CHAPTER 3

Transformations III

PAPER 1

ANALYSIS OF THE 2012 – 2018 SPM PAPERS							
SUBTOPIC	NUMBER OF QUESTIONS						
	2012	2013	2014	2015	2016	2017	2018
3.1 Combination of Two Transformations	–	–	–	–	–	–	1

3.1 Combination of Two Transformations

SPM 2018 Question 9

1 P is a translation $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and Q is a clockwise rotation of 90° about the origin.
State the coordinate of the image of point (2, 5) under the combined transformation PQ.

P ialah satu translasi $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ *dan Q ialah satu putaran 90° ikut arah jam pada asalan.*
Nyatakan koordinat imej bagi titik (2, 5) *di bawah gabungan penjelmaan PQ.*

A (–8, 0)
B (8, 0)
C (3, 1)
D (7, 1)

PAPER 2

ANALYSIS OF THE 2012 – 2018 SPM PAPERS														
SUBTOPIC	NUMBER OF QUESTIONS													
	2012		2013		2014		2015		2016		2017		2018	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
3.1 Combination of Two Transformations	–	1	–	1	–	1	–	1	–	1	–	1	–	1

Section B

3.1 Combination of Two Transformations

SPM 2012 Question 13

1 Diagram 13 shows two points, C and J and three pentagons, K, L and M, drawn on a Cartesian plane.
Rajah 13 *menunjukkan dua titik, C dan J, dan tiga pentagon, K, L dan M, dilukis pada suatu satah Cartesan.*

FORM 5 ADDITIONAL MATHEMATICS

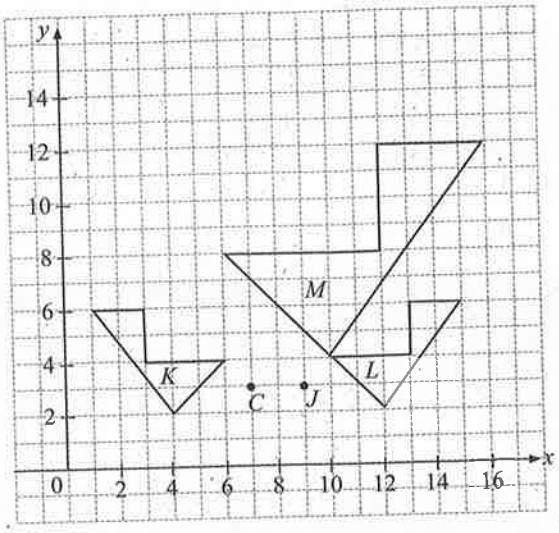


Diagram 13
Rajah 13

(*a*) Transformation **T** is a translation $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$.

Transformation **R** is an anticlockwise rotation of 90° about the centre *C*.
Transformation **P** is a reflection on the line $y = 12$.
State the coordinates of the image of point *J* under the following transformations:

Penjelmaan **T** *ialah satu translasi* $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$.

Penjelmaan **R** *ialah satu putaran* 90° *lawan arah jam pada pusat C.*
Penjelmaan **P** *ialah satu pantulan pada garis* $y = 12$.
Nyatakan koordinat imej di bawah penjelmaan berikut:

(i) **T**,
(ii) **TP**,
(iii) **PR**.

[5 *marks*]
[5 *markah*]

(*b*) (i) *M* is the image of *K* under the combined transformation **WV**.
Describe, in full, the transformation:
M ialah imej bagi K di bawah gabungan penjelmaan **WV**.
Huraikan selengkapnya penjelmaan:
(*a*) **V**,
(*b*) **W**.

(ii) Given *K* represents a region of area 12 m^2, calculate the area, in m^2, of the region represented by *M*.
Diberi bahawa K mewakili suatu kawasan yang mempunyai luas 12 m^2, *hitung luas, dalam* m^2, *kawasan yang diwakili oleh M.*

[7 *marks*]
[7 *markah*]

SPM 2013 Question 13

2 Diagram 13 shows the point $J(1, 2)$ and quadrilaterals $ABCD$ and $EFGH$, drawn on a Cartesian plane.
Rajah 13 menunjukkan titik $J(1, 2)$ dan sisi empat $ABCD$ dan sisi empat $EFGH$, dilukis pada suatu satah Cartesan.

