

NAME \_\_\_\_\_

INDEX NUMBER \_\_\_\_\_

SCHOOL \_\_\_\_\_

DATE \_\_\_\_\_

# THREE DIMENSIONAL GEOMETRY

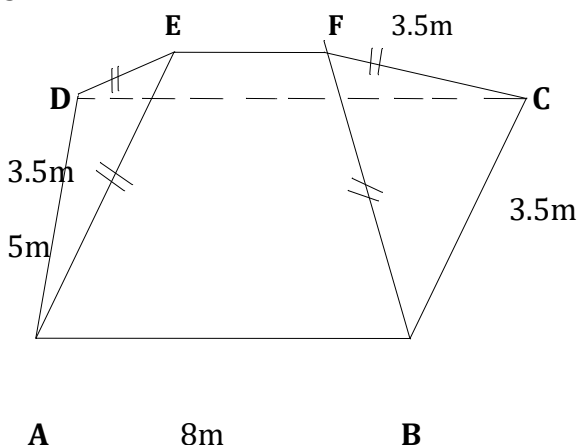
KCSE 1989 – 2012 Form 4 Mathematics

*Working space*

Answer all the questions

1. **1991 Q23 P2**

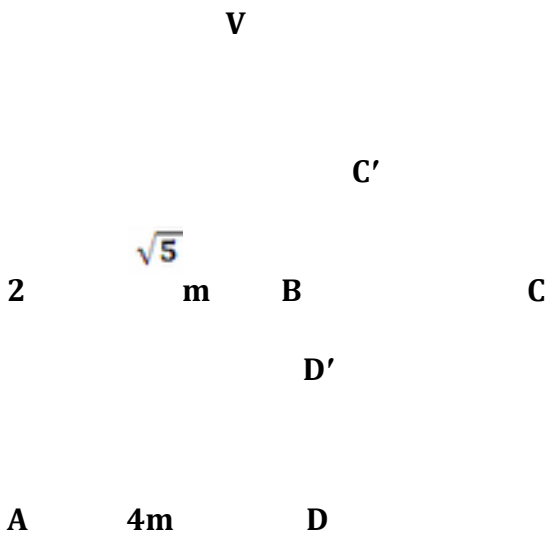
The figure below shows a shape of a roof with a horizontal rectangular base ABCD. The ridge EF is also horizontal. The measurements of the roof are AB = 8m, BC = 5m, EF = 4.5m and EA = ED = FC = 3.5m



Calculate:

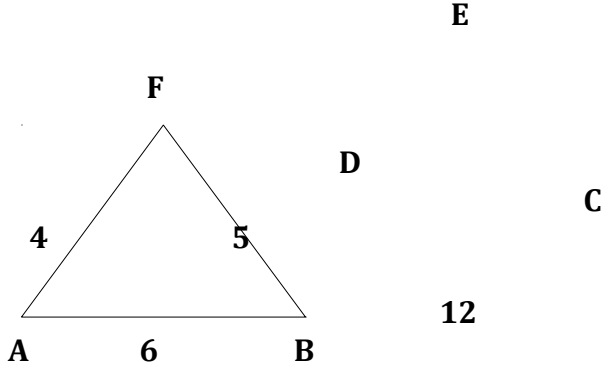
- i) the height of the ridge EF above the base ABCD  
(4marks)
- ii) the angle between the face and the base ABCD  
(4marks)

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



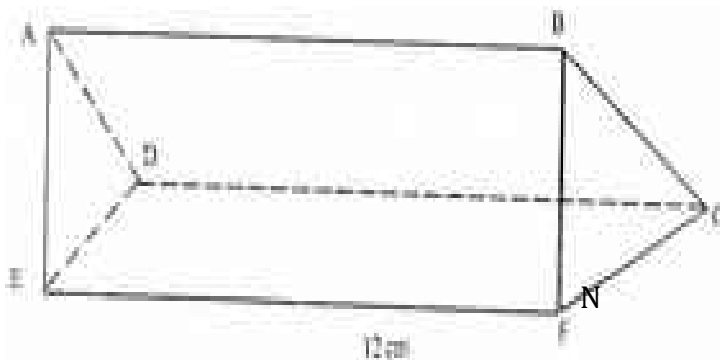
- Calculate
- a) The angle between the faces FBCE and ABCD (2marks)



