1 The points A, B and C have coordinates $A(3, 2, -1)$, $B(-1, 1, 2)$ and $C(10, 5, -5)$, relative to the origin O. Show that $\overrightarrow{OC}$ can be written in the form $\lambda\overrightarrow{OA} + \mu\overrightarrow{OB}$, where λ and μ are to be determined.

What can you deduce about the points O, A, B and C from the fact that $\overrightarrow{OC}$ can be expressed as a combination of $\overrightarrow{OA}$ and $\overrightarrow{OB}$? **[6]**

2 Vectors **a** and **b** are given by $\mathbf{a} = 2\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} - 2\mathbf{j} + \mathbf{k}$.

Find constants λ and μ such that $\lambda\mathbf{a} + \mu\mathbf{b} = 4\mathbf{j} - 3\mathbf{k}$. **[5]**

3 A triangle ABC has vertices $A(-2, 4, 1)$, $B(2, 3, 4)$ and $C(4, 8, 3)$. By calculating a suitable scalar product, show that angle ABC is a right angle. Hence calculate the area of the triangle. [6]