1 *(a)* Transformation **R** is a rotation 90^o anticlockwise at (5, 5) and transformation **T** is a translation $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$.

State the coordinates of the image of point (1, 4) under each of the following transformations:

(i)Translation **T**, *(ii)* Combined transformations **TR**.

[3 *marks*]

(b) Diagram 1 shows three quadrilaterals, *JKLM, PQRS* and *TUVW* drawn on a Cartesian plane.

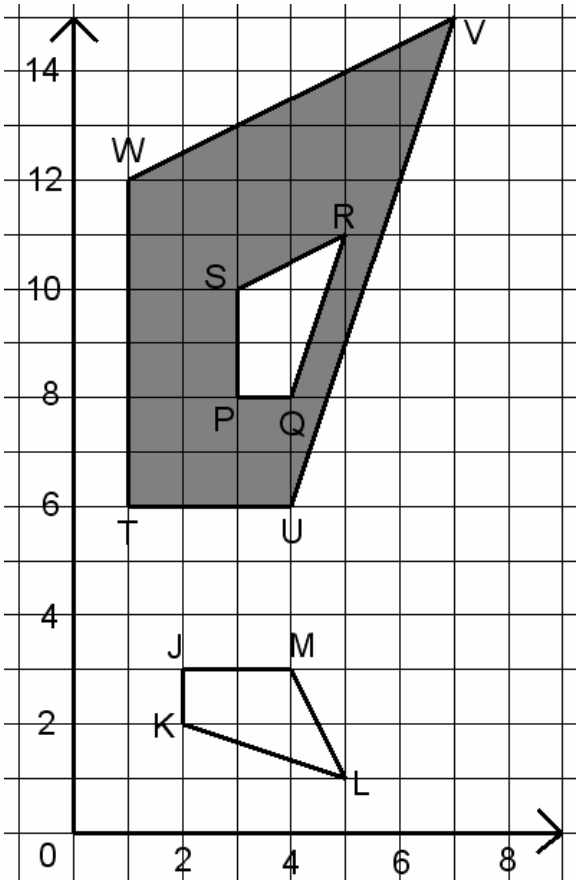

DIAGRAM 1

PQRS is the image of *JKLM* under transformation **Q**.

TUVW is the image of *PQRS* under transformation **M**.

(i) Describe in full the transformation:

(a) **Q**,

(b) **M**. [6 marks]

(ii) Given that quadrilateral JKLM represents a region of area 343 cm^2. Calculate the area, in cm^2, of the shaded region. [3 marks]

2. The Diagram 2 shows pentagons ABCDE, GFCDH, PQRST and JKLMN on a Cartesian plane.

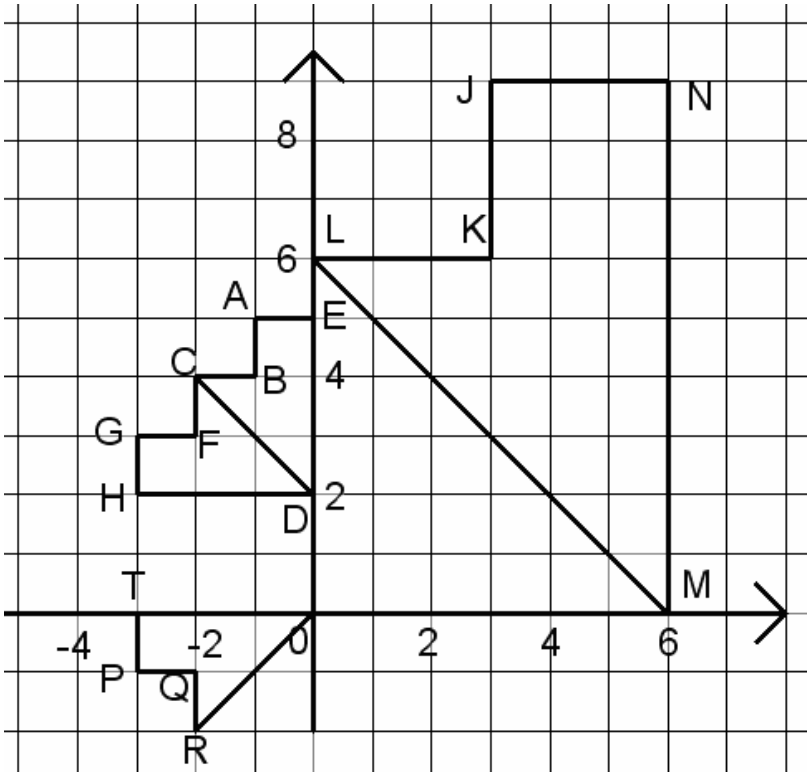

Diagram 2

a) Transformation V is a reflection in the line y = 4. Transformation U is a translation $\begin{pmatrix} -4 \\ -2 \end{pmatrix}$.

