VECTORS

Pearson Edexcel – Tuesday 19 May 2020 - Paper 1 (Non-Calculator) Higher Tier

1.

21	Proof	M1 M1 B1 C1	for $\overrightarrow{DQ} = \frac{1}{2}(\mathbf{b}-\mathbf{a})$ oe or $\overrightarrow{EQ} = \frac{1}{2}(\mathbf{a}-\mathbf{b})$ oe for $\overrightarrow{PQ} = \frac{1}{2}\mathbf{a} + \overrightarrow{DQ}$ **or** $\frac{1}{2}\mathbf{a} + \frac{1}{2}(\mathbf{b}-\mathbf{a})$ oe **or** $\overrightarrow{PQ} = -\frac{1}{2}\mathbf{a} + \mathbf{b} + \overrightarrow{EQ}$ **or** $-\frac{1}{2}\mathbf{a} + \mathbf{b} + \frac{1}{2}(\mathbf{a}-\mathbf{b})$ oe for $\overrightarrow{PQ} = \frac{1}{2}\mathbf{b}$ for complete proof with statement, eg $FE = 2PQ$ **or** FE is a multiple of PQ **or** $\mathbf{b} = 2(\frac{1}{2}\mathbf{b})$	Vectors could be written on the diagram

Pearson Edexcel – Thursday 4 June 2020 - Paper 2 (Calculator) Higher Tier

2.

6	$\begin{pmatrix}-9\\14\end{pmatrix}$	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

Pearson Edexcel - Thursday 7 June 2018 - Paper 2 (Calculator) Higher Tier

3.

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 A1	for $\mathbf{a} + 2\mathbf{b}$ drawn with resultant vector **or** for writing $\mathbf{a}$ and $\mathbf{b}$ as column vectors **and** attempt to add $\mathbf{a} + 2\mathbf{b}$, eg $\begin{pmatrix}1\\2\end{pmatrix} + 2\times\begin{pmatrix}1\\-3\end{pmatrix}$ **or** $\begin{pmatrix}1+2\\c\end{pmatrix}$ **or** $\begin{pmatrix}d\\2+-6\end{pmatrix}$ **or** $\begin{pmatrix}-4\\3\end{pmatrix}$ cao	Accept consistent incorrect notation for M1

Pearson Edexcel - Specimen Papers Set 2 - Paper 3 (Calculator) Higher Tier

4.

20		$\frac{1}{4}$	P1 P1 P1 A1	starts process eg $\overrightarrow{AB} = 2\mathbf{b} - 2\mathbf{a}$ process to find $\overrightarrow{AP}$ or $\overrightarrow{BP}$ complete process to find $\overrightarrow{OP}$ for $\frac{1}{4}$ oe

Pearson Edexcel - Specimen Papers Set 1 - Paper 1 (Non-Calculator) Higher Tier

5.

22			M1 states AB as $6\mathbf{b} - 3\mathbf{a}$ M1 for $AX = \frac{1}{3}AB$ or $\frac{1}{3}$"$(6\mathbf{b} - 3\mathbf{a})$" or ft to $2\mathbf{b} - \mathbf{a}$ M1 for $\overrightarrow{CY} = \overrightarrow{CB} + \overrightarrow{BY}$ or $6\mathbf{b} + 5\mathbf{a} - \mathbf{b}$ $(=5\mathbf{b} + 5\mathbf{a})$ M1 for $\overrightarrow{CX} = 3\mathbf{a} +$ "$2\mathbf{b} - \mathbf{a}$" or $\overrightarrow{CX} = 6\mathbf{b} - \frac{2}{3}$"$(6\mathbf{b} - 3\mathbf{a})$" $(= 2\mathbf{a} + 2\mathbf{b})$ C1 for $\frac{2}{5}\overrightarrow{CY} = \frac{2}{5}(5\mathbf{a} + 5\mathbf{b}) = 2(\mathbf{a} + \mathbf{b}) = \overrightarrow{CX}$

Pearson Edexcel - Sample Paper 3 - (Calculator) Higher Tier

6.

18	$\overrightarrow{OM} = \mathbf{3a}$ $\overrightarrow{AB} = 6\mathbf{b} - 6\mathbf{a}$ $\overrightarrow{MC} = 3\mathbf{a} + 2(6\mathbf{b} - 6\mathbf{a})$ $= 12\mathbf{b} - 9\mathbf{a}$ $= 3(4\mathbf{b} - 3\mathbf{a})$ $\overrightarrow{MN} = k\mathbf{b} - 3\mathbf{a}$ MNC is a straight line so $\overrightarrow{MC}$ is a scalar multiple of $\overrightarrow{MN}$	4	P1 For process to start e.g. $\overrightarrow{OM} = 3\mathbf{a}$ **or** $\overrightarrow{MA} = \mathbf{3a}$ P1 For process to find $\overrightarrow{AB}$ $(=6\mathbf{b} - 6\mathbf{a})$ P1 For process to find $\overrightarrow{MC}$ $(=3\mathbf{a} + 2(6\mathbf{b} - 6\mathbf{a})$ **and** $\overrightarrow{MN}$ $(= k\mathbf{b} - 3\mathbf{a})$ P1 For correct process to find k e.g. $3k\mathbf{b} - 9\mathbf{a} = 12\mathbf{b} - 9\mathbf{a}$ A1

Pearson Edexcel - Thursday 26 May 2016 - Paper 1 (Non-Calculator) Higher Tier

7.

23	(a)(i)		$\mathbf{a} + \mathbf{b}$	2	B1 for $\mathbf{a} + \mathbf{b}$ oe
	(ii)		$-\mathbf{a} + 3\mathbf{b}$		B1 for $-\mathbf{a} + 3\mathbf{b}$ oe
	(b)		$\frac{3}{4}\mathbf{a} + \frac{3}{4}\mathbf{b}$	2	M1 for $\overrightarrow{OP} + \frac{1}{4}\overrightarrow{PR}$ or $\overrightarrow{OR} + \frac{3}{4}\overrightarrow{RP}$ (may be in terms of $\mathbf{a}$ and $\mathbf{b}$) A1 for $\frac{3}{4}\mathbf{a} + \frac{3}{4}\mathbf{b}$ or $\frac{3}{4}(\mathbf{a} + \mathbf{b})$
	*(c)		$OS = \frac{3}{4}OT$	2	C2 (dep A1) for S divides OT in the ratio 3:1 oe or $OS = \frac{3}{4}OT$ oe (C1 (dep A1) for S lies on OT or that OT and PR intersect at S oe)

Pearson Edexcel - Monday 8 June 2015 - Paper 2 (Calculator) Higher Tier

8.

