

Core 4 Vectors Questions

- 7 The quadrilateral $ABCD$ has vertices $A(2, 1, 3)$, $B(6, 5, 3)$, $C(6, 1, -1)$ and $D(2, -3, -1)$.

The line l_1 has vector equation $\mathbf{r} = \begin{bmatrix} 6 \\ 1 \\ -1 \end{bmatrix} + \lambda \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$.

- (a) (i) Find the vector \overrightarrow{AB} . (2 marks)
- (ii) Show that the line AB is parallel to l_1 . (1 mark)
- (iii) Verify that D lies on l_1 . (2 marks)
- (b) The line l_2 passes through $D(2, -3, -1)$ and $M(4, 1, 1)$.
- (i) Find the vector equation of l_2 . (2 marks)
- (ii) Find the angle between l_2 and AC . (3 marks)
-

- 6 The points A and B have coordinates $(2, 4, 1)$ and $(3, 2, -1)$ respectively. The point C is such that $\overrightarrow{OC} = 2\overrightarrow{OB}$, where O is the origin.

- (a) Find the vectors:
- (i) \overrightarrow{OC} ; (1 mark)
- (ii) \overrightarrow{AB} . (2 marks)
- (b) (i) Show that the distance between the points A and C is 5. (2 marks)
- (ii) Find the size of angle BAC , giving your answer to the nearest degree. (4 marks)
- (c) The point $P(\alpha, \beta, \gamma)$ is such that BP is perpendicular to AC .
- Show that $4\alpha - 3\gamma = 15$. (3 marks)
-

6 The points A , B and C have coordinates $(3, -2, 4)$, $(5, 4, 0)$ and $(11, 6, -4)$ respectively.

(a) (i) Find the vector \overrightarrow{BA} . (2 marks)

(ii) Show that the size of angle ABC is $\cos^{-1}\left(-\frac{5}{7}\right)$. (5 marks)

(b) The line l has equation $\mathbf{r} = \begin{bmatrix} 8 \\ -3 \\ 2 \end{bmatrix} + \lambda \begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix}$.

(i) Verify that C lies on l . (2 marks)

(ii) Show that AB is parallel to l . (1 mark)

(c) The quadrilateral $ABCD$ is a parallelogram. Find the coordinates of D . (3 marks)

7 The lines l_1 and l_2 have equations $\mathbf{r} = \begin{bmatrix} 8 \\ 6 \\ -9 \end{bmatrix} + \lambda \begin{bmatrix} 3 \\ -3 \\ -1 \end{bmatrix}$ and $\mathbf{r} = \begin{bmatrix} -4 \\ 0 \\ 11 \end{bmatrix} + \mu \begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$ respectively.

(a) Show that l_1 and l_2 are perpendicular. (2 marks)

(b) Show that l_1 and l_2 intersect and find the coordinates of the point of intersection, P . (5 marks)

(c) The point $A(-4, 0, 11)$ lies on l_2 . The point B on l_1 is such that $AP = BP$.

Find the length of AB . (4 marks)
