Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
10 (a)	Diagram	B1	for correct vector drawn including arrow	May be drawn anywhere on the grid. Condone missing label
(b)	$\begin{pmatrix} 3 \\ -4 \end{pmatrix}$	M1	for **a** + 2**b** drawn with resultant vector **or** for writing **a** and **b** as column vectors **and** attempt to add **a** + 2**b** , eg $\binom{1}{2} + 2 \times \binom{1}{-3}$ **or** $\binom{1+2}{c}$ **or** $\binom{d}{2+-6}$ **or** $\binom{-4}{3}$	Accept consistent incorrect notation for M1
Q1		A1	cao	

Paper: 1MA1/3H				
Question	**Working**	**Answer**	**Mark**	**Notes**
21 **Q2**		$\frac{2}{5}$	P1 P1 P1 P1 A1	for process to find $\overrightarrow{AB}$ (= **b** – **a**) or $\overrightarrow{BA}$ (= **a** – **b**) for process to find $\overrightarrow{MN}$ (= $-\frac{1}{2}$**b** + **a** + 2**a**) or $\overrightarrow{PN}$ (= –k(**b** – **a**) + 2**a**) or $\overrightarrow{MP}$ (= $-\frac{1}{2}$**b** + **a** + *k*(**b** – **a**) or $\frac{1}{2}$**b** + (1 – *k*)(**a** – **b**)) for process to find two of $\overrightarrow{MN}$, $\overrightarrow{PN}$ and $\overrightarrow{MP}$ for process to find *k*, using $\overrightarrow{MN}$ as a multiple of $\overrightarrow{PN}$ or using $\overrightarrow{MN}$ as a multiple of $\overrightarrow{MP}$ or using $\overrightarrow{PN}$ as a multiple of $\overrightarrow{MP}$ for $\frac{2}{5}$ oe

Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
19 **Q3**		$\frac{2}{5}$	P1	for first step to solve the problem e.g. $\overrightarrow{AC} = -\mathbf{a} + \mathbf{c}$ or $\overrightarrow{OX} = \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$ or demonstrates the location of D and X on the diagram
			P1	for a correct vector statement using $\overrightarrow{CD}$ eg $\overrightarrow{CD} = \overrightarrow{CX} + \overrightarrow{XD}$ or $\overrightarrow{CD} = \overrightarrow{OD} - \overrightarrow{OC}$ or $\overrightarrow{OD} = \frac{7}{2}\mathbf{c}$ or $\overrightarrow{CD} = 2.5\mathbf{c}$ oe
			P1	for a correct equation or ratio using k eg equating $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a} = \frac{1}{2}(-\mathbf{a} + \mathbf{c}) + \frac{1}{k}\mathbf{c}$ or $\frac{\overrightarrow{OD}}{\overrightarrow{OC}} = \frac{k+1}{k}$ or $k = \frac{1}{2.5}$ or using a ratio approach eg $(\overrightarrow{OC} : \overrightarrow{CD}) = k : 1 = 1 : 2.5$
			A1	cao

