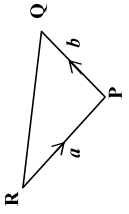


VECTOR JOURNEYS in 2D Part 1

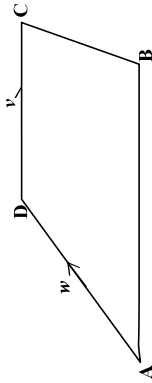
1. Express each of the following displacements in terms of vectors a and b .

- (a) \vec{PQ} (b) \vec{QP} (c) \vec{PR}
 (d) \vec{RQ} (e) \vec{QR}



2. In the diagram $\vec{AB} = 2\vec{DC}$. Express each of the following displacements in terms of vectors v and w .

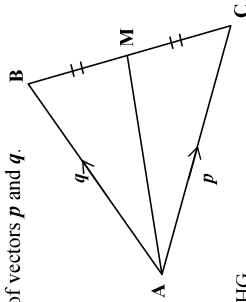
- (a) \vec{CD} (b) \vec{CA} (c) \vec{AB}
 (d) \vec{CB} (e) \vec{BD}



3. In the diagram 'M' is the mid-point of BC.

Express each of the following displacements in terms of vectors p and q .

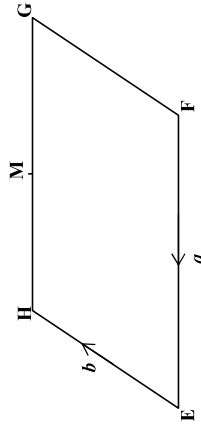
- (a) \vec{CB} (b) \vec{BC} (c) \vec{BM}
 (d) \vec{AM}



4. EFGH is a parallelogram. 'M' is the mid point of side HG.

Express each of the following displacements in terms of vectors a and b .

- (a) \vec{FG} (b) \vec{GH} (c) \vec{GM}
 (d) \vec{FM}

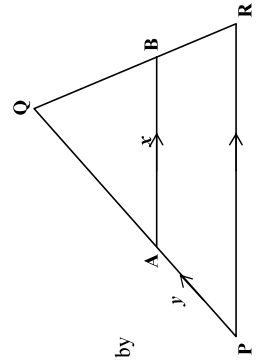


5. In the diagram AB is parallel to PR.

PA = 1 cm and PQ = 3 cm

Find in terms of x and/or y the vectors represented by

- (a) \vec{AQ} (b) \vec{QB}



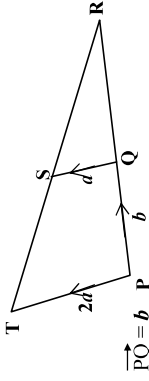
VECTOR JOURNEYS in 2D Part 2

1. (a) Express in terms of a and b .

- (i) \vec{PS} (ii) \vec{ST}

(b) If $\vec{QR} = \frac{2}{3}\vec{PQ}$, show that RS can be expressed as

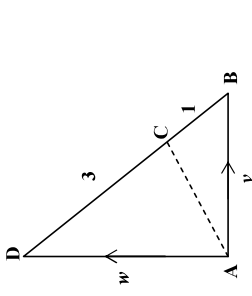
$$\frac{1}{2}(2a - 3b)$$



2. Express in terms of vectors v and w .

- (a) \vec{BD} (b) \vec{BC} (c) \vec{AC}

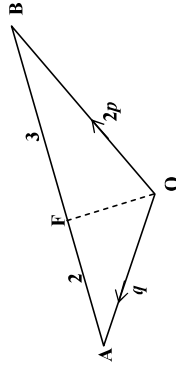
If $v = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$ and $w = \begin{pmatrix} 0 \\ 12 \end{pmatrix}$, find the components of the displacement AC.



3. Express in terms of p and q .

- (a) \vec{AB} (b) \vec{AF} (c) \vec{OF}

If $p = \begin{pmatrix} -10 \\ 5 \end{pmatrix}$ and $q = \begin{pmatrix} 5 \\ 5 \end{pmatrix}$ find the components of OF and hence its magnitude correct to 1 decimal place.

