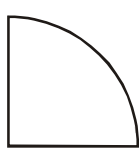


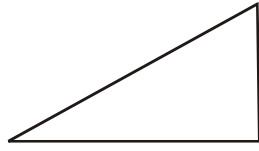
6

SYMMETRY, REFLECTION AND ROTATION

1. Draw the line or lines of symmetry.



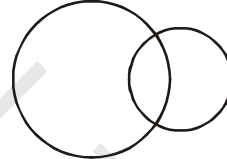
(i)



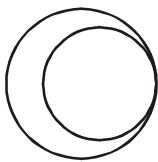
(ii)



(iii)



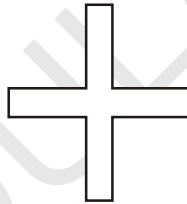
(iv)



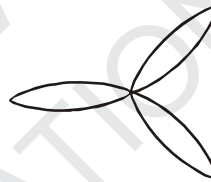
(v)



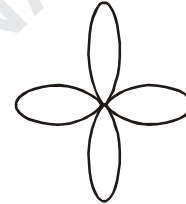
(vi)



(vii)

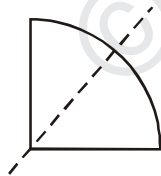


(viii)



(ix)

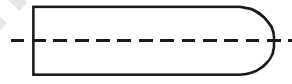
Ans.



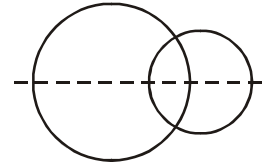
(i) (one)



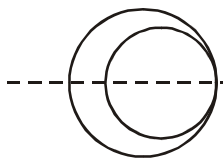
(ii) (none)



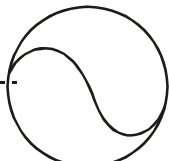
(iii) (one)



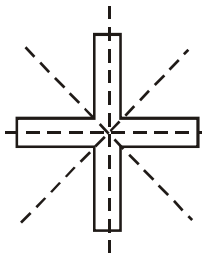
(iv) (one)



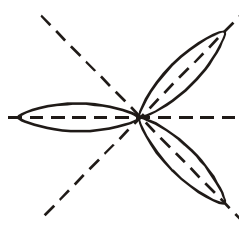
(v) (one)



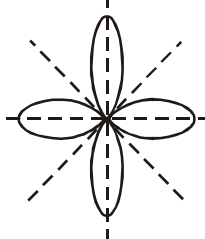
(vi) (none)



(vii) (four)

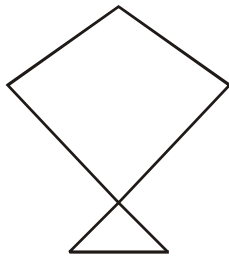


(viii) (three)

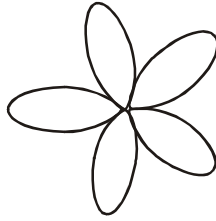


(ix) (four)

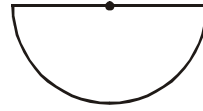
2. If possible, draw the largest number of lines of symmetry in each case :



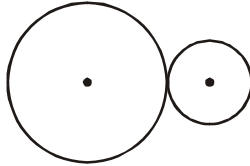
(i)



(ii)



(iii)

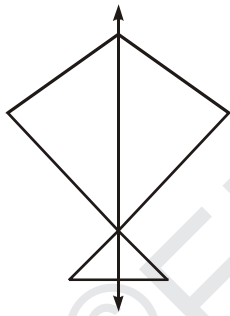


(iv)

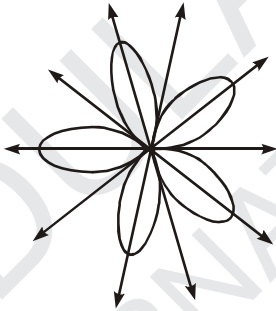


(v)

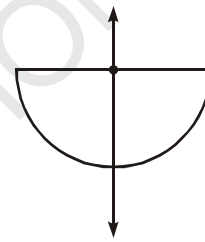
Ans.



