

Answers to Vector Worksheet

Q1 (i) $2\mathbf{q}$ (ii) $\mathbf{p} + \mathbf{q}$

(iii) $\mathbf{p} - \frac{1}{2}\mathbf{q}$ (iv) $-\frac{1}{2}\mathbf{q} - \frac{1}{2}\mathbf{p} = -\frac{1}{2}(\mathbf{p} + \mathbf{q})$

Q2

(i) Using similar triangle we have

$$\frac{|\overrightarrow{PC}|}{|\overrightarrow{GQ}|} = \frac{|\overrightarrow{AP}|}{|\overrightarrow{AG}|}$$

$$\Rightarrow \frac{|\overrightarrow{PC}|}{2|\mathbf{q}|} = \frac{3|\mathbf{p}|}{2|\mathbf{p}|}$$

$$\Rightarrow |\overrightarrow{PC}| = 3|\mathbf{q}| \Rightarrow \overrightarrow{PC} = 3\mathbf{q}$$

(ii) $3\mathbf{p} + 3\mathbf{q}$ (iii) $-\mathbf{p} - 2\mathbf{q}$

Q3 T lies on AB and AT is one-third the length of AB .

Q4

(a)(i) $\overrightarrow{QR} = \overrightarrow{QP} + \overrightarrow{PR} = \begin{pmatrix} 8 \\ 2 \end{pmatrix}$

(b) $\overrightarrow{PT} = \overrightarrow{PQ} + \overrightarrow{QT} = \begin{pmatrix} -3 \\ 2 \end{pmatrix} + \frac{1}{2}\overrightarrow{QR} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

(c) $\overrightarrow{RX} = \overrightarrow{PQ} \Rightarrow \overrightarrow{OX} = \begin{pmatrix} 3 \\ 7 \end{pmatrix} \Rightarrow X = (3, 7)$

Q5

(a)(i) $\begin{pmatrix} 9 \\ 6 \end{pmatrix}$ (ii) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ (iii) $\overrightarrow{OP} = \begin{pmatrix} 6 \\ 6 \end{pmatrix}$

(b) $(9, 6)$ or $(15, 14)$

Q6

$\overrightarrow{OG} = \overrightarrow{OA} + \overrightarrow{AG} = \overrightarrow{OA} + \overrightarrow{BC} = \overrightarrow{OA} + \overrightarrow{OC} - \overrightarrow{OB} = \mathbf{a} + \mathbf{c} - \mathbf{b}$

$\overrightarrow{CD} = \overrightarrow{BG} = \overrightarrow{OG} - \overrightarrow{OB} = (\mathbf{a} + \mathbf{c} - \mathbf{b}) - (\mathbf{b}) = \mathbf{a} + \mathbf{c} - 2\mathbf{b}$

Q7

(a) $3\mathbf{p} - 3\mathbf{q}$

(b) Need to show that $\overrightarrow{OP} = \overrightarrow{RT}$.

$\overrightarrow{OP} = \mathbf{p} + \mathbf{q}$

$\overrightarrow{RT} = \overrightarrow{OT} - \overrightarrow{OR} = (5\mathbf{p}) - (4\mathbf{p} - \mathbf{q}) = \mathbf{p} + \mathbf{q} = \overrightarrow{OP}$ (shown)

Q8

(i) $D(9, 10)$

(ii) $\sqrt{29}$

(iii) $5y = -2x + 20$

(iv) $E(3, 2.8)$

Q9

(a) (i) $\overrightarrow{AY} = \frac{1}{4}\overrightarrow{AC} = \dots = \frac{1}{4}(\mathbf{p} + 3\mathbf{q})$

(ii) $\overrightarrow{BY} = \overrightarrow{BA} + \overrightarrow{AY} = -\mathbf{p} + \frac{1}{4}(\mathbf{p} + 3\mathbf{q}) = \frac{3}{4}(\mathbf{q} - \mathbf{p})$

(iii) $\frac{1}{2}(\mathbf{q} - \mathbf{p})$

(b) $\overrightarrow{BY} = \frac{3}{2}\overrightarrow{XW}$ parallel

(c) trapezium

(d) (i) $\frac{1}{3}$ (same height)

(ii) $\left(\frac{3}{2}\right)^2 = \frac{9}{4}$ (similar Δ s)

Q10

(a)(i) $4\mathbf{a} + 2\mathbf{b}$

(a)(ii) $6\mathbf{a}$

(b)(i) $\frac{1}{2}$ (Δ s with common height)

(b)(ii) $= \left(\frac{1}{3}\right)^2 = \frac{1}{9}$ (similar Δ s)

(b)(iii) $\frac{2}{3}$ (Δ s with common height)