State the coordinates of point S under the following transformation.

i. V

ii. VU

b) GFCDH is the image of ABCDE under a transformation X and PQRST is the image of ABCDE under a transformation Y. Describe in full

i. the transformation X,

ii. the transformation Y.

c) JKLMN is the image of ABCDE under an enlargement.

i. State the center of enlargement.

ii. Given that the area of JKLMN is 76.95 unit^2, find the area id ABCDE.

3. Diagram 3 shows quadrilaterals, *ABCD*, *PQRS* and *KLRM*, drawn on a Cartesian plane.

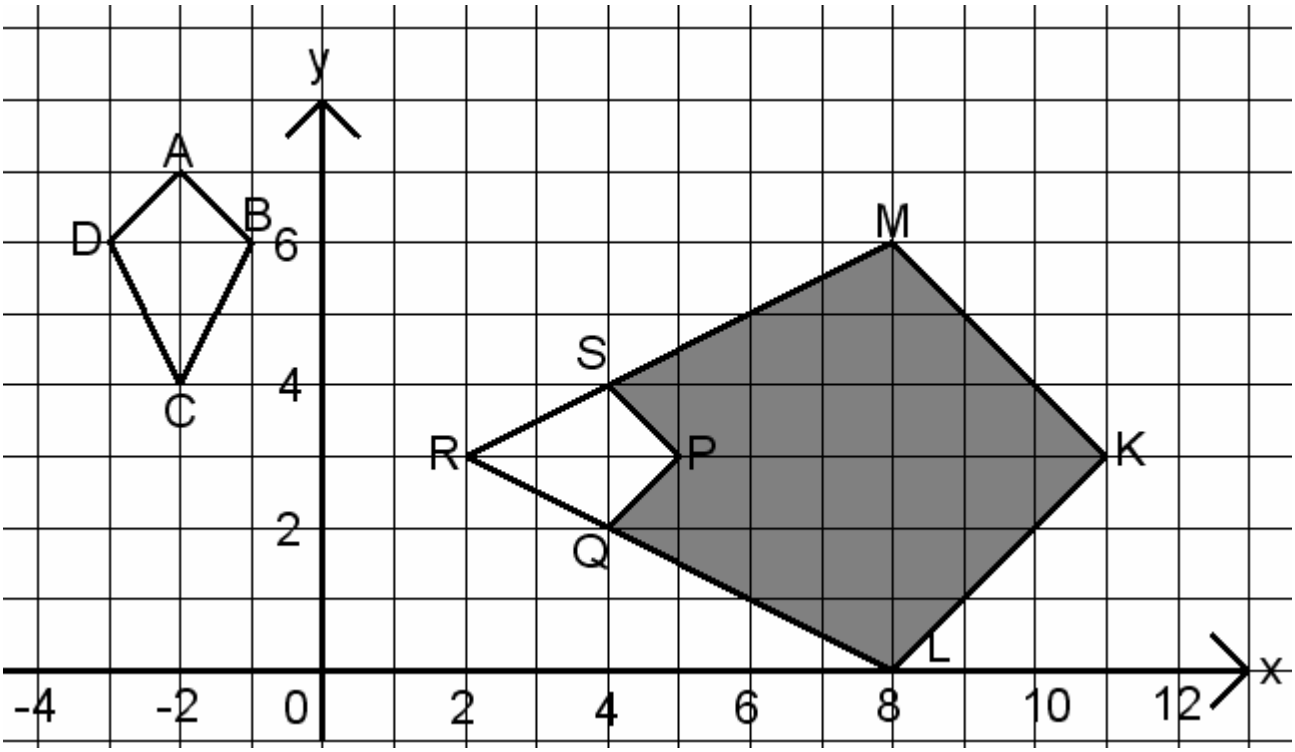

DIAGRAM 3

a) Transformation **T** is a translation $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$.

