

JAWAPAN

BAB
11

Transformasi Isometri Isometric Transformations

1.

	Apabila objek When an object is	Bentuk Shape	Saiz Size	Kedudukan Position	Orientasi Orientation
(a)	diputar/ <i>rotated</i>	X	X	✓	X
(b)	dialihkan/ <i>diverted</i>	X	X	✓	X
(c)	diterbalikkan/ <i>overturned</i>	X	X	✓	✓
(d)	dibesarkan/ <i>enlarged</i>	X	✓	✓	X
(e)	dikecilkan/ <i>reduced</i>	X	✓	✓	X

2. (a)

Imej yang terhasil mempunyai
bentuk _____ dan _____ saiz _____ yang sama
dengan objek.
*Image produced has the same _____ shape _____ and
_____ size _____ with the object.*

Maka, imej dan objek adalah _____ kongruen _____.
Thus, the image and the object are _____ congruent _____.

(b)

Imej yang terhasil mempunyai bentuk
yang _____ sama _____ tetapi _____ saiz _____
yang berbeza dengan objek.
*Image produced has the _____ same _____ shape but
different _____ size _____ with the object.*

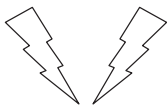
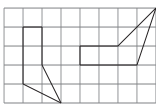
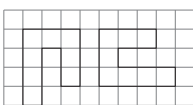
Maka, imej dan objek adalah _____ serupa _____.
Thus, the image and the object are _____ similar _____.

- padanan satu-dengan-satu antara titik-titik bagi objek dan imej dalam satu satah.
one-to-one correspondence between points of object and image in a plane.
- suatu pergerakan dengan orientasi dan padanan yang tertentu tanpa mengubah bentuk.
a movement with a specific orientation and match without changing the shape.

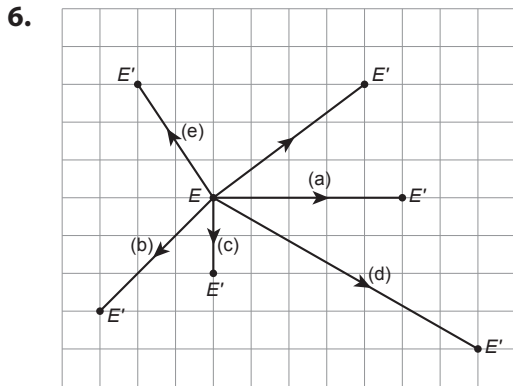
3.

	Objek/ Object	Imej/ Image
(a)	Titik B/ Point B	Titik F/ Point F
(b)	Garis AI/ Line AI	Garis GH/ Line GH
(c)	$\angle BCD$	$\angle FED$
(d)	Titik A/ Point A	Titik G/ Point G
(e)	Garis AB/ Line AB	Garis FG/ Line FG

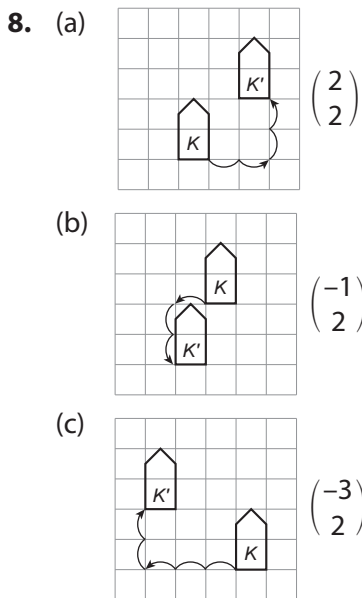
4.

Objek / Object	Kekongruenan / Congruency	Sebab / Reason
	Kongruen <i>Congruent</i>	Bentuk dan saiz adalah sama. <i>Shape and size are the same.</i>
	Bukan kongruen <i>Not congruent</i>	Bentuk adalah berbeza. <i>Shape is different.</i>
	Kongruen <i>Congruent</i>	Bentuk dan saiz adalah sama. <i>Shape and size are the same.</i>

