Vectors 1 Answers IGCSE

1)

(a)	$2\mathbf{a} - \mathbf{g}$ cao	1	$-\mathbf{g} + 2\mathbf{a}$
(b)	$2\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{g}$ oe cao	1	Allow 2.5 or $\frac{5}{2}$ and 0.5

2)

(a)	**(i) OQ**	1	
	(ii) RM or **MP**	1	Allow ½**RP**
(b)		2	**B1, B1** correct position wrt each direction of the vector ± 1 mm

3)

(a)	$2\mathbf{p}$ $3\mathbf{p} + \mathbf{q}$ …….. $5\mathbf{p} + 3\mathbf{q}$ cao	1, 1, 1	
(b)	**(i)** all 4 plotted correctly ft	2	**B1** 2 or 3 correct
	(ii) a (straight) line	1	Allow linear, collinear

4)

(a) (i)	$\begin{pmatrix}15\\8\end{pmatrix}$	2	**B1** each component
(ii)	17 www 2	2**ft**	**ft** their 15 and their 8. **M1** for (their 15)^2 + (their 8)^2
(b) (i)	$\frac{1}{2}\mathbf{v} - \frac{1}{2}\mathbf{c}$ **or** $\frac{1}{2}(\mathbf{v} - \mathbf{c})$ cao	2	**M1** for $\frac{1}{2}\overrightarrow{CV}$ soi
(ii)	$\frac{1}{2}\mathbf{c} + \frac{1}{2}\mathbf{v}$ again allowing brackets cao	2	**M1** for $\overrightarrow{OM}$ e.g. $\overrightarrow{OC} + \overrightarrow{CM}$ or better seen or **v** – their **(i)** or **c** + their **(i)**
(iii)	$\frac{1}{6}\mathbf{v} - \frac{1}{2}\mathbf{c}$ again allowing brackets cao	2	**M1** for any correct route e.g. $\overrightarrow{MV} + \overrightarrow{VL}$ or their **(i)** $-\frac{1}{3}$ **v** or $\frac{2}{3}\mathbf{v}$ – their **(b)(ii)**

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5)

(a)	**(i)** **-r + q** or **q** – **r**	**1**	
	(ii) ½(3**q** – **r**) oe	**1**	Must be simplified
(b)	correct working	**3**	**M1** for ***MX*** = ½ **r** + ¾ their (–**r** + **q**) **M1** using a different route for ***XS*** or ½ ***MS*** **E1** dep correct simplification and conclusion

6)

(a)	$\frac{1}{2}$ **a** – $\frac{1}{2}$ **c** oe	**2**	**M1** correct but unsimplified e.g. $\frac{1}{2}$ **a** + – $\frac{1}{2}$ **c**
(b)	$\frac{3}{4}$ **a** + $\frac{3}{4}$ **c** oe	**2**	**M1** correct but unsimplified

7)

(a)	**(i)** **(a)**	**p** + **q**	1	
	(b)	$\frac{1}{2}$ **p** – $\frac{1}{2}$ **q** oe	2	M1 for $\overrightarrow{LC} + \overrightarrow{CM}$ o.e. can be written in terms of **p** and/or **q**
	(c)	$\frac{3}{4}$ **p** + $\frac{3}{4}$ **q** oe cao	2	M1 for $\overrightarrow{AD} + \overrightarrow{DL} + \overrightarrow{LN}$ o.e can be written in terms of **p** and/or **q** ft their **(i)(b)**
	(ii)	$\overrightarrow{AN}$ is a multiple of $\overrightarrow{AC}$ o.e	1	Must be vectors (dependent on answers to **(a)**, **(c)**)
(b)	**(i)**	30	2	M1 for $2x + x + 15 + 75 = 180$ or better
	(ii)	135	1**ft**	ft 165 – their x but only if final answer obtuse

8)

(a)	–**p** + **t**	**1**	
(b)	**p** + 2**t**	**2**	**M1** for a correct route from P to R or unsimplified answer
(c)	2(**p** + **t**) or 2**p** + 2**t**	**2ft**	**M1** for **OR** or a correct route or ft **p** + their (b) unsimplified provided their (b) is a vector

9)

(a)	**p** – $\frac{1}{3}$ **q** oe	**2**	**M1** $\overrightarrow{QR} + \overrightarrow{RX}$ oe or –**q** + **p** + $(\frac{2}{3})$**q** oe
(b)	$\frac{1}{2}$ **p** + $\frac{5}{6}$ **q** oe	**2 ft**	ft **q** + $\frac{1}{2}$ their (a) but must be vectors or **M1** for $\overrightarrow{OQ} + \overrightarrow{QM}$ oe

10)

(a)	(5, 3)	**1**	
(b) (i)	$3\mathbf{a} + \mathbf{c}$	**1**	
(ii)	$3\mathbf{a} + \frac{1}{2}\mathbf{c}$ **or** $\frac{1}{2}(6\mathbf{a} + \mathbf{c})$	**2**	**M1** for $\overrightarrow{OM}$ oe e.g $OA+AM$ or correct unsimplified answer
(iii)	$\mathbf{a} + \mathbf{c}$	**1**	
(iv)	$\frac{3}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$ or $\frac{1}{2}(3\mathbf{a} + \mathbf{c})$	**2**	**M1** for $-\mathbf{c} + \frac{3}{2}\times$ their (iii) or $\mathbf{a} + \frac{1}{2}\times$ their (iii) or correct unsimplified answer or any correct route e.g. $CE + ED$
(c)	(CD) parallel (to OB) oe cao	**1dep**	Part (c) dependent on simplified (i) and (iv) Dep on (i) = $k \times$ (iv)
	$CD = \frac{1}{2}\ OB$ oe cao	**1dep**	Dep on (i) = 2 × (iv) must be scalars