*Working space*

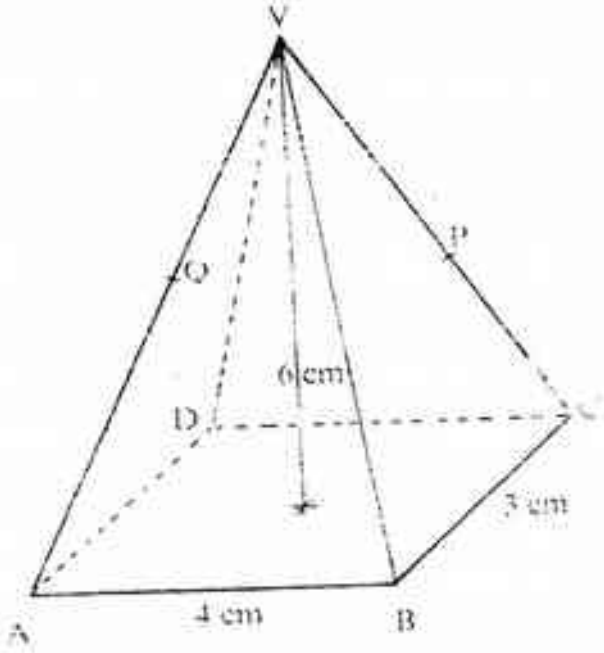
7. **1997 Q 6 P2**  
A pyramid of height 10cm stands on a square base ABCD of side 6 cm
- (a) Draw a sketch of the pyramid (1mark)
- (b) Calculate the perpendicular distance from the vertex to the side AB (1mark)

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)

	<p>(ii) EN (1mark)          (b) Find the angle between the line EB and the plane CDEF (2marks)</p>	<i>Working space</i>
9.	<p><b>1999 Q 14 P1</b>          An equilateral triangle ABC lies in a horizontal plane, A vertical flag AH stand at A. If <math>AB = 2 AH</math> find the angle between the planes ABC and HBC (3marks)</p>	
10.	<p><b>1999 Q 24 P2</b>          The diagram below shows a right pyramid VABCD with V as the vertex. The base of the pyramid is rectangle ABCD, WITH <math>ab = 4</math> cm and <math>BC = 3</math> cm. . The height of the pyramid is 6cm</p> 	

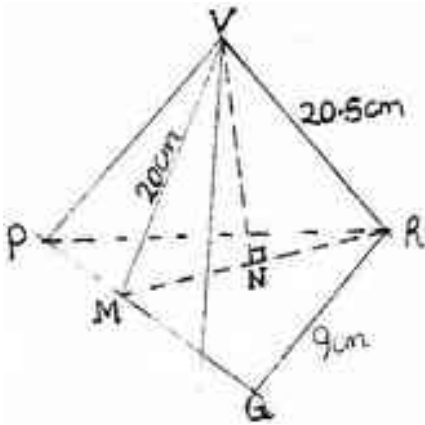
	<p>(a) Calculate the</p> <p>(ii) length of the projection of VA on the base (2marks)</p> <p>(iii) Angle between the face VAB and the base (2marks)</p> <p>(b) P is the mid- point of VC and Q is the mid – point of VD. Find the angle between the planes VAB and the plane ABPQ (4marks)</p>	<i>Working space</i>
11.	<p><b>2000 Q 11 P1</b></p> <p>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. (2marks)</p>	
12.	<p><b>2002 Q 18 P1</b></p> <p>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.</p> <p>The length of the prism is 20cm</p> <div style="text-align: center;"> </div> <p>Calculate the:</p> <p>a) Angle CE (2marks)</p> <p>b) Angle between</p> <p>i) The line CE and the plane BCDF (2marks)</p> <p>ii) The plane EBC and the base BCDF (2marks)</p>	

Working space

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  $VP = VQ = VR = 20.5\text{cm}$ . Point M is the midpoint of PQ and  $VM = 20\text{cm}$ .

