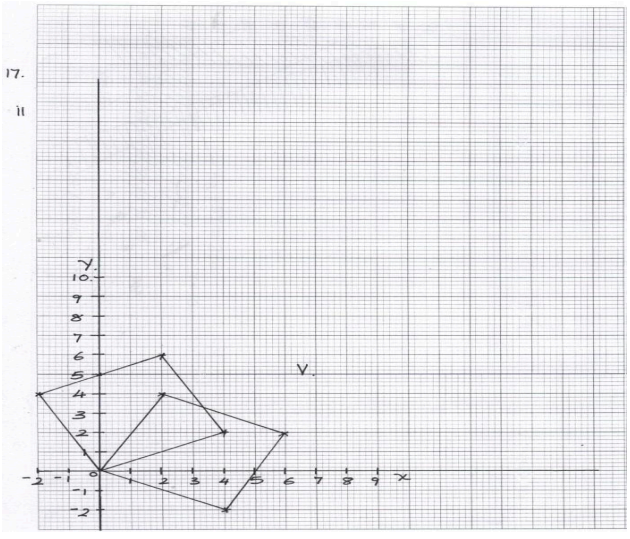
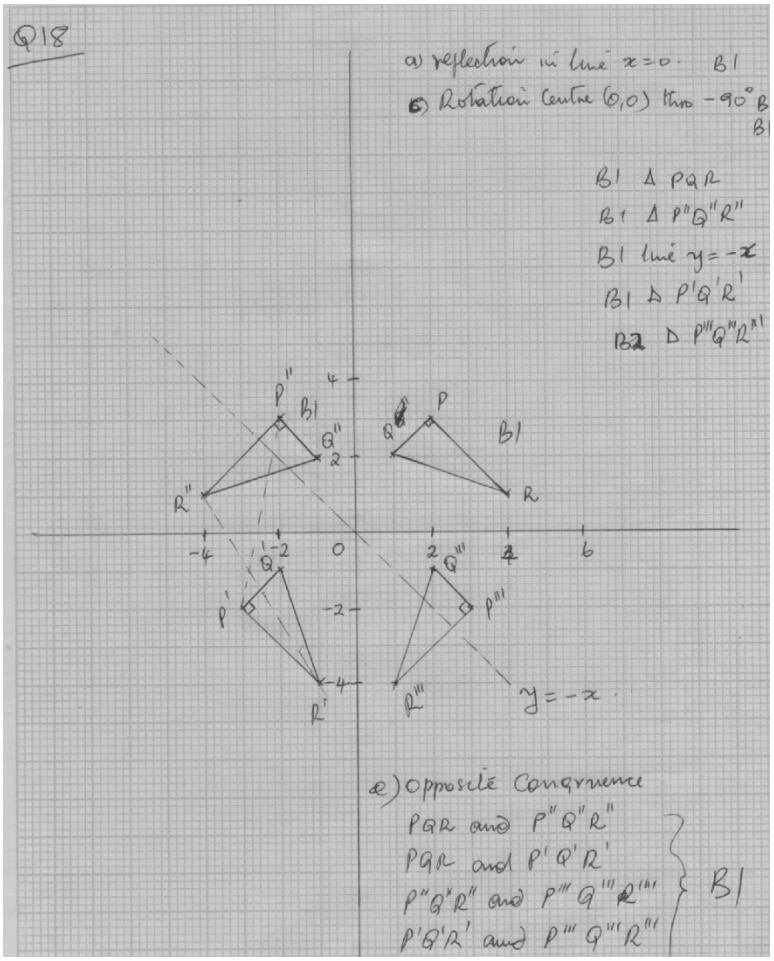
2. *Matrices and Transformations*

