6

Write $\overrightarrow{AB}$ as a column vector.

$$\overrightarrow{AB} = \begin{pmatrix} \\ \end{pmatrix} \quad [1]$$
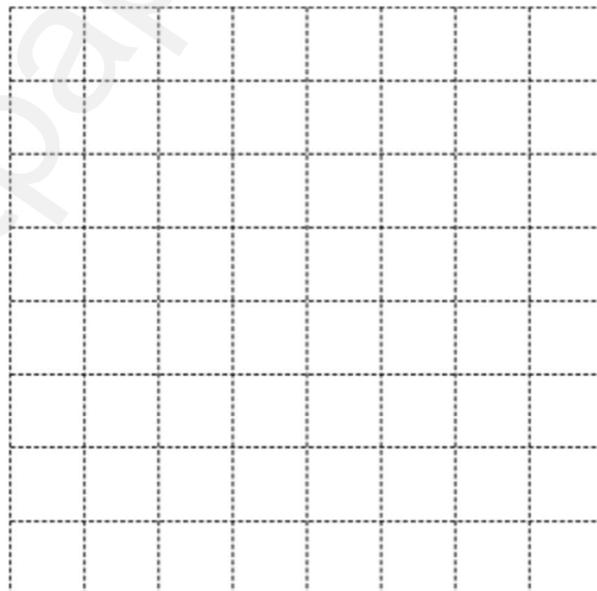
10 (a) $\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$

(i) On the grid, draw and label vector **2a**.

[1]

(ii) On the grid, draw and label vector (**a** − **b**).

[2]

2 Work out $4 \times \begin{pmatrix} 6 \\ -2 \end{pmatrix}$.

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

5 Work out.

(a) $\begin{pmatrix} 6 \\ -5 \end{pmatrix} + \begin{pmatrix} 8 \\ -1 \end{pmatrix}$

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

(b) $3\begin{pmatrix} -4 \\ 7 \end{pmatrix}$

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

2 $\mathbf{v} = \begin{pmatrix} -1 \\ 3 \end{pmatrix} \qquad \mathbf{y} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

Find

(a) $\mathbf{v} - \mathbf{y}$

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

(b) $2\mathbf{v}$.

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

3 Point A has coordinates $(6, 4)$ and point B has coordinates $(2, 7)$.

Write $\overrightarrow{AB}$ as a column vector.

$$\overrightarrow{AB} = \begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

2 Point A (7, 5) is translated to point B (2, 2).

Find the vector that represents this translation.

$$\begin{pmatrix} \\ \end{pmatrix}$$ [2]

2 $\qquad \mathbf{p} = \begin{pmatrix} 3 \\ -1 \end{pmatrix} \qquad \mathbf{q} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$

(a) Find $\mathbf{p} + \mathbf{q}$.

$$\begin{pmatrix} \\ \end{pmatrix}$$ [1]

(b) A is the point (2, 7).
The point A is translated to the point B by the vector $\mathbf{p} + \mathbf{q}$.

Find the coordinates of B.

(.........................., ...) [2]

3 (a) Work out $\begin{pmatrix} 1 \\ 2 \end{pmatrix} - \begin{pmatrix} -5 \\ 3 \end{pmatrix}$.

$$\begin{pmatrix} \\ \end{pmatrix}$$ [1]

(b) P is the point $(-3, 6)$.
Q is the point $(0, 2)$.

Find the translation vector that maps the point P onto the point Q.

$$\begin{pmatrix} \\ \end{pmatrix}$$ [2]

4 **(a)** Work out $2\begin{pmatrix} 2 \\ 3 \end{pmatrix} - \begin{pmatrix} -3 \\ 5 \end{pmatrix}$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) F is the point (5, 7).
The vector that maps F onto the point G is $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

Find the coordinates of G.

(......................... , ...) [1]

10 Find the magnitude of the vector $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$.

Give your answer in simplest surd form.

.... [2]

7 Find the magnitude of $\begin{pmatrix} 9 \\ -3 \end{pmatrix}$.

Give your answer in its simplest surd form.

.... [2]

8 (a) Work out $\begin{pmatrix} 12 \\ -5 \end{pmatrix} - 5\begin{pmatrix} 4 \\ -1 \end{pmatrix}$.

$\begin{pmatrix} \\ \end{pmatrix}$ [2]

(b) Work out the magnitude of $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$.

.... [2]

8   $\mathbf{a} = \begin{pmatrix} -4 \\ -3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

(a) Find $\mathbf{a} - 3\mathbf{b}$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Find the magnitude of $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$.

.... [2]

7       $\mathbf{u} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ $\mathbf{v} = \begin{pmatrix} -12 \\ 5 \end{pmatrix}$

(a) Find $\mathbf{u} - 2\mathbf{v}$.

$\begin{pmatrix} & \\ & \end{pmatrix}$
[2]

(b) Find $|\mathbf{v}|$.

.... [2]

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12 $\mathbf{a} = \begin{pmatrix} 4 \\ -10 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$

Find the magnitude of the vector $\mathbf{a} - \mathbf{b}$.
Give your answer in its simplest surd form.

