

1. Find the angle between the following vectors \mathbf{a} and \mathbf{b} , giving your answer to the nearest degree.

$$\begin{aligned}\mathbf{a} &= -4\mathbf{i} - 2\mathbf{j} \\ \mathbf{b} &= \mathbf{i} - 7\mathbf{j}\end{aligned}$$

(Total 4 marks)

2. Find the size of the angle between the two vectors $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 6 \\ -8 \end{pmatrix}$. Give your answer to the nearest degree.

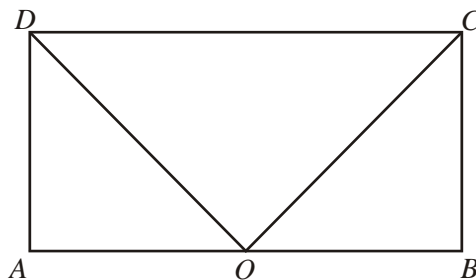
(Total 4 marks)

3. The vectors $\begin{pmatrix} 2x \\ x-3 \end{pmatrix}$ and $\begin{pmatrix} x+1 \\ 5 \end{pmatrix}$ are perpendicular for two values of x .

- (a) Write down the quadratic equation which the two values of x must satisfy.
(b) Find the two values of x .

(Total 4 marks)

4. $ABCD$ is a rectangle and O is the midpoint of $[AB]$.



Express each of the following vectors in terms of \overrightarrow{OC} and \overrightarrow{OD}

- (a) \overrightarrow{CD}
(b) \overrightarrow{OA}
(c) \overrightarrow{AD}

(Total 4 marks)

5. The quadrilateral $OABC$ has vertices with coordinates $O(0, 0)$, $A(5, 1)$, $B(10, 5)$ and $C(2, 7)$.

- (a) Find the vectors \overrightarrow{OB} and \overrightarrow{AC} .
- (b) Find the angle between the diagonals of the quadrilateral $OABC$.

(Total 4 marks)

6. The following diagram shows quadrilateral $ABCD$, with $\overrightarrow{AD} = \overrightarrow{BC}$, $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ and $\overrightarrow{AC} = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$.

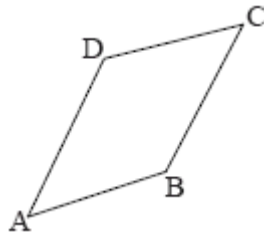


diagram not to scale

- (a) Find \overrightarrow{BC} . (2)
- (b) Show that $\overrightarrow{BD} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$. (2)
- (c) Show that vectors \overrightarrow{BD} and \overrightarrow{CA} are perpendicular. (3)

(Total 7 marks)

7. Consider the points $A(5, 8)$, $B(3, 5)$ and $C(8, 6)$.

- (a) Find
- (i) \overrightarrow{AB} ;
- (ii) \overrightarrow{AC} . (3)
- (b) (i) Find $\overrightarrow{AB} \cdot \overrightarrow{AC}$.
- (ii) Find the sine of the angle between \overrightarrow{AB} and \overrightarrow{AC} . (3)

(Total 6 marks)

8. A triangle has its vertices at A(-1, 3), B(3, 6) and C(-4, 4).

(a) Show that $\vec{AB} \cdot \vec{AC} = -9$.

(3)

(b) Find \hat{BAC} .

(4)

(Total 7 marks)

9. A triangle has its vertices at A(-1, 3), B(3, 6) and C(-4, 4).

(a) Show that $\vec{AB} \cdot \vec{AC} = -9$

(b) Show that, to three significant figures, $\cos \hat{BAC} = -0.569$.

(Total 6 marks)

10. The points A and B have the position vectors $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$ and $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$ respectively.

(a) (i) Find the vector \vec{AB} .

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

(4)

The point D has position vector $\begin{pmatrix} d \\ 23 \end{pmatrix}$

(b) Find the vector \vec{AD} in terms of d .

(2)

The angle \hat{BAD} is 90° .

(c) (i) Show that $d = 7$.

(ii) Write down the position vector of the point D.

(3)

The quadrilateral ABCD is a rectangle.

(d) Find the position vector of the point C.

(4)

(e) Find the area of the rectangle ABCD.

(2)

(Total 15 marks)