DULWICH COLLEGE SHANGHAI

ADDITIONAL MATHS

MATRICES AND COORDINATE GEOMETRY

TIME 50 MINS

MARK SCHEME

0606/11/M/J/11

1)

(a) **AB, AC**	B2,1,0	–1 each one incorrect or extra
(b) Either: $\mathbf{Y}=\mathbf{X}\begin{pmatrix}-12x+3y & 6\\ -7x+3y & 6\end{pmatrix}$	M1	M1 for pre-multiplying by **X** M1 for multiplication of matrices
$\begin{pmatrix}2x & 3y\\ x & 4y\end{pmatrix}=\begin{pmatrix}-52x+18y & 36\\ -71x+24y & 48\end{pmatrix}$	M1A1	A1 for correct product
leading to $y=12$ and $x=4$	M1 A1A1	M1 for equating like elements
Or		
$\frac{1}{10-12}\begin{pmatrix}5 & -4\\ -3 & 2\end{pmatrix}\mathbf{Y}=\begin{pmatrix}-12x+3y & 6\\ -7x+3y & 6\end{pmatrix}$	B1	B1 for determinant for inverse
	B1	B1 for 'matrix part' of inverse
$-\frac{1}{2}\begin{pmatrix}6x & -y\\ -4x & -y\end{pmatrix}=\begin{pmatrix}-12x+3y & 6\\ -7x+3y & 6\end{pmatrix}$	M1	M1 for multiplication of matrices
	M1	M1 for equating like elements
leading to $y=12$ and $x=4$	A1A1 [8]	

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2)

Grad of $AB=-2$, perp grad $=\frac{1}{2}$	B1M1	B1 for grad AB M1 use of $m_1m_2=-1$
Eqn of perp $\quad y-15=\frac{1}{2}(x+2)$	M1	M1 for correct attempt to find the equation of AC and hence to find C
$C(0, 16)$	A1	
Area $=\frac{1}{2}\sqrt{125}\sqrt{5}$	M1	M1 for a valid method to find area
$=12.5$	A1 [6]	
(or $\frac{1}{2}\begin{vmatrix}-2 & 3 & 0 & -2\\ 15 & 5 & 16 & 15\end{vmatrix}=\frac{1}{2}(38-13)$)		

3)

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3 **(i)** $\mathbf{A}+\mathbf{I}=\begin{pmatrix}3 & 1\\ -2 & 6\end{pmatrix}$	B1
$(\mathbf{A}+\mathbf{I})^{-1}=\frac{1}{20}\begin{pmatrix}6 & -1\\ 2 & 3\end{pmatrix}$	B1 + B1√
(ii) $\mathbf{X}=(\mathbf{A}+\mathbf{I})^{-1}=\begin{pmatrix}14\\ 4\end{pmatrix}$ evaluated to matrix with 2 entries	M1
$\begin{pmatrix}4\\ 2\end{pmatrix}$	A1 [5]

4)

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6	Eliminates y (or x) $x^2+3x-10=0$ (or $y^2+27y+72=0$) oe	M1 A1
	Factorises 3 term quadratic or solves using formula $x=-5$ and 2 (or $y=-24$ and -3) $y=-24$ and -3 (or $x=-5$ and 2)	M1 A1 A1√
	Uses Pythagoras 22.1 or $\sqrt{490}$ or $7\sqrt{10}$	M1 A1 [7]

5)

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3	(i) $\mathbf{A}^{-1}=\frac{1}{16}\begin{pmatrix}-2 & -3\\ 8 & 4\end{pmatrix}$	B2, 1, 0	–1 each error
	(ii) $\mathrm{M}=\frac{1}{16}\begin{pmatrix}-2 & -2\\ 8 & 4\end{pmatrix}\begin{pmatrix}1 & 4\\ 2 & 3\end{pmatrix}$	M1 DM1	M1 for pre-multiplication DM1 for attempt to multiply matrices, at least one element correct
	$=\frac{1}{16}\begin{pmatrix}-8 & -17\\ 16 & 44\end{pmatrix}$	A1 [5]	A1 all correct

6)

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$m_{AB}=2$	B1
Uses $m_1m_2=-1$ and point A	M1
AD: $y-4=-\frac{1}{2}(x-1)$ or $x+2y=9$ or $y=-\frac{1}{2}x+\frac{9}{2}$	A1
CD: $y-13=2(x-13)$ or $y=2x-13$	B1
Solve equation AD with equation CD	M1
(7,1)	A1 [6]

7)

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4	(i) $\begin{pmatrix}4 & 1 & 7\\ 2 & 5 & 1\end{pmatrix}\begin{pmatrix}5\\ 3\\ 1\end{pmatrix}$ or transpose	B1
	$+\begin{pmatrix}2 & 5 & 2\\ 4 & 3 & 6\end{pmatrix}\begin{pmatrix}8\\ 4\\ 2\end{pmatrix}$ or transpose	B1+B1
	(ii) $\begin{pmatrix}30\\ 26\end{pmatrix}$ or $\begin{pmatrix}40\\ 56\end{pmatrix}$ or $\begin{pmatrix}30\\ y\end{pmatrix}$ and $\begin{pmatrix}40\\ y\end{pmatrix}$ or $\begin{pmatrix}x\\ 26\end{pmatrix}$ and $\begin{pmatrix}x\\ 56\end{pmatrix}$ from correct part **(i)**	B1
	Claire 70 and Denise 82	B1