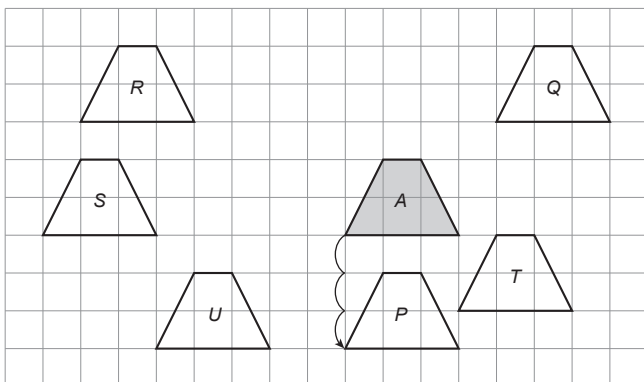
5. (a) Bukan translasi
Not a translation
- (b) Translasi
A translation
- (c) Translasi
A translation



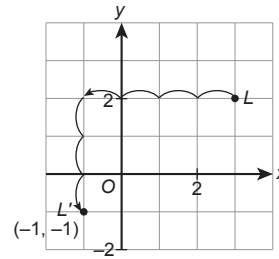
7. (a) $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$
- (b) $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$
- (c) $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$



9.



10. (a)



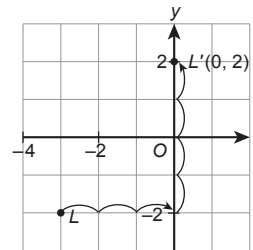
(b) $L' = (3 + 0, -5 + (-1))$
 $= (3, -6)$

$\therefore L'(3, -6)$

(c) $\begin{pmatrix} 1 \\ -2 \end{pmatrix} + \begin{pmatrix} 4 \\ -5 \end{pmatrix} = \begin{pmatrix} 1+4 \\ -2+(-5) \end{pmatrix}$
 $= \begin{pmatrix} 5 \\ -7 \end{pmatrix}$

$\therefore L'(5, -7)$

(d)



(e) $L' = (2 + 2, 5 + (-4))$
 $= (4, 1)$

$\therefore L'(4, 1)$

(f) $\begin{pmatrix} -6 \\ 3 \end{pmatrix} + \begin{pmatrix} -1 \\ -2 \end{pmatrix} = \begin{pmatrix} -6+(-1) \\ 3+(-2) \end{pmatrix}$
 $= \begin{pmatrix} -7 \\ 1 \end{pmatrix}$

$\therefore L'(-7, 1)$

11. (a) $M = (5 - 8, -2 - (-5))$
 $= (-3, 3)$

(b) $M = (-7 - (-9), -3 - (-6))$
 $= (2, 3)$

(c) $M = (3 - (-5), 3 - 5)$
 $= (8, -2)$

(d) $M = (4 - 7, 0 - 3)$
 $= (-3, -3)$

(e) $M = (7 - 9, -3 - (-4))$
 $= (-2, 1)$

(f) $M = (5 - 10, 2 - 6)$
 $= (-5, -4)$

12. (a) Vektor translasi
Translation vector

$= \begin{pmatrix} 4 - (-9) \\ 4 - (-3) \end{pmatrix} = \begin{pmatrix} 13 \\ 7 \end{pmatrix}$



- (b) Vektor translasi

Translation vector

$$= \begin{pmatrix} 9 - (-1) \\ 2 - 7 \end{pmatrix} = \begin{pmatrix} 10 \\ -5 \end{pmatrix}$$

- (c) Vektor translasi

Translation vector

$$= \begin{pmatrix} 12 - 2 \\ -1 - (-5) \end{pmatrix} = \begin{pmatrix} 10 \\ 4 \end{pmatrix}$$

- (d) Vektor translasi

Translation vector

$$= \begin{pmatrix} 14 - 0 \\ 8 - 3 \end{pmatrix} = \begin{pmatrix} 14 \\ 5 \end{pmatrix}$$

- (e) Vektor translasi

Translation vector

$$= \begin{pmatrix} -7 - 4 \\ 6 - (-3) \end{pmatrix} = \begin{pmatrix} -11 \\ 9 \end{pmatrix}$$

- (f) Vektor translasi

Translation vector

$$= \begin{pmatrix} -10 - 4 \\ -5 - 3 \end{pmatrix} = \begin{pmatrix} -14 \\ -8 \end{pmatrix}$$