27		$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ $= \mathbf{a} + \mathbf{b}$ $\overrightarrow{AC} = \frac{7}{2}\overrightarrow{AB}$ $\overrightarrow{OC} = \overrightarrow{OA} + \overrightarrow{AC}$ $= 2\mathbf{a} + \mathbf{b} + \frac{7}{2}(\mathbf{a} + \mathbf{b})$	$\frac{11}{2}\mathbf{a} + \frac{9}{2}\mathbf{b}$	4	M1 for $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ $(= -(2\mathbf{a} + \mathbf{b}) + (3\boldsymbol{a} + 2\boldsymbol{b}))$ or $\mathbf{a} + \mathbf{b}$ M1 for $\overrightarrow{AC} = \frac{7}{2}\overrightarrow{AB}$ or $\overrightarrow{BC} = \frac{5}{2}\overrightarrow{AB}$, may be in terms of $\mathbf{a}$ and $\mathbf{b}$ M1 (dep M2) for complete method to find $\overrightarrow{OC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ A1 for $\frac{11}{2}\mathbf{a} + \frac{9}{2}\mathbf{b}$ or equivalent simplest form (SCB2 for $\frac{11}{2}\mathbf{a} + \frac{23}{2}\mathbf{b}$ or $\frac{11}{2}\mathbf{a} + \frac{19}{2}\mathbf{b}$)

Pearson Edexcel - Monday 9 June 2014 - Paper 1 (Non-Calculator) Higher Tier

9.

*24			Proof	3	M1 for $\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{ON}$ (= **n** – **m**) or $\overrightarrow{NM} = \overrightarrow{OM} + \overrightarrow{NO}$ (= **m** – **n**) or $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ (= 2**n** – 2**m**) or $\overrightarrow{BA} = \overrightarrow{OA} + \overrightarrow{BO}$ (= 2**m** – 2**n**) M1 for $\overrightarrow{MN}$= **n** – **m** and $\overrightarrow{AB}$= 2**n** – 2**m** oe C1 (dep on M1, M1) for fully correct proof, with $\overrightarrow{AB}$= 2$\overrightarrow{MN}$ or $\overrightarrow{AB}$ is a multiple of $\overrightarrow{MN}$ [SC M1 for $\overrightarrow{MN}$= 0.5**n** – 0.5**m** and $\overrightarrow{AB}$ = **n** – **m** C1 (dep on M1) for fully correct proof, with $\overrightarrow{AB}$= 2$\overrightarrow{MN}$ or $\overrightarrow{AB}$ is a multiple of of $\overrightarrow{MN}$]

Pearson Edexcel - Wednesday 6 November 2013 - Paper 1 (Non-Calculator) Higher Tier

10.

24	(a)	$\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$ $\overrightarrow{ON} = \overrightarrow{OA} + \frac{2}{3}\overrightarrow{AB}$ $\overrightarrow{ON} = \mathbf{a} + \frac{2}{3}(-\mathbf{a} + \mathbf{b})$ $= \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ OR $\overrightarrow{ON} = \overrightarrow{OB} + \frac{1}{3}\overrightarrow{BA}$ $\overrightarrow{ON} = \mathbf{b} + \frac{1}{3}(-\mathbf{b} + \mathbf{a})$ $= \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$	3	M1 for correct vector equation involving $\overrightarrow{ON}$, eg. $\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$, may be written, partially or fully, in terms of **a** and **b**, e.g. ($\overrightarrow{ON}$ =) **a** + $\frac{2}{3}\overrightarrow{AB}$ M1 for showing answer requires $\overrightarrow{AN} = \frac{2}{3}\overrightarrow{AB}$ or $\overrightarrow{BN} = \frac{1}{3}\overrightarrow{BA}$ A1 $\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe
	(b)	$\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AC} + \overrightarrow{CD}$ $= \mathbf{a} + \mathbf{b} + \mathbf{b}$ $= \mathbf{a} + 2\mathbf{b}$ $\overrightarrow{OD} = 3(\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b})$ $\overrightarrow{OD} = 3\overrightarrow{ON}$	Proof	3	M1 for a correct vector statement for $\overrightarrow{OD}$ or $\overrightarrow{ND}$ in terms of **a** and **b**, e.g. $\overrightarrow{OD}$ = **a** + **b** + **b** oe or $\overrightarrow{ND} = \frac{2}{3}(-\mathbf{b} + \mathbf{a}) + \mathbf{b} + \mathbf{b}$ oe A1 for correct and fully simplified vectors for $\overrightarrow{ON}$ (may be seen in (a)) **and** for $\overrightarrow{OD}$ (= **a** + 2**b**) or $\overrightarrow{ND}$ (= $\frac{2}{3}\mathbf{a} + \frac{4}{3}\mathbf{b}$) C1 (dep on A1) for statement that $\overrightarrow{OD}$ or $\overrightarrow{ND}$ is a multiple of $\overrightarrow{ON}$ (+ common point)

Pearson Edexcel - Tuesday 11 June 2013 - Paper 1 (Non-Calculator) Higher Tier

11.

27	(a)		**a - b**	1	B1 for **a - b** oe
	(b)		$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$	3	M1 for a correct vector statement for $\overrightarrow{NR}$ eg. ($\overrightarrow{NR}$ =) $\overrightarrow{NQ} + \overrightarrow{QR}$ or ($\overrightarrow{NR}$ =) $\overrightarrow{NS} + \overrightarrow{SR}$ M1 for $\frac{2}{5}SQ$ (+ QR) or $\frac{3}{5}QS$ (+ SR) (SQ, QR, QS, SR may be written in terms of **a** and **b**) A1 for $\frac{2}{5}(\mathbf{a} - \mathbf{b}) + \mathbf{b}$ oe or $\frac{3}{5}(\mathbf{b} - \mathbf{a}) + \mathbf{a}$ oe

Pearson Edexcel - Thursday 28 February 2013 - Paper 1 (Non-Calculator) Higher Tier

12.