1	a) (i) (ii) $\begin{pmatrix}2&-1\\1&2\end{pmatrix}\quad\begin{pmatrix}0&2&2&0\\0&0&2&2\end{pmatrix}$ $=\begin{pmatrix}0&4&2&-2\\0&2&6&4\end{pmatrix}$ $T \Rightarrow (0,0),(4,-2),(2,6),(-2,4)$ (iii) $\begin{pmatrix}2&1\\-1&2\end{pmatrix}\quad\begin{pmatrix}0&2&2&0\\0&0&2&2\end{pmatrix}=\begin{pmatrix}0&4&6&2\\0&-2&2&6\end{pmatrix}$ $U \Rightarrow (0,0),(4,-2),(6,2),(2,4)$ b) (i) $\begin{pmatrix}2&-1\\1&2\end{pmatrix}\quad\begin{pmatrix}2&1\\-1&2\end{pmatrix}=\begin{pmatrix}5&0\\0&5\end{pmatrix}$ $\begin{pmatrix}5&0\\0&5\end{pmatrix}\quad\begin{pmatrix}0&2&2&0\\2&0&2&2\end{pmatrix}=\begin{pmatrix}0&10&10&0\\10&0&10&10\end{pmatrix}$ $V \Leftarrow (0,0),(10,0),(10,10),(0,10)$ (ii) Enlargement center (0,0) s.f = 5	B_1 M_1 A_1 B_1 B_1 B_1 B_1 B_1 B_1 B_1	Square S drawn ✔coordinates given Square T drawn ✔coordinates (implied) Square U drawn ✔coordinates (implied) Square V drawn
			
		10	

2.	 Total 10		
		10	

1. *a) B (4,-5), C (3,6 ½)*

Δ ABC drawn

Δ ABC drawn

a) ii) Shear maps

1

I (1, 1½)

Matrix = 1 0

1 ½

1 1 1

b) i) $\begin{pmatrix} & \\ & \end{pmatrix}$ *A B C* $\begin{pmatrix} & & \\ & & \end{pmatrix}$

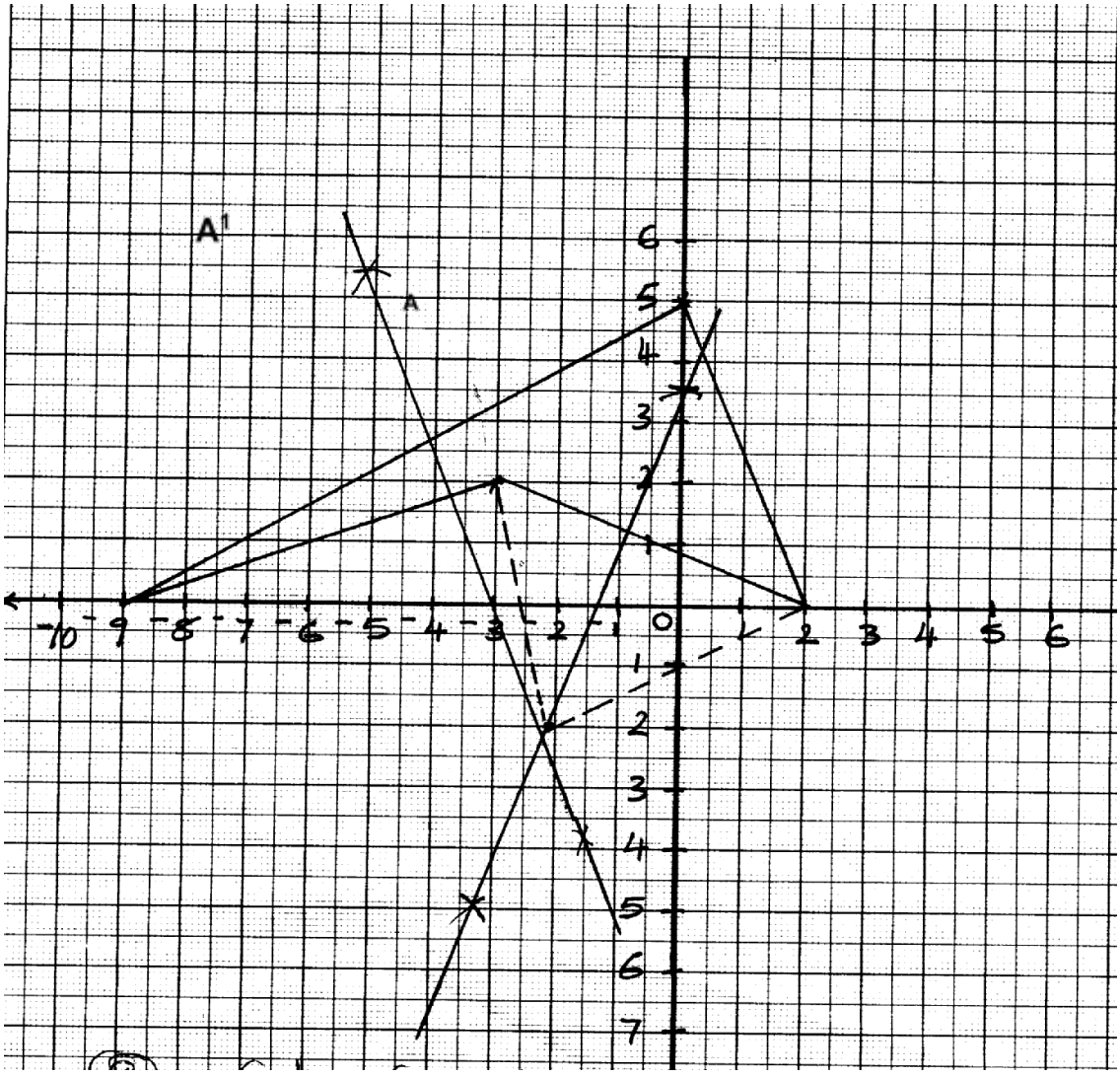
$= \quad A^{II} \quad B^{II} \quad C^{II}$