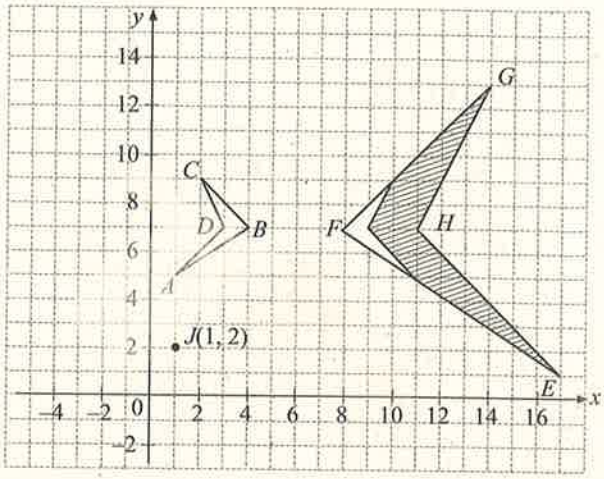


Diagram 13
Rajah 13

(*a*) Transformation **T** is a translation $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$.

Transformation **U** is a clockwise rotation of 90° about the origin.
Transformation **R** is a reflection at the line $x = 3$.
State the coordinates of the image of point J under the following transformations:
Penjelmaan **T** *ialah satu translasi* $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$.

Penjelmaan **U** *ialah satu putaran 90° ikut arah jam pada asalan.*
Penjelmaan **R** *ialah satu pantulan pada garis $x = 3$.*
Nyatakan koordinat imej bagi titik J di bawah penjelmaan berikut:
(i) **RU**,
(ii) **TR**.

[4 *marks*]
[4 *markah*]

(*b*) $EFGH$ is the image of $ABCD$ under the combined transformation **MN**.
Describe in full, the transformation:
$EFGH$ ialah imej bagi $ABCD$ di bawah gabungan penjelmaan **MN**.
Huraikan selengkapnya penjelmaan:
(i) **N**,
(ii) **M**.

[5 *marks*]
[5 *markah*]

(*c*) It is given that quadrilateral $ABCD$ represents a region of area 18 m².
Calculate the area, in m², of the shaded region.
Diberi bahawa sisi empat $ABCD$ mewakili suatu kawasan yang mempunyai luas 18 m².
Hitung luas, dalam m², *kawasan yang berlorek.*

[3 *marks*]
[3 *markah*]

FORM 5

SPM 2014 Question 13

3 (*a*) Diagram 13.1 shows point *A* and point *B* marked on a Cartesian plane.
Rajah 13.1 *menunjukkan titik A dan titik B ditanda pada suatu satah Cartes.*

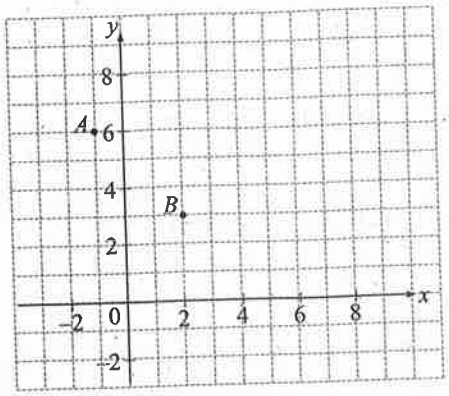


Diagram 13.1
Rajah 13.1

Transformation **T** is a translation $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$.

Transformation **R** is a rotation of 90°, clockwise about the centre *B*.
State the coordinates of the image of point *A* under each of the following transformations:

Penjelmaan **T** *ialah satu translasi* $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$.

Penjelmaan **R** *ialah satu putaran* 90°, *ikut arah jam pada pusat B.*
Nyatakan koordinat imej bagi titik A di bawah setiap penjelmaan berikut:

(i) **RT**, (ii) $\mathbf{R}^2$. [4 *marks*] [4 *markah*]

(*b*) Diagram 13.2 shows three trapeziums *ABCD*, *PQRS* and *TUVS*, drawn on a Cartesian plane.
Rajah 13.2 *menunjukkan tiga trapezium ABCD, PQRS dan TUVS, dilukis pada suatu satah Cartes.*

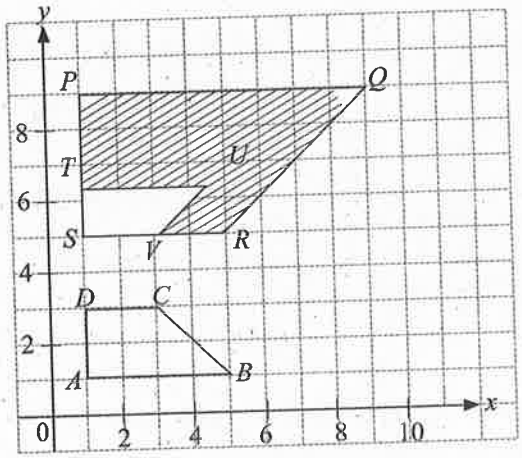


Diagram 13.2
Rajah 13.2

(i) Trapezium *PQRS* is the image of trapezium *ABCD* under the combined transformation **MN**.
Describe in full, the transformation:
Trapezium PQRS ialah imej bagi trapezium ABCD di bawah gabungan penjelmaan **MN**.
Huraikan selengkapnya penjelmaan:
(*a*) **N**,
(*b*) **M**.