26	(a) (b)		$6\mathbf{b} - 3\mathbf{a}$	1 4	B1 for $6\mathbf{b} - 3\mathbf{a}$ oe M1 for $\overrightarrow{AX} = \frac{1}{3}\overrightarrow{AB}$ or $\frac{1}{3}$ '$(6\mathbf{b} - 3\mathbf{a})$' or ft to $2\mathbf{b} - \mathbf{a}$ M1 for $\overrightarrow{OY} = \overrightarrow{OB} + \overrightarrow{BY} = 6\mathbf{b} + 5\mathbf{a} - \mathbf{b}$ $(= 5\mathbf{b} + 5\mathbf{a})$ oe M1 for $\overrightarrow{OX}$ = $3\mathbf{a}$ + '$2\mathbf{b} - \mathbf{a}$' = $2\mathbf{a} + 2\mathbf{b}$ oe **Or** $\overrightarrow{OX} = 6\mathbf{b} - \frac{2}{3}$ '$(6\mathbf{b} - 3\mathbf{a})$' $(= 2\mathbf{a} + 2\mathbf{b})$ oe C1 for $\frac{2}{5}\overrightarrow{OY} = \frac{2}{5} \times 5(\mathbf{a} + \mathbf{b}) = 2(\mathbf{a} + \mathbf{b}) = \overrightarrow{OX}$

Pearson Edexcel - Tuesday 6 November 2012 - Paper 1 (Non-Calculator) Higher Tier

13.

28	(a) (b)		$\mathbf{a} - 3\mathbf{b}$	1 4	B1 for $\mathbf{a} - 3\mathbf{b}$ oe M1 for (**NC** =) $2\mathbf{a} - 2\mathbf{b}$ oe M1 for (**NM** =) $\mathbf{b} + \frac{1}{2}"(\mathbf{a} - 3\mathbf{b})"$ A1 for $\frac{1}{2}(\mathbf{a} - \mathbf{b})$ oe and $2\mathbf{a} - 2\mathbf{b}$ oe C1 for **NC** is a multiple of **NM** (+ common point) **OR** M1 for (**NC** =) $2\mathbf{a} - 2\mathbf{b}$ oe M1 for (**MC** =) $\frac{1}{2}"(\mathbf{a} - 3\mathbf{b})" + \mathbf{a}$ A1 for $\frac{3}{2}(\mathbf{a} - \mathbf{b})$ oe and $2\mathbf{a} - 2\mathbf{b}$ oe C1 for **NC** is a multiple of **MC** (+ common point) **OR** M1 for (**NM** =) $\mathbf{b} + \frac{1}{2}"(\mathbf{a} - 3\mathbf{b})"$ M1 for (**MC** =) $\frac{1}{2}"(\mathbf{a} - 3\mathbf{b})" + \mathbf{a}$ A1 for $\frac{1}{2}(\mathbf{a} - \mathbf{b})$ oe and $\frac{3}{2}(\mathbf{a} - \mathbf{b})$ oe C1 for **NM** is a multiple to **MC** (+ common point)

Pearson Edexcel - Wednesday 13 June 2012 - Paper 2 (Calculator) Higher Tier

14.

26	(a)		$\mathbf{b}-\mathbf{a}$	1	B1 for $\mathbf{b}-\mathbf{a}$ or $-\mathbf{a}+\mathbf{b}$
	(b)	$\overrightarrow{OP}=\overrightarrow{OA}+\overrightarrow{AP}$ $\overrightarrow{AP}=\frac{3}{4}\times(\mathbf{b}-\mathbf{a})$ $\overrightarrow{OP}=\mathbf{a}+\frac{3}{4}\times(\mathbf{b}-\mathbf{a})$ OR $\overrightarrow{OP}=\overrightarrow{OB}+\overrightarrow{BP}$ $\overrightarrow{BP}=\frac{1}{4}\times(\mathbf{a}-\mathbf{b})$ $\overrightarrow{OP}=\mathbf{b}+\frac{1}{4}\times(\mathbf{a}-\mathbf{b})$	$\frac{1}{4}(\mathbf{a}+3\mathbf{b})$	3	B1 for $\frac{3}{4}\times$ '$(\mathbf{b}-\mathbf{a})$' M1 for $(\overrightarrow{OP}=)\ \overrightarrow{OA}+\overrightarrow{AP}$ or $(\overrightarrow{OP}=)\ \overrightarrow{OA}+\frac{3}{4}\overrightarrow{AB}$ or $\mathbf{a}\pm\frac{3}{4}\times$ '$(\mathbf{b}-\mathbf{a})$' A1 for $\frac{1}{4}(\mathbf{a}+3\mathbf{b})$ or $\frac{1}{4}\mathbf{a}+\frac{3}{4}\mathbf{b}$ **OR** B1 for $\frac{1}{4}\times$ '$(\mathbf{a}-\mathbf{b})$' M1 for $(\overrightarrow{OP}=)\ \overrightarrow{OB}+\overrightarrow{BP}$ or $(\overrightarrow{OP}=)\ \overrightarrow{OB}+\frac{1}{4}\overrightarrow{BA}$ or $\mathbf{b}\pm\frac{1}{4}\times$ '$(\mathbf{a}-\mathbf{b})$' A1 for $\frac{1}{4}(\mathbf{a}+3\mathbf{b})$ or $\frac{1}{4}\mathbf{a}+\frac{3}{4}\mathbf{b}$

Pearson Edexcel - Friday 2 March 2012 - Paper 3 (Non-Calculator) Higher Tier

15.

23	(a)		$\mathbf{b}-\mathbf{a}$	1	B1 $\mathbf{b}-\mathbf{a}$ or $-\mathbf{a}+\mathbf{b}$
	(b)	$\vec{BK}=2\times\vec{AB}=2\times(\mathbf{b}-\mathbf{a})$ $\vec{CK}=\vec{CB}+\vec{BK}=\mathbf{a}+2\times(\mathbf{b}-\mathbf{a})$	$2\mathbf{b}-\mathbf{a}$	3	M1 for a correct vector statement for $\overrightarrow{CK}$ eg. $\overrightarrow{CK}=\overrightarrow{CA}+\overrightarrow{AK}$ **or** $\overrightarrow{CK}=\overrightarrow{CB}+\overrightarrow{BK}$ M1 for $\overrightarrow{BK}=2\overrightarrow{AB}$ **or** $\overrightarrow{BK}=2$('$\mathbf{b}-\mathbf{a}$') **or** $\overrightarrow{AK}=3\overrightarrow{AB}$ **or** $\overrightarrow{AK}=3$('$\mathbf{b}-\mathbf{a}$') (may be seen as part of a vector equation BUT $2(\mathbf{b}-\mathbf{a})$ or '$2(\mathbf{b}-\mathbf{a})$' or $3(\mathbf{b}-\mathbf{a})$ or '$3(\mathbf{b}-\mathbf{a})$' by itself does not score M1) A1 $2\mathbf{b}-\mathbf{a}$ or $-\mathbf{a}+2\mathbf{b}$

Pearson Edexcel - Monday 6 June 2011 - Paper 3 (Non-Calculator) Higher Tier

16.