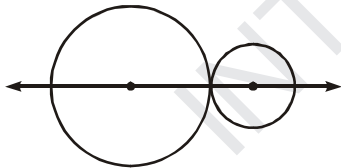
(i)



(ii)



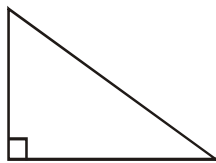
(iii)



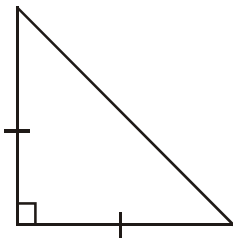
(iv)

(v) none

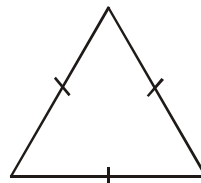
3. Examine each of the following figures, carefully, and then draw line of symmetry if possible :



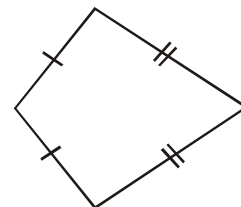
(i)



(ii)

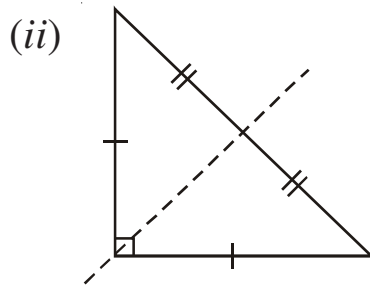


(iii)

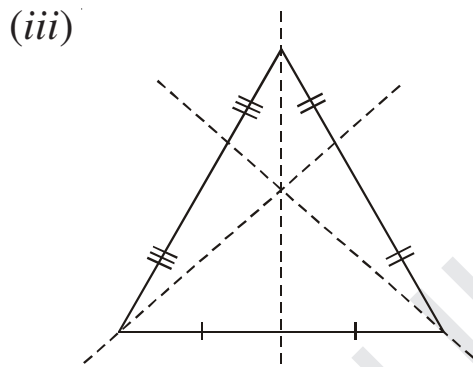


(iv)

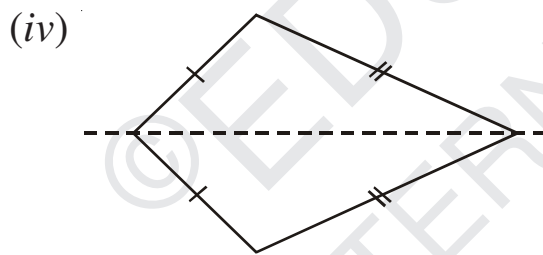
Ans.(i) The figure has no line of symmetry.



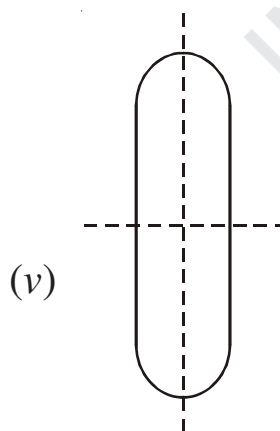
The figure has one line of symmetry.



The figure has 3 lines of symmetry.



The figure has one line of symmetry.



The figure has two lines of symmetry.

4. Draw all lines of symmetry for each of the following letters.

C

(i)

E

(ii)

F

(iii)

K

(iv)

X

(v)

V

(vi)

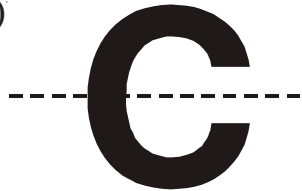
M

(vii)

Y

(viii)

Ans. (i)



One line of symmetry.

(ii)



One line of symmetry.

(iii)



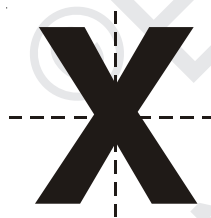
No line of symmetry.

(iv)



No line of symmetry.

(v)



Two lines of symmetry

(vi)



one line of symmetry.

(vii)



One line of symmetry.

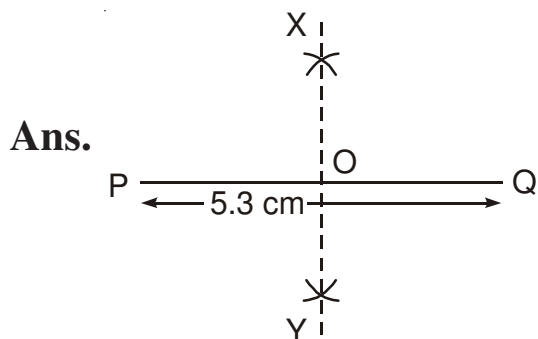
(viii)



One line of symmetry.

5. Mark two points P and Q which are 5.3 cm apart. Construct the perpendicular bisector of line segment PQ .

Are the points P and Q symmetric with respect to the perpendicular bisector drawn ?



P and Q are symmetric with respect to perpendicular bisector xy .