$\begin{pmatrix} & & \\ & & \end{pmatrix}$

$\Delta A^{11}\ B^{11}\ C^{11}\ D^{11}$ *drawn*

ii) Half turn about (0,0)

2.



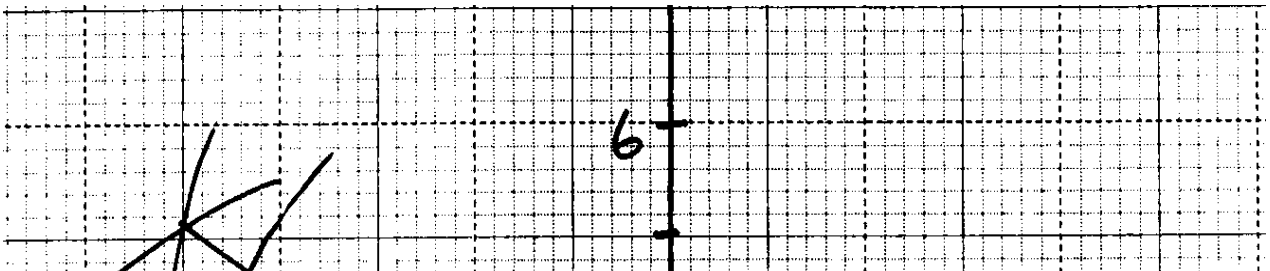
(a) Centre (-2, -2) 90º
(b) A11 (-2 , -4) , B11 (0, 9)
(c) Half-turn about the centre (0, 2)

3.

A_1 (-2, -1)
B_1 (-2, -6)
C_1 (4, -6
D_1 (-4, -1)

A_2 (-1, 2)
B_2 (-2, -6)
C_2 (-6, 4)
D_2 (-6, 4)

(b)