26	(a)	$\overrightarrow{AB}=\overrightarrow{AO}+\overrightarrow{OB}$	$-2\mathbf{a}+3\mathbf{b}$	1	B1 for $-2\mathbf{a}+3\mathbf{b}$ or $3\mathbf{b}-2\mathbf{a}$
	(b)	$\overrightarrow{OP}=2\mathbf{a}+\frac{2}{5}(3\mathbf{b}-2\mathbf{a})$ $=\frac{6}{5}\mathbf{a}+\frac{6}{5}\mathbf{b}$ $=\frac{6}{5}(\mathbf{a}+\mathbf{b})$ parallel	$\frac{6}{5}(\mathbf{a}+\mathbf{b})$ is parallel to $\mathbf{a}+\mathbf{b}$	3	M1 for $2\mathbf{a}\pm\frac{2}{5}$('$3\mathbf{b}-2\mathbf{a}$') OR $3\mathbf{b}\pm\frac{3}{5}$ ('$2\mathbf{a}-3\mathbf{b}$') A1 for $\frac{6}{5}\mathbf{a}+\frac{6}{5}\mathbf{b}$ oe A1 for $\frac{6}{5}(\mathbf{a}+\mathbf{b})$ is parallel to $\mathbf{a}+\mathbf{b}$ oe

Pearson Edexcel - Tuesday 9 November 2010 - Paper 3 (Non-Calculator) Higher Tier

17.

27	(a)	$\overrightarrow{OP} = \mathbf{a} + \mathbf{b}$ $\overrightarrow{OM} = \frac{1}{2}\overrightarrow{OP}$	$\frac{1}{2}(\mathbf{a} + \mathbf{b})$	2	M1 for $\overrightarrow{OP} = \overrightarrow{OT} + \overrightarrow{TP}$ or $\overrightarrow{OM} = \frac{1}{2}\overrightarrow{OP}$ or $\overrightarrow{OM} = \frac{1}{2}\overrightarrow{OT} + \frac{1}{2}\overrightarrow{TP}$ or $\overrightarrow{OP} = \mathbf{a} + \mathbf{b}$ A1 for $\frac{1}{2}(\mathbf{a} + \mathbf{b})$ oe SC : B1 for $\mathbf{a} + \mathbf{b} \div 2$
	(b)	$\overrightarrow{TO} + \overrightarrow{OM}$ $-\mathbf{a} + \frac{1}{2}(\mathbf{a} + \mathbf{b})$	$-\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$	2	M1 for $-\mathbf{a} +$ "$\frac{1}{2}(\mathbf{a} + \mathbf{b})$" oe or $\overrightarrow{TM} = \overrightarrow{TO} + \overrightarrow{OM}$ or $\overrightarrow{TM} = \overrightarrow{TP} + \overrightarrow{PM}$ A1 ft

Pearson Edexcel - Thursday 5 November 2009 - Paper 3 (Non-Calculator) Higher Tier

18.

22	(a)		$\mathbf{b} - \mathbf{a}$	1	B1 cao
	(b)	$OP = OA + AP$ $= OA + \frac{2}{3}AB = \underline{\mathbf{a}} + \frac{2}{3}(\underline{\mathbf{b}} - \underline{\mathbf{a}})$	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$	3	M1 for $\vec{OP} = \vec{OA} + \vec{AP}$ or $\vec{OP} = \vec{OB} + \vec{BP}$ M1 for $\vec{AP} = k(\mathbf{b} - \mathbf{a})$ ft from (a) with $0 < k < 1$ or $\vec{AP} = \frac{2}{3}\vec{AB}$ or $\vec{BP} = k(\mathbf{a} - \mathbf{b})$ ft from (a) with $0 < k < 1$ or $\vec{BP} = \frac{1}{3}\vec{BA}$ A1 for $\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe (must be in its simplest form)

OCR GSCE – Monday 9 November 2020 – Paper 6 (Calculator) Higher Tier

19.

7	**(a)**		$\begin{pmatrix} 4 \\ -2 \end{pmatrix}$	**2**	**B1** for 1 component correct If **0** scored, then **SC1** for $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$ or $\left(\frac{4}{-2}\right)$ or (4, -2)	Penalise first appearance of vinculum or poor form in vector but condone second use
	(b)		$\begin{pmatrix} 1 \\ 9 \\ 4 \end{pmatrix}$ oe	**2**	**B1** for 1 component correct or $\begin{pmatrix} 4 \\ 9 \end{pmatrix}$ seen	

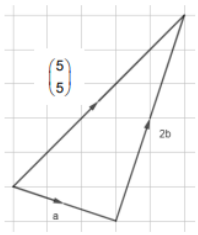
OCR GSCE – Monday 9 November 2020 – Paper 6 (Calculator) Higher Tier

20.

20			-9	**4**	**M2** for $\begin{pmatrix} 7 \\ 2k + 11 \end{pmatrix}$ or **M1** for $\begin{pmatrix} 7 \end{pmatrix}$ or $\begin{pmatrix} 2k + 11 \end{pmatrix}$ or $\begin{pmatrix} 4 \\ 2k \end{pmatrix}$ **M1** for (*their* $2k + 11$) = – (*their* 7)	*their* 7 must follow from their working for **M2** and must not be -1

OCR GSCE – Monday 11 November 2019 – Paper 6 (Calculator) Higher Tier

21.

9	**a**		2.5 5	**3**	**B2** for [k =] 2.5 or **B1** for $\begin{pmatrix}4\\2\end{pmatrix}$ **B1** for [n =] 5	
9	**b**			**1** **1** **1**	Correct arrow and label $\begin{pmatrix}5\\5\end{pmatrix}$ or **a** + 2**b** Correct arrows on **a** and 2**b** Correct labels on **a** and 2**b**	Accept single arrowhead

OCR GSCE – Tuesday 21 May 2019 – Paper 4 (Calculator) Higher Tier

22.

15			Accept any correct justification e.g. two of OC = **a** + 2**b** OD = 2**a** + 4**b** CD = **a** + 2**b** and correct conclusion e.g. OD = 2(**a** + 2**b**) = 2OC or OD is a multiple of OC or OC = CD (must be consistent with vectors found)	**5**	**B1** for [AB =] 3**b** – 3**a** oe **M1** for each of e.g. OC = 3**a** + $\frac{2}{3}$ (3**b** – 3**a**) oe soi by **a** + 2**b** OD = 3**b** + 2**a** + **b** oe soi by 2**a** + 4**b** CD = $\frac{1}{3}$ (3**b** – 3**a**) + 2**a** + **b** oe soi by **a** + 2**b** to a maximum of **M2** and may be on diagram and condone notation OCD for OD only **M1** for [OD =] 2(**a** + 2**b**) or 2OC = OD or OC = CD and must be consistent with vectors found If **0** scored **M1** for any correct route leading to OC, CD or OD e.g. OC = OB + BC

OCR GSCE – Monday 12 November 2018 – Paper 6 (Calculator) Higher Tier

23.

