Question			Answer	Marks	Part Marks and Guidance	
1	**(a)**	**(i)**	**a + b** or **b + a**	1		Capitals, eg A and B, do not score
		(ii)	**b – a** or ⁻**a + b**	1		
		(iii)	$\frac{1}{2}$**a** $+ \frac{1}{2}$**b** oe	2	**M1** for $\overrightarrow{OA} + \frac{1}{2}\overrightarrow{AB}$	eg **2** for **a** $+ \frac{1}{2}$(**b – a**)
	(b)		O, M, C collinear/all on a line M is midpoint of OC oe	1 1		It is an equal distance from O to M as from M to C OC is double OM OM is half of OC

2	(a		$\begin{pmatrix} 2 \\ 4 \end{pmatrix}$	1		Condone fraction line
	(b)		$\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a}$ oe	2	Allow algebraic equivalents eg $\frac{1}{2}(\mathbf{c} - \mathbf{a})$ **M1** for $\overrightarrow{MN} = \overrightarrow{MB} + \overrightarrow{BN}$ or $= \overrightarrow{MA} + \overrightarrow{OA} + \overrightarrow{OC} + \overrightarrow{CN}$ or $= \frac{1}{2}\overrightarrow{OC} - \frac{1}{2}\overrightarrow{OA}$ or $= \frac{1}{2}\overrightarrow{AB} + \frac{1}{2}\overrightarrow{BC}$ or $\overrightarrow{BN}$ or $\overrightarrow{NC} = -\frac{1}{2}\mathbf{a}$ or $\overrightarrow{MB}$ or $\overrightarrow{AM} = \frac{1}{2}\mathbf{c}$ Or **SC1** for $\frac{1}{2}$ $\mathbf{c}$ + $\frac{1}{2}$ -$\mathbf{a}$	To earn any marks the intention should clearly be *vectors* not just line lengths **0** for A etc

3		PQS or PSQ $=\dfrac{180-30}{2}(=75)$	**M1**	Allow Q, no label etc if unambiguous	'Isos triangle' alone gets 0.
		Tangents and either 'point' or 'equal' QRS = 75°	**1** **A1FT**	*their* PQS or PSQ	75° on answer line scores 2 if unambiguous
		Alt(ernate) seg(ment)	**1**	Or **M1** QOS =150° **1** (Angle between) tangent and radius = 90° **A1FT** QRS = 75° **1** Angle at the centre/circumference	Condone 'opposite' segment

Question			Answer	Marks	Part Marks and Guidance	
4	(a)		$\begin{pmatrix} 6 \\ -6 \end{pmatrix}$	1		If 'fraction lines' seen penalise 1 mark first time only
	(b)	(i)	$\begin{pmatrix} 2 \\ 10 \end{pmatrix}$	2	Or **M1** for $\begin{pmatrix} 3 \\ 7 \end{pmatrix}+\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	
		(ii)	$\begin{pmatrix} 4 \\ -12 \end{pmatrix}$	2	Or **M1** for $-4\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	

5	(a)		Correct point marked A	1		Allow BOD if neither labelled
	(b)		Correct point marked B	1		
	(c)		$\frac{13}{3}\mathbf{a} - 6\mathbf{b}$ oe	3	**B1** for unsimplified version of $\frac{13}{3}\mathbf{a}$ **B1** for unsimplified version of $^-6\mathbf{b}$	Condone $\mathbf{a}\frac{13}{3}$ etc. Condone 4.33(333..)

Question			Answer	Marks	Part Marks and Guidance	
6			Correct proof with working and reasons • AD stated correctly • Attempt at stating ±PQ or ±QR • Method for ±PS or ±SR seen • PQ = (or parallel to) SR or QR = (or parallel to) PS stated • Convincing correct conclusion	5		$\overrightarrow{AS} = \frac{1}{2}\overrightarrow{AD}$ $= \frac{1}{2}(2\mathbf{e} + 2\mathbf{f} + 2\mathbf{g})$ $= \mathbf{e} + \mathbf{f} + \mathbf{g}$ $\overrightarrow{PS} = \overrightarrow{PA} + \overrightarrow{AS}$ $= {}^-\mathbf{e} + \mathbf{e} + \mathbf{f} + \mathbf{g}$ $= \mathbf{f} + \mathbf{g}$ $\overrightarrow{QR} = \overrightarrow{QC} + \overrightarrow{CR}$ $= \mathbf{f} + \mathbf{g}$ Opposite sides equal length and parallel therefore PQRS is a parallelogram
			As above but conclusion not convincing or error in method seen	4–3	For the lower mark - method will be missing or incorrect and conclusion not convincing ie 3 of the bullet points	
			$\overrightarrow{AD}$ found with working or $\overrightarrow{AD}$ *and* one side of PQRS stated without working or 2 sides of PQRS stated without working ie 2 of the bullet points	2–1	For the lower mark - one side found ie 1 of the bullet points	
			No correct work seen	0		

7	Using frequencies: Up to 30: 7, 14, 35, 40; [total 96] Over 30: 24, 18, 12; [total 54] [Total 150]	**B2**	Award for seen Need 6 or 7 frequencies correct for **B2** **OR** Accept **two of** 54, 96 or 150 shown **or B1** for at least 3 frequencies correct or for **one of** 54, 96 or 150 shown	Figures could be seen written on diagram and may break down the frequencies into smaller blocks e.g. 12 = 4 + 4 + 4 **Accept multiples of these values for B2 or B1** e.g. 14, 28, 70, 80 etc

	Calculation
	e.g. (1) 1/3 of *their* 150 = 50
	or (2) 96/54 = 1.77 to 1.78
	and correct conclusion:
	    (1)[< 54] so no
	or (2) so no [since < 2]
	                isw further comments
		M1FT
		
		A1
			FT *their* values for **M1** must evaluate their
			fraction correctly in some way e.g. to a
			decimal **or** find 1/3 of their total; award
			when a relevant calculation done even if
			incorrect/no conclusion
			All must be correct to award A1
				Accept other valid comparisons
				e.g. 54/150 = 0.36 **M1** which is greater
				than 1/3 **A1**
				54/96 = 0.56[25] **M1** which is greater than
				0.5 **A1**
				A0 if any error seen

	OR Using rectangles: Up to 30: 1.4 , 2.8 , 7 , 8 [= 19.2] Over 30: 4.8, 3.6, 2.4[= 10.8] [Total 30]	**B2**	Award for seen Need 6 or 7 rectangles correct for **B2** **OR** Accept **two of** 19.2, 10.8 or 30 shown **or B1** for at least 3 values correct [allow different sized unit rectangles used from this solution]	Other variations using scaling e.g. Up to 30: 2.8, 5.6, 14, 16 [= 38.4] e.g. Over 30: 9.6, 7.2, 4.8 [= 21.6] [Total 60] both sets of values could also be scaled further e.g. 10 times the values here or in the scheme

	Calculation
	e.g. (1) 1/3 of *their* 60 = 20
	or (2) 38.4/21.6 = 1.77 to 1.78
	and correct conclusion:
	    (1) 21.6] so no
	or (2) [< 2] so no
	                isw further comments
		M1FT
		
		A1
			FT *their* values for **M1** must evaluate the
			fraction correctly in some way e.g. to a
			decimal **or** find 1/3 of their total; award
			when a relevant calculation done even if
			incorrect/no conclusion
			All must be correct to award A1
				
				A0 if any error seen