6. Find the co-ordinates of the following points under reflection in x -axis :

- (i) $(4, 8)$ (ii) $(3, -10)$ (iii) $(-2, 0)$ (iv) $(-2, -4)$

Ans. Required point are :

- (i) $(4, -8)$ (ii) $(3, 10)$ (iii) $(-2, 0)$ (iv) $(-2, 4)$

7. Find the reflection of the following points in y -axis :

- (i) $(9, 10)$ (ii) $(9, 0)$ (iii) $(0, 9)$ (iv) $(-9, 10)$
(v) $(9, -10)$ (vi) $(-9, -10)$

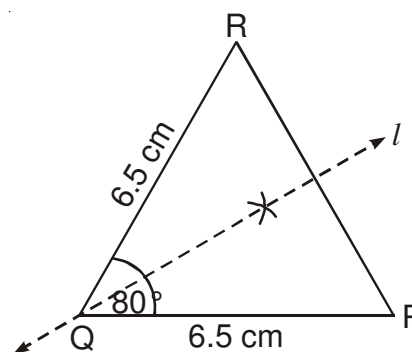
Ans. (i) $(-9, 10)$ (ii) $(-9, 0)$ (iii) $(0, 9)$ (iv) $(9, 10)$
(v) $(-9, -10)$ (vi) $(9, -10)$

8. Construct an angle $\angle PQR = 80^\circ$. Draw its line of symmetry if $PQ = QR = 6.5$ cm.

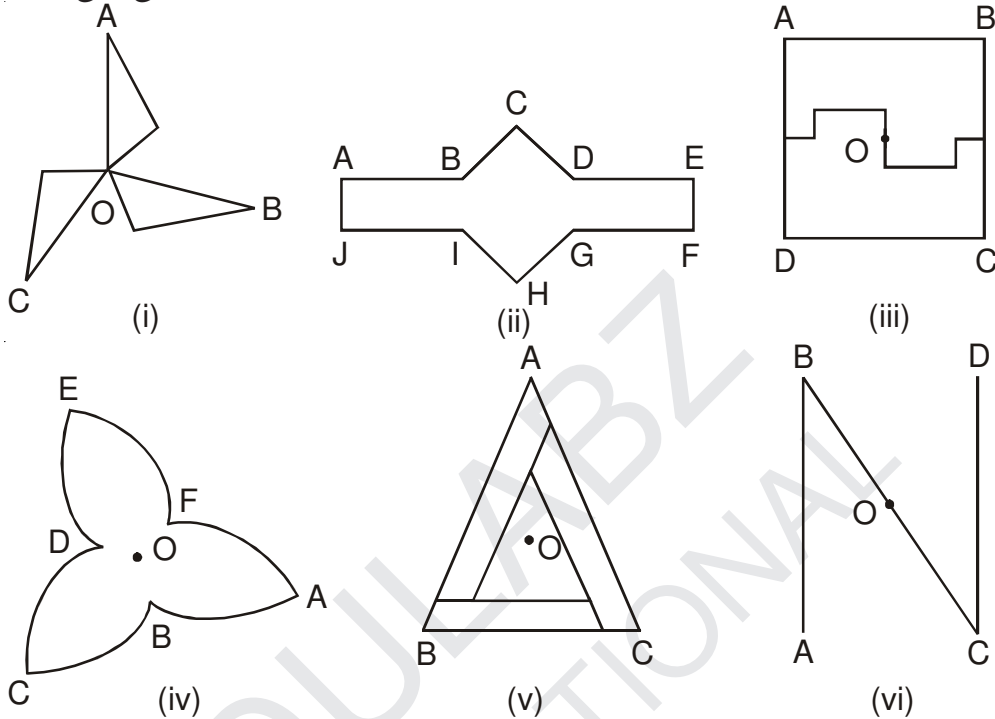
Ans. Steps of Constructions :

- (i) First we draw a line segment $PQ = 6.5$ cm
(ii) With Q as a centre draw a ray making an angle of 80° and cut off $QR = 6.5$ cm and join PR .
(iii) Draw the angle bisector of $\angle PQR$.

This is the required line of symmetry.



9. State and explain the types of symmetry possessed by each of the following figures.



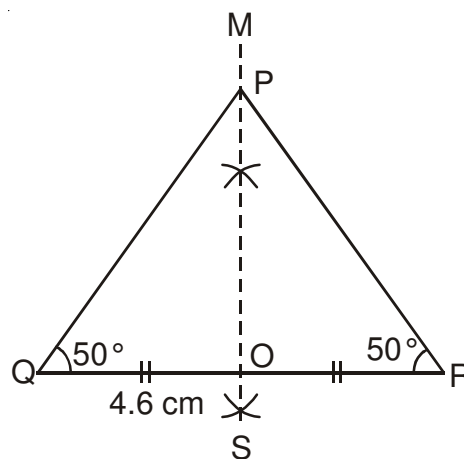
- Ans.** (i) (a) From figure it is not a linear symmetry because it has no line of symmetry.
 (b) From figure its a point symmetry because it has point O which is the centre of symmetry.
 (c) From figure it is a rotational symmetry because it has rotational symmetry of order 3 above the point O .
- (ii) (a) From figure it is a linear symmetry because it has two lines of symmetry.
i.e., The line joining C and H and the line joining the mid points of AJ and EF .
 (b) From figure it is a point symmetry because it has point O which is the point of symmetry.
 (c) From figure it is a point symmetry because it has rotational symmetry of order 2 about the point O .
- (iii) (a) From figure it is not a linear symmetry because it has no line of symmetry.
 (b) From figure it is a point symmetry because point O is the point of symmetry.

