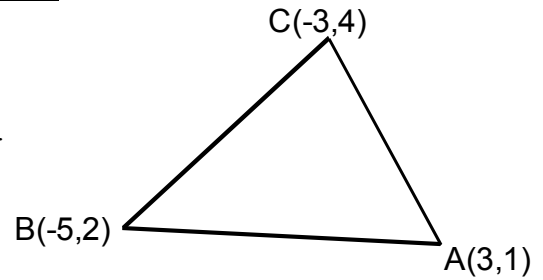


Angle between Vectors

1. A triangle has vertices $A(3,1)$, $B(-5,2)$ and $C(-3,4)$.
Calculate the size of angle BCA .

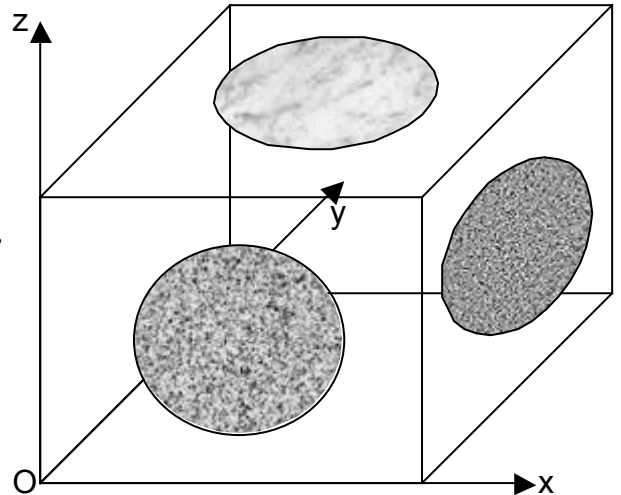


2. A triangle has vertices $P(2,1,-4)$, $Q(3,3,5)$ and $R(0,1,5)$.
Calculate the size of angle PQR .

3. A box in the shape of a cuboid is designed with circles of different sizes on each face.

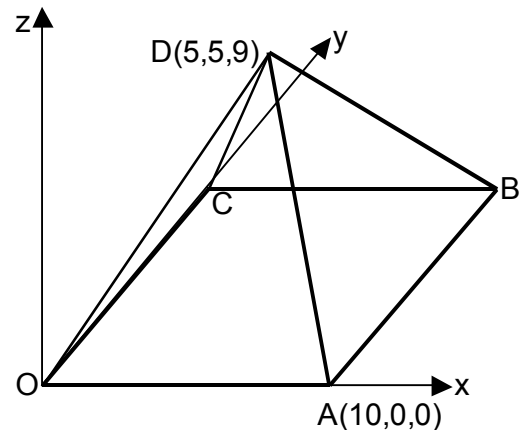
The diagram shows 3 of the circles, where the origin represents one of the corners of the cuboid. The centres of the circles are $A(6,0,7)$, $B(12,5,6)$ and $C(7,5,14)$.

Find the size of angle ABC .



4. The diagram shows a square based pyramid of height 8 units.
Square $OABC$ has side of length 10 units.
The coordinates of A and D are $(10,0,0)$ and $(5,5,9)$.
 C lies on the y -axis.

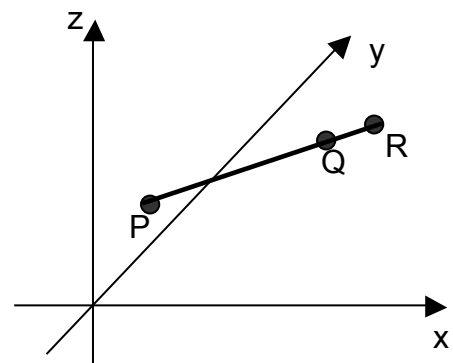
- (a) Write down the coordinates of B .
(b) Calculate the size of angle ADB .



