Question Number	Scheme	Notes	Marks
8(a)	$\left(\mathbf{r}=\right)\begin{pmatrix}-4\\-5\\3\end{pmatrix}+t\begin{pmatrix}3\\4\\-1\end{pmatrix}$	Forms the parametric form of the line	M1
	$3(3t-4)+4(4t-5)-(3-t)=17$ $\Rightarrow t=(2)$	Substitutes the parametric form for the line into the plane equation and solves for "t". **Depends on the first mark.**	dM1
	$\begin{pmatrix}-4\\-5\\3\end{pmatrix}+"2"\begin{pmatrix}3\\4\\-1\end{pmatrix}$	Uses their value of t correctly to find Q. **Depends on the previous mark.**	dM1
	$(2,\ 3,\ 1)$	Correct coordinates Accept if written as a column vector but not with **i**, **j**, **k**	A1 **(4)**
Way 2	$\frac{x+4}{3}=\frac{y+5}{4}=\frac{z-3}{-1}$ eg $x=\mathrm{f}(y)\ \ z=\mathrm{g}(y)$	Forms the Cartesian equation of the line, rearranges twice to get 2 of x, y, z as functions of the third	M1
		Substitutes these into the plane equation and solves for one coordinate	dM1
		Obtains the other 2 coordinates	dM1
	$(2,\ 3,\ 1)$	Correct coordinates Accept if written as a column vector but not with **i**, **j**, **k**	A1
			(4)
(b)	$\mathbf{PQ}=\begin{pmatrix}2+4\\3+5\\1-3\end{pmatrix}$, $\mathbf{PR}=\begin{pmatrix}-1+4\\6+5\\4-3\end{pmatrix}$, $\mathbf{RQ}=\begin{pmatrix}2+1\\3-6\\1-4\end{pmatrix}$	Attempts 2 vectors in plane PQR (Must use the given coordinates of P, R and their coordinates of Q	M1
	$\begin{vmatrix}\mathbf{i}&\mathbf{j}&\mathbf{k}\\6&8&-2\\3&11&1\end{vmatrix}=\begin{pmatrix}30\\-12\\42\end{pmatrix}$	Attempt vector product between 2 vectors in PQR. **Depends on the first mark.**	dM1
	$\begin{pmatrix}5\\-2\\7\end{pmatrix}\bullet\begin{pmatrix}2\\3\\1\end{pmatrix}=11$	Uses any of P, Q or R to find constant. **Depends on the previous mark.**	dM1
	$5x-2y+7z=11$	Any correct Cartesian equation	A1
			(4)

Way 2	$-4a-5b-3c=1$ $2a+3b+c=1$ $-a+6b+4c=1$	Uses the Cartesian form of the equation of a plane, $ax+by+cz=1$, and substitutes the coordinates of each of the 3 points	M1
	Solves to get a value for any of a, b or c		dM1
	Obtains values for the other 2		dM1
	$\frac{5}{11}x-\frac{2}{11}y+\frac{7}{11}z=1$	Any correct Cartesian equation	A1
			(4)

(c)	Reflection of P in Π is $\begin{pmatrix}-4\\-5\\3\end{pmatrix}+2\times"2"\left(\begin{pmatrix}3\\4\\-1\end{pmatrix}=\begin{pmatrix}8\\11\\-1\end{pmatrix}\right)$	Correct strategy for another point on l_3	M1
	$\begin{pmatrix}8\\11\\-1\end{pmatrix}-\left(\begin{pmatrix}-1\\6\\4\end{pmatrix}=\begin{pmatrix}9\\5\\-5\end{pmatrix}\right)$	Attempts direction of l_3. **Depends on the first mark.**	dM1
	$\mathbf{r}=\begin{pmatrix}-1\\6\\4\end{pmatrix}+\lambda\begin{pmatrix}9\\5\\-5\end{pmatrix}$	Forms the equation of l_3 using R (or their reflected P) and their direction. **Depends on the previous mark.**	ddM1
		Any correct equation in vector form	A1 **(4)**
			Total 12