Question Number	Scheme	Marks
5. (i)	Attempts to solve $2+\lambda=-1+2\mu$ and $3+2\lambda=6+7\mu$	M1
	Correct solution $\lambda=-9,\ \mu=-3$	A1
	Substitutes their $\lambda=-9,\ \mu=-3$ into $-1+4\lambda=\beta-\mu$	dM1
	$\beta=-40$	A1
(ii)	E.g. Substitutes their $\lambda=-9$ into $\mathbf{r}=\begin{pmatrix}2\\-1\\3\end{pmatrix}+\lambda\begin{pmatrix}1\\4\\2\end{pmatrix}$	dM1
	$(-7,-37,-15)$	A1
		(6)
		(6 marks)

(i)

M1: Attempts to write down and solve equations (1) and (3) to find the value of either λ or μ

Do not be concerned by the mechanics of the rearrangement in solving.

May be implied by $\lambda=-9$ or $\mu=-3$.

A1: Correct solution **for both** $\lambda=-9,\ \mu=-3$

dM1: Substitutes their values for λ and μ into equation (2) and solves to find a value for β

Do not be concerned by the mechanics of the rearrangement in solving. It is dependent on the previous method mark.

A1: $\beta=-40$

(ii)

dM1: Scored for either substituting their $\lambda=-9$ into $\mathbf{r}=\begin{pmatrix}2\\-1\\3\end{pmatrix}+\lambda\begin{pmatrix}1\\4\\2\end{pmatrix}$ or

substituting their $\mu=-3$ and $\beta=-40$ into $\mathbf{r}=\begin{pmatrix}-1\\\beta\\6\end{pmatrix}+\mu\begin{pmatrix}2\\-1\\7\end{pmatrix}$ **and**

proceeding to find coordinates for *P*. Do not allow this mark to be scored if they then do some further manipulation.

It is dependent upon the attempt to find either λ or both of μ and β. May be implied by 2 correct coordinates for their λ or both of μ and β.

A1: $(-7,-37,-15)$ or position vector e.g. $-7\mathbf{i}-37\mathbf{j}-15\mathbf{k}$ or $\begin{pmatrix}-7\\-37\\-15\end{pmatrix}$ condone $(-7\mathbf{i},-37\mathbf{j},-15\mathbf{k})$

Allow $x=-7,\ y=-37,\ z=-15$ or condone $-7,-37,-15$. Do not isw if they calculate two different sets of coordinates using μ and β for one and then λ for the other unless they select the correct answer.

Question Number	Scheme	Marks
6	$u = 3 + \cos\theta \Rightarrow \dfrac{\mathrm{d}u}{\mathrm{d}\theta} = -\sin\theta$	B1
	$\displaystyle\int \frac{\sin 2\theta}{\sqrt{3+\cos\theta}}\,\mathrm{d}\theta = \int -\frac{2(u-3)}{\sqrt{u}}\,\mathrm{d}u$	M1 A1
	$= -\dfrac{4}{3}u^{\frac{3}{2}} + 12u^{\frac{1}{2}}$	dM1A1
	Uses limits of 3 and 4 within their attempted integration	ddM1
	$= 8\sqrt{3} - \dfrac{40}{3}$	A1
		(7 marks)

Condone the omission of du to be implied

B1: States or uses $\dfrac{\mathrm{d}u}{\mathrm{d}\theta} = -\sin\theta$ o.e. This may be seen within the integrand. Note that B0 will mean that no A marks will be scored.

M1: Simplifies $\dfrac{\sin 2\theta}{\sqrt{3+\cos\theta}}\mathrm{d}\theta$ to a function in terms of u using

- the double angle formula for $\sin 2\theta$ Allow/condone $\sin 2\theta = \kappa \sin\theta\cos\theta$
- the given substitution condoning $\cos\theta = \pm 3 \pm u$
- $\dfrac{\mathrm{d}u}{\mathrm{d}\theta} = \pm\sin\theta$
- $\sqrt{u}$ in the denominator

Expect to see a form $\displaystyle\int k\frac{(\pm u \pm 3)}{\sqrt{u}}(\mathrm{d}u)$ oe condone missing du provided the integral is of the required form. Condone $\mathrm{d}\theta$ for du as a slip for this mark. Condone $k = \pm 1$

A1: $\displaystyle\int -\frac{2(u-3)}{\sqrt{u}}(\mathrm{d}u)$ from correct work. Ignore limits for this mark but allow $\displaystyle\int_3^4 \frac{2(u-3)}{\sqrt{u}}(\mathrm{d}u)$ if the limits are written on the integral (3 and 4) and are the opposite way round. Condone missing du but do not allow $\mathrm{d}\theta$