Transformation **V** is a reflection in the line y = 1.

State the coordinates of the image of point A under each of the following transformations:

i) Translation **T**,

ii) Combined transformations **VT**.

b) i) KLRM is the image of *ABCD* under the combined transformations **WU**.

Describe in full, the transformation **U** and the transformation **W**.

ii) Given that the shaded region *KLQPSM* represents a region of area 120 m^2, calculate the area, in m^2, of the region represented by *PQRS*.

4. a) Diagram 4(i) shows two points, *M* and *N*, on a Cartesian plane.

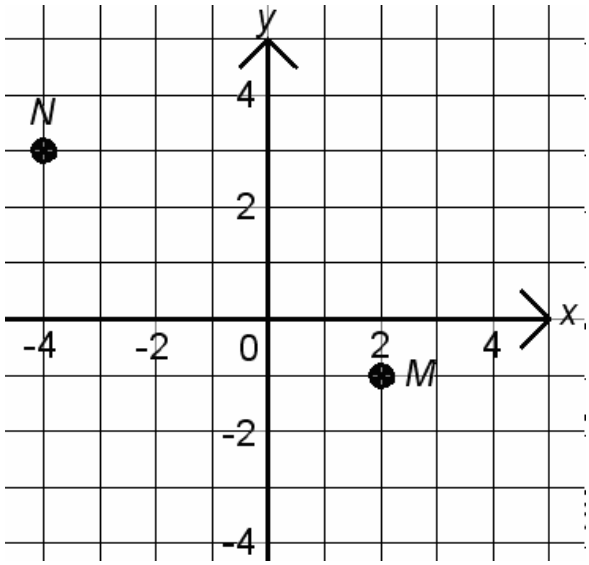

DIAGRAM 4(i)

Transformation **T** is a translation $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

Transformation **R** is an anticlockwise rotation of 90^0 about the center (0, 2).

i) State the coordinates of the image of point *M* under transformations **R**.

ii) State the coordinates of the image of point *N* under following transformation:

a. T^2

b. TR

b) Diagram 4(ii) shows three quadrilaterals, *ABCD*, *EFGH* and *PQRS* on Cartesian plane.

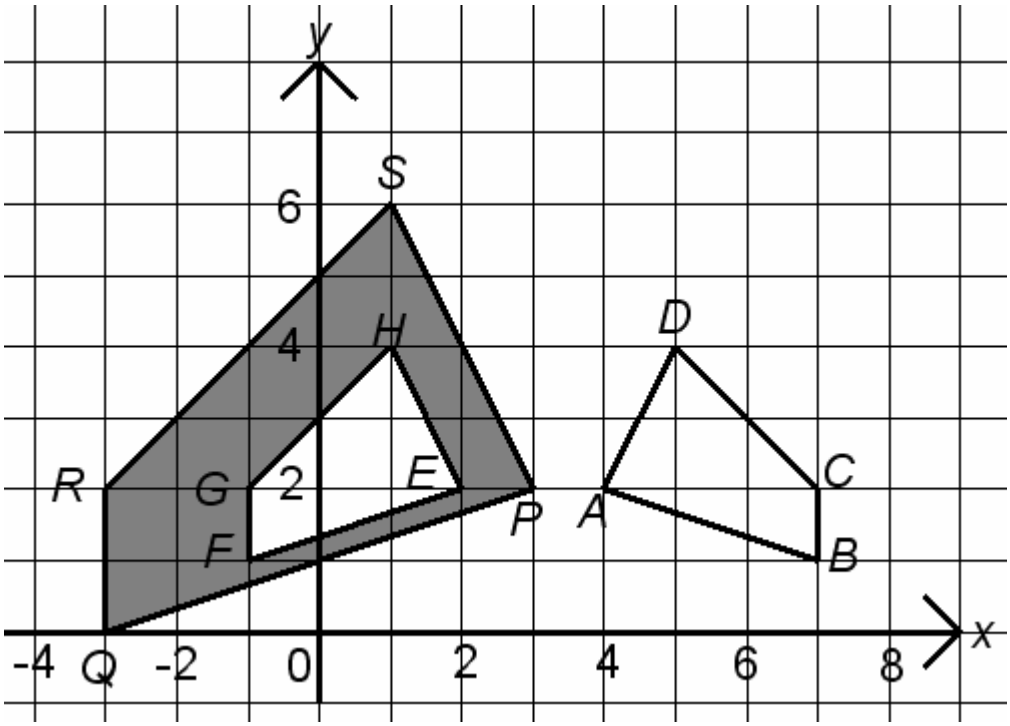

DIAGRAM 4(ii)

