1.

22(a)	$\boldsymbol{a}-\frac{2}{5}\boldsymbol{b}$ oe simplified	**2**	**M1** for $-\boldsymbol{b}+\boldsymbol{a}+\frac{3}{5}\boldsymbol{b}$ or a correct route
22(b)	$\frac{5}{2}\boldsymbol{a}$ oe	**2**	**B1** for $k\mathbf{a}$ where $k>1$ or $\frac{5}{2}\overrightarrow{\text{OR}}$

2.

Question	Answer	Marks	Partial Marks
21(a)(i)	$\mathbf{a}-\mathbf{b}$ or $-\mathbf{b}+\mathbf{a}$	**2**	**B1** for a correct route or identifying $\overrightarrow{OT}$
21(a)(ii)	$\frac{1}{2}\mathbf{a}-\mathbf{b}$ or $-\mathbf{b}+\frac{1}{2}\mathbf{a}$	**1**	
21(b)	$\overrightarrow{PT}=\mathbf{a}-2\mathbf{b}$ oe	**M1**	
	$\overrightarrow{PT}=2\overrightarrow{RV}$ oe	**A1**	Dep on correct vector RV Accept in words

3.

2(a)(i)	$\begin{pmatrix}6\\17\end{pmatrix}$	**2**	**B1** for each
2(a)(ii)	6.4[0] or 6.403...	**2**	**M1** for 4^2+5^2
2(b)	(1, 2)	**1**	
2(c)	(0, –2)	**1**	

2(d)	$\frac{1}{2}\mathbf{c}+\frac{1}{3}\mathbf{d}$	**3**	**B2** for correct unsimplified answer or **M1** for $\overrightarrow{CT}=-\mathbf{c}+\frac{2}{3}\mathbf{d}$ oe or $\overrightarrow{TC}=\mathbf{c}-\frac{2}{3}\mathbf{d}$ oe or for correct route

4.

5(a)(i)(a)	$\begin{pmatrix}5\\-13\end{pmatrix}$ final answer	**1**	
5(a)(i)(b)	$\begin{pmatrix}-4\\11\end{pmatrix}$ final answer	**2**	**B1** for answer $\begin{pmatrix}-4\\k\end{pmatrix}$ or $\begin{pmatrix}k\\11\end{pmatrix}$ or $\begin{pmatrix}-6\\16\end{pmatrix}$ seen
5(a)(i)(c)	5.39 or 5.385…	**2**	**M1** for $2^2 + ([-]5)^2$
5(a)(ii)	$[k=]$ 8 $[m=]-32$	**3**	**B2** for $k = 8$ or $m = -32$ or **M1** for $-3 + 2k = 13$ oe or for $m = -5 \times$ *their* $k + 8$ correctly evaluated
5(b)(i)(a)	$\mathbf{p} + \mathbf{q}$ final answer	**1**	
5(b)(i)(b)	$\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{q}$ **or** $\frac{1}{2}(\mathbf{p} - \mathbf{q})$ or $\frac{\mathbf{p}-\mathbf{q}}{2}$ final answer	**2**	**M1** for unsimplified answer or any correct vector route for $\overrightarrow{CM}$, e.g. $-\mathbf{q} + \frac{1}{2}$ *their* **(b)(i)(a)**
5(b)(i)(c)	$\frac{1}{2}\mathbf{p} + \frac{1}{10}\mathbf{q}$ or $\frac{5\mathbf{p}+\mathbf{q}}{10}$ final answer	**2**	**M1** for unsimplified answer or any correct vector route for $\overrightarrow{MN}$
5(b)(ii)	$\frac{5}{3}\mathbf{p} + \mathbf{q}$ or $\frac{5\mathbf{p}+3\mathbf{q}}{3}$ final answer	**3**	**B2** for unsimplified correct answer OR **M1** for $\mathbf{p} + \frac{3}{5}\mathbf{q}$ seen **B1** for final answer of form $k\mathbf{p} + \mathbf{q}$ $(k > 1)$ or final answer $\frac{5}{3}\mathbf{p} + j\mathbf{q}$ oe (any j)