Point N is on the base and vertically below V.



Calculate:

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

b) The model is made of material whose density is  $2,700 \text{ kg/m}^3$ . Find the mass of the model. (2marks)

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  $20^\circ$ .

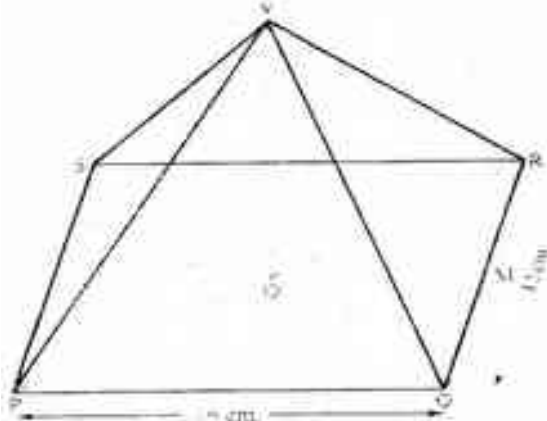
Calculate:

- a) The distance of B from O. (2marks)
- b) The height of the mast in metres (2marks)

*Working space*

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.

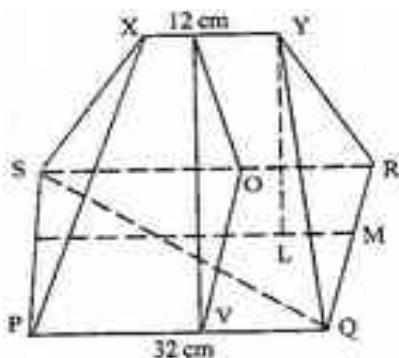


Find:

- a) The length of the projection of line VP on the plane PQRS (2marks)
- b) The size of the angle between line VP and the plane PQRS. (2marks)
- c) The size of the angle between the planes VQR and PQRS. (2marks)

16. **2004 Q 24 P2**

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



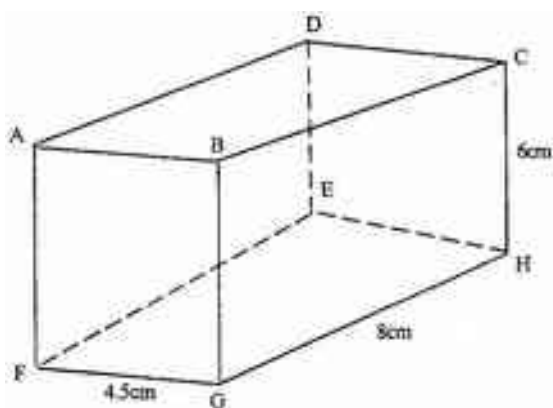


The ridge  $XY = 12$  cm and is centrally placed.  
The faces  $PSX$  and  $QRY$  are equilateral triangles  $M$  is the midpoint of  $QR$ . Calculate

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

*Working space*

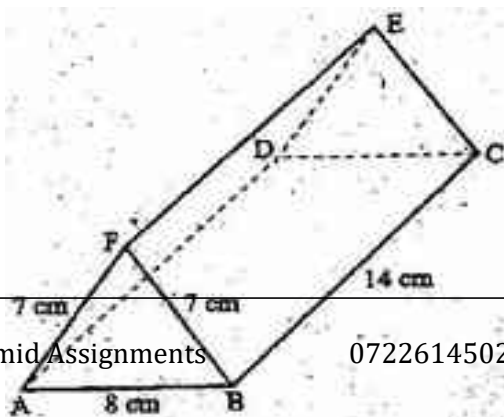
17. **2005 Q 23 P2**  
The diagram below represents a cuboid  $ABCDEFGH$  in which  $FG = 4.5$  cm,  $GH = 8$  cm and  $HC = 6$  cm



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  $FGHE$  (2 marks)

18. **2008 Q 14 P2**  
The figure below represents a triangular prism. The faces  $ABCD$ ,  $ADEF$  and  $CBFE$  are rectangles.