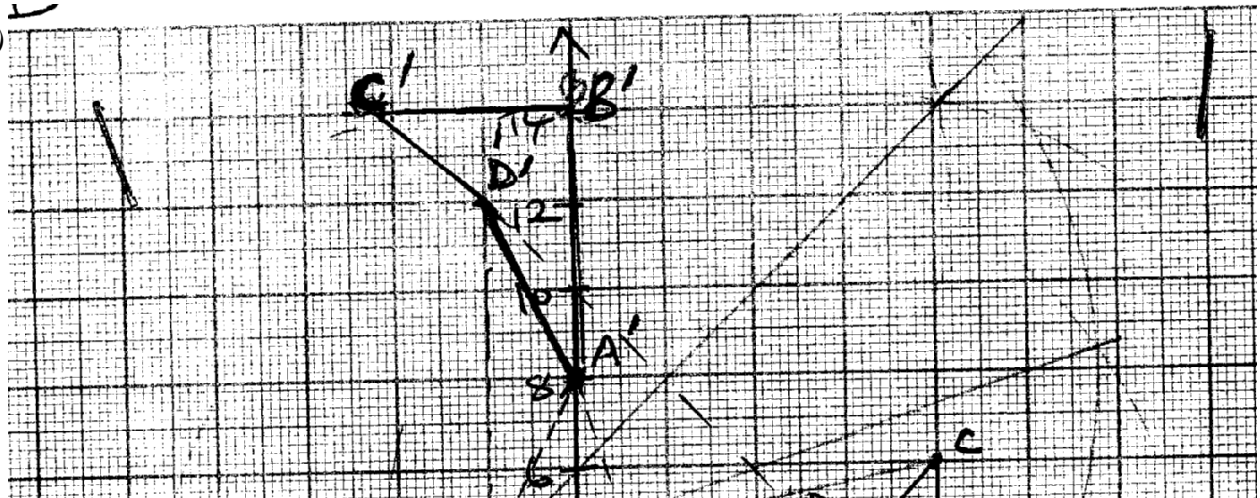
(c) (i) U - - positive three-quarter turn about the origin

(ii)UT – Reflection I the line x = 0

(d) IdetI = I2.5 x -2 – 1x 0 I= 5

∴Area = 5x(5x2) = 20sq. units

4. (a)



b) Centre (-2, 4)

Angle + 90°

5. *P(5,-3)* *P^1 (2, -5)*

$$\begin{pmatrix} \quad \end{pmatrix} + \begin{pmatrix} \quad \end{pmatrix} = \begin{pmatrix} \quad \end{pmatrix}$$

$$\begin{pmatrix} \quad \end{pmatrix} = \begin{pmatrix} \quad \end{pmatrix}$$

$$R^1 = \begin{pmatrix} \quad \end{pmatrix} + \begin{pmatrix} \quad \end{pmatrix}$$

$$= \begin{pmatrix} \quad \end{pmatrix}$$

$$P^1R^1 = \begin{pmatrix} \quad \end{pmatrix} - \begin{pmatrix} \quad \end{pmatrix}$$

$$= \begin{pmatrix} \quad \end{pmatrix}$$

Mag. = 7units

6. *A^1 = (0+1, -1-2) = (1, -3)*

B^1 = (4 + 1) , 3-2) = (4, 1)

C^1 = (2 +1, 2-2) = (3-0)

Matrix

$$\begin{pmatrix} \quad \\ \quad \end{pmatrix} \begin{pmatrix} \quad \end{pmatrix} = \begin{pmatrix} \quad \end{pmatrix}$$

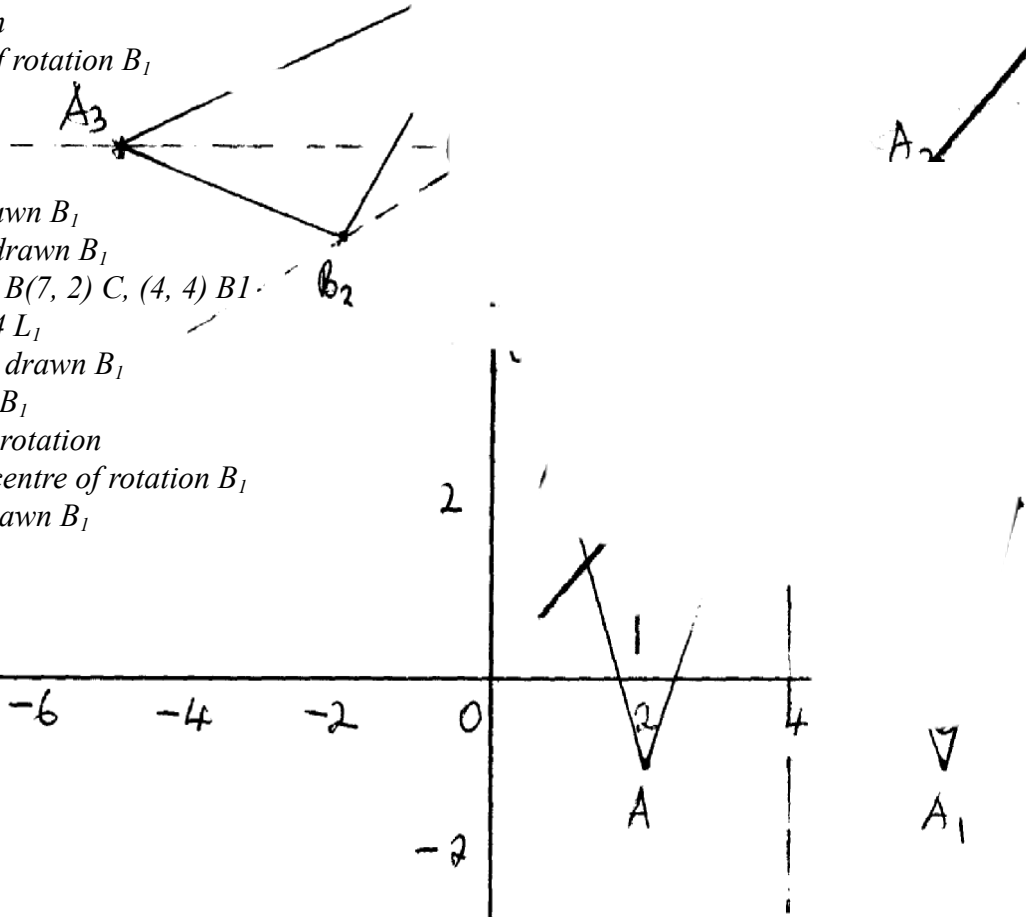
A^{11} (5, -5) B (15, 3) C (5,0)