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Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
20 (a)	2**a**	M1	for **a** – **b** + **a** + **b** (=2**a**)	
		A1	cao	
(b)	4	P1	for a process to find $\overrightarrow{MF}$= −0.5**b**−**a**−(**a**−**b**) (=0.5**b**−2**a**) **or** $\overrightarrow{CE}$= **a** + **b** **or** $\overrightarrow{FM}$ = **a**−**b**+**a**+0.5**b** (=2**a**−0.5**b**)	Accept ft from (a) providing vectors are clearly stated
Q4		P1	For finding a suitable vector expression for **two** of ($\overrightarrow{CE}$ or $\overrightarrow{EC}$), ($\overrightarrow{CX}$ or $\overrightarrow{XC}$) or ($\overrightarrow{EX}$ or $\overrightarrow{XE}$) eg, $\overrightarrow{CX}$ = **a** +0.5**b**+ $\frac{1}{n+1}$ (0.5**b**−2**a**) **or** $\overrightarrow{CX}$ = −**a** + **b** + $\frac{n}{n+1}$(2**a**−0.5**b**) $\overrightarrow{XE}$ = $\frac{1}{n+1}$ (2**a** −0.5**b**) + 0.5**b** **or** $\overrightarrow{XE}$ = $\frac{n}{n+1}$(0.5**b** – 2**a**) + 2**a** **or** $\overrightarrow{XC}$ = $\frac{n}{n+1}$(0.5**b**−2**a**)+**a**−**b** **or** $\overrightarrow{XC}$ = $\frac{1}{n+1}$ (2**a** – 0.5**b**) – 0.5**b** − **a** **or** $\overrightarrow{EX}$ = −0.5**b**+$\frac{1}{n+1}$(0.5**b**−2**a**) **or** $\overrightarrow{EX}$ = –2**a** + $\frac{n}{n+1}$(2**a** – 0.5**b**)	$\overrightarrow{CX} = \frac{n-1}{n+1}\mathbf{a} + \frac{n+2}{2(n+1)}\mathbf{b}$ $\overrightarrow{XE} = \frac{2}{n+1}\mathbf{a} + \frac{n}{2(n+1)}\mathbf{b}$ $\overrightarrow{XC} = \frac{1-n}{n+1}\mathbf{a} + \frac{-n-2}{2(n+1)}\mathbf{b}$ $\overrightarrow{EX} = \frac{-2}{n+1}\mathbf{a} - \frac{n}{2(n+1)}\mathbf{b}$
		P1	for complete process to equate the coefficients of **a** and **b** eg $\frac{n-1}{n+1} = \frac{n+2}{2(n+1)}$	
		A1	cao	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
			ALTERNATIVE	
		P1	for a process to find $\overrightarrow{MF}$= −0.5**b** − **a** − (**a** − **b)** (=0.5**b** − 2**a**) **or** $\overrightarrow{CE}$= **a** + **b** **or** $\overrightarrow{FM}$ = **a** – **b** + **a** + 0.5**b** (=2**a** − 0.5**b)**	Accept ft from (a) providing vectors are clearly stated
		P1	For finding two suitable vector expressions for $\overrightarrow{FX}$ eg $\overrightarrow{FX} = \frac{n}{n+1}$(2**a** − 0.5**b**) **and** $\overrightarrow{FX}$ = **a** – **b** + k**a** + k**b**	
		P1	for complete process to equate the coefficients of **a** and **b** eg $\frac{2n}{n+1} - 1 = 1 - \frac{n}{2(n+1)}$	
		A1	cao	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
21 **Q5**	Proof	M1 M1 B1 C1	for $\overrightarrow{DQ}$ = ½ (**b** − **a**) oe or $\overrightarrow{EQ}$ = ½ (**a** − **b**) oe for $\overrightarrow{PQ}$ = ½ **a** + $\overrightarrow{DQ}$ **or** ½ **a** + ½ (**b** − **a**) oe **or** $\overrightarrow{PQ}$ = − ½ **a** + **b** + $\overrightarrow{EQ}$ **or** − ½ **a** + **b** + ½ (**a** − **b**) oe for $\overrightarrow{PQ}$ = ½ **b** for complete proof with statement, eg *FE* = 2*PQ* **or** *FE* is a multiple of *PQ* **or** **b** = 2(½ **b**)	Vectors could be written on the diagram

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Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
6 **Q6**	$\begin{pmatrix}-9\\14\end{pmatrix}$	M1 A1	for $2\begin{pmatrix}3\\4\end{pmatrix}-3\begin{pmatrix}5\\-2\end{pmatrix}$ **or** $\begin{pmatrix}6\\8\end{pmatrix}$ **and** $\begin{pmatrix}15\\-6\end{pmatrix}$ **or** $\begin{pmatrix}-9\\y\end{pmatrix}$ **or** $\begin{pmatrix}x\\14\end{pmatrix}$ cao	May be seen in two separate calculations eg $2\times3+-3\times5$ and $2\times4+-3\times-2$ Condone incorrect notation if method is clear for this mark only

