Question Number	Scheme	Marks
2 (a)	$\dfrac{3x}{(2x-1)(x-2)} \equiv \dfrac{A}{2x-1}+\dfrac{B}{x-2} \Rightarrow$ Values for A and B	M1
	One correct value, either $A=-1$ or $B=2$	A1
	Correct PF form $\dfrac{-1}{2x-1}+\dfrac{2}{x-2}$	A1
		(3)
(b)	$\displaystyle\int \frac{-1}{2x-1}+\frac{2}{x-2}\,\mathrm{d}x = -\frac{1}{2}\ln(2x-1)+2\ln(x-2)+(c)$	M1, A1ft
	$\displaystyle\int_5^{25} \frac{3x}{(2x-1)(x-2)}\,\mathrm{d}x = \left[-\frac{1}{2}\ln(2x-1)+2\ln(x-2)\right]_5^{25}$	
	$= \left(-\frac{1}{2}\ln 49+2\ln 23\right)-\left(-\frac{1}{2}\ln 9+2\ln 3\right)$	dM1
	$\ln\dfrac{529}{21}$	A1
		(4)
		(7 marks)

(a)

M1: Attempts a correct PF form leading to values for A and B.

Condone $\dfrac{3x}{(2x-1)(x-2)} \equiv C+\dfrac{A}{2x-1}+\dfrac{B}{x-2} \Rightarrow$ Values for at least A and B

A1: One correct value for A or B or one correct term

A1: Correct PF form $\dfrac{-1}{2x-1}+\dfrac{2}{x-2}$.

This is not just for correct values for A and B but it may be awarded from work seen in (b)

(b)

M1: $\displaystyle\int \frac{A}{2x-1}+\frac{B}{x-2}\,\mathrm{d}x = C\ln(2x-1)+D\ln(x-2)$ o.e. Condone missing brackets here

A1ft: Correct ft on their values for A and B $\displaystyle\int \frac{A}{2x-1}+\frac{B}{x-2}\,\mathrm{d}x = \frac{A}{2}\ln(2x-1)+B\ln(x-2)+(c)$

Do not condone missing brackets but the brackets can be implied by subsequent working, E.g. ln 49

dM1: Attempts to substitute the limits 5 and 25 (no misreads on the limits but condone slips, so don't accept a consistent lower limit of 0 for instance) into an expression of the correct form (with brackets which may be implied) and subtracts, either way around. Condone attempts where the substitutions were made into incorrectly combined ln terms.

A1: cso $\ln\dfrac{529}{21}$ Also allow in mixed number form $\ln 25\frac{4}{21}$

Question Number	Scheme	Marks
3 (a)	Attempts $\left(2\mathbf{i}-3\mathbf{j}+4\mathbf{k}\right)-\left(8\mathbf{i}-5\mathbf{j}+3\mathbf{k}\right)$	M1
	$\overrightarrow{RQ}=-6\mathbf{i}+2\mathbf{j}+\mathbf{k}$	A1 **(2)**
(b)	Attempts $\overrightarrow{PQ}\square\overrightarrow{RQ}=2\times-6+-3\times2+4\times1$	M1
	Full attempt to find $\cos PQR$ E.g. $2\times-6+-3\times2+4\times1=\sqrt{29}\sqrt{41}\cos PQR$	dM1
	Angle PQR = 114°	A1 **(3)** **(5 marks)**

(a)

M1: Attempts to subtract vectors $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ either way around. Look for $\overrightarrow{PQ}-\overrightarrow{PR}$ or $\overrightarrow{PR}-\overrightarrow{PQ}$. If a method is not shown it can be implied by two correct components of $\pm6\mathbf{i}\pm2\mathbf{j}\pm\mathbf{k}$ Note that an attempt such as $\overrightarrow{PR}-\overrightarrow{QP}$ is M0

A1: $\overrightarrow{RQ}=-6\mathbf{i}+2\mathbf{j}+\mathbf{k}$ o.e. such as $\begin{pmatrix}-6\\2\\1\end{pmatrix}$ Do not accept coordinates or indeed $\begin{pmatrix}-6\mathbf{i}\\2\mathbf{j}\\\mathbf{k}\end{pmatrix}$

(b)

M1: Attempts scalar product of $\overrightarrow{PQ}$ and their $\overrightarrow{RQ}$. Look for an attempt at multiplying together the components and adding. There will be some confusion over direction so allow for sight of

$$\left(\pm2\times\text{"}\pm6\text{"}\right)+\left(\pm3\times\text{"}\pm2\text{"}\right)+\left(\pm4\times\text{"}\pm1\text{"}\right)$$

This cannot be scored if they attempt a scalar product of $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ for instance.

dM1: Full attempt to find $\cos PQR$ using $\mathbf{a}.\mathbf{b}=\left|\mathbf{a}\right|\left|\mathbf{b}\right|\cos\theta$ using vectors $\pm\overrightarrow{PQ}$ and their $\pm\overrightarrow{RQ}$.

There must be an attempt at both moduli with at least one correct (which may be unsimplified)

but you should ft on their $\overrightarrow{RQ}$. Don't be concerned whether the angle is acute or obtuse.

A1: Angle PQR = awrt 114° ISW after sight of this, e.g followed by 66°

Alt (b)

M1: Attempts all three lengths or all three lengths^2 using Pythagoras' Theorem. Look for an attempt to square and add with at least one modulus or modulus^2 correct.

dM1: Attempts to use the cosine rule with the lengths in the correct positions in order to find angle PQR

Look for $\cos PQR=\dfrac{PQ^2+QR^2-PR^2}{2\times PQ\times QR}$

There are more round about methods including finding other angles first and then using the sine rule

but this method mark can only be awarded when an attempt is made at angle PQR

A1: Angle PQR = awrt 114°

It must be found using "correct" vectors, e.g . $\pm\left(-6\mathbf{i}+2\mathbf{j}+\mathbf{k}\right)$ and $\pm\left(2\mathbf{i}-3\mathbf{j}+4\mathbf{k}\right)$

If, for example $\overrightarrow{RQ}$ is incorrect, e.g. $6\mathbf{i}-2\mathbf{j}+\mathbf{k}$, A0 will be awarded even if 114° is stated