

1(a)	$\begin{pmatrix} 5 \\ -9 \end{pmatrix}$	2	B1 for one correct element
1(b)	$(-3 \ -3 \ 7)$	2	M1 for any 1×3 matrix If 0 scored, SC1 for $\begin{pmatrix} -3 \\ -3 \\ 7 \end{pmatrix}$
2(a)	$\begin{pmatrix} -1 & 0 \\ 3 & 1 \end{pmatrix}$	2	B1 for 2 or 3 correct elements in final answer or $\begin{pmatrix} -3 & 0 \\ 9 & 3 \end{pmatrix}$ soi or $\begin{pmatrix} 3 & 0 \\ -9 & -3 \end{pmatrix}$ soi
2(b)	$\frac{1}{2}\begin{pmatrix} -3 & 2 \\ -4 & 2 \end{pmatrix}$ or $\begin{pmatrix} -1.5 & 1 \\ -2 & 1 \end{pmatrix}$	3	B2 for $p = -3$ OR M1 for $2p - (4 \times -2) = 2$ oe B1 for $\frac{1}{2}\begin{pmatrix} \text{their } p & 2 \\ -4 & 2 \end{pmatrix}$ oe
3(a)	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	2	B1 for two or three correct elements
3(b)	$(-6 \ -4)$	2	M1 for $[\mathbf{X} =](0 \ 2)\begin{pmatrix} 2 & 1 \\ -3 & -2 \end{pmatrix}$ or for using $\mathbf{X} = \begin{pmatrix} a & b \end{pmatrix}$ to get as far as $(2a - 3b \quad a - 2b) [= (0 \ 2)]$
4	$\frac{1}{8}\begin{pmatrix} 2 & 2 \\ -1 & 3 \end{pmatrix}$ oe or $\begin{pmatrix} \frac{1}{4} & \frac{1}{4} \\ -\frac{1}{8} & \frac{3}{8} \end{pmatrix}$ oe	2	B1 for $[k]\begin{pmatrix} 2 & 2 \\ -1 & 3 \end{pmatrix}$ oe or for $\frac{1}{8}\begin{pmatrix} \cdot & \cdot \\ \cdot & \cdot \end{pmatrix}$ oe
5(a)	$\begin{pmatrix} 5 & 4 \\ 7 & 9 \end{pmatrix}$	1	
5(b)(i)	$\begin{pmatrix} 175 \\ 347 \end{pmatrix}$	2	B1 for $\begin{pmatrix} 175 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 347 \end{pmatrix}$ or 175 and 347 seen in final answer
5(b)(ii)	Total cost of Adam's tickets and total cost of Ben's tickets	1	

6(a)(i)	$\begin{pmatrix} 140 \\ 145 \end{pmatrix}$	2	B1 for one element correct in a 2 by 1 matrix If 0 scored, SC1 for answer (140 145)
6(a)(ii)	Total money for tickets on Monday and total money for tickets on Tuesday	1	
6(b)	$\begin{pmatrix} 2.75 \\ 2.20 \end{pmatrix}$	2	B1 for one element correct or for 2.75 oe and 2.20 oe seen If 0 scored, SC2 for answer $\begin{pmatrix} 154 \\ 159.5 \end{pmatrix}$ or $\begin{pmatrix} 1.1 \times \text{their} 140 \\ 1.1 \times \text{their} 145 \end{pmatrix}$ evaluated or SC1 for one element correct
7(a)	$\begin{pmatrix} 9 & -4 \\ -6 & -5 \end{pmatrix}$	2	B1 for two or three correct elements
7(b)	-2	1	
7(c)	$-\frac{1}{2} \begin{pmatrix} -1 & 0 \\ 3 & 2 \end{pmatrix}$ oe	1	FT $\frac{1}{\text{their } -2} \begin{pmatrix} -1 & 0 \\ 3 & 2 \end{pmatrix}$
7(d)	(5 2)	2	B1 for one correct element in 1 by 2 matrix or M1 for $\mathbf{X} = (4 \ -2)\mathbf{A}^{-1}$ oe or for $(2x - 3y \ -y) = (4 \ -2)$ oe If 0 scored, SC1 for answer $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$
8(a)	$\begin{pmatrix} 5 & -5 \\ -4 & 4 \end{pmatrix}$	2	B1 for two or three correct elements
8(b)	$\begin{pmatrix} 2 & -2 \\ 0 & 1 \end{pmatrix}$ oe isw or $2 \begin{pmatrix} 1 & -1 \\ 0 & \frac{1}{2} \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 1 & -1 \\ 0 & \frac{1}{2} \end{pmatrix}$ oe with $k \neq 2$ or 0 or for $2 \begin{pmatrix} \cdot & \cdot \\ \cdot & \cdot \end{pmatrix}$ oe
8(c)	$\begin{pmatrix} 2 \\ -1 \end{pmatrix}$	2	M1 for using \mathbf{X} is a 2 by 1 matrix If 0 scored, SC1 for a final answer of (2 -1)