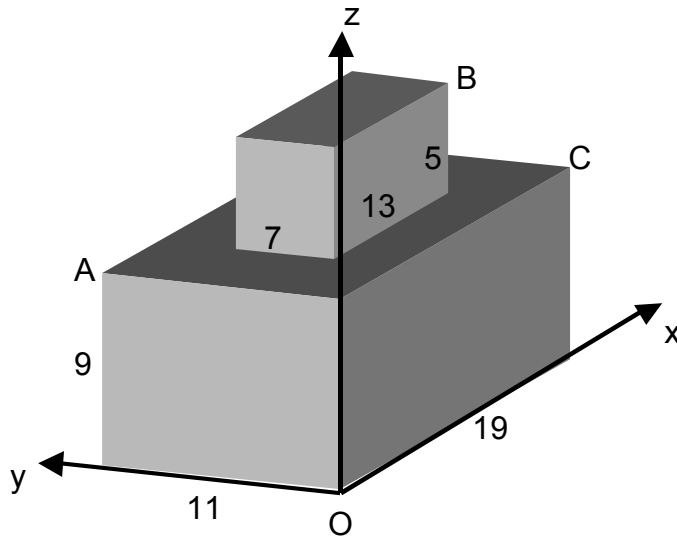
5. In the diagram opposite $P(-1,3,2)$ and $Q(5,0,5)$ represent points on a road.

The road is extended to the point R such that $\vec{PR} = \frac{4}{3}\vec{PQ}$.

- (a) Find the coordinates of R .
(b) Roads from P and R are built to meet at the point $S(-2,2,5)$.
Calculate the size of angle PSR .

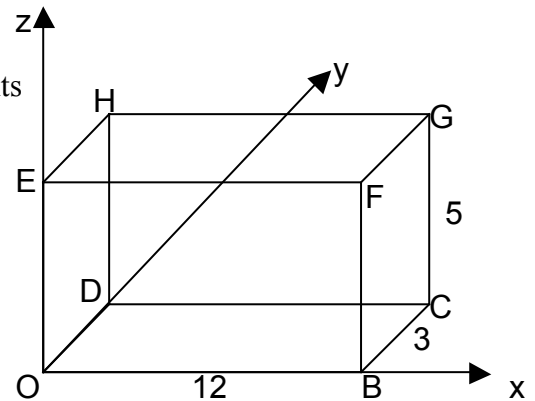


6. A cuboid measuring 13 cm by 5 cm by 7 cm is placed centrally on top of another cuboid measuring 19 cm by 11 cm by 9 cm. Coordinates axes are taken as shown.



- (a) The point A has coordinates (0,11,9) and C has coordinates (19,0,9). Write down the coordinates of B.
 (b) Calculate the size of angle ABC.

7. The diagram opposite shows a cuboid with measurements as shown.



- (a) Write down the coordinates of C and H.
 (b) Find the size of angle HCO.

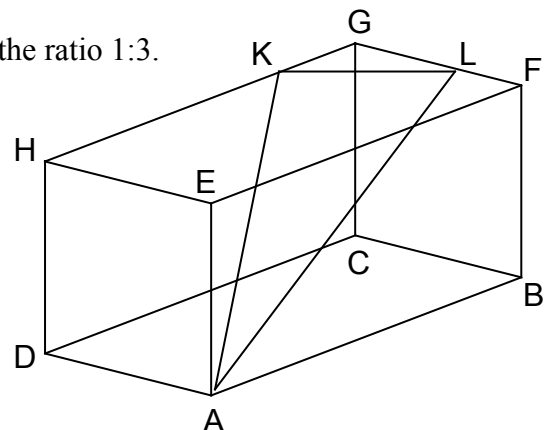
8. PQRS is a quadrilateral with vertices P((-2,-1,-4), Q(1,5,-7), R(7,8,5) and S(7,2,17).

- (a) T divides PR in the ratio 5:4. Find the coordinates of T.
 (b) Show that Q, T and S are collinear.
 (c) Calculate the size of the acute angle between the diagonals of PQRS.