Determinant (0-9) =-9
Area = 9x24 = 216cm²

$\begin{pmatrix} & \\ & \end{pmatrix}\begin{pmatrix} & \\ & \end{pmatrix} = \begin{pmatrix} & \\ & \end{pmatrix}$

-15a+3b =5 *15c +3d=1*
-48b =0 *-48d = -16*
b = 0 *d = 1/3*
a = 1/3 *c=0*
matrix $\begin{pmatrix} & \\ & \end{pmatrix}$

7. *Scale u*
ΔABC drawn B_1
$ΔA_1B_1C_1$ drawn B_1
A, (6, -1), B(7, 2) C, (4, 4) B1
Line x = 4 L_1
$ΔA_2 B_2 C_2$ drawn B_1
Two seen B_1
Centre of rotation
Angle of centre of rotation B_1
$A_3B_3C_3$ drawn B_1



Scale used S_1
ΔABC drawn B_1
$ΔA_1B_1C_1$ drawn B_1
A, (6, -1), B(7, 2) C, (4, 4) B1
Line x = 4 L_1
$ΔA_2 B_2 C_2$ drawn B_1
Two seen B_1
Centre of rotation
Angle of centre of rotation B_1
$A_3B_3C_3$ drawn B_1

8. *(a)* *P(6, -2)*
X^1 = 6 -3 (-2) = 12
Y^1 = 2(6) = 12
(X^1, Y^1) = (12, 12)

(b) (i) $A^1(3, 4)$
(ii) $B^1(3, 2)$
$C^1(1, 4)$
$D^1(4, 3)$

(c) (i) $\begin{pmatrix} & \end{pmatrix} \begin{pmatrix} A^1 & B^1 & C^1 & D \\ 3 & 3 & 1 & 4 \\ 4 & 2 & 4 & 5 \end{pmatrix}$

$= \begin{pmatrix} & & & \end{pmatrix}^1$

$A^{11}(-5, 4)$, $B^{11}(-1, 2)$, $C^{11}(-7, 4)$ and $D^{11}(-6, 5)$

(ii) A stretch with y-axis invariant and a sketch factor (3)

$2h = 6$

$h = 3$

$-5a + 4b = 4$
$-a + 2b = 2$

$-5a + 4b = 4$
$-a + 4b = 4$
$-4a = 0$
$a = 0$
$b = 1$

$-5c + 4d = -3$
$-c + 2d = 3$

$-5c + 4d = -3$
$-c + 4d = -6$
$-4c = 3$
$c = -\frac{3}{4}$
$d = \frac{15}{8}$

9. (a) $X1(5, -1)$ $y_1(7, -1)$ $Z_1(-2, 2)$
xyz & $x_1y_1z_1$ well drawn

(b) 1-3 xyz x1y1z1
$X_2(2, 10)$ $y_2(2, 14)$
$X_2y_2Z_2$ well drawn

(c) $\begin{pmatrix} & \end{pmatrix} \begin{pmatrix} & \end{pmatrix} \begin{pmatrix} ., & ., & \end{pmatrix}$
-1, -1, 2