(ii) It is given that trapezium *ABCD* represents a region of area 30 m^2.
Calculate the area, in m^2, of the shaded region.
Diberi bahawa trapezium ABCD mewakili suatu kawasan yang mempunyai luas 30 m^2.
Hitung luas, dalam m^2, *kawasan yang berlorek.*

[8 *marks*]
[8 *markah*]

SPM 2015 Question 13

4 (*a*) Diagram 13.1 shows point $Q(0, 3)$ marked on a Cartesian plane.
Rajah 13.1 *menunjukkan titik* $Q(0, 3)$ *ditanda pada suatu satah Cartes.*

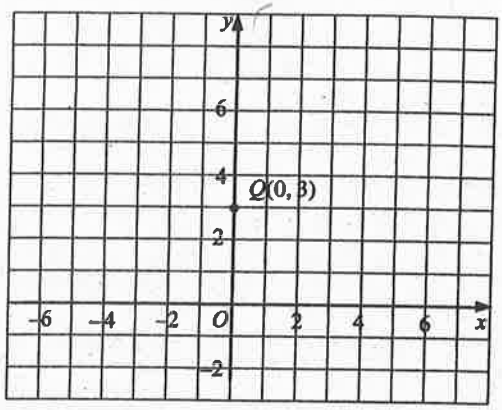


Diagram 13.1
Rajah 13.1

Transformation **T** is a translation $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$.

Transformation **R** is a rotation of 90°, anticlockwise about the centre *O*.
State the coordinates of the image of point *Q* under each of the following transformations:
Penjelmaan **T** *ialah satu translasi* $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$.

Penjelmaan **R** *ialah satu putaran* 90°, *lawan arah jam pada pusat O.*
Nyatakan koordinat imej bagi titik Q di bawah setiap penjelmaan berikut:
(i) **RT**,
(ii) **TR**.

[4 *marks*]
[4 *markah*]

(*b*) Diagram 13.2 shows three irregular pentagons *ABCDE*, *FJPHG* and *FNMLK*, drawn on a Cartesian plane.
Rajah 13.2 *menunjukkan tiga pentagon tak sekata ABCDE, FJPHG dan FNMLK, dilukis pada suatu satah Cartes.*

FORM 5

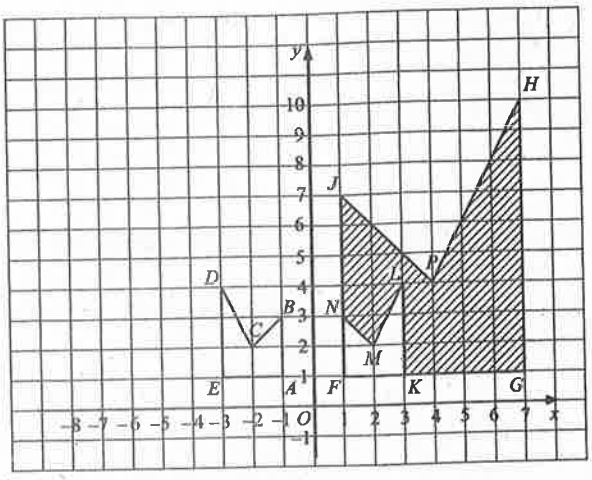


Diagram 13.2
Rajah 13.2

(i) Irregular pentagon *FJPHG* is the image of irregular pentagon *ABCDE* under the combined transformation **VU**.
Describe in full, the transformation:
Pentagon tak sekata FJPHG ialah imej bagi pentagon tak sekata ABCDE di bawah gabungan penjelmaan **VU**.
Huraikan selengkapnya penjelmaan:
(*a*) **U**;
(*b*) **V**.