- (c) From figure it is a rotational symmetry because it has rotational symmetry of order 2 about the point O .
- (iv) (a) From figure it is a linear symmetry because three lines of symmetry which are the lines joining AD , BE and CF .
- (b) From figure it is not a point symmetry because it has no point symmetry.
- (c) From figure it is a rotational symmetry because it has a rotational symmetry of order three about the point O .
- (v) (a) From figure it is not a linear symmetry because it has no line of symmetry.
- (b) From figure it is not a point symmetry because it has no point of symmetry.
- (c) From figure it is a rotational symmetry because it has a rotational symmetry of order 3 about the point O .
- (vi) (a) From figure it is not a linear symmetry because it has no line of symmetry.
- (b) From figure it is a point symmetry because at O , the point symmetry.
- (c) From figure it is a rotational symmetry it has a rotational symmetry order 2 about the point O .

10. The point $P(a, b)$ is reflected in x -axis and the point P' so obtained is reflected in y -axis to get the point P'' . If the co-ordinate of P'' are $(-5, -3)$, find the values of a and b .

Ans. The point $P(a, b)$ when reflected in x -axis, will be $P'(a, -b)$ and when point $P'(a, -b)$ is reflected in y -axis, will be $P''(-a, -b)$

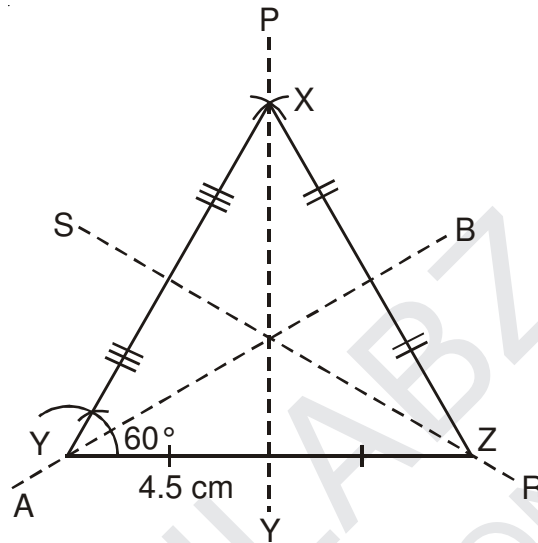
MS is the only line of symmetry of ΔPQR .



11. Construct a triangle XYZ in which $XY = YZ = ZX = 4.5$ cm. Draw all its lines of symmetry.

Ans.

PQ , RS and AB are three lines of symmetry passing through mid-points of sides of triangle.

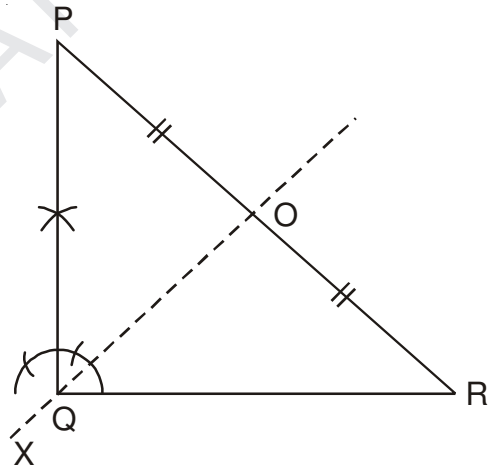


12. Construct a triangle PQR in which $PQ = QR = 4.2\text{ cm}$ and $\angle PQR = 90^\circ$. Draw all its lines of symmetry.

Ans.

O is mid point of PR .

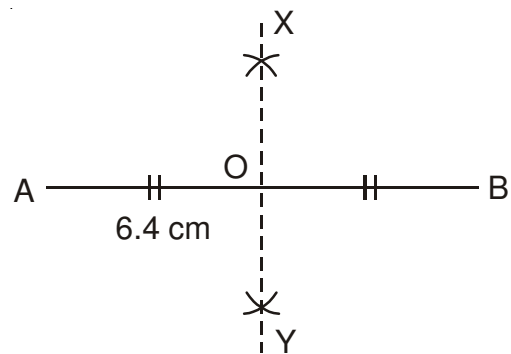
The figure is isosceles right triangle.
It has only one line of symmetry XY passing through mid-point of PR .



13. Mark two points A and B 6.4 cm apart. Construct the line of symmetry so that the points A and B are symmetric with respect to this line.