EFGH is the image of *ABCD* under transformation **V**.

PQRS is the image of *EFGH* under transformation **W**.

i) Describe in full the transformation:

   a. **V**,

   b. **W**.

ii) Given that quadrilateral *PQRS* represents a region of area 45.6 cm^2, calculate the area, in cm^2, of the region represented by the shaded region.

5. a) Transformation **T** is a translation $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and transformation **P** is an anticlockwise rotation of 90^0 about the centre (1, 0).

State the coordinates of the image of point (5, 1) under each of the following transformation:

i) Rotation **P**

ii) Translation **T**,

iii) Combined transformation $\mathbf{T^2}$.

b) Diagram 5 shows three quadrilaterals, *ABCD*, *EFGH* and *JKLM* drawn on a Cartesian plane.

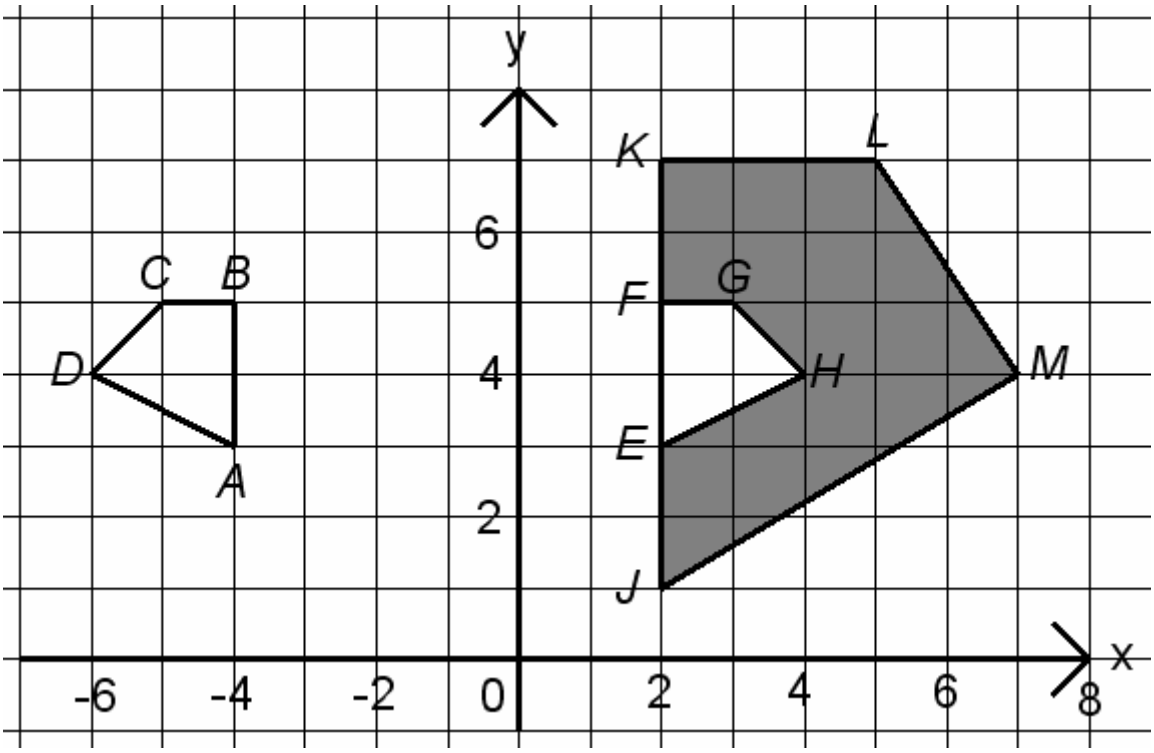

DIAGRAM 5

i) *JKLM* is the image of *ABCD* under the combined transformation **VU**. Describe in full the transformations:

a. **U**,

b. **V**.

ii) It is given that quadrilateral *ABCD* represents a region of area 18 m^2.