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
18 **Q7**	$\frac{2}{5}\mathbf{a}+\mathbf{b}$	P1	for relationship involving D eg $\overrightarrow{OD}=\frac{2}{5}\overrightarrow{OB}$ or $\overrightarrow{DB}=\frac{3}{5}\overrightarrow{OB}$ **or** for relationship involving E eg $\overrightarrow{BE}=\frac{1}{5}\overrightarrow{BC}$ or $\overrightarrow{EC}=\frac{4}{5}\overrightarrow{BC}$	
		P1	for relationship involving D in terms of **a** and **b** eg $\overrightarrow{OD}=\frac{2}{5}(\mathbf{a}+\mathbf{b})$ or $\overrightarrow{DB}=\frac{3}{5}(\mathbf{a}+\mathbf{b})$ **or** for relationship involving E in terms of **a** and **b** eg $\overrightarrow{BE}=\frac{1}{5}(-\mathbf{b}-\mathbf{a}+3\mathbf{b})$ oe or $\overrightarrow{EC}=\frac{4}{5}(-\mathbf{b}-\mathbf{a}+3\mathbf{b})$ oe **or** $\overrightarrow{BC}=2\mathbf{b}-\mathbf{a}$ oe or $\overrightarrow{CB}=\mathbf{a}-2\mathbf{b}$ oe	
		P1	(dep P2) for expression for $\overrightarrow{DE}$ in terms of **a** and **b** eg $\overrightarrow{DE}=\frac{3}{5}(\mathbf{a}+\mathbf{b})+\frac{1}{5}(-\mathbf{b}-\mathbf{a}+3\mathbf{b})$	
		A1	for $\frac{2}{5}\mathbf{a}+(1)\mathbf{b}$ or $\frac{1}{5}(2\mathbf{a}+5\mathbf{b})$	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
21 **Q8**	3 : 4	P1 P1 P1 P1 A1 P1 P1 P1 P1 A1	starts process eg $AB = \mathbf{b} - \mathbf{a}$ oe for process to find $\overrightarrow{OM} = \mathbf{a} + \frac{1}{2}$ "($\mathbf{b} - \mathbf{a}$)"oe $(= \frac{1}{2}(\mathbf{a} + \mathbf{b}))$ for process to find $\overrightarrow{AP} = -\mathbf{a} + \frac{3}{5}$ "$(\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b})$" oe **or** (indep) for $\overrightarrow{AN} = -\mathbf{a} +$ "k"$\mathbf{b}$ process to find "k" using $\overrightarrow{AN} = -\mathbf{a} +$ "k"$\mathbf{b}$ as a multiple of $\overrightarrow{AP}$ cao **ALTERNATIVE** for producing OM to C such that AC is parallel to OB for process to show that $MC = OM$, using congruent triangles ACM and BOM for process to find PC as a multiple of OM/5 (= 7OM/5) for process to find ON as a multiple of AC(OB) (= 3OB/7) using similar triangles ACP and NOP cao	Formal geometric reasoning relating to congruent and similar triangles is not required

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
24 **Q9**	4 : 3	P1 P1 P1 P1 A1	Process to find a missing vector using the given ratios as fractions, eg. $\frac{1}{3}$ of $\overrightarrow{OX}$ (=$\frac{1}{3}$ **a**) or. $\frac{1}{4}$ of $\overrightarrow{OY}$ (=$\frac{1}{4}$ **b**) for a process to use $\overrightarrow{ZO} = \overrightarrow{YX} = \mathbf{a} - \mathbf{b}$ oe for a process to find either $\overrightarrow{ZP}$ or $\overrightarrow{ZR}$ in terms of **a** and **b**, eg. either $\overrightarrow{ZP} = \mathbf{a} - \mathbf{b} + \frac{1}{3}\mathbf{a}$ or $\overrightarrow{ZR} = \mathbf{a} - \mathbf{b} + \frac{1}{4}\mathbf{b}$ for a process to write $\overrightarrow{ZP}$ and $\overrightarrow{ZR}$ as multiples of the same vector, eg. multiplying both by 12 to get the ratio, $\frac{4}{3}$**(a** – 0.75**b)** and **a** – 0.75**b** respectively oe	Might be embedded in their answer for ZP The award of this mark implies the first two process marks.

