Question	Answer	Marks	Guidance
10	**Alternative 4**		
	$40+20\theta=65$	**(*M1)**	
	$\theta=1.25$	**(A1)**	
	$\sin\left(\frac{their\ \theta}{2}\right)=\frac{\frac{1}{2}AB}{20}$ $AB=23.4$ or $\frac{1}{2}AB=11.7$	**(2)**	**Dep M1** for an attempt to find AB or $\frac{1}{2}AB$
	$\tan\left(\frac{their\ \theta}{2}\right)=\frac{\text{height of triangle } ACB}{their\ \frac{1}{2}AB}$ Height of triangle = 8.44	**(M1)**	**DepM1** for a correct attempt to find the height of the triangle
	Height of triangle ABO $=\sqrt{20^2-\left(\frac{1}{2}AB\right)^2}$ $=16.22$	**(M1)**	for a correct attempt to find to find the height of the triangle
	Area of the sector = 250	**(B1)**	
	Area of kite $=\frac{1}{2}\times 23.4\times(16.22+8.44)$ $=288.5$	**(M1)**	
	Area = 288.5 – 250 =38.5	**(A1)**	
11(a)	$\overrightarrow{XY}=-\overrightarrow{OX}+\mathbf{a}+\frac{1}{3}\overrightarrow{AB}$ oe soi or $\overrightarrow{XY}=\overrightarrow{XB}-\frac{2}{3}\overrightarrow{AB}$ oe soi	**M1**	
	$\overrightarrow{XY}=-\frac{4}{5}\mathbf{b}+\mathbf{a}+\frac{1}{3}(\mathbf{b}-\mathbf{a})$ oe soi or $\overrightarrow{XY}=\frac{1}{5}\mathbf{b}+\frac{2}{3}\mathbf{(a-b)}$ oe soi	**M1**	For $\pm\frac{1}{3}(\mathbf{b}-\mathbf{a})$ or $\pm\frac{4}{5}\mathbf{b}$ For $\pm\frac{1}{5}\mathbf{b}$ or $\pm\frac{2}{3}\mathbf{(a-b)}$
	$\overrightarrow{XY}=\frac{2}{3}\mathbf{a}-\frac{7}{15}\mathbf{b}$ cao	**A1**	**AG**
11(b)	$\overrightarrow{YZ}=\lambda\left(\frac{2}{3}\mathbf{a}-\frac{7}{15}\mathbf{b}\right)$ cao	**B1**	

Question	Answer	Marks	Guidance
11(c)	$\overrightarrow{YZ} = \mu\mathbf{a} - \frac{1}{3}\overrightarrow{AB}$ oe soi	**M1**	
	$\overrightarrow{YZ} = \mu\mathbf{a} - \frac{1}{3}(\mathbf{b} - \mathbf{a})$ oe	**A1**	Allow unsimplified ISW from correct answer
11(d)	$\mu\mathbf{a} - \frac{1}{3}(\mathbf{b} - \mathbf{a}) = \lambda\left(\frac{2}{3}\mathbf{a} - \frac{7}{15}\mathbf{b}\right)$ soi	**M1**	For equating *their* (b) and *their* (c) **and** attempt to equate coefficients of **a** or **b** at least once.
	$\lambda = \frac{5}{7}$	**A1**	**nfww**
	$\mu = \frac{1}{7}$	**A1**	**nfww**
12	$\sin\left(\frac{2x}{3} - \frac{\pi}{3}\right) = \pm\frac{\sqrt{3}}{2}$ or $\tan\left(\frac{2x}{3} - \frac{\pi}{3}\right) = \pm\sqrt{3}$	**B1**	Allow if $\pm$ is missing
	$x = \pi, \frac{3\pi}{2}, \frac{5\pi}{2}, 3\pi$	**4**	**M1dep** on **B1** for obtaining $\frac{2x}{3} - \frac{\pi}{3} = \frac{\pi}{3}$ or any valid value **A1** for one correct solution **A1** for a 2nd correct solution **A1** for a 3rd and 4th correct solutions and no extras in the range