Question	Answer	Marks	Guidance
3	$\frac{3}{8}p^{-2}q^{\frac{3}{2}}r^{-\frac{16}{5}}$	**4**	**B1** for $k=\frac{3}{8}$ or 0.375 **B1** for $a=-2$ **B1** for $b=\frac{3}{2}$ oe **B1** for $c=-\frac{16}{5}$, –3.2. $-3\frac{1}{5}$
4	$\tan\left(2x+\frac{\pi}{4}\right)=\frac{1}{\sqrt{3}}$ or $\sin^2\left(2x+\frac{\pi}{4}\right)=\frac{1}{4}$ or $\cos^2\left(2x+\frac{\pi}{4}\right)=\frac{3}{4}$	**B1**	Must be from correct working Allow if $\theta=2x+\frac{\pi}{4}$ oe
	$2x+\frac{\pi}{4}=\frac{\pi}{6},\ \frac{7\pi}{6},\frac{13\pi}{6}$ $x=-\frac{\pi}{24}$	**M1**	**Dep** on previous **B1** For attempt at the correct order of operations, may be implied by a correct solution or $x=-\frac{\pi}{24}$.
	$x=\frac{11\pi}{24}$ or $\frac{23\pi}{24}$ oe 0.458π or 0.958π 1.44 or 3.01	**2**	**Dep M1** for an attempt to find a solution within the given range. Must be working with $\frac{7\pi}{6}$ or $\frac{13\pi}{6}$ **A1** for either
	$x=\frac{11\pi}{24}$ or $\frac{23\pi}{24}$ oe 0.458π or 0.958π 1.44 or 3.01	**A1**	For a second solution within the given range with no extra solutions within the range.
5(a)	25	**B1**	soi
	$\begin{pmatrix}56\\-192\end{pmatrix}$ or $8\begin{pmatrix}7\\-24\end{pmatrix}$	**B1**	
5(b)	$\overrightarrow{AC}=\frac{1}{3}(\mathbf{b}-\mathbf{a})$ or $\overrightarrow{CB}=\frac{2}{3}(\mathbf{b}-\mathbf{a})$ oe	**B1**	
	$\overrightarrow{OC}=\mathbf{a}+\frac{1}{3}(\mathbf{b}-\mathbf{a})$ or $\mathbf{b}-\frac{2}{3}(\mathbf{b}-\mathbf{a})$ oe	**M1**	For using $\overrightarrow{OA}+their\,\overrightarrow{AC}$ or $\overrightarrow{OB}+their\,\overrightarrow{BC}$ oe
	$\frac{2}{3}\mathbf{a}+\frac{1}{3}\mathbf{b}$	**A1**	

Question	Answer	Marks	Guidance
5(c)	$2p+2q=-5p+5$ or $p+4q=5p+5q$	**M1**	For equating like vectors to obtain at least one equation
	$p=-5,\ q=20$	**2**	**Dep M** mark for attempt to solve *their* equations to obtain both *p* and *q* **A1** for both
6	1144	**3**	**B1** With the brothers: 220 or ${}^{12}C_3$ **B1** Without the brothers: 924 or ${}^{12}C_6$
7(a)	2.8 oe	**B1**	
7(b)	$(BC=AC=)\ 10\tan 1.4$ or $\frac{10\sin 1.4}{\sin 0.1708}$	**M1**	
	Perimeter = $10(\textit{their}\ 2.8)+2(\textit{their}\ AC \text{ or } BC)$	**M1**	
	144	**A1**	
7(c)	Area of triangle *AOC* or *BOC* = $\frac{1}{2}\textit{their}(AC \text{ or } BC)\times 10$ or $\frac{1}{2}\textit{their}\ OC\times 10\sin 1.4$ soi	**M1**	Allow premature approximation for *OC*
	Area of minor sector *AOB* = 140	**B1**	**FT** on 50 × *their* 2.8
	Shaded area = 439 to 440	**A1**	Must have 579 ⩽ kite area ⩽ 580
8(a)	–1.5	**B1**	
8(b)	$f\in\mathbb{R}$	**B1**	Allow $y\in\mathbb{R}$, $\mathbb{R}$, $-\infty<f(x)<\infty$ oe, $f(x)\in\mathbb{R}$