Topical Worksheets for Cambridge IGCSE™

Mathematics (0580)

Vectors

Mark Scheme

1st edition, for examination until 2025

Question	Answer	Marks	AO Element	Notes	Guidance
1(a)	$\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ cao	**1**			
1(b)	4.47 or 4.472…	**2**		**M1** for $(their\ 2)^2 + (their\ 4^2)$	
1(c)	(7, 10)	**2**		**B1** for each	
1(d)	$y = 2x - 4$ oe	**3**		**M1** for gradient = $\frac{6-2}{5-3}$ oe or answer $y = mx - 4$ **M1** for substituting (3, 2) or (5, 6) into $y = their\ mx + c$ or into $y - k = their\ m(x - h)$ or into $their\ y = mx - 4$	
1(e)	(0, –4)	**1**		**FT** *their* **(d)**	
2(a)	(–2, 5)	**1**			
2(b)	$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$	**1**			
2(c)	(5, 4) plotted	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
2(d)	**B1** for parallelogram *PQRS* correctly drawn **B1** for (1, 7)	**2**		**FT** *their R* **FT** *their S* dep on first **B1**	
3(a)	(5, 3)	**1**			
3(b)	Point plotted at (4, −3)	**1**			
3(c)	$\begin{pmatrix} -8 \\ 2 \end{pmatrix}$	**1**			
4(a)	$\begin{pmatrix} -5 \\ 3 \end{pmatrix}$	**1**			
4(b)	$\begin{pmatrix} -15 \\ 9 \end{pmatrix}$	**1**		**FT** *their* **(a)**	
5(a)	$\begin{pmatrix} 3 \\ -7 \end{pmatrix}$	**1**			
5(b)	$\begin{pmatrix} 18 \\ 0 \end{pmatrix}$	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
6	$\begin{pmatrix}13\\18\end{pmatrix}$	**2**		**B1** for $\begin{pmatrix}10\\0\end{pmatrix}$ or $\begin{pmatrix}3\\18\end{pmatrix}$ or $\begin{pmatrix}13\\m\end{pmatrix}$ or $\begin{pmatrix}n\\18\end{pmatrix}$	
7(a)	$\begin{pmatrix}-15\\12\end{pmatrix}$	**1**			
7(b)	$\begin{pmatrix}5\\2\end{pmatrix}$	**1**			
8(a)	$\begin{pmatrix}-1\\4\end{pmatrix}$	**1**			
8(b)	$\begin{pmatrix}-21\\28\end{pmatrix}$	**1**			
9(a)	$\begin{pmatrix}-19\\-2\end{pmatrix}$	**2**		**B1** for answer $\begin{pmatrix}-19\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-2\end{pmatrix}$ or for $\begin{pmatrix}-9\\6\end{pmatrix}$ or $\pm\begin{pmatrix}10\\8\end{pmatrix}$ seen	

Question	Answer	Marks	AO Element	Notes	Guidance
9(b)	3.61 or 3.605 to 3.606	**2**		**M1** for $\sqrt{([-]3)^2 + 2^2}$ oe	
9(c)	**B1** for $-3m + 5n = 14$ and $2m + 4n = 9$ **B4** for $[m =] -\frac{1}{2}$ or -0.5 and $[n =] 2\frac{1}{2}$ or 2.5 or $\frac{5}{2}$ with evidence of a correct algebraic method	**5**		Accept equivalents **M1** for correctly equating one set of coefficients of *their* equations or rearranges one of *their* equations to make *m* or *n* the subject e.g. $[m =] \frac{1}{2}(9 - 4n)$ oe **M1** for correct method to eliminate one variable for *their* equations or correctly substitutes *their m* or *their n* into the other equation e.g. $-\frac{3(9 - 4n)}{2} + 5n = 14$ oe **B1** for one correct answer	

