Vectors Paper 2-1

| 20 | (a) (i) $-\frac{2}{3}\mathbf{p} + \mathbf{q}$
 (ii) $-\frac{3}{4}\mathbf{q} + \mathbf{p}$

 (b) $\frac{1}{3}\mathbf{p} - \frac{1}{2}\mathbf{q}$ | 2*
 2*

 2* | **M1** use of $\mathbf{AQ} = \pm\frac{2}{3}\mathbf{p} \pm \mathbf{q}$ or $\mathbf{AO} + \mathbf{OQ}$
 M1 use of $\mathbf{BQ} = \pm\frac{3}{4}\mathbf{q} \pm \mathbf{p}$ or $\mathbf{BO} + \mathbf{OP}$

 M1 $-\frac{1}{4}\mathbf{q} + \frac{1}{3}\mathbf{BP}$ |

| 6 | a) | B1 | C at $(-1,3)$ or a representative of $\begin{bmatrix} -1 \\ 3 \end{bmatrix}$ drawn unambiguously anywhere | |
| | b) $-\mathbf{a} + \mathbf{b}$ oe | B1 | condone missing vector symbols | 2 |

Vector Paper 2-2

| 21 | (a) vector lines drawn

 (b) (5, 1)

 (c) 5.83 | 1, 1

 1, 1

 2* | **AB** ends at (4,6)
 BC horizontal 4 units long
 SC2 for (1, 5) if B is at (6, 4) and C is at (6, 8)
 M1 $\sqrt{(3^2 + 5^2)}$ |

| 8 | $\frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{c}$ | 2* | **M1** any answer or working simplifying to $\frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{c}$ |

Vector paper 2 - 3

| 23 | (a) | $\mathbf{a} + \mathbf{b}$, $\mathbf{a} - \mathbf{b}$, $3\mathbf{a} + \mathbf{b}$
 $1\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$ | 1,1,2*
 1 f.t. | **M1** in (iii) for (i) + $\mathbf{a}$ + (ii) + $\mathbf{b}$
 $\frac{1}{2}$ TP |
| | (b) | 4 | 1 | |

Vector paper 2 - 4

19	(a)	4p	1	
	(b)	-4p + 2q	1	
	(c)	-2p + q	1√	(b) ÷ 2
	(d)	multiple	1 dep	must refer to both vectors and halve / double or multiple

16	(a)	$a + c$	1	
	(b)	$a - c$ or $-c + a$	1	
	(c)	$-\dfrac{1}{2}a - \dfrac{1}{2}c$ or $-\dfrac{1}{2}(a + c)$	2*	**M1 A0** for answers simplifying to these seen

Vectors Paper 4 - 1

5 (a)(i)	$c - d$ final answer o.e.	B1	
(ii)	OD + DE <u>or</u> OC + their CD + DE o.e. $d - 0.5c$ final answer o.e.	M1 A1	Must be seen if answer incorrect
(iii)	OA + AB <u>or</u> OC + CB <u>or</u> OC + EO o.e. $1.5c - d$ final answer o.e.	M1 A1	Must be seen if answer incorrect
(b)(i)	120	B1	If 90 then only method marks in **(iv)** available If 60 only method marks in **(ii)** and **(iv)** available
(ii)	0.5 × 8 × 8 sin120 o.e. art 27.7 (cm²) www	M1 A1	e.g. perp. onto AC, then 8sin60 × 8cos60 (16√3)
(iii)	$8^2 + 8^2 - 2 \times 8 \times 8 \cos120$ Square root of correct combination (√192 or 13.8$\left(\dfrac{5}{6}\right)$) art 13.9 (cm)(13.856406)	M1 M1 A1	** Dep on first M1. Errors must be due to slips, not incorrect combination (8√3) ** Alternative methods e.g. perp onto AC, then 8sin60 M1 ×2 M1 Sine Rule Implicit M1 Explicit M1
(iv)	ABC (×2) + OACD o.e. their **(ii)** × 2 + their **(iii)** × 8 166 to 167 (cm²) c.a.o.	M1 M1 A1	Alt meth. 6 × ABX (X is centre) <u>or</u> 6 × ABC <u>etc.</u> 6 × [0.5 × 8 × 8 sin60] <u>or</u> their **(ii)** × 6 <u>etc.</u> (96√3)
		14	

6					
(a)(i)		$-p+q$		B1	Accept any form for correct simplified answers
(ii)		$-\frac{2}{3}p+\frac{2}{3}q$		B1ft	f.t. 2/3 of their (a)(i)
(iii)		$-q+-\frac{2}{3}p+\frac{2}{3}q$	oe	M1	$-q +$ their (ii) or $-p+-\frac{1}{2}$ their (ii)
		$-\frac{2}{3}p-\frac{1}{3}q$		A1	
(iv)		$p+-\frac{2}{3}p+\frac{2}{3}q$	oe	M1	$p +$ their (ii) or $q+-\frac{1}{2}$ their (ii),
					or $p + q +$ their (iii)
		$\frac{1}{3}p+\frac{2}{3}q$		A1	Accept in column vector
				B1	
(b)(i)		(4, -2)			
(ii)		$\begin{pmatrix} -3 \\ 4 \end{pmatrix}$		B1	
(c)(i)		Rotation only,		B1	
		90° clockwise oe,		B1	e.g. -90 ° or 270 °
		centre (0 ,0)		B1	
(ii)		(3, -5)		B1	
(d)		$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$		B2	B1 each correct column
					14

Vectors paper 4 -2

7	(a)				
		(i) $\overrightarrow{OS} = 3a$	www	B1	
		(ii) $\overrightarrow{AB} = b - a$	www	B1	
		(iii) $\overrightarrow{CD} = a$	www	B1	
		(iv) $\overrightarrow{OR} = 2a + 2b$	www	B2	If B0, allow **SC1** for correct but unsimplified seen
		(v) $\overrightarrow{CF} = 2a - 2b$ www		B2 (7)	If B0, allow **SC1** for correct but unsimplified seen
	(b)	(i) $|b| = 5$		B1	
		(ii) $|a - b| = 5$	www	B1 (2)	

(c)	(i)	**Enlargement**, S.F. **3**, Centre *0*	**B2**	Allow **SC1** for Enlargement **or** (S.F. 3 <u>and</u> Centre *0*)
	(ii)	**Reflection** In line **CF** o.e.	**M1** **A1 (4)**	} **SC1** for 'Mirrored in CF' o.e.
(d)	(i)	**6** c.a.o.	**B1**	
	(ii)	**60°**	**B1 (2)**	
		TOTAL	15	