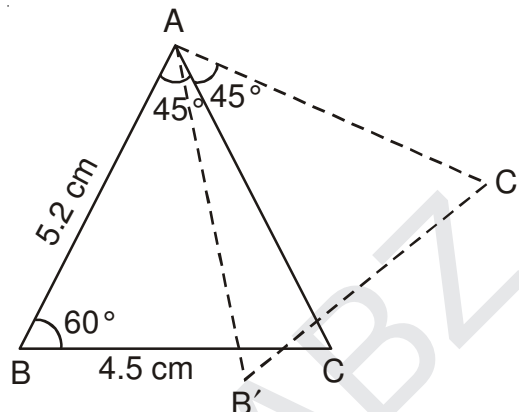
Ans. Draw perpendicular bisector XY of AB , bisecting AB at O .

Thus, XY is the line of symmetry.



14. Construct a triangle ABC such that $AB = 5.2$ cm, $BC = 4.5$ cm and $\angle B = 60^\circ$. Rotate the triangle ABC through 45° (anti-clockwise) about the point A . Are the two triangles congruent ?

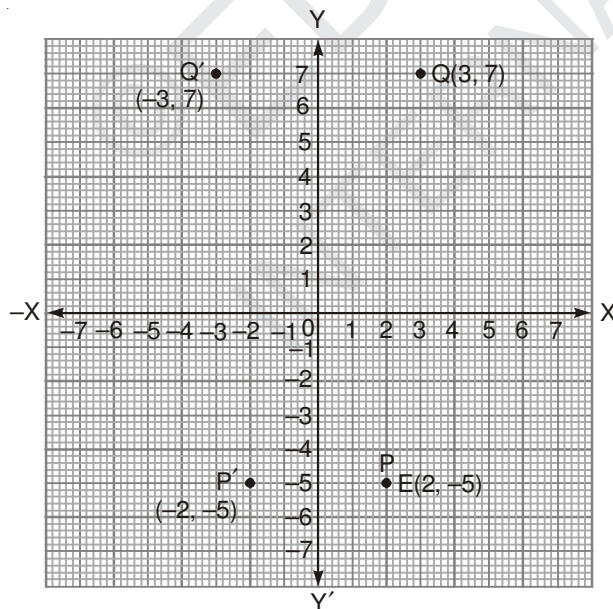
Ans.



Yes, $\triangle ABC$ and $\triangle AB'C'$ are congruent.

15. Plot the points $P(2, -5)$ and $Q(3, 7)$ on the graph paper. Reflect the line segment PQ in the y -axis to $P'Q'$. Write down the coordinates of P' and Q' . Are PQ and $P'Q'$ equal ?

Ans.



Yes, both PQ and $P'Q'$ are equal.

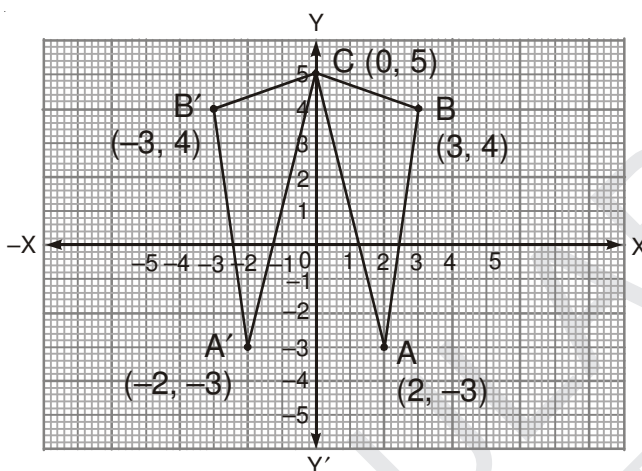
16. The triangle ABC whose vertices are $A(2, -3)$, $B(3, 4)$ and $C(0, 5)$ is reflected in the y -axis to the triangle $A'B'C'$. Write down the

coordinates of the vertices of triangle $A'B'C'$. Are the two triangles congruent ?

Ans. $A(2, -3)$, $B(3, 4)$ and $C(0, 5)$

The vertices of triangle are reflected in y-axis.

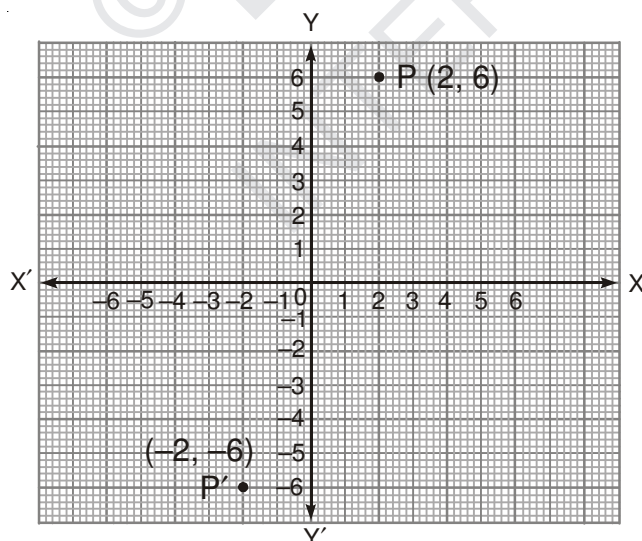
$\therefore A'(-2, -3)$ $B'(-3, 4)$ $C'(0, 5)$



ΔABC and $\Delta A'B'C'$ both are congruent.