20	**(a)**		eg. $\begin{pmatrix}1\\1\end{pmatrix}$ and $\begin{pmatrix}3\\2\end{pmatrix}$	**3**	**B2** for one correct answer or **M1** for any multiple of $\begin{pmatrix}2\\1\end{pmatrix}$ seen	Other correct answers include: $\begin{pmatrix}5\\3\end{pmatrix}, \begin{pmatrix}-1\\0\end{pmatrix}, \begin{pmatrix}-3\\-1\end{pmatrix}, \begin{pmatrix}-7\\-3\end{pmatrix}, \begin{pmatrix}-9\\-4\end{pmatrix}, \begin{pmatrix}-11\\-5\end{pmatrix}, \begin{pmatrix}-13\\-6\end{pmatrix}$ and $\begin{pmatrix}-15\\-7\end{pmatrix}$ For others, check that top + 5 is double bottom + 2
	(b)		$m = -2$, $n = 4$	**5**	**B1** for $\begin{pmatrix}4m\\m\end{pmatrix}$ or $\begin{pmatrix}5n\\2n\end{pmatrix}$ soi and **M1** for $4m + 5n = 12$ or $m + 2n = 6$ and **M1** for multiplication by scalar(s) to equate coefficients in m or n or reduction to one variable by substitution e.g. $4(6 - 2n) + 5n = 12$ and **M1** for elimination or simplification to $3m = -6$ or $3n = 12$ oe	

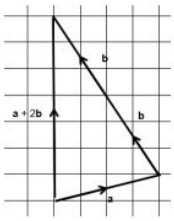
OCR GSCE – Thursday 7 June 2018 – Paper 5 (Non - Calculator) Higher Tier

24.

3	**(a)**		$\begin{pmatrix}2\\9\end{pmatrix}$	**1**		In (a) and (b) penalise first occurrence of fraction line in vector
	(b)		$\begin{pmatrix}1\\10\end{pmatrix}$	**2**	**B1** for answer $\begin{pmatrix}1\\k\end{pmatrix}$ or $\begin{pmatrix}k\\10\end{pmatrix}$	

OCR GSCE – Tuesday 12 June 2018 – Paper 6 (Calculator) Higher Tier

25.

10			Correct triangle drawn with **a** + 2**b** labelled and with correct arrows or **a** and 2**b** labelled and with correct arrows AND length 7cm indicated on diagram  OR $\begin{pmatrix}4\\1\end{pmatrix}+2\begin{pmatrix}-2\\3\end{pmatrix}=\begin{pmatrix}0\\7\end{pmatrix}$ with brackets	**3**	**M1** for vector 2**b** drawn on grid **M1** **a** + *k***b** drawn on grid The two vectors must be joined end to end but arrows may be contradictory. *k***b** should be in the direction of **b** OR **B1** for $\begin{pmatrix}4\\1\end{pmatrix}$ **B1** for $\begin{pmatrix}-2\\3\end{pmatrix}$ or $\begin{pmatrix}-4\\6\end{pmatrix}$	If both methods shown/started, mark the better one For **M** marks condone missing or incorrect arrows and labels on vectors Mark intent: end of vectors within 2mm of of vertices of relevant square Examples (ignore arrows): **M1M1** for **a** + 2**b** drawn (3 marks if labelled and 7 cm indicated) **M1M1** for **a** – 2**b** **M1M0** for 2**b** or – 2**b** **M0M1** for **a** + **b**, **a** – 1.5**b** etc For **B1** marks, condone missing brackets and fraction lines

OCR GSCE – Wednesday 8 November 2017 – Paper 6 (Calculator) Higher Tier

26.

16	**(a)**	**(i)**	**b – a**	**1**		
		(ii)	$\frac{1}{4}(\mathbf{b}-\mathbf{a})$ or $\frac{1}{4}\mathbf{b}-\frac{1}{4}\mathbf{a}$	**1**	**FT** from **(a)(i)**	
	(b)		$\overrightarrow{EF}=\overrightarrow{EB}+\overrightarrow{BF}=\frac{1}{4}(\mathbf{b}-\mathbf{a})+\frac{1}{2}\mathbf{b}$ leading to $\frac{1}{4}(3\mathbf{b}-\mathbf{a})$ as given.	**2**	**M1** for *their* part **(a)(ii)** + $\frac{1}{2}\mathbf{b}$ oe	**(a)(ii)** must be in terms of **a** and **b**
	(c)		$\overrightarrow{AG}=\frac{3}{2}\mathbf{b}-\frac{1}{2}\mathbf{a}$ $\overrightarrow{AG}=2\overrightarrow{EF}$ oe so are parallel.	**3**	**B2** for $\overrightarrow{AG}=\frac{3}{2}\mathbf{b}-\frac{1}{2}\mathbf{a}$ or **M1** for **b** + $\frac{1}{2}$ (*their* part **(a)(i)**) oe	Allow vectors found in reverse throughout eg. $\overrightarrow{GA}$ instead of $\overrightarrow{AG}$ Condone "AG and EF are multiples of each other" Full marks dependent on both AG and EF in correct simplified forms

OCR GSCE – Thursday 8 June 2017 – Paper 5 (Non - Calculator) Higher Tier

27.

11	(a)	(i) (ii)	Draws vector $\begin{pmatrix}4\\2\end{pmatrix}$ and Draws vector $\begin{pmatrix}0\\2\end{pmatrix}$	2	**B1** for each	In (a), penalise first instance only where direction arrow is omitted Condone good freehand mark intention Could be part of correct vector triangle
	(b)		They are different in direction oe	1	Accept correct comments that mention the directions of the vectors	Accept any comment implying the directions of the 2 vectors are different e.g. 'They are not parallel' 'They are going in different directions' 'They are going in opposite *x*–directions' 'Vector A is a [vertical] reflection of vector B' 'One goes left, the other goes right' 'One goes in positive direction the other goes in negative direction' 'One has –2 and the other has 2' Condone 'They are going in opposite directions' Do not accept mention of just 1 vector only unless the reason clearly implies a comparison e.g. Do not accept 'Vector **a** goes right' 'One of them has a minus sign'
	(c)		-3	2	**M1** for $k\left(\begin{pmatrix}2\\1\end{pmatrix}-\begin{pmatrix}-2\\1\end{pmatrix}\right)=\begin{pmatrix}-12\\0\end{pmatrix}$ oe	M1 implied by answer $\begin{pmatrix}-3\\0\end{pmatrix}$

OCR GSCE – Sample Papers – Paper 5 (Non - Calculator) Higher Tier

28.

