

Vector Geometry

Starter

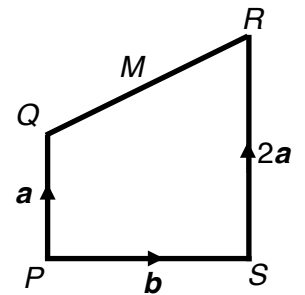
1. (Review of last lesson) Given that $A(-4, 9)$ and $B(8, -5)$, find the vector \vec{AB} .

Working:
$$\vec{AB} = \mathbf{b} - \mathbf{a} = \begin{pmatrix} 8 \\ -5 \end{pmatrix} - \begin{pmatrix} -4 \\ 9 \end{pmatrix} = \begin{pmatrix} 12 \\ -14 \end{pmatrix}$$

- E.g. 1** In the trapezium, $PQRS$: $\vec{PQ} = \mathbf{a}$, $\vec{PS} = \mathbf{b}$ and $2\vec{PQ} = \vec{SR}$.
Let M be the mid-point of QR .

Find, in terms of \mathbf{a} and \mathbf{b} :

- (a) \vec{QS} (b) \vec{SQ} (c) \vec{PR} (d) \vec{QR} (e) \vec{QM}



- Working** (a) We cannot go directly to \vec{QS} as no vector connect Q and S . Instead we must go via P .

$$\vec{QS} = \vec{QP} + \vec{PS} = -\mathbf{a} + \mathbf{b}$$

N.B. We cannot go via R because we aren't given the vector \vec{QR} .

- (b) $\vec{SQ} = -\vec{QS} = -(-\mathbf{a} + \mathbf{b}) = \mathbf{a} - \mathbf{b}$
Alternatively, you could go via P : $\vec{SQ} = \vec{SP} + \vec{PQ} = -\mathbf{b} + \mathbf{a}$

- (c) $\vec{PR} = \vec{PS} + \vec{SR} = \mathbf{b} + 2\mathbf{a}$

- (d) $\vec{QR} = \vec{QP} + \vec{PS} + \vec{SR} = -\mathbf{a} + \mathbf{b} + 2\mathbf{a} = \mathbf{a} + \mathbf{b}$

- (e) Since M is the mid-point, $\vec{QM} = \frac{1}{2}\vec{QR}$
We can substitute the answer for \vec{QR} from (d)
$$\vec{QM} = \frac{1}{2}\vec{QR} = \frac{1}{2}(\mathbf{a} + \mathbf{b})$$

Video: [Vectors](#)

[Solutions to Starter and E.g.s](#)

Exercise

- 9-1 class textbook: p336 M10.13 Qu 6-12; p340 E10.1 Qu 1-11
A*-G class textbook: p300 E10.2 Qu 6-10; p304 E10.3 Qu 1-11
9-1 homework book: p118 M10.13 Qu 3, 4, 6; p119 E10.1 Qu 1-4
A*-G homework book: p86 E10.2 Qu 3, 4, 6; p87 E10.3 Qu 1-4

Homework book answers (only available during a lockdown)