[5 *marks*]
[5 *markah*]

(ii) It is given that irregular pentagon *ABCDE* represents a region of area 24 m^2. Calculate the area, in m^2, of the shaded region.
Diberi bahawa pentagon tak sekata ABCDE mewakili suatu kawasan yang mempunyai luas 24 m^2. *Hitung luas, dalam* m^2, *kawasan yang berlorek.*

[3 *marks*]
[3 *markah*]

SPM 2016 Question 13

5 Diagram 13.1 shows three triangles *CAB*, *FDE* and *CGB*, drawn on a Cartesian plane.
Rajah 13.1 *menunjukkan tiga segi tiga CAB, FDE dan CGB, dilukis pada suatu satah Cartes.*

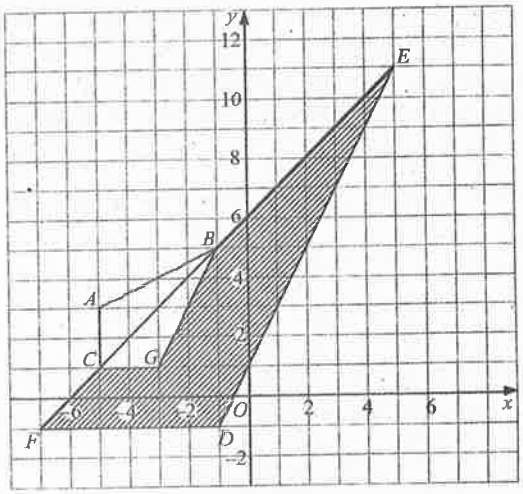


Diagram 13.1
Rajah 13.1

(*a*) Transformation **R** is a rotation of 90°, clockwise about the centre *O*.
Transformation **T** is a translation $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$.

State the coordinates of the image of point *A* under each of the following transformations:
Penjelmaan **R** *ialah satu putaran* 90°, *ikut arah jam pada pusat O.*
Penjelmaan **T** *ialah satu translasi* $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$.
Nyatakan koordinat imej bagi titik A di bawah setiap penjelmaan berikut:
(i) $\mathbf{T}^2$,
(ii) **TR**.

[4 *marks*]
[4 *markah*]

(*b*) (i) Triangle *FDE* is the image of triangle *CAB* under the combined transformation **MN**.
Describe in full, the transformation:
Segi tiga FDE ialah imej bagi segi tiga CAB di bawah gabungan penjelmaan **MN**.
Huraikan selengkapnya penjelmaan:
(*a*) **N**,
(*b*) **M**.

(ii) It is given that triangle *CAB* represents a region of an area 15 m².
Calculate the area, in m², of the shaded region.
Diberi bahawa segi tiga CAB mewakili suatu kawasan yang mempunyai luas 15 m².
Hitung luas, dalam m², *kawasan berlorek.*

[8 *marks*]
[8 *markah*]

SPM 2017 Question 13

6 (*a*) Diagram 7.1 shows *K*(5, 1) drawn on a Cartesian plane.
Rajah 7.1 *menunjukkan K*(5, 1) *dilukis pada suatu satah Cartes.*

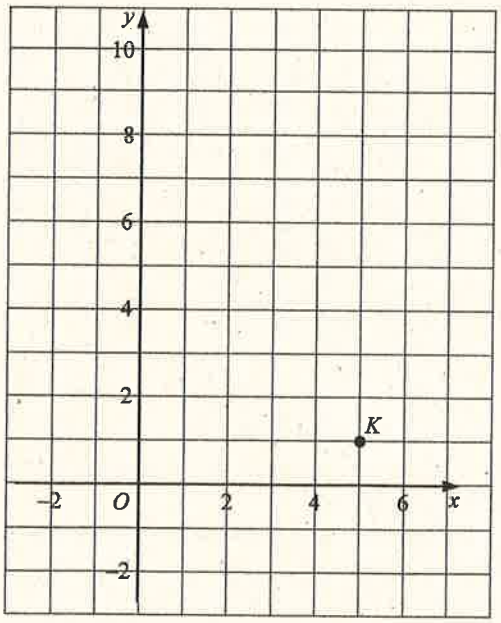


Diagram 7.1
Rajah 7.1

Transformation **T** is a translation $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$.

Transformation **P** is a reflection in the line $y = 2$.

State the coordinates of the images of point K under each of the following transformations:

Penjelmaan **T** *ialah translasi* $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$.

Penjelmaan **P** *ialah pantulan pada garis* $y = 2$.

Nyatakan koordinat imej bagi titik K di bawah setiap penjelmaan berikut.

