



Scan for the solutions

Name: _____ **Date:** _____ **Score:** _____ / 63

1 The vectors **a** and **b** are given by $\mathbf{a} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$

a. Find $2\mathbf{a} - 3\mathbf{b}$, giving your answer in terms of **i** and **j**

b. Find $|\mathbf{a}|$

(3 marks)

Answer _____

2 The vector $\mathbf{v} = 5\mathbf{i} - 12\mathbf{j}$

a. Find a unit vector in the direction of **v**

b. Find the angle between **v** and the positive **i** direction.

(4 marks)

Answer _____

3 Relative to a fixed origin *O*, the point *A* has position vector $2\mathbf{i} - \mathbf{j}$ and the point *B* has position vector $-4\mathbf{i} + 7\mathbf{j}$

a. Find $\vec{AB}$

b. Find the distance *AB*

c. Find the position vector of the midpoint of *AB*

(4 marks)

Answer _____

- 4 The vectors $\mathbf{p} = (k + 2)\mathbf{i} + 6\mathbf{j}$ and $\mathbf{q} = 2\mathbf{i} + (k + 3)\mathbf{j}$, where k is a constant.

Given that $\mathbf{p}$ is parallel to $\mathbf{q}$, find the possible values of k .

(4 marks)

Answer _____

- 5 The vector $\mathbf{c} = 2t\mathbf{i} + (t - 5)\mathbf{j}$, where t is a constant.

Given that $|\mathbf{c}| = \sqrt{65}$

- find the possible values of t
- find, for the positive value of t , a unit vector in the direction of $\mathbf{c}$

(5 marks)

Answer _____

- 6 Relative to a fixed origin O , the points A and B have position vectors

$$\vec{OA} = 3\mathbf{i} + \mathbf{j} \quad \text{and} \quad \vec{OB} = -\mathbf{i} + 4\mathbf{j}$$

- Find the size of angle AOB , giving your answer in degrees to one decimal place.
- Find the exact area of triangle OAB

(6 marks)

Answer _____

7 Relative to a fixed origin O , the points A , B , C and D have position vectors

$$\mathbf{a} = \mathbf{i} + 2\mathbf{j}, \quad \mathbf{b} = 5\mathbf{i} + 4\mathbf{j}, \quad \mathbf{c} = 8\mathbf{i} + 10\mathbf{j}, \quad \mathbf{d} = 2\mathbf{i} + 7\mathbf{j}$$

- Show that $ABCD$ is a trapezium, giving reasons for your answer.
- Find the ratio $AB : DC$

(4 marks)

Answer _____

8 Relative to a fixed origin O , the point A has position vector $4\mathbf{i} - 7\mathbf{j}$ and the point B has position vector $14\mathbf{i} + 8\mathbf{j}$

The point P lies on the line segment AB such that $AP : PB = 3 : 2$

- Find the position vector of P
- Find $|\vec{OP}|$, giving your answer as a simplified surd.

(4 marks)

Answer _____

9 In triangle OAB , $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$

The point M is the midpoint of OA . The point N lies on AB such that $AN : NB = 2 : 1$

- Find $\vec{MN}$ in terms of $\mathbf{a}$ and $\mathbf{b}$, giving your answer in its simplest form.

The point P is such that $\vec{OP} = 2\mathbf{b}$

- Show that M , N and P lie on a straight line.
- Find the ratio $MN : NP$

(6 marks)

Answer _____

10

A park is modelled as a quadrilateral $OPQR$. Relative to the point O , the corners have position vectors

$$\vec{OP} = 6\mathbf{i}, \quad \vec{OQ} = 10\mathbf{i} + 9\mathbf{j}, \quad \vec{OR} = 8\mathbf{i} + 18\mathbf{j}$$

where $\mathbf{i}$ and $\mathbf{j}$ are unit vectors due east and due north and each unit represents 10 metres.

- Show that the side PQ is parallel to the side OR
- A straight path runs from O to Q . Find the length of the path in metres.
- Find the size of angle OPQ
- Give one limitation of the model.

(8 marks)

Answer _____

11

Relative to a fixed origin O , the points A , B and C have position vectors

$$\mathbf{i} + 2\mathbf{j}, \quad 4\mathbf{i} + 6\mathbf{j} \quad \text{and} \quad p\mathbf{i} - 3\mathbf{j}$$

respectively, where p is a constant. Given that angle $ABC = 90^\circ$

- use Pythagoras' theorem to find the value of p
- find the area of triangle ABC
- The point D is such that $ABCD$ is a rectangle. Find the position vector of D

(7 marks)

Answer _____

12

In triangle OAB , $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$

The point P lies on OA such that $OP : PA = 1 : 2$ and the point Q is the midpoint of AB . The lines OQ and BP meet at the point X .

- Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, (i) $\vec{OQ}$ (ii) $\vec{BP}$
- Using a vector method, find the ratio $OX : XQ$
- Find the ratio $BX : XP$

(8 marks)

Answer _____

End of questions | Total 63 marks