4(c)

4(c)(i)	$\frac{2}{3}\mathbf{t} + \frac{1}{3}\mathbf{u}$ or $\frac{1}{3}(2\mathbf{t} + \mathbf{u})$ final answer	**2**	**M1** for $\overrightarrow{UY} = \frac{2}{3}(\mathbf{t} - \mathbf{u})$ oe or $\overrightarrow{TY} = \frac{1}{3}(\mathbf{u} - \mathbf{t})$ oe or correct route soi
4(c)(ii)	$\frac{2}{3}\mathbf{t}$ cao	**1**	

5.

22	4 : 3 oe	**2**	**M1** for $\overrightarrow{AD} = -\frac{4}{7}x + \frac{4}{7}y$ oe or $\overrightarrow{DB} = -\frac{3}{7}x + \frac{3}{7}y$ oe

6.

26	$\frac{5}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$ final answer	**4**	**M1** for $\overrightarrow{AK} = -\frac{1}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$ or $\overrightarrow{BK} = \frac{2}{3}\mathbf{a} - \frac{2}{3}\mathbf{b}$ **M1** for $\overrightarrow{AL}$ (or $\overrightarrow{OK}$) = **a** + *their* $\overrightarrow{AK}$ oe soi or $\overrightarrow{OK}$ (or $\overrightarrow{AL}$) = **b** + *their* $\overrightarrow{AK}$ oe soi or $\overrightarrow{BL}$ = **a** + *their* $\overrightarrow{AK}$ oe soi **M1** for a correct route e.g. $\overrightarrow{OL}$, **a** + $\overrightarrow{AL}$, **b** + $\overrightarrow{BL}$

7.

23(a)	$\frac{5}{6}\mathbf{m} - \frac{1}{3}\mathbf{n}$	**3**	**B2** for correct unsimplified answer in terms of **m** and **n** e.g. $\frac{1}{3}(\mathbf{m} - \mathbf{n}) + \frac{1}{2}\mathbf{m}$ or **M1** for a correct route or for $\overrightarrow{FC} = \mathbf{m} - \mathbf{n}$ or $\overrightarrow{CF} = \mathbf{n} - \mathbf{m}$ or better e.g. $\overrightarrow{AC} = \frac{1}{3}(\mathbf{m} - \mathbf{n})$
23(b)	$\overrightarrow{GH} = 3\overrightarrow{JK}$ oe or $\overrightarrow{GH}$ has a greater magnitude $\overrightarrow{GH}$ and $\overrightarrow{JK}$ are parallel	**2**	**B1** for each

8.

22(a)	$-\mathbf{a} + \mathbf{b}$	**1**	

22(b)	$2\mathbf{a} - \frac{1}{2}\mathbf{b}$	**3**	**B2** for answer $2\mathbf{a} + p\mathbf{b}$ or $q\mathbf{a} - \frac{1}{2}\mathbf{b}$ $q \neq \frac{1}{2}$ or correct unsimplified answer in terms of **a** and **b** or **M1** for $\overrightarrow{AC} = \frac{3}{2}\mathbf{a}$ or $\overrightarrow{OC} = \frac{5}{2}\mathbf{a}$ or correct route If 0 scored **SC1** for answer $\mathbf{a} + \frac{1}{2}\mathbf{b}$

9.

