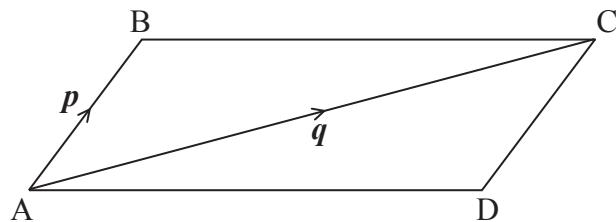


2. [Maximum mark: 7]

The following diagram shows the parallelogram ABCD.



Let $\vec{AB} = \mathbf{p}$ and $\vec{AC} = \mathbf{q}$. Find each of the following vectors in terms of \mathbf{p} and/or \mathbf{q} .

(a) \vec{CB} [2]

(b) \vec{CD} [2]

(c) \vec{DB} [3]



Do **not** write solutions on this page.

Section B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

8. [Maximum mark: 16]

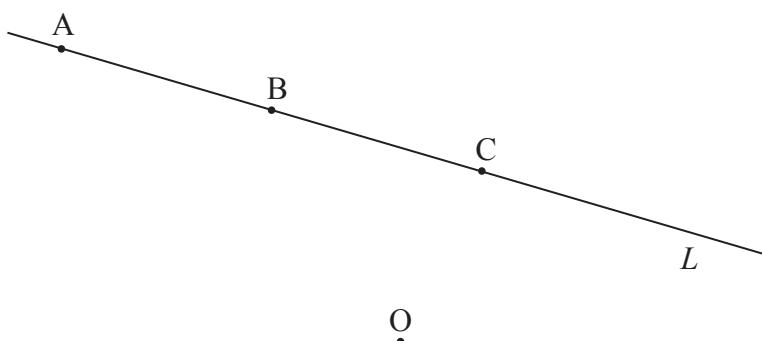
A line L passes through points $A(-2, 4, 3)$ and $B(-1, 3, 1)$.

(a) (i) Show that $\vec{AB} = \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix}$.

(ii) Find $|\vec{AB}|$. [3]

(b) Find a vector equation for L . [2]

The following diagram shows the line L and the origin O . The point C also lies on L .



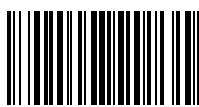
Point C has position vector $\begin{pmatrix} 0 \\ y \\ -1 \end{pmatrix}$.

(c) Show that $y = 2$. [4]

(d) (i) Find $\vec{OC} \cdot \vec{AB}$.

(ii) Hence, write down the size of the angle between OC and L . [3]

(e) Hence or otherwise, find the area of triangle OAB . [4]



Turn over

Do **not** write solutions on this page.

9. [Maximum mark: 15]

Let P and Q have coordinates $(1, 0, 2)$ and $(-11, 8, m)$ respectively.

(a) Express \vec{PQ} in terms of m .

[2]

Let \mathbf{a} and \mathbf{b} be perpendicular vectors, where $\mathbf{a} = \begin{pmatrix} 1 \\ 1 \\ n \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -3 \\ 2 \\ 1 \end{pmatrix}$.

(b) Find n .

[4]

(c) Given that \vec{PQ} is parallel to \mathbf{b} ,

(i) express \vec{PQ} in terms of \mathbf{b} ;

(ii) hence find m .

[5]

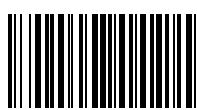
In part (d), distance is in metres, time is in seconds.

(d) A particle moves along a straight line through Q so that its position is given by $\mathbf{r} = \mathbf{c} + t\mathbf{a}$.

(i) Write down a possible vector \mathbf{c} .

(ii) Find the speed of the particle.

[4]



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Turn over

Do **not** write solutions on this page.

9. [Maximum mark: 15]

A line L_1 passes through the points $A(0, -3, 1)$ and $B(-2, 5, 3)$.

(a) (i) Show that $\vec{AB} = \begin{pmatrix} -2 \\ 8 \\ 2 \end{pmatrix}$.

(ii) Write down a vector equation for L_1 .

[3]

A line L_2 has equation $\mathbf{r} = \begin{pmatrix} -1 \\ 7 \\ -4 \end{pmatrix} + s \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}$. The lines L_1 and L_2 intersect at a point C.

(b) Show that the coordinates of C are $(-1, 1, 2)$.

[5]

(c) A point D lies on line L_2 so that $|\vec{CD}| = \sqrt{18}$ and $\vec{CA} \cdot \vec{CD} = -9$. Find \hat{ACD} .

[7]



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Turn over