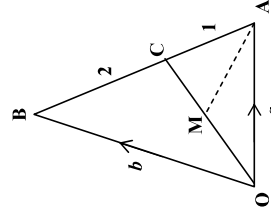


4. (a) Express in terms of a and b :-

- (i) \vec{AB} (ii) \vec{AC} (iii) \vec{OC}

(b) If M is the mid-point of OC show that:-

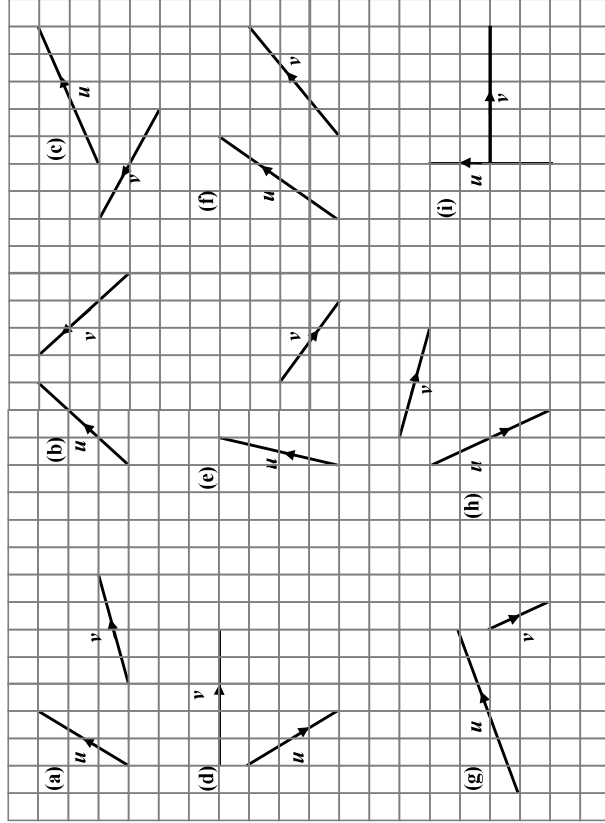
$$\vec{AM} = \frac{1}{6}b - \frac{2}{3}a = \frac{1}{6}(b - 4a)$$



2.3 USING VECTOR COMPONENTS

Adding or subtracting 2 or 3 dimensional vectors using components.

- For each pair of vectors:
 - Write down the components of u and v .
 - Find the components of the resultant vector $u + v$
 - Find the components of the resultant vector $v - u$
 - Find the components of the resultant vector $2v + 3u$
 - Find the components of the resultant vector $3v - 4u$



- u, v and w are 3 vectors with components $\begin{pmatrix} 2 \\ 3 \\ 5 \end{pmatrix}$, $\begin{pmatrix} -4 \\ 5 \\ -3 \end{pmatrix}$ and $\begin{pmatrix} -1 \\ -3 \\ 5 \end{pmatrix}$ respectively.

- Find the components of the following:
- $2u + 3v$
 - $3u - 6v$
 - $3w + 2v$
 - $4u - 2w$
 - $-3u - 4v$
 - $3w - 4u$
 - $3u - 6v + 2w$
 - $2u + 3v - 4w$
 - $3u - 2v + w$

- Calculate the magnitude of each of these vectors giving answers to one decimal place:

- $p = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}$
- $v = \begin{pmatrix} 3 \\ 4 \\ -7 \end{pmatrix}$
- $r = \begin{pmatrix} 1 \\ -3 \\ 2 \end{pmatrix}$
- $t = \begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$

- $u = \begin{pmatrix} 6 \\ -1 \\ -4 \end{pmatrix}$
- $q = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$
- $a = \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix}$
- $b = \begin{pmatrix} 5 \\ -12 \\ 0 \end{pmatrix}$

- u, v and w are 3 vectors with components $\begin{pmatrix} 2 \\ 4 \\ 0 \end{pmatrix}$, $\begin{pmatrix} 3 \\ 8 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ 5 \\ -1 \end{pmatrix}$ respectively.

- Find the components of the following:

- $2u + 3v$
- $3u - 6v$
- $3w + 2v$
- $4u - 2w$
- $-3u - 4v$
- $3w - 4u$
- $3u - 6v + 2w$
- $2u + 3v - 4w$

- Calculate the magnitude of each resultant vector above giving answers to 1 decimal place.

- If $p = 4i + 2j - 5k$ and $q = i - 3j + k$, express the following in component form:

- $p + q$
- $p - q$
- $q - 2p$
- $3p + q$
- $3p - 2q$
- $2q - 3p$
- $3p + 4q$
- $-2q - 2p$

- Calculate the magnitude of each resultant vector above giving answers to 1 decimal place.

- Calculate the magnitude of these vectors, leaving you answer a surd in its simplest form.

- $u = \begin{pmatrix} -5 \\ 3 \\ 2 \end{pmatrix}$
- $AB = \begin{pmatrix} -1 \\ 1 \\ 5 \end{pmatrix}$
- $t = 3i - 2j + 5k$

- t where point T has coordinates $(\sqrt{3}, \sqrt{5}, 2\sqrt{2})$

- Given that $v = 2k - 3i + 4k$, $u = 5i + cj - k$ have the same magnitude, calculate the value of a if $a > 0$.