1	(a)		$[p=]\ 5 \quad [q=]\ {-5}$	2 1 AO1.2 1 AO1.3a	**B1** for each	
	(b)		$\mathbf{c} = 3\mathbf{a}$ $\mathbf{d} = \mathbf{a} + \mathbf{b}$ $\mathbf{e} = \mathbf{a} - \mathbf{b}$	3 3 AO1.3a	**B1** for each	

OCR GSCE – Sample Papers – Paper 5 (Non - Calculator) Higher Tier

29.

18			$\vec{ZY} = {-2}\mathbf{c} + 2\mathbf{a} + 2\mathbf{b}$ $\vec{SR} = \mathbf{c} + ({-\mathbf{c}} + \mathbf{a} + \mathbf{b})$ so $\vec{SR} = \mathbf{a} + \mathbf{b}$ $\vec{PQ} = \mathbf{a} + \mathbf{b}$ $\vec{SR} = \vec{PQ}$ so they are parallel	5 1 AO1.3a 2 AO2.2 2 AO2.4b	**M1** for $\vec{ZY} = {-2}\mathbf{c} + 2\mathbf{a} + 2\mathbf{b}$ **M1** for $\vec{SR} = \mathbf{c} + ({-\mathbf{c}} + \mathbf{a} + \mathbf{b})$ **M1** for $\vec{SR} = \mathbf{a} + \mathbf{b}$ **M1** for $\vec{PQ} = \mathbf{a} + \mathbf{b}$	

AQA GSCE – Tuesday 19 May 2020 – Paper 1 (Non - Calculator) Higher Tier

30.

Q	Answer	Mark	Comments
2	$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$	B1	

AQA GSCE – Thursday 8 June 2020 – Paper 3 (Calculator) Higher Tier

31.

23	$(\vec{JN}=)\ \frac{3}{2} \times 4\mathbf{b}$ or $6\mathbf{b}$	M1	oe eg $(\vec{NJ}=) -6\mathbf{b}$ implied by $\vec{JL} = 10\mathbf{b}$ may be seen on diagram
	$(\vec{JK}=)$ their $6\mathbf{b} + 4\mathbf{b} - 7\mathbf{a}$ or $10\mathbf{b} - 7\mathbf{a}$	M1dep	oe eg $(\vec{KJ}=)\ 7\mathbf{a} - 10\mathbf{b}$
	$5\mathbf{b} - \frac{7}{2}\mathbf{a}$ or $5\mathbf{b} - 3.5\mathbf{a}$	A1	oe eg $\frac{1}{2}(10\mathbf{b} - 7\mathbf{a})$ SC2 $3.5\mathbf{a} - 5\mathbf{b}$ or $\frac{7}{2}\mathbf{a} - 5\mathbf{b}$
	Additional Guidance		

AQA GSCE – Tuesday 21 May 2019 – Paper 1 (Non - Calculator) Higher Tier

32.

22(a)	$-3\mathbf{b} + 6\mathbf{a} + 7.5\mathbf{b}$ (= $6\mathbf{a} + 4.5\mathbf{b}$) or $6\mathbf{a} + 7.5\mathbf{b} - 3\mathbf{b}$ (= $6\mathbf{a} + 4.5\mathbf{b}$) or $6\mathbf{a} + 7.5\mathbf{b} - (6\mathbf{a} + 4.5\mathbf{b}) = 3\mathbf{b}$	B1	oe rearranged equation using all 5 terms
	Additional Guidance		
	$3\mathbf{b} + 6\mathbf{a} + 4.5\mathbf{b} = 6\mathbf{a} + 7.5\mathbf{b}$		B1
	$6\mathbf{a} + 4.5\mathbf{b} + 3\mathbf{b} = 6\mathbf{a} + 7.5\mathbf{b}$		B1
	$7.5\mathbf{b} - 3\mathbf{b} = 4.5\mathbf{b}$, so $6\mathbf{a} + 4.5\mathbf{b}$		B0
	$6\mathbf{a} + 7.5\mathbf{b} - 3\mathbf{b} = 4.5\mathbf{b}$		B0

22(b)	**Alternative method 1: equal ratios from *k*a + 3b and 6a + 4.5b**		
	(*BC* =) *k***a** + 3**b** or $k : 6 = 3 : 4.5$ or $k : 3 = 6 : 4.5$	M1	oe ratio
	$3 \times 6 \div 4.5$ or 4**a** + 3**b**	M1dep	oe
	4	A1	
	Alternative method 2: scale factor from *k*a + 3b and 6a + 4.5b		
	(*BC* =) *k***a** + 3**b** or $4.5 \div 3$ or $\frac{3}{2}$ or $3 \div 4.5$ or $\frac{2}{3}$ or $4.5 \div 6$ or $\frac{3}{4}$ or $6 \div 4.5$ or $\frac{4}{3}$	M1	oe fractions or decimals
	$6 \div$ their $\frac{3}{2}$ or $6 \times$ their $\frac{2}{3}$ or $3 \div$ their $\frac{3}{4}$ or $3 \times$ their $\frac{4}{3}$ or 4**a** + 3**b**	M1dep	oe
	4	A1	
	The mark scheme for question 22(b) continues on the next page		

AQA GSCE – Tuesday 11 June 2019 – Paper 3 (Calculator) Higher Tier

33.

13(a)	$-2\mathbf{a}$	B1	oe eg $-\mathbf{a}$ $-\mathbf{a}$ or $2(-\mathbf{a})$
	Additional Guidance		
	Do not accept in column vector form unless correct answer is also seen		
	Do not accept $-\mathbf{a}2$ for $-2\mathbf{a}$		

13(b)	$\begin{pmatrix}-8\\2\end{pmatrix}$ drawn on the grid with direction shown	B2	± ¼ centimetre square B1 $\begin{pmatrix}-8\\2\end{pmatrix}$ seen in working or correct line drawn with incorrect direction or no direction shown or correctly joined vectors for **c** and $-\mathbf{d}$ with correct directions shown
	Additional Guidance		
	Mark intention, line does not need to be ruled and ignore all labelling for **c**, **d** and **c** – **d**		

AQA GSCE – Tuesday 6 November 2018 – Paper 1 (Non - Calculator) Higher Tier

34.

14	1 – 0.3 – 0.15 – 0.35 or 1 – 0.8 or 0.2 or 0.15 + 0.35 (+ 0.2) or 0.5 (+ 0.2) or 1 – 0.3 or A' U B clearly shaded on diagram	M1	oe
	0.7	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Do not award M1 for 0.15 + 0.35 or 0.5 if it is then used in an incorrect calculation eg 0.15 + 0.35 = 0.5, 0.5 + 0.3 = 0.8 (no further working)		M0

AQA GSCE – Thursday 8 November 2018 – Paper 2 (Calculator) Higher Tier

35.