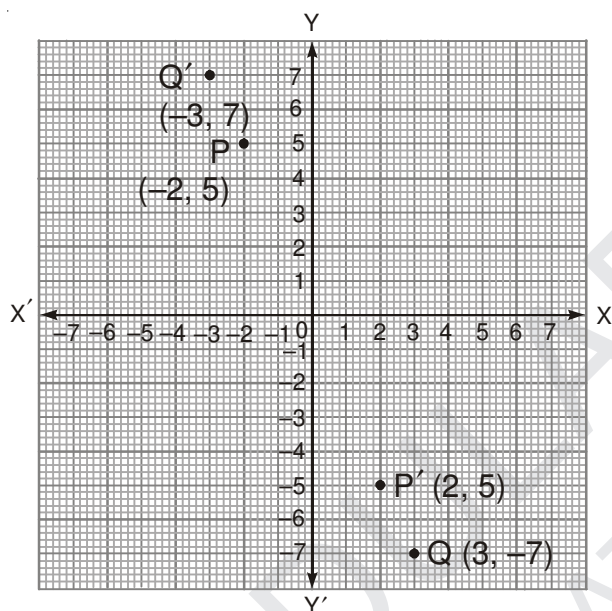
17. A point $P(2, 6)$ is rotated about the origin through 180° to the point P' , write down the coordinates of P' graphically.

Ans.



18. Plot the points $P(-2, 5)$ and $Q(3, -7)$ on the graph paper. Rotate the line segment PQ through 180° about the origin to the position $P'Q'$. Write down the coordinates of P' and Q' . Are PQ and $P'Q'$ equal ?

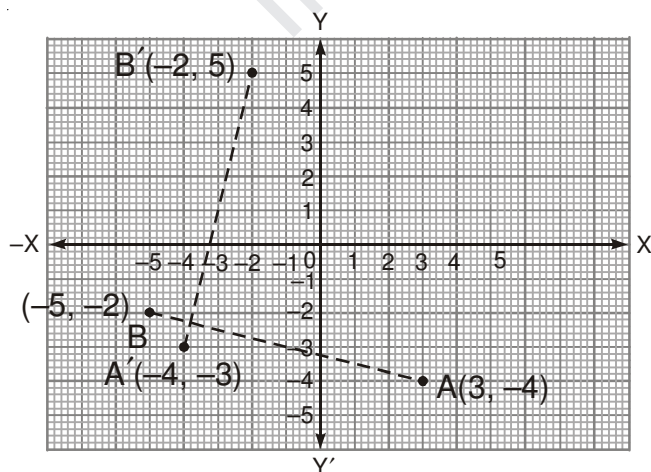
Ans.



Both PQ and $P'Q'$ are equal.

19. Plot the points $A(3, -4)$ and $B(-5, -2)$ on the graph paper. Rotate the line segment AB through 90° clockwise about the origin to the position $A'B'$. Write down the coordinates of A' and B' . Are AB and $A'B'$ equal?

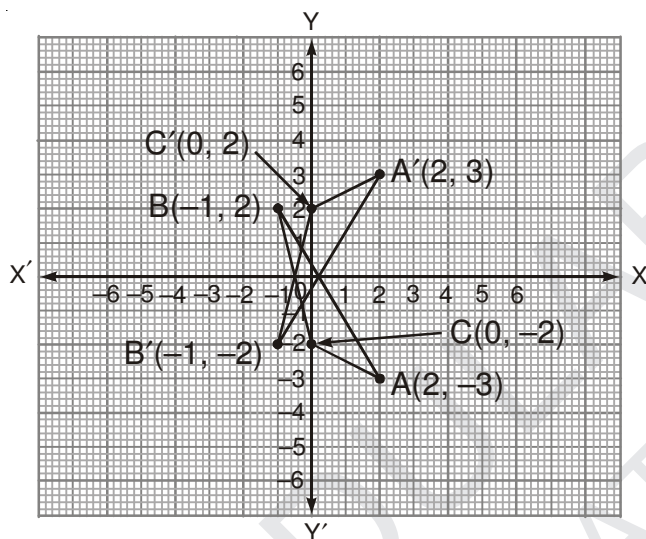
Ans.



Also, $AB = A'B'$.