9. ABCDEFGH is a cuboid.

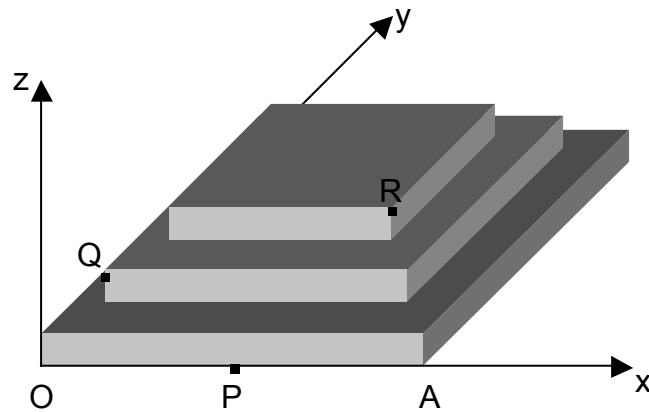
K divides HG in the ratio 2:1 and L divides FG in the ratio 1:3.

$$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 6 \\ 3 \end{pmatrix} \quad \overrightarrow{AD} = \begin{pmatrix} -8 \\ 4 \\ 4 \end{pmatrix} \quad \overrightarrow{AE} = \begin{pmatrix} 1 \\ -3 \\ 5 \end{pmatrix}.$$

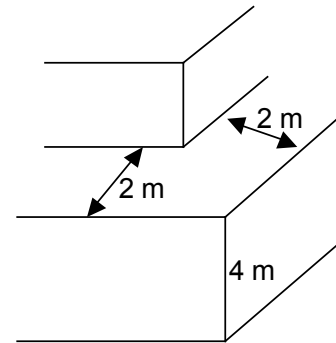


- (a) Calculate the components of \overrightarrow{AK} and \overrightarrow{AL}
 (b) Calculate the size of angle KAL.

10. The first three levels of a stepped pyramid with a square base are shown



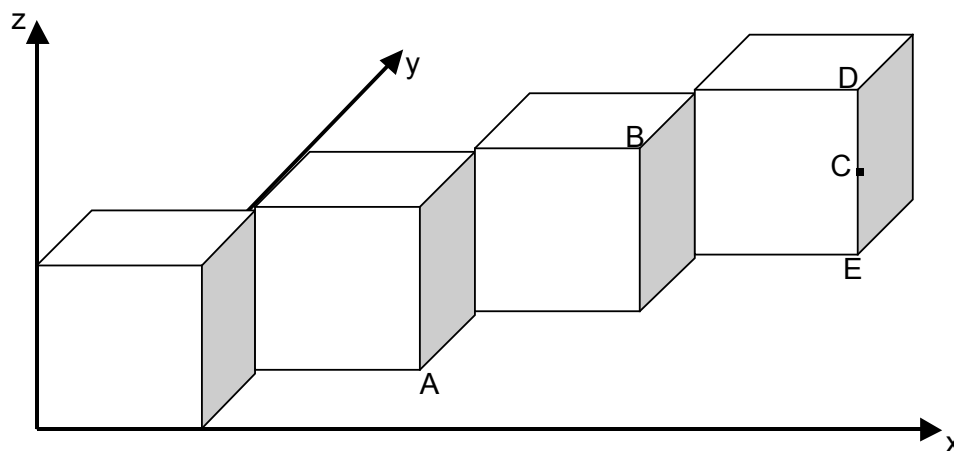
Each level is a square based cuboid of height 4 m.
The shaded parts indicate the steps which have a width of 2 m.



With coordinate axes as shown the coordinates of P and A are $(16,0,0)$ and $(32,0,0)$.

- Find the coordinates of Q and R.
- Find the size of angle QPR.

11. The diagram below shows 4 identical cubes placed edge to edge at right angles on a coordinate diagram. The cubes have length of side of 4 units. C is the midpoint of side DE.



- A has coordinates $(8,4,0)$. Write down the coordinates of B and C.
- Calculate the size of angle ABC.