$\begin{pmatrix} & \end{pmatrix} \begin{pmatrix} 1 & -1 \\ 0, & 1 \end{pmatrix} \begin{pmatrix} & \end{pmatrix}$

(d)) Area of $\Delta X_2y_2Z_2$
$= 4x15 = 60cm^2$

10. $\begin{pmatrix} & \end{pmatrix}$ $2 \quad 4 \quad 4 \quad 2 = 7 \quad 14 \quad 14 \quad 8$
$1 \quad 1 \quad 4 \quad 4 \quad 8 \quad 7 \quad 16 \quad 16$

$2a + b = 8$
$4a + b = 14$
$-2a = -6$
$6 + b - = 8$
$b = 2$
$\therefore 6 + b = 8$
$b=2$
$2c + d = 7$
$4c + d = 7$
$-2c = 0$
$c = 0$
$d = 7$
$\begin{pmatrix} 3 & 2 \\ 0 & 7 \end{pmatrix}$

$\therefore$

- it is an enlargement with scale factor 3 with centre (-1, -2)

(c) $\begin{pmatrix} \\ \end{pmatrix} + \begin{pmatrix} \\ \end{pmatrix} = \begin{pmatrix} \\ \end{pmatrix}$

$a + 8 = 7 \qquad 7 + b = 9$

$a = -1 \quad b = 2$

$\therefore T = \begin{pmatrix} \\ \end{pmatrix}$

11. *a)* *ABCD drawn* B_1

Name – Parallelogram B_1

b) $A^1B^1C^1D^1$ *drawn* B_1

Attempt to joining any two points and bisecting. B_1

Description – Rotation + 90^0. B_1 *or quarter turn about (0,0)*

c) $A^{11}B^{11}C^{11}D^{11}$ *drawn.* B_1

Description – Enlargement centre (0, 0) Scale factor –Z. B_1

d) $A^{111}B^{111}C^{111}D^{111}$ *– drawn.* B_1

Attempt to reflect. B_1

Coordinates

A^{111} *= 9-2, 4)* C^{111} *= (-8, 4)* B_1 *All correct*

B^{111} *= (-6, 0)* D^{111} *(-4, 8)*

12. $\begin{pmatrix} \\ \end{pmatrix} \begin{pmatrix} \\ \end{pmatrix}$

$\begin{pmatrix} \\ \end{pmatrix}$

A (-3, 3) $B^{|}$*(-2, 6)* $C^{|}$*(6, -16)*

$\begin{pmatrix} \\ \end{pmatrix} \begin{matrix} -2 & 6 \\ 6 & -6 \end{matrix} \begin{pmatrix} \\ \end{pmatrix}$

$\begin{pmatrix} \\ \\ \end{pmatrix}$ *10, 10) C" (18, -6)*

MN $= \begin{pmatrix} \\ \end{pmatrix} \begin{pmatrix} \\ \end{pmatrix}$

$= \begin{pmatrix} \\ \end{pmatrix}$

$p-1 = \frac{1}{-12} \begin{pmatrix} \\ \end{pmatrix}$

$\begin{pmatrix} \\ \end{pmatrix}$

13. $Det = 2 - 6$

$= -4$

$A.S.F = 4$

$\frac{25.6}{x} = 4$

$x = 6.4cm^2$

$Area\ of\ \Delta ABC = 6.4cm^2$

14. $T + (2) = (4)$

$-4 \quad 0$

$T = (4 \ -2) = (2)$

$0 + 4 \quad 4$

$\therefore\ (2) + (-1) = (1)$

$4 \quad 2 \quad 6$

$Q\ (1,6)$

16. $5x^2 + 6 = {}^{110}/_{10}$

$5x^2 + 6 = 11$

$x^2 = 1$

$x = \pm 1$