9(a)	$\begin{pmatrix} 4 & 8 \\ -2 & -7 \end{pmatrix}$	2	B1 for two or three correct elements
9(b)(i)	-2	1	
9(b)(ii)	$-\frac{1}{4}\begin{pmatrix} -2 & 1 \\ -2 & 3 \end{pmatrix}$ oe isw or $\begin{pmatrix} \frac{1}{2} & -\frac{1}{4} \\ \frac{1}{2} & -\frac{3}{4} \end{pmatrix}$ oe isw	1	FT $-\frac{1}{4}\begin{pmatrix} \text{their } k & 1 \\ -2 & 3 \end{pmatrix}$
10(a)	$\begin{pmatrix} -2 & -1 \\ -4 & -2 \end{pmatrix}$	2	B1 for two or three correct elements or M1 for $\begin{pmatrix} 6 & -3 \\ 0 & -2 \end{pmatrix} - 2\begin{pmatrix} 4 & -1 \\ 2 & 0 \end{pmatrix}$ oe or SC1 for answer $\begin{pmatrix} 2 & 1 \\ 4 & 2 \end{pmatrix}$
10(b)	$\frac{1}{2}\begin{pmatrix} 0 & 1 \\ -2 & 4 \end{pmatrix}$ or $\begin{pmatrix} 0 & \frac{1}{2} \\ -1 & 2 \end{pmatrix}$ oe	3	B2 for $k\begin{pmatrix} 0 & 1 \\ -2 & 4 \end{pmatrix}$ oe with $k \neq \frac{1}{2}$ or for $\frac{1}{2}\begin{pmatrix} \cdot & \cdot \\ \cdot & \cdot \end{pmatrix}$ oe or for 3 or 4 correct elements in $\begin{pmatrix} 0 & \frac{1}{2} \\ -1 & 2 \end{pmatrix}$ seen or M1 for $\mathbf{Y} = \mathbf{A}^{-1}$; or for $\mathbf{Y} = \mathbf{A}^{-1} \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ or for determinant of $\mathbf{A} = 2$ or B1 for $\begin{pmatrix} 4 & -1 \\ 2 & 0 \end{pmatrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 4a - c & 4b - d \\ 2a & 2b \end{pmatrix}$
11(a)	(6) nfw	2	B1 for 76 seen or for 70 seen or M1 for $(30 \times 1.2 + 20 \times 2) - (40 \times -0.5 + 30 \times 3)$ oe
11(b)	Difference in profit between Week 1 and Week 2 oe	1	
12(a)	$\begin{pmatrix} 1 & 0 \\ 8 & 8 \end{pmatrix}$	2	B1 for 2 or 3 elements correct
12(b)	$\begin{pmatrix} -7 \\ 5 \end{pmatrix}$	2	B1 for $\begin{pmatrix} -7 \\ 5 \end{pmatrix}$ or $-\frac{7}{5}$ or $\begin{pmatrix} -7 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 5 \end{pmatrix}$ or $(-7 \text{ [] } 5)$
12(c)	$\begin{pmatrix} 2 & 1 \\ -2 & -\frac{1}{2} \end{pmatrix}$ or $\frac{1}{2}\begin{pmatrix} 4 & 2 \\ -4 & -1 \end{pmatrix}$ oe isw	3	B2 for $\frac{1}{2}\begin{pmatrix} -2 & -2 \\ 4 & 3 \end{pmatrix}$ oe or B1 for determinant = 2 soi or $k\begin{pmatrix} -2 & -2 \\ 4 & 3 \end{pmatrix}$

13 (a)	$\frac{1}{7}$	1	
(b)	$\begin{pmatrix} -1 & -4 \\ 2 & 0 \end{pmatrix}$	2	C1 for 2 or 3 correct elements.
(c)	$(2 \ 0)$, or $(14 \times \textit{their (a) } 0)$ ft	2 ⁺	M1 for $(Y =) (6 \ 2) A^{-1}$ seen. If $(x \ y) A = (6 \ 2)$ is used, then award M1 at the stage where an attempt to solve the simultaneous eqns. is made.
14	(a) $\begin{pmatrix} 6 \\ 7 \\ 15 \end{pmatrix}$ (b) $\begin{pmatrix} 13 \\ 10 \end{pmatrix}$ (c) (i) $\frac{1}{4} \begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$ oe isw (ii) $\begin{pmatrix} -2 & 0 \\ -2 & 1 \end{pmatrix}$	2 2 2 2	B1 for 2 correct entries or for $\begin{pmatrix} 10 \\ -5 \\ 15 \end{pmatrix}$ or $\begin{pmatrix} 4 \\ -12 \\ 0 \end{pmatrix}$ soi B1 for one entry correct or for both 13 and 10 seen but not in this form. B1 for $\det \begin{pmatrix} 1 & 0 \\ -2 & 4 \end{pmatrix} = 4$ soi or $\begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$ B1 for three entries correct or $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ soi
15 (a)	$\begin{pmatrix} 5 \\ -10 \end{pmatrix}$ oe	1	
(b)	$(s =) 5$ $(t =) 2$	2	C1 for one correct or M1 for $\begin{pmatrix} 3s \\ -2s \end{pmatrix} + \begin{pmatrix} -3 \\ 12 \end{pmatrix} = \begin{pmatrix} 12 \\ t \end{pmatrix}$ oe