Question Number	Scheme	Notes	Marks
4	$\mathbf{A}=\begin{pmatrix}-3 & 8\\ -3 & k\end{pmatrix}$ $\quad$ $\mathbf{B}=\begin{pmatrix}a & -4\\ 2 & 3\end{pmatrix}$ $\quad$ $\mathbf{BC}=\begin{pmatrix}2 & 5 & 1\\ 1 & 4 & 2\end{pmatrix}$		
(i)	$\det\mathbf{A}=-3k-8(-3)\ \{=-3k+24\}$ Could be implied	Attempts det **A** and obtains $\pm3k\pm8(\pm3)$ or $\pm3k\pm24$	M1
	$-3k+24=3$ or $-3k+24=-3$ $\Rightarrow k=...$ May see $(-3k+24)^2=\mathbf{+9}\Rightarrow 9k^2-144k+567=0\Rightarrow...$	Equates their det **A** of form $ak+b$ $a, b\neq 0$ to 3 or –3 or equivalent work and solves for k (usual rules if quadratic and must use +9)	M1
	$k=7,\ k=9$ 1st A1: Either correct value of k from correct work. Allow e.g., $\frac{-21}{-3}$ or $\frac{-27}{3}$ 2nd A1: Both correct values of k from correct work. 7 and 9 only. No extra		A1 A1
			(4)
(ii)	$\det\mathbf{B}=1\times3a-(-4)\times2\ \{=3a+8\}$	Correct unsimplified expression for det **B**. Could be implied	B1
	$\mathbf{B}^{-1}=\frac{1}{"3a+8"}\begin{pmatrix}3 & 4\\ -2 & a\end{pmatrix}$	Correct $\mathbf{B}^{-1}$ with their det **B**. Adj(**B**) to be correct but allow elements to have their det **B** as denominators if incorporated.	M1
	$\mathbf{C}=\mathbf{B}^{-1}\mathbf{BC}=\frac{1}{3a+8}\begin{pmatrix}3 & 4\\ -2 & a\end{pmatrix}\begin{pmatrix}2 & 5 & 1\\ 1 & 4 & 2\end{pmatrix}=...$ Access to this mark is allowed if there is no determinant or if $\mathbf{B}^{-1}=$ det **B** × Adj(**B**) used	Multiplies **BC** by their $\mathbf{B}^{-1}$ (changed – and not just by incorporation of their determinant) **the correct way round.** Expect four correct elements for their matrices if the method is unclear. The incorrect order scores M0 even if the correct result is obtained.	M1
	$\mathbf{C}=\frac{1}{3a+8}\begin{pmatrix}10 & 31 & 11\\ a-4 & 4a-10 & 2a-2\end{pmatrix}$ Ignore any reference to inapplicable values of a $\left(a\neq-\frac{8}{3}\right)$	Correct **C** or equivalent with like terms collected and single fractions if necessary. e.g., $\begin{pmatrix}\frac{10}{3a+8} & \frac{31}{3a+8} & \frac{11}{3a+8}\\ \frac{a-4}{3a+8} & \frac{2(2a-5)}{3a+8} & \frac{2(a-1)}{3a+8}\end{pmatrix}$	A1
			(4)
Alt **Sim. equations**	$\begin{pmatrix}a & -4\\ 2 & 3\end{pmatrix}\begin{pmatrix}p & q & r\\ s & t & u\end{pmatrix}=\begin{pmatrix}2 & 5 & 1\\ 1 & 4 & 2\end{pmatrix}\Rightarrow\begin{matrix}ap-4s=2 & aq-4t=5 & ar-4u=1\\ 2p+3s=1 & 2q+3t=4 & 2r+3u=2\end{matrix}$ Multiplies in the correct order to obtain at least **three** correct equations		B1
	$(3a+8)p=10$ $\quad$ $(3a+8)q=31$ $\quad$ $(3a+8)r=11$ $p=\frac{10}{3a+8}$ $\quad$ $q=\frac{31}{3a+8}$ $\quad$ $r=\frac{11}{3a+8}$ $s=\frac{1}{3}\left(1-\frac{20}{3a+8}\right)$ $\quad$ $t=\frac{1}{3}\left(4-\frac{62}{3a+8}\right)$ $\quad$ $u=\frac{1}{3}\left(2-\frac{22}{3a+8}\right)$ $\Rightarrow\begin{pmatrix}\frac{10}{3a+8} & \frac{31}{3a+8} & \frac{11}{3a+8}\\ \frac{a-4}{3a+8} & \frac{4a-10}{3a+8} & \frac{2a-2}{3a+8}\end{pmatrix}$ $s=\frac{a-4}{3a+8}$ $\quad$ $t=\frac{4a-10}{3a+8}$ $\quad$ $u=\frac{2a-2}{3a+8}$ M1: Solves their equations to find expressions in terms of a for three elements M1: Finds expressions in terms of a for all six elements A1: Correct matrix – like terms collected and single fractions		M1 M1 A1
			Total 8