13. (a) $(-6 + a, -2 + b) = (1, 0)$

$$-6 + a = 1, \quad -2 + b = 0$$

$$a = 7, \quad b = 2$$

$$\therefore \text{Translasi / Translation: } \begin{pmatrix} 7 \\ 2 \end{pmatrix}$$

Maka, koordinat N

Hence, the coordinates of N

$$= (5 - 7, 10 - 2)$$

$$= (-2, 8)$$

- (b) $(18 + a, -15 + b) = (12, -10)$

$$18 + a = 12, \quad -15 + b = -10$$

$$a = -6, \quad b = 5$$

$$\text{Translasi / Translation: } \begin{pmatrix} -6 \\ 5 \end{pmatrix}$$

Maka, koordinat T'

Hence, the coordinates of T'

$$= (-11 + (-6), 12 + 5)$$

$$= (-17, 17)$$

- (c) Vektor translasi / Translation vector

$$= \begin{pmatrix} -3 - (-1) \\ 2 - (-2) \end{pmatrix}$$

$$= \begin{pmatrix} -2 \\ 4 \end{pmatrix}$$

Katakan kedudukan asal gerai G ialah (x, y)

Let the initial position of stall G be (x, y)

$$(x, y) = (1 - (-2), 1 - 4)$$

$$= (3, -3)$$

$$\therefore G(3, -3)$$

- (d) Koordinat rumah Hairul

Coordinates of Hairul's house

$$= [3 - (-6), 7 - 3]$$

$$= (9, 4)$$

Koordinat rumah Rizam

Coordinates of Rizam's house

$$= [3 - 6, 7 - (-2)]$$

$$= (-3, 9)$$

$$(9 + a, 4 + b) = (-3, 9)$$

$$9 + a = -3, \quad 4 + b = 9$$

$$a = -12, \quad b = 5$$

$$\therefore \text{Translasi / Translation: } \begin{pmatrix} -12 \\ 5 \end{pmatrix}$$

14. (a) Objek dan imej mempunyai bentuk dan saiz yang sama, tetapi berbeza orientasi.

Object and image have the same shape and size, but different orientation.

- (b) Kedudukan objek adalah bertentangan dengan imej pada paksi pantulan.

Position of object is opposite with the image on the axis of reflection.

- (c) Jarak objek dan jarak imej daripada paksi pantulan adalah sama panjang dan berserenjang dengan paksi pantulan.

The object distance and image distance from the axis of reflection are the same length and perpendicular to the axis of reflection.

- (d) Kedudukan imej bagi titik pada paksi pantulan adalah tidak berubah.

Position of the image of a point on the axis of reflection does not change.

15. (a) Bukan pantulan

Not a reflection

- (b) Pantulan

A reflection

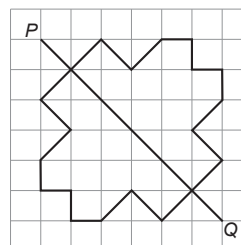
- (c) Bukan pantulan

Not a reflection

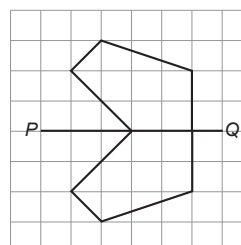
- (d) Pantulan

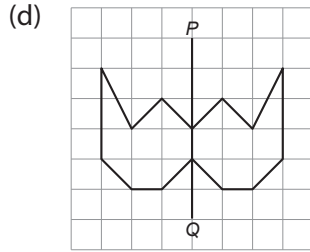
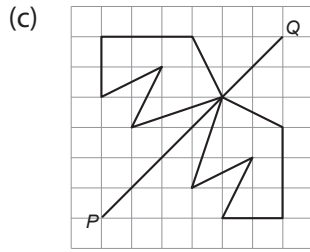
A reflection

16. (a)