20. Plot the points $A(2, -3)$, $B(-1, 2)$ and $C(0, -2)$ on the graph paper. Reflect the triangle ABC in the x -axis to the triangle $A'B'C'$. Write down the coordinates of the vertices of $\Delta A'B'C'$. Are the two triangles congruent ?

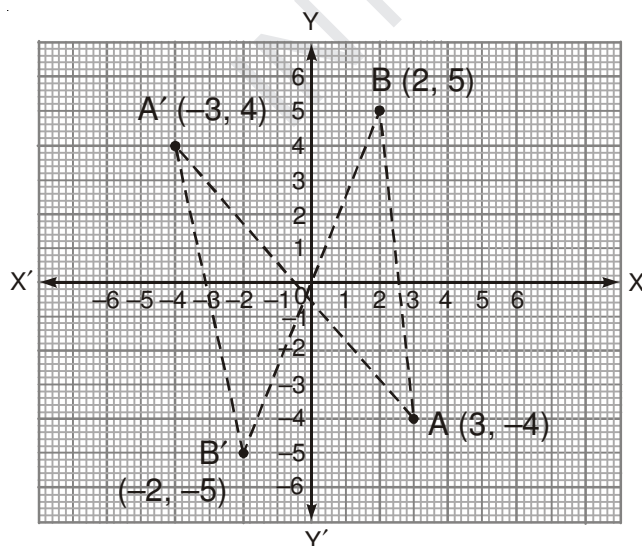
Ans. Co-ordinates of $\Delta A'B'C'$ are $A'(2, 3)$ $B'(-1, -2)$ $C'(0, 2)$



Yes ΔABC & $\Delta A'B'C'$ are congruent.

21. Plot the points $A(3, -4)$ and $B(2, 5)$ on the graph paper. Rotate the triangle OAB through 180° about O (origin). Find the coordinates of the vertices of this new triangle.

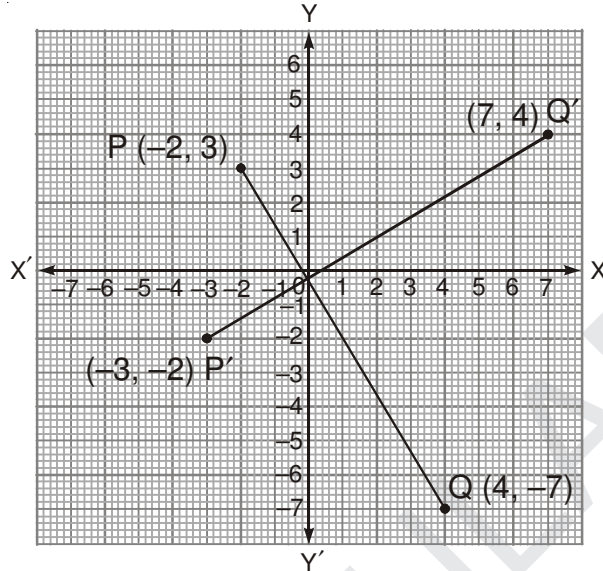
Ans.



So co-ordinate of vertices of new triangle $OA'B'$ are $(0, 0)$ $(-3, 4)$ $(-2, -5)$

22. Plot the points $P(-2, 3)$ and $Q(4, -7)$ on the graph paper. Rotate the line segment PQ through 90° anti-clockwise about the origin to the position $P'Q'$. Write down the coordinates of P' and Q' .

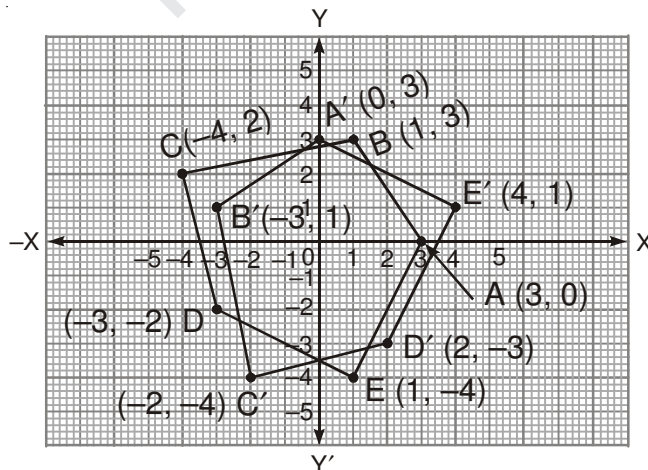
Ans.



Co-ordinates of P' and Q' are $(-3, -2)$ and $(7, 4)$

23. Plot the points $A(3, 0)$, $B(1, 3)$, $C(-4, 2)$, $D(-3, -2)$ and $E(1, -4)$ on the graph paper. Rotate the pentagon $ABCDE$ through 90° anti-clockwise about the origin to take the position $A'B'C'D'E'$. Write down the coordinates of the vertices of the pentagon in new position.