Calculate the area, in m^2, of the region represented by the shaded region.

6. Diagram 6 shows quadrilaterals *ABCD*, *EFGH* and *JKLM* drawn on a Cartesian plane.

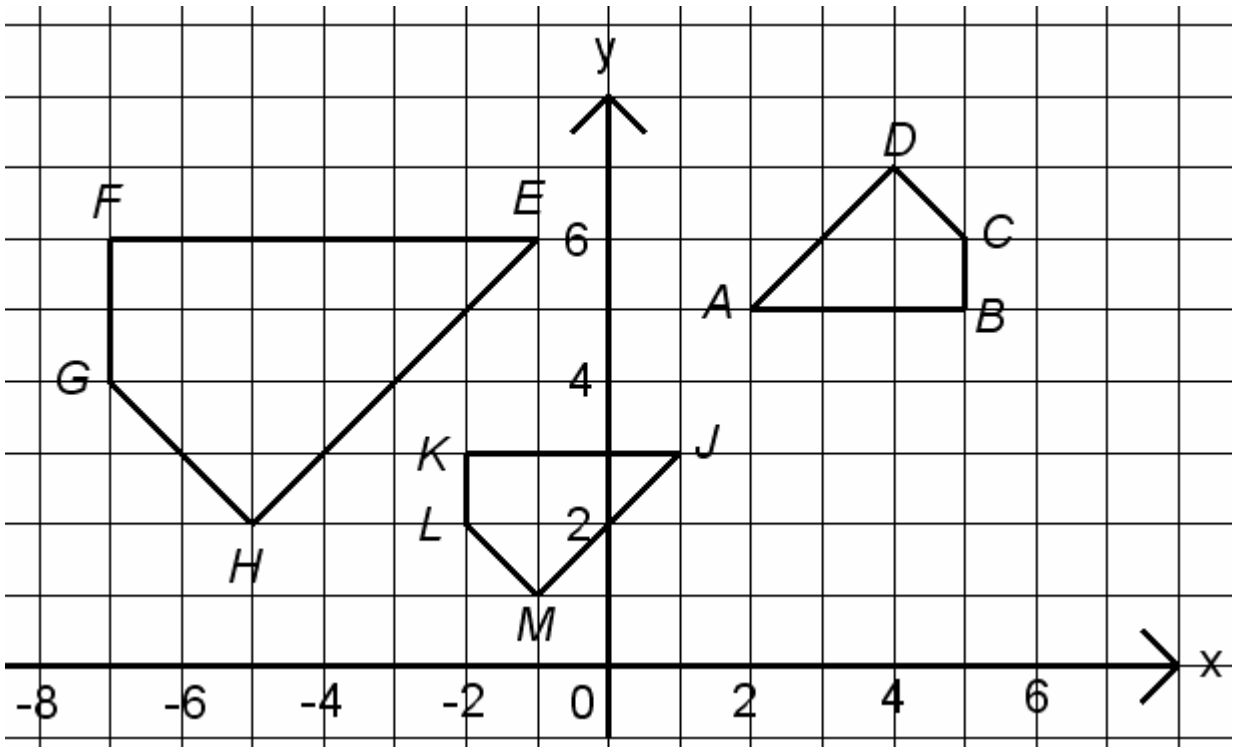

DIAGRAM 6

a) Transformation **R** is a rotation of 900 anticlockwise about the center (0, 2).
Transformation **P** is a reflection in the straight line $x = 2$.
State the coordinates of the image of point *A* under each of the following transformations:

i) **R**,

ii) **RP**.

b) *EFGH* is the image of *ABCD* under the combined transformation **MN**.
Describe in full

i) the transformation **M**,

ii) the transformation **N**.

c) *JKLM* is the image of *EFGH* under an enlargement at centre (3, 0).

i) State the scale factor of the enlargement.

ii) Given that *EFGH* represents a region of area 112 m^2, calculate the area, in m^2, of the region represented by *JKLM*.