(i) $\mathbf{T}^2$

(ii) **TP**

[4 *marks*]
[4 *markah*]

(*b*) Diagram 7.2 shows two pentagons *KLMNP* and *QRSTU*, drawn on a Cartesian plane.
Rajah 7.2 *menunjukkan dua pentagon KLMNP dan QRSTU dilukis pada suatu satah Cartes.*

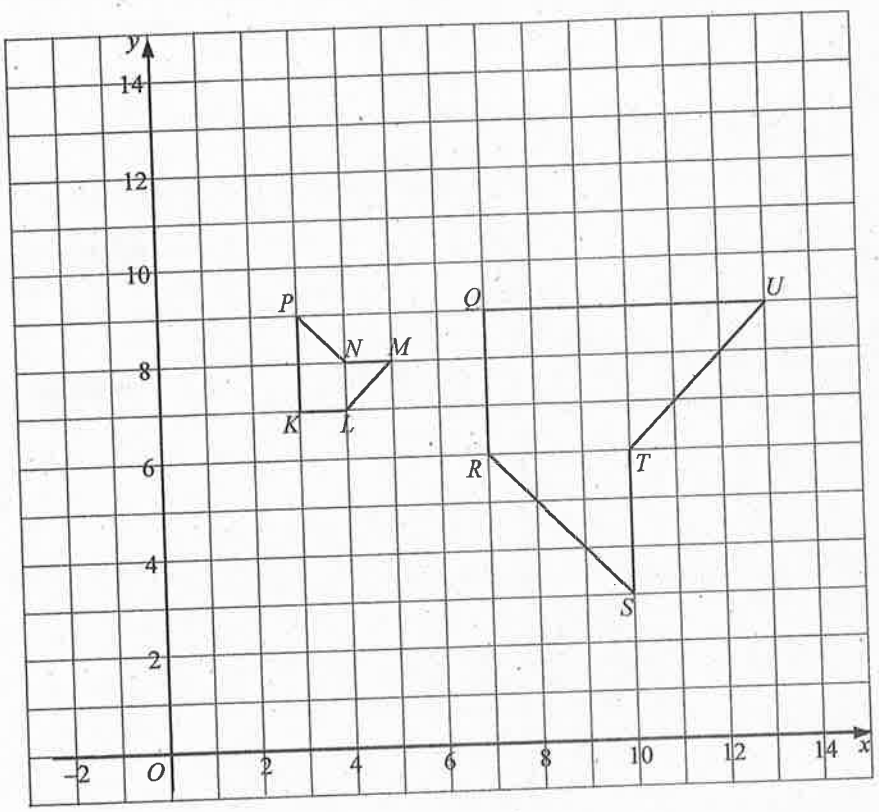


Diagram 7.2
Rajah 7.2

(i) Pentagon *QRSTU* is the image of pentagon *KLMNP* under the combined transformation **WV**.
Describe in full the transformation:
Pentagon QRSTU ialah imej bagi pentagon KLMNP di bawah gabungan penjelmaan **WV**.
Huraikan selengkapnya penjelmaan:
(*a*) **V**,
(*b*) **W**.

(ii) It is given that the pentagon *QRSTU* represents a region with an area 90 m^2.
Calculate the area,in m^2, of pentagon *KLMNP*.
Diberi bahawa pentagon QRSTU mewakili suatu kawasan yang mempunyai luas 90 m^2.
Hitung luas , dalam m^2, *pentagon KLMNP.*

[8 *marks*]
[8 *markah*]

SPM 2018 Question 13

7 (*a*) Diagram 9.1 shows point *P* on a Cartesian plane.
Rajah 9.1 *menunjukkan titik P pada suatu satah Cartes.*

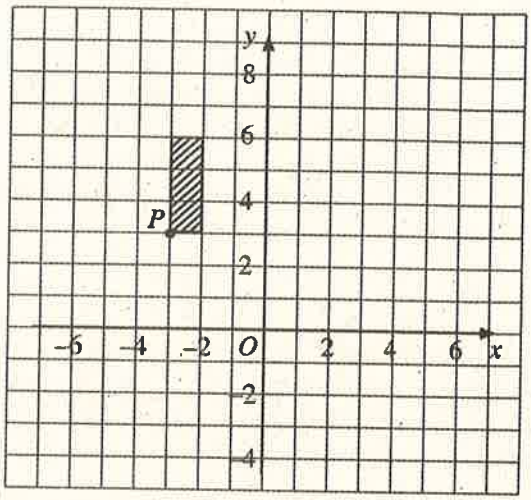


Diagram 9.1
Rajah 9.1

Transformation **T** is a translation $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$.
Transformation **S** is an enlargement about the centre (–5, 2) with a scale factor 2.
State the coordinates of the image of point *P* under the following transformations:
Penjelmaan **T** *ialah satu translasi* $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$.
Penjelmaan **S** *ialah satu pembesaran pada pusat* (–5, 2) *dengan faktor skala* 2.
Nyatakan koordinat imej bagi titik P di bawah penjelmaan berikut:

(i) **T**^{2},

(ii) **TS.**

[4 *marks*]
[4 *markah*]

