Question	Scheme	Marks	AOs
3 (a)	det **A** = $k^2 + 2(1-k) = (k-1)^2 + 1$ or uses quadratic formula/discriminant = $(-2)^2 - 4(1)(2)$	M1	2.1
	$(k-1)^2 + 1 \geq 1$ or discriminant = $-4 < 0$ therefore **A** is non-singular for all values of k.	A1	2.4
		(2)	
(b)	$\begin{pmatrix} k & -2 \\ 1-k & k \end{pmatrix}\begin{pmatrix} a \\ 2a \end{pmatrix} = \begin{pmatrix} 7 \\ -3 \end{pmatrix} \Rightarrow$ at least one equation $ka - 4a = 7$ $(1-k)a + 2ak = -3$	M1	3.1a
	Solves simultaneously to find a value for either a or k e.g $a + 2ak = -3 \Rightarrow ak = -3 - a$ $\Rightarrow -3 - a - 4a = 7 \Rightarrow a = \ldots$	M1	1.1b
	$a = -2, k = \dfrac{1}{2}$	A1	1.1b
		(3)	
(c)	$\begin{pmatrix} k & -2 \\ 1-k & k \end{pmatrix}\begin{pmatrix} x \\ 2x \end{pmatrix} = \begin{pmatrix} X \\ 2X \end{pmatrix} \Rightarrow$ at least one equation $kx - 4x = X$ $(1-k)x + 2kx = 2X$	M1	3.1a
	$2(kx - 4x) = (1-k)x + 2xk \Longrightarrow k = \ldots$	M1	1.1b
	$k = 9$	A1	1.1b
		(3)	
			(8 marks)

Notes:

(a)
M1: Finds the determinant and chooses an appropriate method to show that the resulting quadratic has no real roots.
A1: Complete process to show discriminant > 0 and draws the conclusion that **A** is **non-singular** for **all values of *k*.**

(b)
M1: Translates the problem into a matrix multiplication to obtain at least one equation.
M1: Solves simultaneously to find a value for either a or k
A1: Correct values for both a and k

(c)
M1: Translates the problem into a matrix multiplication to obtain at least one equation.
M1: Solves simultaneously to find a value of k
A1: Correct value for k