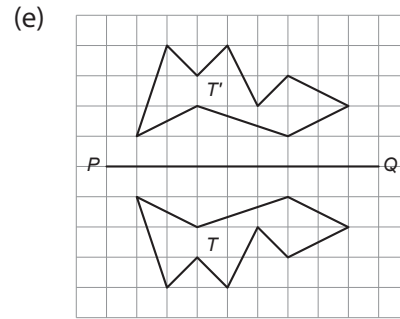
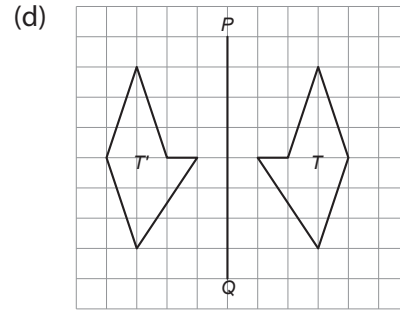
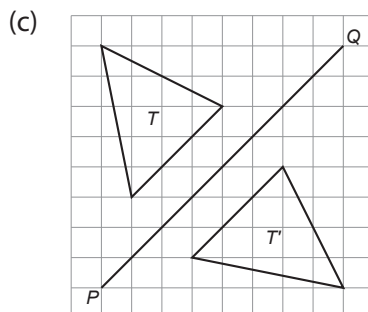
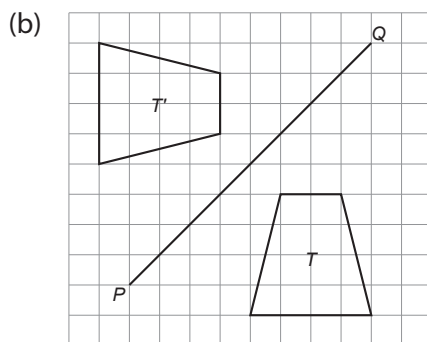
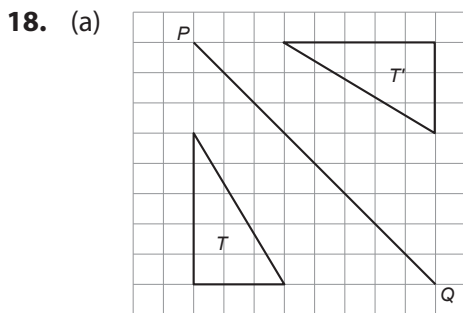


- (b)

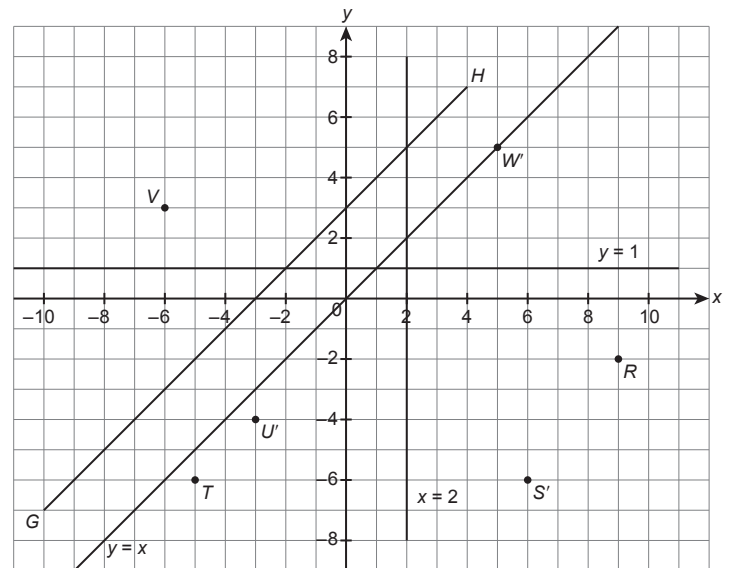




17. (a) Pantulan pada garis MN .
Reflection in the line MN .
- (b) Pantulan pada paksi-y.
Reflection in the y -axis.
- (c) Pantulan pada garis $y = x$.
Reflection in the line $y = x$.
- (d) Pantulan pada garis $x = 5$.
Reflection in the line $x = 5$.
- (e) Pantulan pada garis $y = -2$.
Reflection in the line $y = -2$.



19.



Pantulan pada Reflection in the	Koordinat Coordinates
paksi-x x -axis	Imej bagi R / Image of R $= (9, 2)$
paksi-y y -axis	Objek bagi S' / Object of S' $= (-6, -6)$
garis GH line GH	Imej bagi T / Image of T $= (-9, -2)$
$y = 1$	Objek bagi U' / Object of U' $= (-3, 6)$
$x = 2$	Imej bagi V / Image of V $= (10, 3)$
$y = x$	Objek bagi W' / Object of W' $= (5, 5)$



20. (a) (i) Pantulan pada garis OR dan diikuti dengan pantulan pada garis OQ .
Reflection in the line OR and followed by reflection in the line OQ .