23	$-\frac{1}{3}\mathbf{a}$	B1	
	Additional Guidance		

AQA GSCE – Monday 24 May 2018 – Paper 1 (Non - Calculator) Higher Tier

36.

22	$A \cup B'$	B1	

AQA GSCE – Tuesday 12 June 2018 – Paper 3 (Calculator) Higher Tier

37.

11(a)	$\begin{pmatrix} 1 \\ -1 \end{pmatrix}$	B2	B1 for 1 correct value in correct position Condone a divisor line
	Additional Guidance		

	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen	M1	
	Valid reason	A1	eg $\begin{pmatrix}-2\\4\end{pmatrix} = 2 \times \begin{pmatrix}-1\\2\end{pmatrix}$ $\begin{pmatrix}-2\\4\end{pmatrix} = 2\mathbf{b}$ $\begin{pmatrix}-2\\4\end{pmatrix}$ is a multiple of $\begin{pmatrix}-1\\2\end{pmatrix}$ $\mathbf{a} + 2\mathbf{c}$ is a multiple of $\mathbf{b}$ $2\mathbf{b} = \mathbf{a} + 2\mathbf{c}$

	Additional Guidance	
	Condone vectors written as coordinates, eg (–1, 2) is half of (–2, 4)	
	Must see $\begin{pmatrix}-2\\4\end{pmatrix}$ or (–2, 4) to award the A mark	
11(b)	Condone missing brackets and / or divisor lines	
	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen and both gradient –2	M1A1
	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen and double so parallel	M1A1
	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen and half so parallel	M1A1
	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen and $\mathbf{a} + 2\mathbf{c}$ is $2\mathbf{b}$	M1A1
	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen and $\mathbf{b} = \frac{1}{2}\mathbf{a} + 2\mathbf{c}$	M1A0
	$\begin{pmatrix}-2\\4\end{pmatrix}$ seen and both have same ratio	M1A0
	$\frac{-2}{4}$ and $\frac{-1}{2}$ both equal –0.5	M1A0

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38.

26	**Alternative method 1** Shows that *CB* (or *BC*) is equal and parallel to *DE* (or *ED*)		
	$(\vec{CB} =) -(\mathbf{b} - 2\mathbf{a}) - 2\mathbf{b} - \mathbf{a}$ or $(\vec{BC} =) \mathbf{b} - 2\mathbf{a} + 2\mathbf{b} + \mathbf{a}$	M1	oe method
	$(\vec{CB} =) \mathbf{a} - 3\mathbf{b}$ or $(\vec{BC} =) 3\mathbf{b} - \mathbf{a}$	A1	Must see correct method for $\vec{CB}$ or $\vec{BC}$
	CB is equal and parallel to *DE*	A1	Must see a correct vector for first A1 and have a statement oe eg *CB* is equal and parallel to *ED*
	Alternative method 2 Shows that *BE* (or *EB*) is equal and parallel to *CD* (or *DC*)		
	$(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ or $(\vec{CD} =) -(\mathbf{b} - 2\mathbf{a}) - (\mathbf{a} - 3\mathbf{b})$ or $(\vec{EB} =) -\mathbf{a} - 2\mathbf{b}$ or $(\vec{DC} =) (\mathbf{a} - 3\mathbf{b}) + (\mathbf{b} - 2\mathbf{a})$	M1	oe method
	$(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{CD} =) \mathbf{a} + 2\mathbf{b}$ or $(\vec{EB} =) -\mathbf{a} - 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$	A1	Must see correct method for $\vec{CD}$ or $\vec{DC}$ oe eg $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$
	BE is equal and parallel to *CD*	A1	Must see two correct vectors for first A1 and have a statement oe eg *BE* is equal and parallel to *DC*

Mark scheme continues on the next page

26	**Alternative method 3** Shows that two pairs of opposite sides are parallel		
	$(\vec{CB} =) -(\mathbf{b} - 2\mathbf{a}) - 2\mathbf{b} - \mathbf{a}$ or $(\vec{BC} =) \mathbf{b} - 2\mathbf{a} + 2\mathbf{b} + \mathbf{a}$ or $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ or $(\vec{CD} =) -(\mathbf{b} - 2\mathbf{a}) - (\mathbf{a} - 3\mathbf{b})$ or $(\vec{EB} =) -\mathbf{a} - 2\mathbf{b}$ or $(\vec{DC} =) (\mathbf{a} - 3\mathbf{b}) + (\mathbf{b} - 2\mathbf{a})$	M1	oe method
	$(\vec{CB} =) \mathbf{a} - 3\mathbf{b}$ or $(\vec{BC} =) 3\mathbf{b} - \mathbf{a}$ or $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{CD} =) \mathbf{a} + 2\mathbf{b}$ or $(\vec{EB} =) -\mathbf{a} - 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$	A1	Must see correct method for $\vec{CB}$ or $\vec{BC}$ or $\vec{CD}$ or $\vec{DC}$ oe eg $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$
	$(\vec{CB} =) \mathbf{a} - 3\mathbf{b}$ and $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{CD} =) \mathbf{a} + 2\mathbf{b}$ and CB is parallel to DE and BE is parallel to CD	A1	Must see three correct vectors and have two statements oe eg $(\vec{BC} =) 3\mathbf{b} - \mathbf{a}$ and $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$ and BC is parallel to DE and BE is parallel to DC