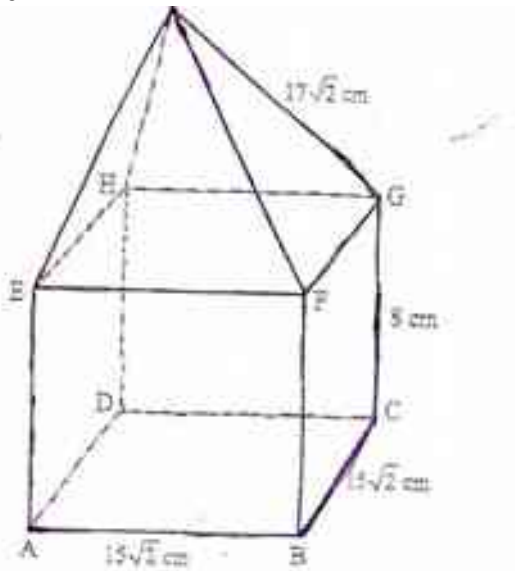


AB=8cm, BC=14cm, BF=7cm and AF=7cm.  
 Calculate the angle between faces BCEF and ABCD.  
 (3marks)

*Working space*

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  
 VG =      cm

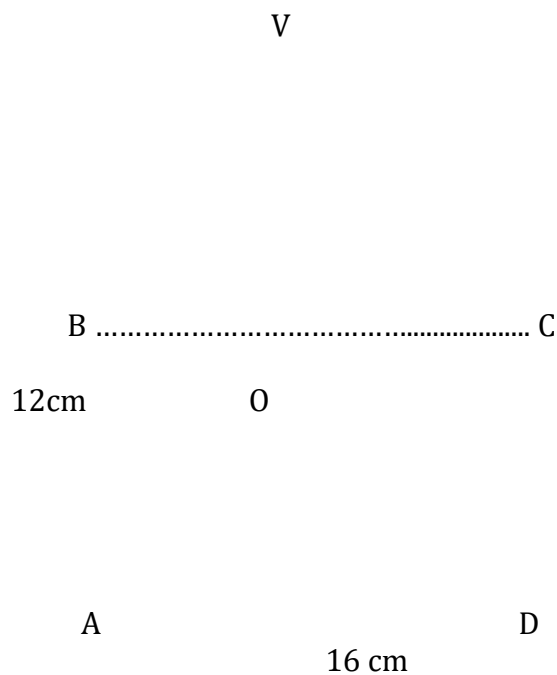


Calculate

- (a) The length of AC; (1mark)
  
- (b) The angle between the line AG and the plane ABCD; (3marks)
  
- (c) The vertical height of point V from plane ABCD; (3marks)
  
- (d) The angle between the planes EFV and ABCD (3marks)

*Working Space*

20. **2011 Q 22 P2**  
The figure below represents a rectangular based pyramid VABCD.



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

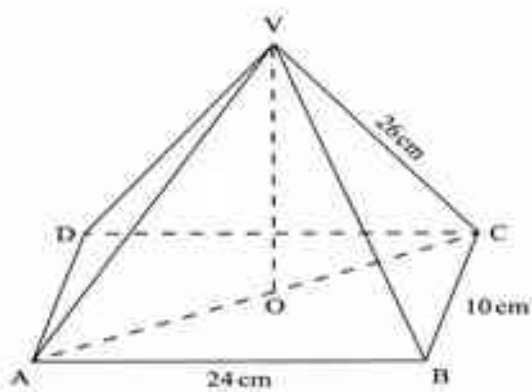
Calculate

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

Working Space

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)