- (ii) Pantulan pada garis OS dan diikuti dengan pantulan pada garis OP .
Reflection in the line OS and followed by reflection in the line OP .

- (b) Koordinat- x bagi titik M dan titik M' adalah sama. Maka, paksi pantulan adalah garis yang selari dengan paksi- x .

x -coordinates of point M and point M' are the same. Thus, the axis of reflection is a line parallel to the x -axis.

Jarak di antara titik M dan M' dengan paksi pantulan.

$$\text{Distance between points } M \text{ and } M' \text{ with axis of reflection} \\ = \frac{5 - (-1)}{2} = 3$$

Jarak di antara M dengan paksi pantulan

Distance between M and axis of reflection

$$= -1 + 3 = 2$$

Jarak di antara M' dengan paksi pantulan

Distance between M' and axis of reflection

$$= 5 - 3 = 2$$

Maka, transformasi itu ialah pantulan pada garis $y = 2$.

Thus, the transformation is reflection in the line $y = 2$.

Koordinat objek N

Coordinates of object N

$$= (7, 2)$$

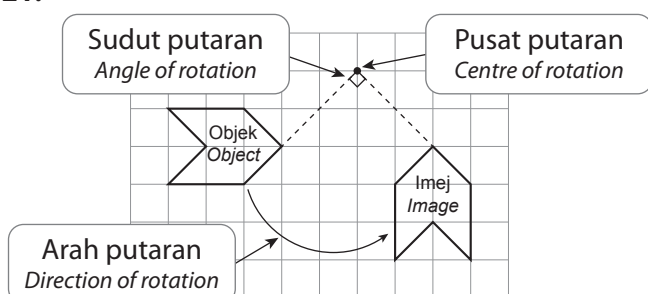
Objek dan imej pada paksi pantulan.
Object and image on the axis of reflection.

$$\begin{aligned} \text{(c) } \angle PSC &= \angle QRS & x &= \angle PSC + \angle TSC \\ &= 180^\circ - 135^\circ & &= 45^\circ + 45^\circ \\ &= 45^\circ & &= 90^\circ \end{aligned}$$

$$\begin{aligned} \angle TSC &= \angle PSC & y &= \angle QRD \\ &= 45^\circ & &= \angle PQR \\ & & &= 135^\circ \end{aligned}$$

$$\begin{aligned} \text{(d) } \angle MQP &= \angle MQK & y &= \angle LMR = \angle KLM \\ &= 180^\circ - 130^\circ & &= 140^\circ \\ &= 50^\circ & & \\ x &= \angle MQP + \angle KQM & x + y &= 100^\circ + 140^\circ \\ &= 50^\circ + 50^\circ & &= 240^\circ \\ &= 100^\circ & & \end{aligned}$$

21.



- Objek dan imej mempunyai bentuk, saiz dan orientasi yang sama.

Object and image have the same shape, size and orientation.

- Pusat putaran ialah satu titik pegun.

Centre of rotation is a stationary point.

- Jarak semua titik objek ke pusat putaran adalah sama dengan jarak titik imej yang sepadan ke pusat putaran.

The distance of all the points of objects to the centre of rotation are equal to the distance of the corresponding points of image to the centre of rotation.

22. (a) Putaran

A rotation

- (b) Putaran

A rotation

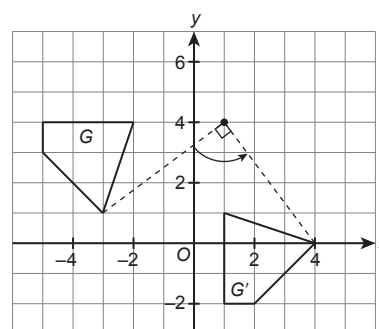
- (c) Bukan putaran

Not a rotation

- (d) Putaran

A rotation

23. (a)



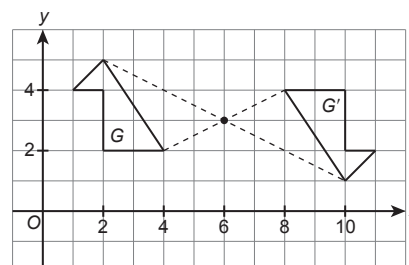
Putaran 90° lawan arah jam pada pusat $(1, 4)$.

