Question	Answer	Marks	Partial Marks
6(c)(i)	$\frac{n!}{(n-3)!3!}+\frac{n!}{(n-2)!2!}$	**B2**	**B1** for either expression correct
	$\frac{n(n-1)(n-2)}{6}+\frac{n(n-1)}{2}$	**M2**	**M1** for either expression correct
	$\frac{n(n-1)(n-2+3)}{6}$ or $\frac{n^3-3n^2+2n}{6}+\frac{3n^2-3n}{6}$ leading to $\frac{1}{6}(n^3-n)$	**A1**	
6(c)(ii)	$n(n^2-25)=0$ oe	**M1**	
	$n = 5$ as the only solution	**A1**	
7	$\frac{\mathrm{d}}{\mathrm{d}x}(\sin 3x)=3\cos 3x$ soi	**B1**	
	$u=(1+\sin 3x)^4$ $\frac{\mathrm{d}u}{\mathrm{d}x}=4(1+\sin 3x)^3(3\cos 3x)$ soi	**M1**	**FT** *their* $3\cos 3x$
	$\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{\sqrt{x}\left(4(1+\sin 3x)^3(3\cos 3x)\right)-(1+\sin 3x)^4\times\frac{1}{2}x^{-\frac{1}{2}}}{\left(\sqrt{x}\right)^2}$	**M1**	FT *their* $\frac{\mathrm{d}u}{\mathrm{d}x}$ *or their* $\frac{\mathrm{d}v}{\mathrm{d}x}$ but not both
	Correct derivative	**A1**	
	Evaluates *their* derivative at $x = 1.9$ and multiplies by h	**M1**	
	$0.651h$	**A1**	
8(a)	$x=6\sqrt{3}\sin 60 \quad y=-6\sqrt{3}\cos 60$ oe and completion to $9\mathbf{i}-3\sqrt{3}\mathbf{j}$	**B2**	**B1** for either x or y correct Allow **SC1** for verification that $9\mathbf{i}-3\sqrt{3}\mathbf{j}$ has a bearing of 120° and that $9\mathbf{i}-3\sqrt{3}\mathbf{j}$ has a magnitude of $6\sqrt{3}$
8(b)	$(5\mathbf{i}+16\mathbf{j})+3\left(9\mathbf{i}-3\sqrt{3}\mathbf{j}\right)$ oe, isw	**B1**	
8(c)	$29\mathbf{i}+16\mathbf{j}+t(-12\sqrt{3}\mathbf{j})$ oe, isw	**B1**	

Question	Answer	Marks	Partial Marks
8(d)	Forms $\overrightarrow{AB}$ or $\overrightarrow{BA}$ when $t = 1$ e.g. $\overrightarrow{BA} = (32\mathbf{i} + (16 - 9\sqrt{3})\mathbf{j}) - (29\mathbf{i} + (16 - 12\sqrt{3})\mathbf{j})$ oe	**B1**	**FT** *their* (b) and (c) with $t = 1$
	$\sqrt{3^2 + (3\sqrt{3})^2}$	**M1**	**FT** *their* $\overrightarrow{AB}$ or $\overrightarrow{BA}$
	6 (km)	**A1**	cao
9(a)	$h = \sqrt{x^2 - \left(\frac{x}{2}\right)^2}$ oe or $\cos 30 = \frac{h}{x}$ oe or $\frac{1}{2}xh = \frac{1}{2}x^2 \sin 60$	**M1**	Correct expression connecting x and h
	$x = \frac{2h}{\sqrt{3}}$ oe	**A1**	Must be $x =$
	$V = \frac{1}{2} \times \left(their \frac{2h}{\sqrt{3}}\right)^2 \times \sin 60° \times 5$ or $\frac{1}{2} \times h \times their \frac{2h}{\sqrt{3}} \times 5$	**M1**	
	Correct completion to given answer $V = \frac{5\sqrt{3}h^2}{3}$	**A1**	
9(b)	Correct derivative of V e.g. $\frac{10\sqrt{3}}{3}h$	**B1**	
	$\frac{dh}{dt} = \frac{dV}{dt} \times \frac{dh}{dV}$ soi	**B1**	Not $\frac{\partial V}{\partial h}$
	$0.5 \div \left(\frac{10\sqrt{3}}{3} \times 0.1\right)$ oe	**M1**	
	0.866 (metres per minute) or 0.8660[25…] rot to 4 or more sf	**A1**	Allow $\frac{\sqrt{3}}{2}$ isw
10(a)	$\ln x - 1$	**B2**	**B1** for $[1\times]\ln x + x \times \frac{1}{x}[-2]$ oe