FORM 5

(*b*) Diagram 9.2 shows geometrical shapes *KLMNP*, *KSRQP* and *KTUVW*, drawn on a Cartesian plane.
Rajah 9.2 *menunjukkan bentuk geometri KLMNP*, *KSRQP dan KTUVW, dilukis pada suatu satah Cartes.*

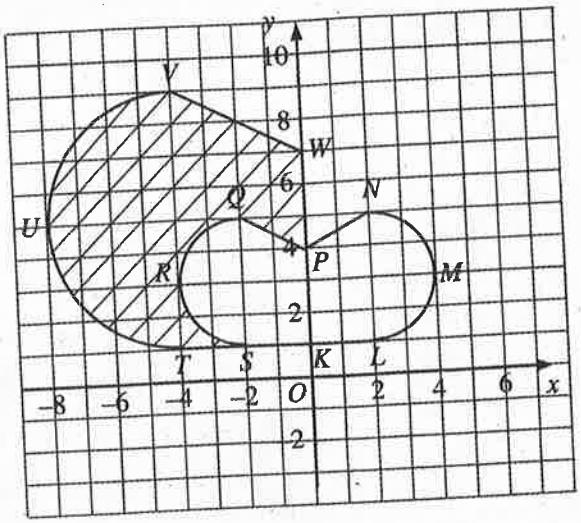


Diagram 9.2
Rajah 9.2

(i) *KTUVW* is the image of *KLMNP* under the combined transformation **YZ**.
Describe, in full, the transformation:
KTUVW ialah imej bagi KLMNP di bawah gabungan penjelmaan **YZ**.
Huraikan selengkapnya penjelmaan:
(*a*) **Z**,
(*b*) **Y**.

(ii) It is given that *KSRQP* represents a region of area 30 m^2.
Calculate the area,in m^2, of the shaded region.
Diberi bahawa KSRQP mewakili suatu kawasan yang mempunyai luas 30 m^2.
Hitung luas , dalam m^2, *kawasan yang berlorek.*

[8 *marks*]
[8 *markah*]

P(translation)

$$\begin{pmatrix}5\\-2\end{pmatrix}+\begin{pmatrix}-2\\3\end{pmatrix}=\begin{pmatrix}3\\1\end{pmatrix}$$

Paper 2

Section B

1 (*a*) (i) $J(9, 3) \xrightarrow{\mathbf{T}} (11, 2)$

(ii) $J(9, 3) \xrightarrow{\mathbf{P}} (9, 21) \xrightarrow{\mathbf{T}} (11, 20)$

(iii) $J(9, 3) \xrightarrow{\mathbf{R}} (7, 5) \xrightarrow{\mathbf{P}} (7, 19)$

(*b*) (i) (*a*) **V**: A reflection in the line $x = 8$

(*b*) **W**: An enlargement of scale factor 2 with centre (14, 0)

(ii) Area of region $M = 2^2 \times 12 = 48$ m²

2 (*a*) (i) $J(1, 2) \xrightarrow{\mathbf{U}} (2, -1) \xrightarrow{\mathbf{R}} (4, -1)$

(ii) $J(1, 2) \xrightarrow{\mathbf{R}} (5, 2) \xrightarrow{\mathbf{T}} (7, 5)$

(*b*) (i) **N**: A reflection in the line $x = 6$

(ii) **M**: An enlargement of scale factor 3 with the centre (8, 7)

(*c*) Area of $EFGH = 3^2 \times 18$

$= 162$

Area of shaded region $= 162 - 18 = 144$ m²

3 (*a*) (i) $A(-1, 6) \xrightarrow{\mathbf{T}} (4, 4) \xrightarrow{\mathbf{R}} (3, 1)$

Image is (3, 1)

(ii) $A(-1, 6) \xrightarrow{\mathbf{R}} (5, 6) \xrightarrow{\mathbf{R}} (5, 0)$

Image is (5, 0)

(*b*) (i) (*a*) **N** is a reflection in the line $y = 4$

(*b*) **M** is an enlargement from the centre $S(1, 5)$ and a scale factor of 2.

(ii) Area of image $PQRS$

$= k^2 \times$ Area of object $TUVS$

$= 2^2 \times 30$

$= 120$ m²

Area of shaded region $= 120 - 30$

$= 90$ m²

Review:

(*a*) (i) Carry out transformation **T** first and then follow by transformation **R**

(ii) Carry out transformation **R** twice.