Rotation of 90° anticlockwise about the centre $(1, 4)$.

- (b) Putaran 90° ikut arah jam pada titik P .

Rotation of 90° clockwise about point P .

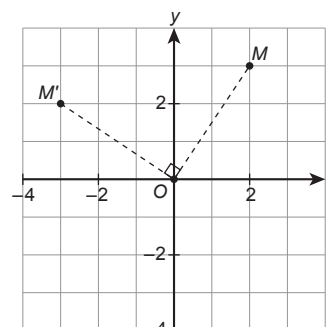
- (c)

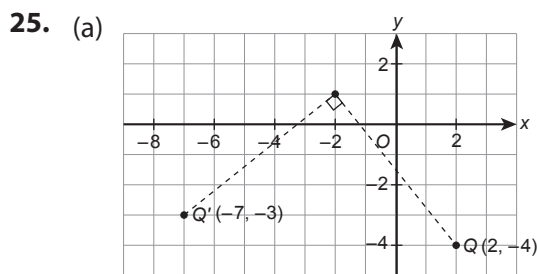
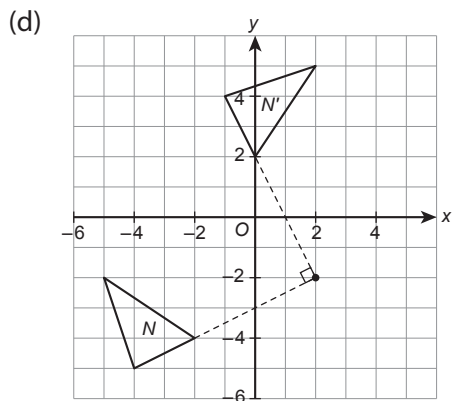
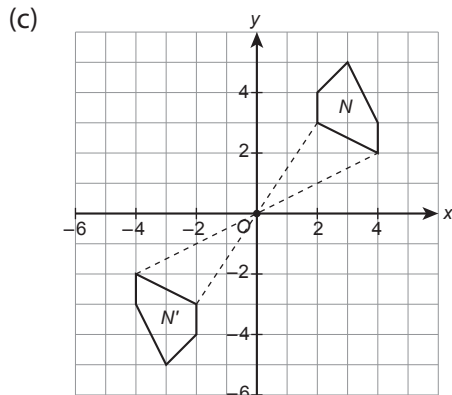
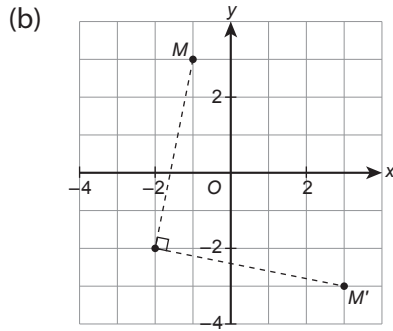


Putaran 180° pada pusat $(6, 3)$.

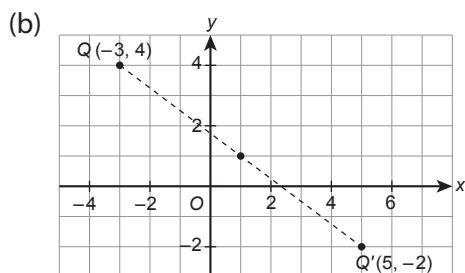
Rotation of 180° about the centre $(6, 3)$.

24. (a)





$\therefore Q(2, -4)$

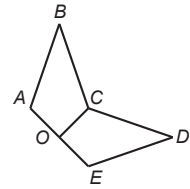


$\therefore Q(-3, 4)$

26. (a) (i) OEFG

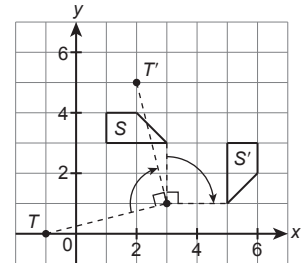


(ii) OCDE



(b) S dipetakan kepada S' di bawah putaran 90° ikut arah jam pada $(3, 1)$.

