VECTORS

(3)

(3)

1 The points *A* and *B* have position vectors $\begin{pmatrix} 2 \\ -1 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ 3 \\ -4 \end{pmatrix}$ respectively, relative to a

fixed origin.

C4

2

a Find, in vector form, an equation of the line *l* which passes through *A* and *B*. (2)The line *m* has equation

$$\mathbf{r} = \begin{pmatrix} 6\\ -5\\ 1 \end{pmatrix} + \boldsymbol{\mu} \begin{pmatrix} a\\ -3\\ 1 \end{pmatrix},$$

where *a* is a constant.

Given that lines l and m intersect,

- **b** find the value of a and the coordinates of the point where l and m intersect. (6)
- Relative to a fixed origin, the points A, B and C have position vectors $(-4\mathbf{i} + 2\mathbf{j} \mathbf{k})$, $(2\mathbf{i} + 5\mathbf{j} 7\mathbf{k})$ and $(6\mathbf{i} + 4\mathbf{j} + \mathbf{k})$ respectively.
 - **a** Show that $\cos(\angle ABC) = \frac{1}{3}$. (3)

The point M is the mid-point of AC.

- **b** Find the position vector of M. (2)
- c Show that BM is perpendicular to AC.(3)
- **d** Find the size of angle *ACB* in degrees.
- 3 Relative to a fixed origin *O*, the points *A* and *B* have position vectors $\begin{pmatrix} 9 \\ 5 \\ -3 \end{pmatrix}$ and $\begin{pmatrix} 11 \\ 7 \\ -3 \end{pmatrix}$

respectively.

a Find, in vector form, an equation of the line L which passes through A and B .	(2)
The point C lies on L such that OC is perpendicular to L.	
b Find the position vector of <i>C</i> .	(5)
c Find, to 3 significant figures, the area of triangle <i>OAC</i> .	(3)

- **d** Find the exact ratio of the area of triangle *OAB* to the area of triangle *OAC*. (2)
- 4 Relative to a fixed origin *O*, the points *A* and *B* have position vectors $(7\mathbf{i} 5\mathbf{j} \mathbf{k})$ and $(4\mathbf{i} 5\mathbf{j} + 3\mathbf{k})$ respectively.
 - **a** Find $\cos(\angle AOB)$, giving your answer in the form $k\sqrt{6}$, where k is an exact fraction. (4)
 - **b** Show that *AB* is perpendicular to *OB*.

The point C is such that $\overrightarrow{OC} = \frac{3}{2} \overrightarrow{OB}$.

- c Show that AC is perpendicular to OA.(3)
- **d** Find the size of $\angle ACO$ in degrees to 1 decimal place. (3)