Mark scheme continues on the next page

Additional Guidance is on the next page

26	**Alternative method 4** Shows that two pairs of opposite sides are equal		
	$(\vec{CB} =) -(\mathbf{b} - 2\mathbf{a}) - 2\mathbf{b} - \mathbf{a}$ or $(\vec{BC} =) \mathbf{b} - 2\mathbf{a} + 2\mathbf{b} + \mathbf{a}$ or $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ or $(\vec{CD} =) -(\mathbf{b} - 2\mathbf{a}) - (\mathbf{a} - 3\mathbf{b})$ or $(\vec{EB} =) -\mathbf{a} - 2\mathbf{b}$ or $(\vec{DC} =) (\mathbf{a} - 3\mathbf{b}) + (\mathbf{b} - 2\mathbf{a})$	M1	oe
	$(\vec{CB} =) \mathbf{a} - 3\mathbf{b}$ or $(\vec{BC} =) 3\mathbf{b} - \mathbf{a}$ or $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{CD} =) \mathbf{a} + 2\mathbf{b}$ or $(\vec{EB} =) -\mathbf{a} - 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$	A1	Must see correct method for $\vec{CB}$ or $\vec{BC}$ or $\vec{CD}$ or $\vec{DC}$ oe eg $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$
	$(\vec{CB} =) \mathbf{a} - 3\mathbf{b}$ and $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{CD} =) \mathbf{a} + 2\mathbf{b}$ and *CB* is equal to *DE* and *BE* is equal to *CD*	A1	Must see three correct vectors and have two statements oe eg $(\vec{BC} =) 3\mathbf{b} - \mathbf{a}$ and $(\vec{BE} =) \mathbf{a} + 2\mathbf{b}$ and $(\vec{DC} =) -\mathbf{a} - 2\mathbf{b}$ and *BC* is equal to *DE* and *BE* is equal to *DC*
	Additional Guidance		
	Choose the method that gives most marks		
	Ignore incorrect vectors if not contradictory		
	For parallel allow in the same direction or in the opposite direction		
	For equal to allow = or the same as		
	Condone incorrect notation if unambiguous eg *CB* = –(b – 2a) – 2b – a		M1

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39.

23	(***BC*** =) 5**a** – 2**b** – 3**a** – **b** or 2**a** – 3**b** or (***CD*** =) 3**a** + **b** + 3**a** – 9**b** or 6**a** – 8**b** or (***BD*** =) 5**a** – 2**b** + 3**a** – 9**b** or 8**a** – 11**b**	M1	oe eg (***CB*** =) 3**a** + **b** – 5**a** + 2**b** or –2**a** + 3**b** or (***DC*** =) –3**a** + 9**b** – 3**a** – **b** or –6**a** + 8**b** or (***DB*** =) –3**a** + 9**b** – 5**a** + 2**b** or –8**a** +11**b** Allow with brackets eg (***BC*** =) 5**a** – 2**b** – (3**a** + **b**)
	Correct expressions for any two of ***BC***, ***CD*** and ***BD***	M1dep	oe eg1 correct expressions for ***BC*** and ***DB*** eg2 correct expressions for ***CB*** and ***DC*** Allow with brackets eg (***BC*** =) 5**a** – 2**b** – (3**a** + **b**) and (***DB*** =) –(3**a** – 9**b**) – (5**a** – 2**b**)
	Correct simplified expressions for any two of ***BC***, ***CD*** and ***BD*** and valid explanation and No	A1	oe eg correct expressions for ***BC*** and ***DB*** and valid explanation and No eg ***BC*** = 2**a** – 3**b** and ***CD*** = 6**a** – 8**b** and 3(2**a** – 3**b**) = 6**a** – 9**b** and No or ***DC*** = –6**a** + 8**b** and ***BD*** = 8**a** – 11**b** and ***DC*** is not a multiple of ***BD*** and not straight

	Additional Guidance	
	Award marks for correct expressions, ignoring any incorrect ones unless contradictions of correct ones	
	BAD means ***BD***	
	BD = 5**a** – 2**b** + 3**a** – 9**b** or 8**a** – 11**b** and ***BAD*** = their ***BC*** + their ***CD*** and answer not 8**a** – 11**b** Do not take ***BAD*** to be a contradiction to ***BD***	
	Two correct simplified expressions used for a valid explanation and saying No with any incorrect non-contradictory expressions seen	M2A1
	Condone absence of vector notation eg Condone CD to mean the vector from C to D	
	$\vec{CD}$ means the vector from C to D and $\overleftarrow{CD}$ means the vector from D to C	
	Do not allow any misreads	
	Missing brackets may be recovered	
23 cont	Allow for up to M2 expressions like (***BC*** =) 5**a** – 2**b** + – 3**a** + – **b**	
	Valid explanations: eg1 ***BC*** = 2**a** – 3**b** and ***CD*** = 6**a** – 8**b** and 3(2**a** – 3**b**) = 6**a** – 9**b** is acceptable as there is a matching coefficient of **a** eg2 ***CD*** = 6**a** – 8**b** and ***BD*** = 8**a** – 11**b** and 2(6**a** – 8**b**) = 12**a** – 16**b** is <u>not</u> acceptable because there is no matching coefficient of **a** or **b** eg3 ***BC*** = 2**a** – 3**b** and ***CD*** = 6**a** – 8**b** and 6**a** – 8**b** = 3(2**a** – 2.6**b**) is acceptable because there is a matching coefficient of **a** and no error in factorisation (just a truncation) eg4 ***BC*** = 2**a** – 3**b** and ***CD*** = 6**a** – 8**b** and 3(2**a** – 3**b**) = 6**a** – 10**b** is <u>not</u> acceptable because there is an error in expansion	
	Allow not parallel or not same gradient for No	
	Allow ***DC*** is not a factor of ***BD*** as a valid explanation	
	Do not allow ***DC*** is not a scalar of ***BD*** as a valid explanation	
	Look for decision in working lines if answer line is blank	
	Note that ***BD*** = ***BC*** + ***CD*** is a fact but is not a valid explanation	

AQA GSCE – Tuesday 13 June 2017 – Paper 3 (Calculator) Higher Tier

40.

1	$\begin{pmatrix}-5\\-3\end{pmatrix}$	B1	
	Additional Guidance		

AQA GSCE – Sample Paper 3 (Calculator) Higher Tier

41.

2	$\begin{pmatrix}7\\-5\end{pmatrix}$	B1	

AQA GSCE – Sample Paper 3 (Calculator) Higher Tier

42.

25(a)	$\overrightarrow{BC} = 2\mathbf{a} - 3\mathbf{b}$ or $\overrightarrow{CB} = -2\mathbf{a} + 3\mathbf{b}$ or $\overrightarrow{AM} = \mathbf{a}$ or $\overrightarrow{MA} = -\mathbf{a}$ or $\overrightarrow{BN} = \frac{2}{5}\overrightarrow{BC}$ or $\overrightarrow{CN} = -\frac{3}{5}\overrightarrow{BC}$	M1	oe
	$\mathbf{a} + \frac{3}{5}(-2\mathbf{a} + 3\mathbf{b})$ or $-\mathbf{a} + 3\mathbf{b} + \frac{2}{5}(2\mathbf{a} - 3\mathbf{b})$	M1	oe
	$-\frac{1}{5}\mathbf{a} + \frac{9}{5}\mathbf{b}$	A1	oe eg $-0.2\mathbf{a} + 1.8\mathbf{b}$ or $\frac{1}{5}(9\mathbf{b} - \mathbf{a})$ Must collect terms
25(b)	$\overrightarrow{MN}$ is not a multiple of $\overrightarrow{AB}$	B1ft	oe