S is mapped onto S' under a rotation of 90° clockwise about $(3, 1)$.



Koordinat objek T

Coordinates of object T

$= (-1, 0)$

Terbalikkan arah putaran kepada lawan arah jam untuk mencari koordinat titik T .
Reverse the direction of rotation to anticlockwise to find the coordinates of point T .

(c) $\angle PRQ = 180^\circ - 70^\circ - 70^\circ$
 $= 40^\circ$

Sisi RS ialah imej bagi sisi PR .

Side RS is the image of side PR

$x = 120^\circ - 40^\circ$
 $= 80^\circ$

27. (a) sama
same

(b) bentuk; saiz
shape; size

(c) translasi; pantulan; putaran
translation; reflection; rotation

28. (a) Bukan / No

(b) Ya / Yes

(c) Ya / Yes

(d) Bukan / No

(e) Ya / Yes

(f) Bukan / No

29. (a) Pantulan

Reflection

(b) Putaran

Rotation

(c) Translasi

Translation

30. (a) (i) $\angle a = 180^\circ - 72^\circ - 72^\circ$
 $= 36^\circ$

(ii) Perimeter $= 3 \text{ cm} \times 5$
 $= 15 \text{ cm}$



- (b) (i) $\Delta A'B'C$ ialah imej bagi ΔABC di bawah pantulan pada garis DC ;

$\Delta A'B''C''$ ialah imej bagi $\Delta A'B'C$ di bawah putaran pada pusat A' melalui 90° ikut arah jam.

$\Delta A'B'C$ is the image of ΔABC under a reflection in the line DC ;

$\Delta A'B''C''$ is the image of $\Delta A'B'C$ under a rotation about point A' through 90° clockwise.

- (ii) Bentuk dan saiz objek dan imej dikekalkan, maka setiap transformasi itu ialah isometri.

The shape and size of the object and image are preserved, so each transformation is isometry.

$$(c) \angle Q'P'R' = \angle QPR \\ = 38^\circ$$

$$\angle P'Q'R' = 180^\circ - 52^\circ - 38^\circ \\ = 90^\circ$$

Maka, ΔPQR dan $\Delta P'Q'R'$ ialah segi tiga bersudut tegak.

Thus, ΔPQR and $\Delta P'Q'R'$ are right-angled triangles.

$$P'R' = PR \\ = 5 \text{ cm}$$

$$\therefore x = \sqrt{5^2 - 3^2} \quad \leftarrow P'Q' = \sqrt{P'R' - R'Q'}$$

$$= 4 \text{ cm}$$

- (d) (i) Pantulan pada garis QT .
Reflection in the line QT .

- (ii) Sudut pedalaman bagi heptagon sekata $PQRSTUV$ / Interior angle of regular heptagon $PQRSTUV$

$$= \frac{(7 - 2) \times 180^\circ}{7} = 128.6^\circ$$

$AQRSTE$ ialah sebuah heksagon dengan keadaan / $AQRSTE$ is a hexagon where

$$\angle QAE = \angle AET = \angle QRS = \angle RST = 128.6^\circ$$

dan/ and

$$\angle AQR = \angle ETS$$

Jumlah sudut pedalaman bagi heksagon $AQRSTE$

Sum of interior angles of hexagon $AQRSTE$

$$= (6 - 2) \times 180^\circ$$

$$= 720^\circ$$

$$4 \times 128.6^\circ + 2x = 720^\circ$$

$$514.4^\circ + 2x = 720^\circ$$

$$2x = 205.6^\circ$$

$$x = 102.8^\circ$$

31. (a) $\times$
(b) $\checkmark$
(c) $\times$
(d) $\checkmark$

32. (a) 2
(b) 4
(c) 10
(d) 2

Power PT3

Bahagian A

1. Jawapan / Answer: D

2. Translasi / Translation $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$

Objek P bergerak 1 unit ke kiri dan 3 unit ke bawah.

Object P moves 1 unit to the left and 3 units downwards.

