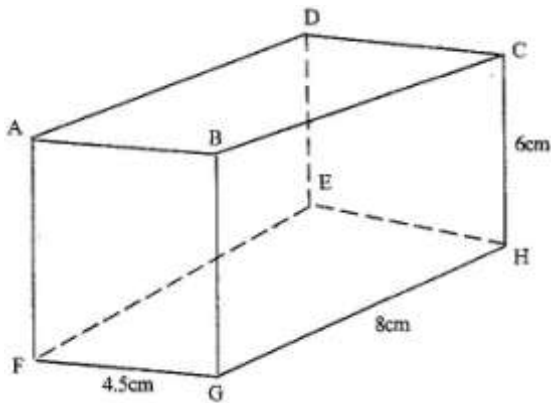
The ridge  $XY = 12$  cm and is centrally placed.  
 The faces  $PSX$  and  $QRY$  are equilateral triangles  $M$  is the midpoint of  $QR$ .

Calculate

- (a) (i) the length of  $YM$  (1mark)  
 (ii) The height of  $Y$  above the base  $PQRS$  (2mark)
- (b) The angle between the planes  $RSXY$  and  $PQRS$  (3mark)
- (c) The acute angle between the lines  $XY$  and  $QS$  (2mark)

17. **2005 Q 23 P2**

The diagram below represents a cuboid  $ABCDEFGH$  in which  $FG = 4.5$  cm,  $GH = 8$  cm and  $HC = 6$  cm

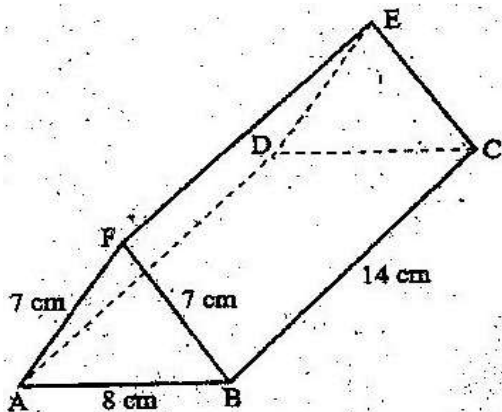


Calculate:

- (a) The length of  $FC$  (2 marks)
- (b) (i) the size of the angle between the lines  $FC$  and  $FH$  (2 marks)  
 (ii) The size of the angle between the lines  $AB$  and  $FH$  (2 marks)
- (c) The size of the angle between the planes  $ABHE$  and the plane  $FGHE$  (2mks)

18. **2008 Q 14 P2**

The figure below represents a triangular prism. The faces  $ABCD$ ,  $ADEF$  and  $CBFE$  are rectangles.



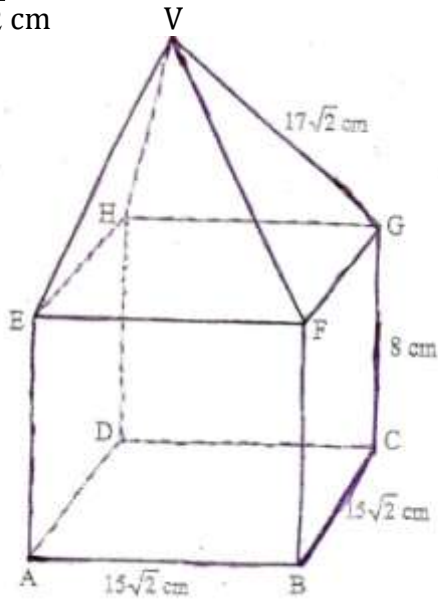
$AB = 8$  cm,  $BC = 14$  cm,  $BF = 7$  cm and  $AF = 7$  cm.

Calculate the angle between faces  $BCEF$  and  $ABCD$ .

(3mks)

19. **2009 Q 22 P2**

The figure below shows a right pyramid mounted onto a cuboid  $AB = BC = 15\sqrt{2}$  cm,  $CG=8$  and  $VG = 17\sqrt{2}$  cm



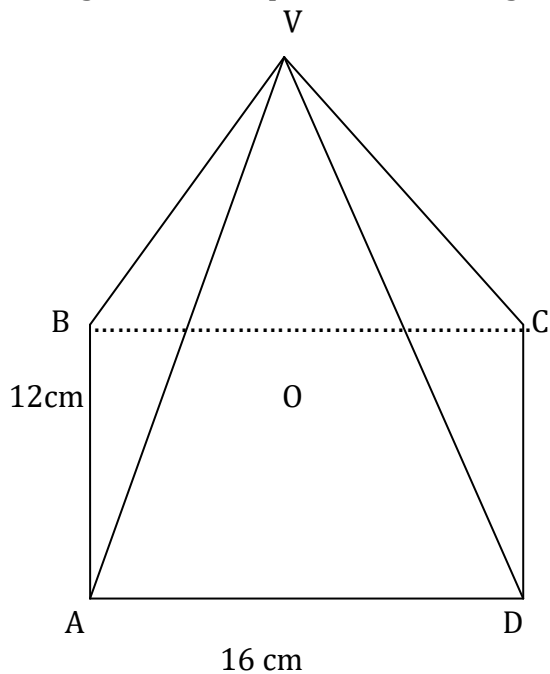
Calculate

- (a) The length of AC; (1mark)  
 (b) The angle between the line AG and the plane ABCD; (3mark)

- (c) The vertical height of point V from plane ABCD; (3mark)  
 (d) The angle between the planes EFV and ABCD (3mark)

20. **2011 Q 22 P2**

The figure below represents a rectangular based pyramid VABCD.



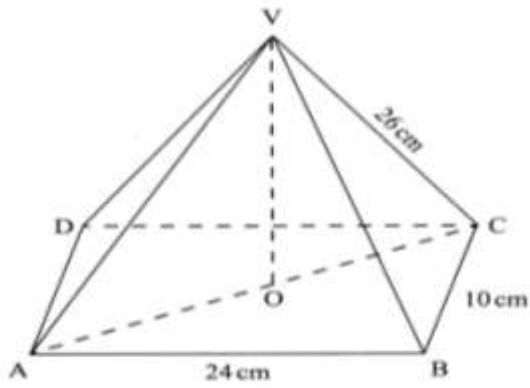
$AB=12$ cm and  $AD=16$  cm. Point O is vertically below V and  $VA=26$ cm.

Calculate

- a) The height, VO, of the pyramid; (4 mks)  
 b) The angle between the edge VA and the plane ABCD; (3 mks)  
 c) The angle between the planes VAB and ABCD. (3 mks)

21. **2012 Q16 P2**

In the figure below,  $VABCD$  is a right pyramid on a rectangular base. Point  $O$  is vertically below the vertex  $V$ .  $AB=24\text{cm}$ ,  $BC=10\text{cm}$  and  $CV=26\text{cm}$ .



Calculate the angle between the edge  $CV$  and the base  $ABCD$ .

(3 marks)