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
24 **Q10**	Proof	C1 C1 C1 C1	for $\overrightarrow{CE}$ = 2**a** – **b** oe for $\overrightarrow{EP}$ = 2**a** – **b** oe or for $\overrightarrow{CP}$ = 4**a** – 2**b** oe for $\overrightarrow{CF}$ = **a** – **b** oe or for $\overrightarrow{DP}$ = 2**a** – 2**b** oe for $\overrightarrow{CF}$ = **a** – **b** and $\overrightarrow{DP}$ = 2**a** – 2**b** **(**or 2**(a – b))** leading to conclusion	Vectors may be seen on diagram. Award marks provided not ambiguous. For the award of the first 3 marks, expressions for vectors $\overrightarrow{CE}$, $\overrightarrow{EP}$, $\overrightarrow{CP}$, $\overrightarrow{CF}$ and $\overrightarrow{DP}$ may not be simplified

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
15 (a)	$\overrightarrow{AC} = 5\overrightarrow{AB}$ and reason	M1	for $\overrightarrow{AC} = 5(3\mathbf{a} + 4\mathbf{b})$ **or** $\overrightarrow{BC} = 4(3\mathbf{a} + 4\mathbf{b})$ or indicates that $15\mathbf{a} + 20\mathbf{b} = 5 \times (3\mathbf{a} + 4\mathbf{b})$	
		C1	for $\overrightarrow{AC} = 5\overrightarrow{AB}$ or $\overrightarrow{AC} = 5(3\mathbf{a} + 4\mathbf{b})$ or $15\mathbf{a} + 20\mathbf{b} = 5(3\mathbf{a} + 4\mathbf{b})$ **and** a correct reason, eg *AC* is a multiple of *AB* / multiples of each other / *AB* is a factor of *AC* **or** they have the same gradient / are parallel / go in the same direction **or** they have a point in common / both start at *A* **or** *AC* is an enlargement of *AB*	Do not award this mark if any incorrect working seen Could use *AB* and *BC* or *AC* and *BC*
(b)	5 : 2	P1	for ($\overrightarrow{DF}$ =) $3\mathbf{e} + 6\mathbf{f} + (-10.5\mathbf{e} - 21\mathbf{f})$ $(= -7.5\mathbf{e} - 15\mathbf{f})$ **or** for a multiplicative relationship for $\overrightarrow{DE}$ and $\overrightarrow{EF}$ eg $\overrightarrow{EF} = -3.5\overrightarrow{DE}$ or for (*DE* : *EF* =) 1 : –3.5 oe	
Q11		P1	for a multiplicative relationship for $\overrightarrow{DF}$ and $\overrightarrow{DE}$ eg $\overrightarrow{DF} = -2.5\overrightarrow{DE}$ **or** for (*DF* : *DE* =) –5 : 2 oe eg –2.5 : 1 or –7.5 : 3 **or** for answer of 2 : 5 oe	
		A1	oe eg 2.5 : 1	

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
13 **Q12**	$\begin{pmatrix}-1\\4\end{pmatrix}$	M1 M1 A1	for $3\begin{pmatrix}2\\-3\end{pmatrix} - 2\mathbf{b} = \begin{pmatrix}8\\-17\end{pmatrix}$ oe or for $\begin{pmatrix}6\\-9\end{pmatrix}$ for $2\mathbf{b} = \begin{pmatrix}3\times 2-8\\3\times -3--17\end{pmatrix} \left(=\begin{pmatrix}-2\\8\end{pmatrix}\right)$ oe or $-2\mathbf{b} = \begin{pmatrix}8-3\times 2\\-17-3\times -3\end{pmatrix} \left(=\begin{pmatrix}2\\-8\end{pmatrix}\right)$ oe or for one element correct, –1 or 4 cao (if M0 scored, SC B1 for $\begin{pmatrix}1\\-4\end{pmatrix}$)	Must see "$2\mathbf{b}$ = ..." or "$-2\mathbf{b}$ **= ...**" to award 2 marks One correct element scores 2 marks