Jawapan / Answer: B

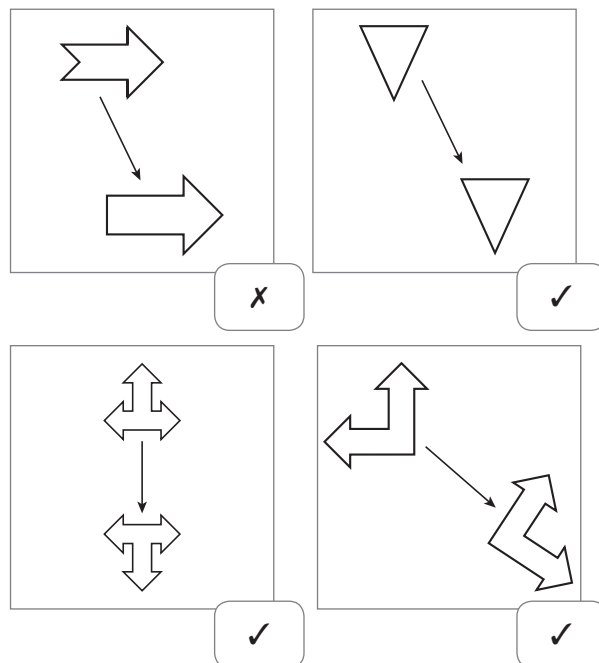
3. $\begin{pmatrix} 5 - 7 \\ 3 - (-2) \end{pmatrix} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$

Jawapan / Answer: C

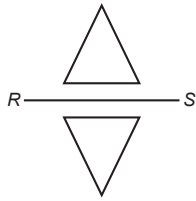
4. Jawapan / Answer: B

Bahagian B

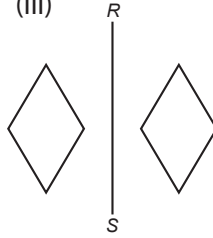
5.



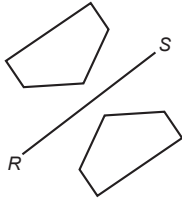
6. (i)



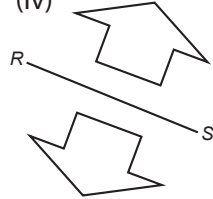
(iii)



(ii)



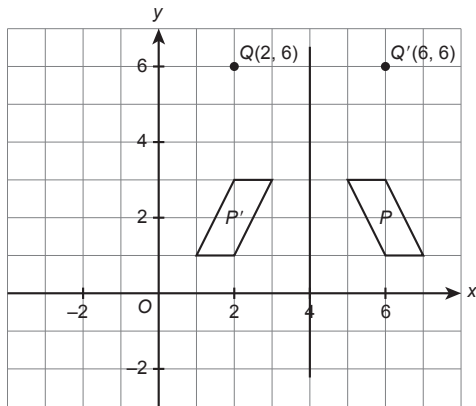
(iv)



Bahagian C

7. (a) (i) Pantulan pada garis lurus $x = 4$.
Reflection on the straight line $x = 4$.

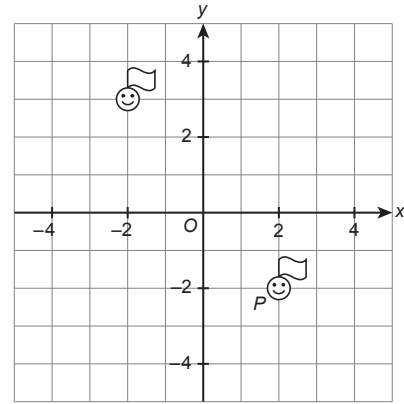
(ii)



$Q'(6, 6)$

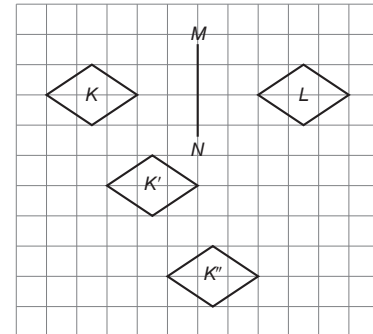
(iii) $R'(1, 1)$

(b)



$(-2, 3)$

(c) (i), (ii)



Power KBAT

Set sofa : Translasi $\begin{pmatrix} 4 \\ -8 \end{pmatrix}$
Sofa set : Translation

Meja : Pantulan pada paksi-y.
Desk : Reflection at y-axis.

Almari : Putaran 90° lawan arah jam pada asalan.
Cabinet : Rotation of 90° anticlockwise at the origin.