(*b*) (i) (*a*) $ABCD$ is reflected in the line $y = 4$ and $TUVS$ is the image

(*b*) $TUVS$ is enlarged from the centre S with a scale factor of 2

(ii) Use the formula:

Area of image $= k^2 \times$ area of object

4 (*a*) (i) $Q(0, 3) \xrightarrow{\mathbf{T}} (2, 6) \xrightarrow{\mathbf{R}} (-6, 2)$

Final image is (−6, 2)

CHAPTER 3 Transformation III

Paper 1

1 C

Review: $Q(90°$, clockwise rotation)

$$\begin{pmatrix}2\\5\end{pmatrix} \rightarrow \begin{pmatrix}5\\-2\end{pmatrix}$$

1st quadrant $(+x, +y)$ 4th quadrant $(+x, -y)$

(ii) $Q(0, 3) \xrightarrow{\mathbf{R}} (-3, 0) \xrightarrow{\mathbf{T}} (-1, 3)$
Final image is $(-1, 3)$

(*b*) (i) (*a*) **U** is a reflection in the *y*-axis
(*b*) **V** is an enlargement from the centre F $(1, 1)$ and a scale factor of 3.

(ii) Area of image $= k^2 \times$ Area of object
Area of $FJPHG = 3^2 \times$ Area of $ABCDE$
$= 9 \times 24\ cm^2$
$= 216\ cm^2$
Area of shaded region $= 216\ cm^2 - 24\ cm^2$
$= 192\ cm^2$

Review:

(*a*) (i) $Q(0, 3) \xrightarrow{\mathbf{T}}$ Image 1 $\xrightarrow{\mathbf{R}}$ Image 2

(ii) $Q(0, 3) \xrightarrow{\mathbf{R}}$ Image 1 $\xrightarrow{\mathbf{T}}$ Image 2

(*b*) (i) (*a*) *ABCDE* is reflected in the *y*-axis.
(*b*) *FNMLK* is enlarged from the centre *F*.

(ii) Use the formula:
Area of image = $k^2 \times$ Area of object

5 (*a*) (i) $(-5, 3) \xrightarrow{\mathbf{T}} (-3, 7) \xrightarrow{\mathbf{T}} (-1, 11)$
Final image is $(-1, 11)$

(ii) $(-5, 3) \xrightarrow{\mathbf{R}} (3, 5) \xrightarrow{\mathbf{T}} (5, 9)$
Final image is $(5, 9)$

(*b*) (i) $CAB \xrightarrow{\mathbf{N}} CGB \xrightarrow{\mathbf{M}} FDE$
(*a*) **N** is a reflection in the line $FCBE$.
(*b*) **M** is an enlargement. The centre of enlargement is $(-4, 2)$ and the scale factor is 3.

(ii) Area of $FDE = k^2 \times$ Area of CAB
$= 3^2 \times 15\ cm^2$
$= 135\ cm^2$
Area of shaded region
= Area of FDE – Area of CGB
$= 135 - 15\ cm^2$
$= 120\ cm^2$

Review:

(*a*) (i) $(-5, 3) \xrightarrow{\mathbf{T}}$ Image 1 $\xrightarrow{\mathbf{T}}$ Final image

(ii) $(-5, 3) \xrightarrow{\mathbf{R}}$ Image 1 $\xrightarrow{\mathbf{T}}$ Final image

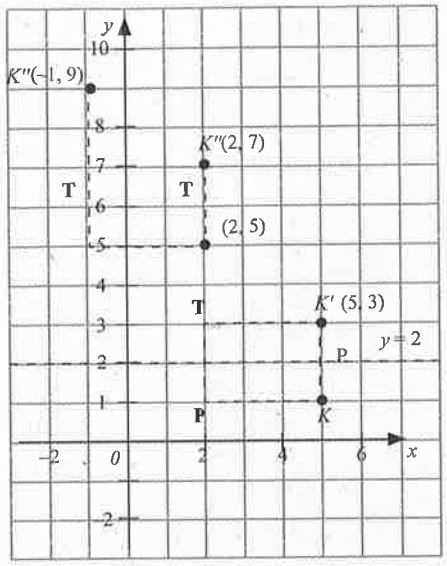
(*b*) (i) **N** is a reflection and **M** is an enlargement.