7. a) Transformation **P** is a reflection in the line $x = k$.

Transformation **R** is a clockwise rotation of 90^0 about the centre (0, 4).

Transformation **T** is a translation $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$.

i) The point (8, 6) is the image of the point (-4, 6) under the transformation P.

State the value of k.

ii) Find the coordinates of the image of point (2, 8) under the following combined transformation:

a. $\mathbf{T^2}$,

b. **TR**.

c) Diagram 7 shows the three pentagons, *ABCDE*, *FGHIJ* and *KLMNJ*, drawn on a Cartesian plane.

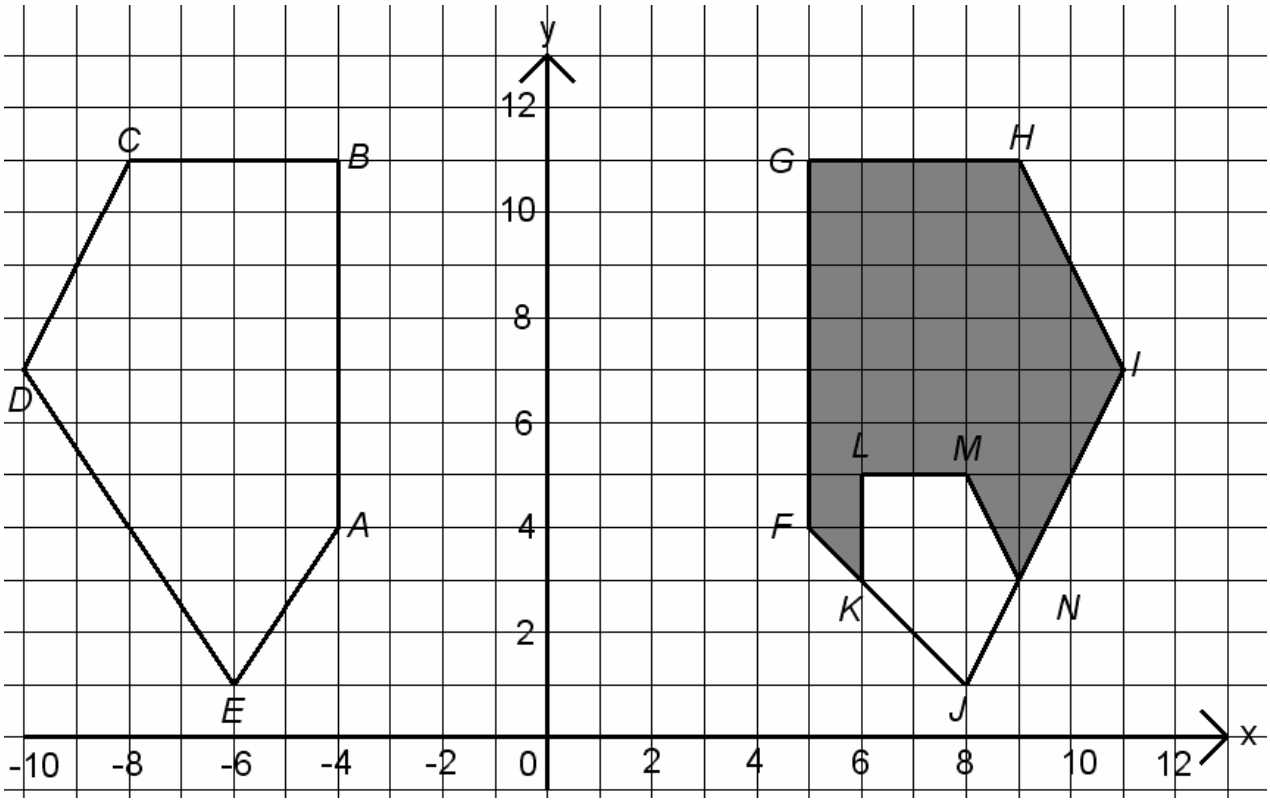

DIAGRAM 7

i) *KLMNJ* is the image of *ABCDE* under a combined transformation **VU**.

Describe in full the transformation

a) **U**,

b) **V**.

ii) It is given that pentagon *KLMNJ* represents a region of area 42.5 m^2.

Calculate the area, in m^2, of the region represented by the shaded region.