8(a)(i)	$\begin{pmatrix}4\\4\end{pmatrix}$	**2**	**B1** for $\begin{pmatrix}4\\k\end{pmatrix}$ or $\begin{pmatrix}k\\4\end{pmatrix}$
8(a)(ii)	$\begin{pmatrix}-4\\8\end{pmatrix}$	**2**	**B1** for $\begin{pmatrix}-4\\k\end{pmatrix}$ or $\begin{pmatrix}k\\8\end{pmatrix}$
8(a)(iii)	5.39 or 5.385..	**2**	**M1** for $(-2)^2 + 5^2$ oe
8(b)(i)	$\mathbf{a} + \mathbf{b}$	**1**	
8(b)(ii)	$\frac{3}{2}\mathbf{a} + \mathbf{b}$	**2**	**M1** for a correct route, e.g. $\overrightarrow{OA} + \overrightarrow{AE}$
8(b)(iii)	$2\mathbf{a} + \frac{4}{3}\mathbf{b}$	**3**	**M2** for unsimplified $\overrightarrow{OD}$ or for $\frac{4}{3}\mathbf{b}$ or **M1** for $\overrightarrow{OD}$ attempted in terms of **a** and **b** or for $\overrightarrow{CD} = \frac{1}{3}\mathbf{b}$ or $\overrightarrow{DB} = \frac{2}{3}\mathbf{b}$ seen

10

26	$\frac{3}{5}\mathbf{r} + \frac{2}{5}\mathbf{t}$ or $\frac{1}{5}(3\mathbf{r} + 2\mathbf{t})$	**3**	**M2** for $\mathbf{r} + \frac{2}{5}(-\mathbf{r} + \mathbf{t})$ oe or $\mathbf{t} + \frac{3}{5}(\mathbf{r} - \mathbf{t})$ oe or **M1** for $\overrightarrow{RT} = -\mathbf{r} + \mathbf{t}$ oe or $\vec{TR} = \mathbf{r} - \mathbf{t}$ **M1** for $\overrightarrow{OR} + \overrightarrow{RX}$ or $\overrightarrow{OT} + \overrightarrow{TX}$ any other correct route.

10(b)

7(b)	$\frac{3}{4}\mathbf{p} + \frac{1}{2}\mathbf{q}$ or $\frac{1}{4}(3\mathbf{p} + 2\mathbf{q})$ or $\frac{3\boldsymbol{p} + 2\boldsymbol{q}}{4}$ final answer	**3**	**M2** for $AM = \overrightarrow{AM} = \frac{1}{2}\left(-\mathbf{p} + \mathbf{q} + \frac{1}{2}\mathbf{p}\right)$ oe or **M1** for correct route for $\overrightarrow{AB}$ oe soi by $-\frac{1}{2}\mathbf{p} + \mathbf{q}$ or for $\overrightarrow{OM}$ soi

10(b) – 对的，还有一个 b

9(b)(i)(a)	$\frac{1}{2}\mathbf{c}$	**1**	
9(b)(i)(b)	$\mathbf{a}+\frac{1}{2}\mathbf{c}$ oe	**1**	FT $\mathbf{a}$ + *their* (b)(i)(a)

9(b)(ii)(a)	$\overrightarrow{OP}=\frac{1}{3}(2\mathbf{a}+\mathbf{c})$ oe and $\overrightarrow{OQ}=\frac{1}{2}(2\mathbf{a}+\mathbf{c})$ oe OR $\overrightarrow{OP}=\frac{2}{3}(\mathbf{a}+\frac{1}{2}\mathbf{c})$ OR $\overrightarrow{PQ}=\frac{1}{3}(\mathbf{a}+\frac{1}{2}\mathbf{c})$ **and** correct comment e.g. have the same base vector or that they are multiples of one another **and** they share a common point OR e.g. $\overrightarrow{OQ}=1.5\overrightarrow{OP}$, $2\overrightarrow{PQ}=\overrightarrow{OP}$	**2**	**B1** for $\overrightarrow{OP}$ or $\overrightarrow{PQ}$ factorised or for correct multiplicative statement on relationship without factorised vectors e.g. $\overrightarrow{OQ}=1.5\overrightarrow{OP}$, $\frac{2}{3}\overrightarrow{OQ}=\overrightarrow{OP}$, $2\overrightarrow{PQ}=\overrightarrow{OP}$, $1.5\left(\frac{2}{3}\mathbf{a}+\frac{1}{3}\mathbf{c}\right)=\mathbf{a}+\frac{1}{2}\mathbf{c}$
9(b)(ii)(b)	1.5 oe	**1**	

11.

