

## (72) Vectors in 3D

### WORKING AT D/E

(1) Point  $A(4, -2, 6)$

(a) Find the position vector  $\vec{OA}$  using  $\mathbf{i j k}$  notation.

(b) Find the position vector  $\vec{OA}$  as a column vector.

(c) Find  $|\vec{OA}|$

(2) Point  $A(1, 0, -12)$  and  $B(3, -2, 8)$

(a) Find the position vector  $\vec{OA}$  using  $\mathbf{i j k}$  notation.

(b) Find the position vector  $\vec{OB}$  using  $\mathbf{i j k}$  notation.

(c) Find the direction vector  $\vec{AB}$  using  $\mathbf{i j k}$  notation.

(d) Find  $|\vec{AB}|$

(3)  $\vec{OA} = 2\mathbf{i} + 5\mathbf{j} - \mathbf{k}$  and  $\vec{OB} = 3\mathbf{i} - 2\mathbf{j} + 7\mathbf{k}$

Find  $|\vec{AB}|$

### WORKING AT B/C

(1)  $\vec{OA} = 3\mathbf{i} + \mathbf{j} - 2\mathbf{k}$  and  $\vec{OB} = \mathbf{i} - 5\mathbf{j} + 5\mathbf{k}$

(a) Find  $|\vec{AB}|$

(b) Hence find the perimeter of triangle  $OAB$  in exact form.

(2) (a) Find the angle the vector  $\mathbf{a} = \begin{pmatrix} 3 \\ -1 \\ 5 \end{pmatrix}$  makes

with each of the coordinate axes.

(b) Find a unit vector in the direction of  $\mathbf{a}$

(3) Points  $P(3, 2, -4)$ ,  $Q(1, 4, 3)$  and  $R(-1, -5, 4)$

(a) Find the exact value of  $\cos(PQR)$

(b) Hence, show that the value of  $\sin(PQR) = 0.994989$  correct to 6SF.

### WORKING AT A\*/A

(1) The point  $A$  is such that  $\vec{OA} = \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix}$

Find the perpendicular distance of  $A$  from the positive  $x$  axis.

(2) The vectors  $\vec{OA}$  and  $\vec{OB}$  are perpendicular.

$\vec{OA} = 4\mathbf{i} + \mathbf{j} + 2\mathbf{k}$  and  $\vec{OB} = 2\mathbf{j} - \mathbf{k}$

Find the exact value of  $\cos(OAB)$ .