Transformations – Paper 2 – Mark Scheme

Question 1

18	(a) E, G	1, 1	
	(b) A, B	1, 1	

Question 2

20	(a) 63.4	2	**M1** $\tan(M) = \dfrac{4}{2}$ oe
	(b) Vertices at (4, 1), (8, 1) and (10, 3)	2	**B1** two vertices correct

Question 3

14	(a)	Shear, SF2, x axis invariant	3	**B1** shear **B1** SF2 **B1** x axis invariant
	(b)	$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	2ft	$\begin{pmatrix} 1 & k \\ 0 & 1 \end{pmatrix}$ 2 marks if $k = 2$ or their SF in (a) 1 mark for any other k, $k \neq 0$

Question 4

13	$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ cao	3	**M2** for $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ or **B1** for one matrix seen

Question 5

21	(a) triangle at (1, 1), (1, –1), (2, –1)	2	**SC1** triangle at (–1, –1),(–1, 1), (–2, 1)
	(b) triangle at (–1, –1)(1, –1), (1, –2)	2ft	correct or reflection of their triangle in $y = -x$
	(c) reflection in the x axis	2	**B1** reflection **B1** x axis or $y = 0$

Question 6

17	(a) Shear x axis invariant sf 3	3	**B1** shear **B1** x axis invariant oe **B1** 3
	(b) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$	2	**M1** $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$ $k \neq 0$ or $k \neq 1$

Question 7

18	trapezium at (–2, –1),(–4, –1), (–4, –2), (–3, –2) **www**	5	**SC4** for correct co-ordinates or vectors or matrix seen with no diagram or with an incorrect diagram. **SC3** for correct diagram with wrong working or one other incorrect trapezium which is not part of a correct method. If 0 then **B2** for $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ or **M1ft** "BA" $\begin{pmatrix} 2 & 4 & 4 & 3 \\ 1 & 1 & 2 & 2 \end{pmatrix} = \begin{pmatrix} -2 & -4 & -4 & -3 \\ -1 & -1 & -2 & -2 \end{pmatrix}$ **A1ft**

Question 8

17	(a)	triangle at (0, 3) (2, 3) and (2, 4)	3	**B1** for each correct vertex If 0 scored then **M1** for correct reflection in the *y* axis or correct translation of their first stage 3 right 2 up
	(b)	reflection in *y* axis	2	**B1** for reflection **B1** for *y* axis or *x* = 0

Question 9

22	(a)	Triangle at $(2,-1)$ $(2,1)$ $(1,-2)$	2	**B1** for translation by $\begin{pmatrix} k \\ -4 \end{pmatrix}$ or $\begin{pmatrix} 3 \\ k \end{pmatrix}$

	(b)	Rotation
		[centre] (1, 0)
		$180°$ or half turn
			1
			1
			1
				OR enlargement
				    [centre] (1, 0)
				    [scale factor] -1

	(c)	Triangle at $(2,3)$ $(4,2)$ $(2,5)$	3	**B2** for 2 correct vertices plotted **or** If no/wrong plots allow **SC2** for 3 correct coordinates shown in working or **SC1** for any 2 correct coordinates shown or a triangle of the correct size and orientation but wrong position or **M1** for $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} -1 & -1 & -2 \\ 3 & 5 & 2 \end{pmatrix}$ oe shown

Question 10

19	(a)	rotation 90 clockwise [about] origin oe	3	**B1** for each
	(b)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	**M1** for any one column or row correct
	(c)	Triangle at (3, 3), (6, 3) and (3, 5)	2	**M1** for any two vertices correct or correct answer translated horizontally

Question 11

6	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	**B1** for one correct column

Question 12

3	Triangle (3, –2), (4, –2), (4, –1)	2	**B1** for movement 2 right or 3 down

Question 13

17	(a)	Enlargement	1	
		$\frac{1}{2}$	1	
		origin oe	1	
	(b)	$\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$ oe	2FT	correct or **FT** *their* (a) allow for 2 marks $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$ where $k =$ *their* scale factor in (a) **B1** for one correct row or correct column or $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$ ($k \neq 0$ or 1)

Question 14

18	(a)	Enlargement	1	
		[s.f.] $\frac{1}{2}$	1	
		[centre] (-1, 3)	1	
	(b)	Triangle at (3 ,-1) (5,-1) (5,-5)	3	**M2** for 2 correct vertices on grid or in working or **M1** for identifying matrix as a reflection in the x-axis or for $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 3 & 5 & 5 \\ 1 & 1 & 5 \end{pmatrix}$ oe

Question 15

16	Shape with vertices at (1, 1), (1, 4), (-1, 2), (-1, 4)	3	**M2** for 3 correct vertices on grid or in working or **M1** for correct set-up $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 2 & 1 & 4 & 4 \\ 1 & -1 & -1 & 1 \end{pmatrix}$ or for rotation, 90° [anti-clockwise], centre O