(ii) Area of $FDE = k^2 \times$ Area of CAB
Area of shaded region = Area of FDE – Area of CGB

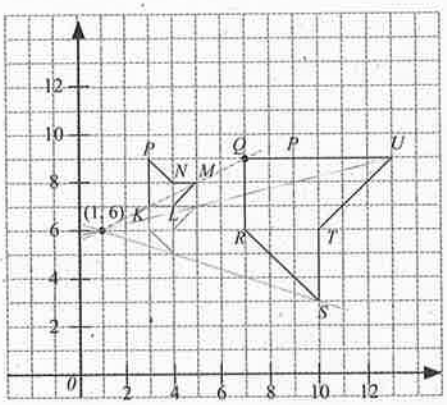
6 (*a*) (i) **T²**, **TT**, $K(5, 1) \xrightarrow{\mathbf{T}}$

$K'(2, 5) \xrightarrow{\mathbf{T}} K''(-1, 9)$

(ii) **TP**, $K(5, 1) \xrightarrow{\mathbf{P}} K'(5.3) \xrightarrow{\mathbf{T}} K''(2, 7)$



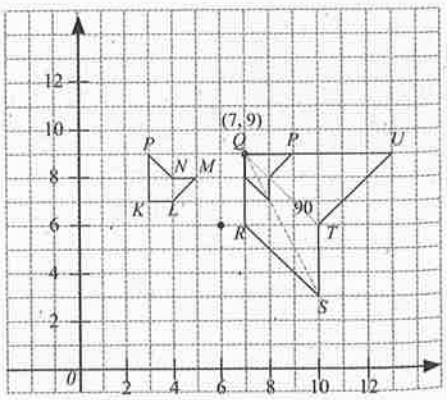
(*b*) (i) Solution 1



(*a*) **V** = 90° rotation in clockwise direction at midpoint $K(3, 7)$

(*b*) **W** = enlargement at midpoint (1, 6) with scale factor = 3

Solution 2



(*a*) **V** = 90° rotation in clockwise direction at midpoint (6, 6)

(*b*) **W** = enlargement at midpoint (7, 9) with scale factor = 3

(ii) Area, 90 m² = 3² × area of object

$$\text{Area } KLMNP = \frac{90}{9} = 10 \text{ m}^2$$

Review:

(*a*) (i) $K(5, 1) \longrightarrow$ Image 1 $\longrightarrow$ Final image 1

(ii) $K(5, 1) \longrightarrow$ Image 1 $\longrightarrow$ Final image 2

(*b*) (i) (*a*) **V** is an 90° rotation clockwise at midpoint (6, 6)

(*b*) **W** is an enlargement at point (7, 9) with scale factor 3

Other solution:

(*a*) **V** is an 90° rotation clockwise at point (3, 7)

(*b*) **W** is an enlargement at point (1, 6) with scale factor 3

(ii) Area of *QUTSR* = k^2 × Area of *KLMNP*

$$\text{Area of } KLMNP = \frac{90 \text{ m}^2}{3^2}$$

7 (*a*) (i) $\begin{pmatrix} -3 \\ 3 \end{pmatrix} \xrightarrow{\mathbf{T}} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \xrightarrow{\mathbf{T}} \begin{pmatrix} 5 \\ -3 \end{pmatrix}$

Thus, image of point *P* under the transformations $\mathbf{T}^2$ is (5, –3)

(ii) $\begin{pmatrix} -3 \\ 3 \end{pmatrix} \xrightarrow{\mathbf{S}} \begin{pmatrix} -1 \\ 4 \end{pmatrix} \xrightarrow{\mathbf{T}} \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

Thus, image of point *P* under the transformations **TS** is (3, 1)

(*b*) (i) (*a*) **Z** = Reflection in the line $x = 0$

(*b*) **Y** = Enlargement with the centre at (0, 0) and a scale factor of 2.

(ii) Area of *KTUVW* = Area of *KSRQP* × 2^2

= 30 × 2^2

= 120 m²

Area of shaded region

= Area of *KTUVW* – Area of *KSRQP*

= 120 – 30

= 90 m²

Alternative method:

(*a*) (i) Object + $\mathbf{T}_1$ = Image (1)

$$\begin{pmatrix} -3 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ -3 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

Image + $\mathbf{T}_2$ = Image (2)

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix} + \begin{pmatrix} 4 \\ -3 \end{pmatrix} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$$

(ii) Centre + **S** + **S** = Image (1)

$$\begin{pmatrix} -5 \\ 2 \end{pmatrix} + \begin{pmatrix} 2 \\ 1 \end{pmatrix} + \begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$

Image (1) + **T** = Image (2)

$$\begin{pmatrix} -1 \\ 4 \end{pmatrix} + \begin{pmatrix} 4 \\ -3 \end{pmatrix} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

Note: **S** $\begin{pmatrix} x \\ y \end{pmatrix}$ value from the center to object

(*b*) (i) **Z** = Enlargement at the centre (0, 0) with scale factor 2.

Y = Reflection in the line $x = 0$ or

Y = Reflection in the *y*-axis.

(ii) Area of *KTUVW* = k^2 × Area of *KSRQP*