.... [4]

7   (a) $\mathbf{p} = \begin{pmatrix} 8 \\ -5 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$

    (i)   Find $3\mathbf{q}$.

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

    (ii) (a) Find $\mathbf{p} - \mathbf{q}$.

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

        (b) Find $|\mathbf{p} - \mathbf{q}|$.

.... [2]

10 $\overrightarrow{AB} = \begin{pmatrix} 7 \\ -3 \end{pmatrix}$

(a) Find $3\overrightarrow{AB}$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

(b) Find $\left| \overrightarrow{AB} \right|$.

$\left| \overrightarrow{AB} \right| =$ .... [2]

(b) Ahmed finds the magnitude of the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

From this list, put a ring around the correct calculation.

$\sqrt{2^2 + -3^2}$ $2^2 - 3^2$ $\sqrt{2^2 - 3^2}$ $2^2 + (-3)^2$ $\sqrt{2^2 + (-3)^2}$

[1]

14 The magnitude of the vector $\begin{pmatrix} 20 \\ k \end{pmatrix}$ is 29.

Find the value of k.

$k =$ .... [3]

9 *F* is the point $(1, -4)$, $\overrightarrow{FG} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$ and $\overrightarrow{GH} = \begin{pmatrix} -12 \\ 35 \end{pmatrix}$.

Find

(a) $3\overrightarrow{FG}$

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

(b) $\overrightarrow{FG} + \overrightarrow{GH}$

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

(c) the coordinates of the point *G*

(........................ , ...) [1]

(d) the magnitude of vector $\overrightarrow{GH}$.

.... [2]

10 (a) *ABC* is a triangle.

B is the point $(1, -10)$, A is the point $(4, 14)$ and $\overrightarrow{CA} = \begin{pmatrix} -11 \\ 8 \end{pmatrix}$.

(i) Find the coordinates of *C*.

(................. , ...) [2]

(ii) Find $\overrightarrow{BA}$.

$\overrightarrow{BA} = \begin{pmatrix} \\ \\ \end{pmatrix}$ [1]

(iii) Find $|\overrightarrow{CA}|$.

.... [2]

(b) *D* is the point $(22, 34)$ and *E* is the point $(23, 39)$.
D is the point on *CE* such that $2CE = 5DE$.

Find the coordinates of *C*.

(................. , ...) [3]

15 Point A has coordinates $(-4, 1)$ and $\overrightarrow{BA} = \begin{pmatrix} -5 \\ -12 \end{pmatrix}$.

(a) Find the coordinates of point B.

(........................ , ...) [2]

(b) Point C has coordinates $(5, -2)$.

Find the vector $\overrightarrow{CA}$.

$$\overrightarrow{CA} = \begin{pmatrix} \\ \end{pmatrix}$$ [2]

(c) $\overrightarrow{EF} = 3\overrightarrow{BA}$

Find $\left| \overrightarrow{EF} \right|$.

.... [3]

12 (a) $\mathbf{v} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Find 5**v**.

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

(b) H is the point $(-3, 8)$ and K is the point $(-4, 0)$.

$\overrightarrow{HJ} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}$

Find $\left| \overrightarrow{JK} \right|$.

.... [4]

5 **(a)** $\quad a = \begin{pmatrix} -3 \\ 8 \end{pmatrix} \quad b = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

(i) Find

(a) $b - a$,

$\begin{pmatrix} \ \\ \ \end{pmatrix}$ [1]

(b) $2a + b$,

$\begin{pmatrix} \ \\ \ \end{pmatrix}$ [2]

(c) $|b|$.

.... [2]

(ii) $\quad a + kb = \begin{pmatrix} 13 \\ m \end{pmatrix}$, where k and m are integers.

Find the value of k and the value of m.

$k =$ ....

$m =$ .... [3]

9 *A* is the point $(3, -1)$.

$$\overrightarrow{AB} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$$

(a) $\overrightarrow{AC} = 2\overrightarrow{AB}$

Find the coordinates of the point *C*.

(................. , ...) [2]

(b) The length of *AB* is $k\sqrt{5}$.

Find the value of *k*.

k = ... [2]

(c) *P* is a point on *AB*.

AP : *PB* = 1 : 3

Find the position vector of *P*.

$$\begin{pmatrix} \\ \end{pmatrix}$$ [2]

8 $\mathbf{m} = \begin{pmatrix} 11 \\ 5 \end{pmatrix}$ $\mathbf{n} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$

(a) Find $2\mathbf{m} - \mathbf{n}$.

$\begin{pmatrix} \\ \end{pmatrix}$ [2]

(b) The vector $\begin{pmatrix} 5 \\ \sqrt{y} \end{pmatrix}$ has a magnitude of 7.

Find the value of y.

$y =$ .... [2]

11   (a) $\left| \begin{pmatrix} 9m \\ 40m \end{pmatrix} \right| = \dfrac{205}{2}$

Find the two possible values of m.

$m =$ .... or .... [3]