6(a)(i)	$\begin{pmatrix}-3\\3\end{pmatrix}$	**1**	
6(a)(ii)	$\begin{pmatrix}3\\2\end{pmatrix}$	**1**	
6(a)(iii)	3.61 or 3.605 to 3.606	**2**	**M1** for 2^2+3^2 oe
6(b)	(6, 1)	**2**	**B1** for each

Question	Answer	Marks	Partial Marks
6(c)	$\frac{2}{7}\mathbf{g}+\frac{3}{14}\mathbf{h}$	**4**	**B3** for correct unsimplified expression for $\overrightarrow{MK}$ or **B2** for $[\overrightarrow{MK}=]\frac{2}{7}\mathbf{g}+k\mathbf{h}$ or $[\overrightarrow{MK}=]\ k\mathbf{g}+\frac{3}{14}\mathbf{h}$ or $\overrightarrow{HK}=\frac{2}{7}(\mathbf{g}-\mathbf{h})$ oe or $\overrightarrow{GK}=\frac{5}{7}(\mathbf{h}-\mathbf{g})$ oe or **M1** for correct route for $\overrightarrow{MK}$

12.

Question	Answer	Marks	Partial Marks
11(a)	2.5 and – 2.5 oe	**3**	**M2** for $1681m^2 = \frac{42025}{4}$ oe or **M1** for $(9m)^2 + (40m)^2$ oe
11(b)(i)(a)	**c** – **a** final answer	**1**	
11(b)(i)(b)	$\frac{3}{4}$**a** final answer	**1**	
11(b)(i)(c)	**c** + $\frac{3}{4}$**a** final answer	**1**	**FT c** + *their* **(b)(i)(b)**, must be a vector in terms of **a** and/or **c** in its simplest form
11(b)(ii)	**a** + $\frac{4}{3}$**c** oe	**2**	**B1** for $[\overline{BQ} =]\ \frac{1}{3}$**c** or $[\overline{AQ} =]\ \frac{4}{3}$**c** or **M1** for a correct route or for answer **a** + k**c** oe, where $k > 1$

13.

Question	Answer	Marks	Partial Marks
10(a)(i)	2**a** drawn correctly with direction arrow	**1**	
10(a)(ii)	**a** − **b** drawn correctly with direction arrow	**2**	**B1** for $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ seen or implied or **M1** for correctly drawing *their* **a** – **b** with an arrow
10(b)(i)(a)	**q** + $\frac{3}{4}$ **p** final answer	**1**	
10(b)(i)(b)	**q** – $\frac{1}{4}$ **p** final answer	**2**	**M1** for a correct route
10(b)(i)(c)	$\frac{13}{24}$**p** – $\frac{2}{3}$**q** final answer	**3**	**M2** for $\frac{3}{8}$**p** – $\frac{2}{3}$ (*their* **(b)(i)(b)**) oe or for – $\frac{3}{8}$**p** – **q** + **p** + $\frac{1}{3}$ (*their* **(b)(i)(b)**) oe or **M1** for a correct route or for $[\overrightarrow{BN} =] -\frac{2}{3}$ (*their* **(b)(i)(b)**) or $[\overrightarrow{AN} =]\ \frac{1}{3}$ (*their* **(b)(i)(b)**) or final answer k**p** – $\frac{2}{3}$**q** oe or $\frac{13}{24}$**p** – k**q** oe
10(b)(ii)	$\frac{19}{16}$**p** oe final answer	**2**	**M1** for $\overrightarrow{AG} = \frac{3}{8}$**p** ÷ 2 soi or for answer k**p** oe