Question	Answer	Marks	AO Element	Notes	Guidance
10(a)	$\mathbf{c} + \frac{2}{3}\mathbf{a}$	**2**		**M1** for correct unsimplified form or correct route e.g. $\overrightarrow{OC} + \overrightarrow{CP}$	
10(b)(i)	$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{c}$	**2**		**M1** for correct unsimplified form or correct route e.g. $\overrightarrow{OC} + \overrightarrow{CX}$	
10(b)(ii)	3 : 2 oe	**2**		**B1** for $\overrightarrow{OX} = \frac{3}{5}\overrightarrow{OP}$ oe or $\overrightarrow{XP} = \frac{2}{5}\mathbf{c} + \frac{4}{15}\mathbf{a}$	
11(a)(i)	$-\mathbf{a} + 2\mathbf{c}$	**1**			
11(a)(ii)	$\frac{3}{8}(-\mathbf{a} + 2\mathbf{c})$ or $-\frac{3}{8}\mathbf{a} + \frac{3}{4}\mathbf{c}$ oe	**1**		**FT** $\frac{3}{8}$ (*their*(**a**)(**i**)) in simplest form	
11(a)(iii)	$\frac{1}{2}(5\mathbf{a} - 2\mathbf{c})$ or $\frac{5}{2}\mathbf{a} - \mathbf{c}$ oe	**1**			
11(a)(iv)	$\frac{1}{8}(5\mathbf{a} - 2\mathbf{c})$ or $\frac{5}{8}\mathbf{a} - \frac{1}{4}\mathbf{c}$ oe	**2**		**M1** for a correct unsimplified route	
11(b)	4	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
12(a)	12.6 or 12.64 to 12.65	**3**		**M2** for $12^2 + (-4)^2$ OR **B1** for $\begin{pmatrix} 12 \\ -4 \end{pmatrix}$ **M1** for $(their\ 12)^2 + (their - 4)^2$	
12(b)	$\begin{pmatrix} -11 \\ 13 \end{pmatrix}$	**2**		**B1** for $\begin{pmatrix} -11 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 13 \end{pmatrix}$ or for $\left[\overrightarrow{BA} =\right] \begin{pmatrix} -8 \\ 7 \end{pmatrix}$	
13(a)	$-\frac{1}{3}\mathbf{q} + \frac{1}{2}\mathbf{p}$ oe	**2**		**M1** for correct unsimplified answer or correct route	
13(b)	$\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{q}$ oe	**2**		**M1** for correct unsimplified answer or correct route	
14(a)	$\frac{1}{3}\mathbf{p} - \frac{1}{2}\mathbf{q}$ oe simplified	**2**		**M1** for a correct unsimplified answer or a correct route	

Question	Answer	Marks	AO Element	Notes	Guidance
14(b)	$\frac{5}{6}\mathbf{p} + \frac{3}{4}\mathbf{q}$ oe simplified	**2**		**M1** for a correct unsimplified answer or a correct route	
15(a)	$-\mathbf{s} + \mathbf{t}$	**1**			
15(b)	$-\frac{4}{5}\mathbf{s} - \frac{1}{5}\mathbf{t}$ oe simplified	**3**		**M2** for correct unsimplified e.g. $-\mathbf{t} + \frac{4}{5}(-\mathbf{s} + \mathbf{t})$ or $-\mathbf{s} - \frac{1}{5}(-\mathbf{s} + \mathbf{t})$ or **M1** for a correct route e.g. $\overrightarrow{CB} + \overrightarrow{BN}$ or $\left[\overrightarrow{BN} =\right] \frac{4}{5}(-\mathbf{s} + \mathbf{t})$ or $\left[\overrightarrow{DN} =\right] -\frac{1}{5}(-\mathbf{s} + \mathbf{t})$	
16(a)	$\frac{5}{3}\mathbf{p} - 2\mathbf{q}$ oe simplified	**2**		**M1** for correct unsimplified answer or $c\mathbf{p} - 2\mathbf{q}$ or $\frac{5}{3}\mathbf{p} + c\mathbf{q}$ $c \neq 0$ or for a correct route	

Question	Answer	Marks	AO Element	Notes	Guidance
16(b)	$\frac{5}{6}$	**2**		**B2FT** for $\frac{\textit{their } c}{2}$ if *their* **(a)** is $c\mathbf{p} - 2\mathbf{q}$ oe **M1** for $\overrightarrow{MX} = \frac{5}{6}\mathbf{p} - \mathbf{q}$ or $\overrightarrow{MX} = \frac{1}{2}$ *their* **(a)** or $\overrightarrow{BX} = \frac{1}{2}\overrightarrow{AN}$ or $\mathbf{q} + \frac{1}{2}$ *their* **(a)** or $\mathbf{q} + \overrightarrow{MX} - k\mathbf{p} = 0$ oe	
17(a)	$6\mathbf{a} - 2\mathbf{b}$ or $2(3\mathbf{a} - \mathbf{b})$	**2**		**M1** for $4\mathbf{a} + \mathbf{b} - (-2\mathbf{a} + 3\mathbf{b})$ or better	
17(b)	$5\mathbf{a} - \mathbf{b}$	**2**		**M1** for a correct route e.g. $\overrightarrow{OD} + \overrightarrow{DE}$, $4\mathbf{a} + \mathbf{b} + \mathbf{a} - 2\mathbf{b}$, $\overrightarrow{OE}$	
18(a)	$\frac{1}{3} = \left(-\mathbf{a} + \mathbf{b}\right)$ oe	**2**		**M1** for any correct route eg $AO + OB + \frac{2}{3}BA$ or **B1** for $\underset{AB}{\rightarrow} = -\mathbf{a} + \mathbf{b}$ oe	

Question	Answer	Marks	AO Element	Notes	Guidance
18(b)	$\frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$ oe simplified	**2**		**FT** *their* **(a) + a** simplified only if in terms of **a** and **b.** **M1** for for identifying $\overrightarrow{OC}$ as position vector or correct route in any form or for correct unsimplified answer	
19	$\mathbf{p} + \frac{3}{4}\mathbf{q}$	**2**		**M1** for a correct route or for $\overrightarrow{AE} = \frac{3}{4}\mathbf{q}$	
20	26	**2**		**M1** for $10^2 + (-24)^2$ or better	
21	$\mathbf{x} + 7\mathbf{y}$	**2**		**M1** for a correct route	
					[Total: 83]