Ans. Coordinates of $A'(0, 3)$, $B'(-3, 1)$, $C'(-2, -4)$, $D'(2, -3)$, $E'(4, 1)$.



24. The point $Q(a, b)$ is reflected in y -axis and the point Q' so obtained is reflected in x -axis to get the point Q'' . If the coordinates of Q'' are $(4, -2)$, find the values of a and b .

Ans. The point $Q(a, b)$ when reflected in y -axis will be

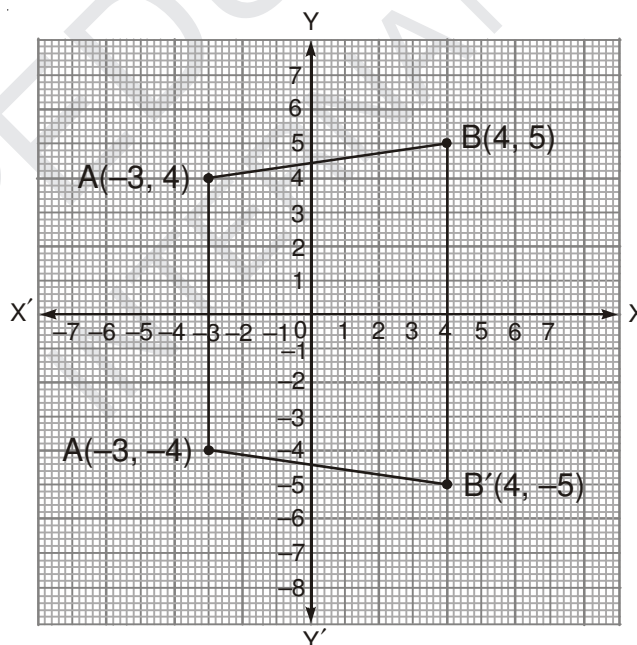
$Q'(-a, b)$ and point $Q'(-a, b)$ when reflected in x -axis will be $Q''(-a, -b)$. But co-ordinates of Q'' are $(4, -2)$

$$\therefore -a = 4 \quad \Rightarrow \quad a = -4$$

$$\text{and } -b = -2 \quad \Rightarrow \quad b = 2$$

25. Draw the image figure of the line segment AB reflected in x -axis, the co-ordinates of A and B being $A(-3, 4)$ and $B(4, 5)$.

Ans. Co-ordinates of $A(-3, 4)$ and $B(4, 5)$ of the line AB . When it is reflected in x -axis then the image of AB will be $A'B'$ and co-ordinates of A' will be $(-3, -4)$ and B' will be $(4, -5)$.



26. $\triangle ABC$ with points $A(2, -3)$, $B(4, -1)$ and $C(3, -4)$ is first reflected in x -axis to give $\triangle A'B'C'$ and then this $\triangle A'B'C'$ is reflected in y -axis to give $\triangle A''B''C''$. Find the co-ordinates of A'' , B'' and C'' .

Ans.In ΔABC

$A (2, -3)$, $B (4, -1)$ and $C (3, -4)$

Now, it is reflected in x -axis then $\Delta A'B'C'$ is formed

and $A'(2, 3)$, $B'(4, 1)$ and $C'(3, 4)$

Now it is reflected in y -axis and $\Delta A''B''C''$ is formed

and coordinate $A''(-2, 3)$, $B''(-4, 1)$ and $C''(-3, 4)$

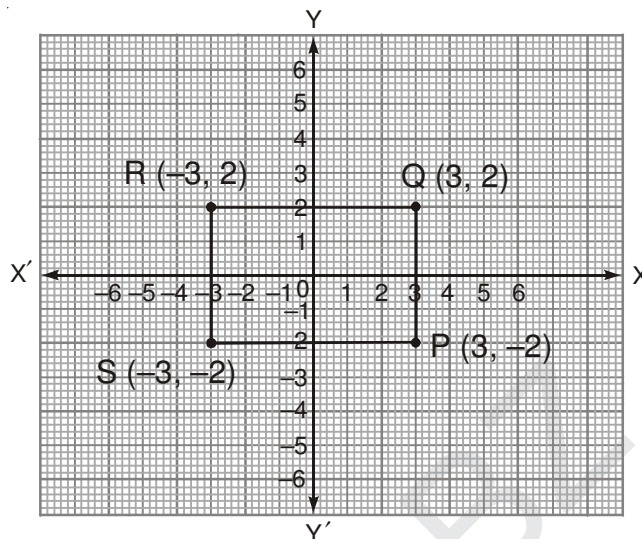
- 27.** A square $PQRS$ with the vertices $P (-1, 5)$, $Q (-5, 5)$, $R (-5, 1)$ and $S (-1, 1)$ is first reflected in x -axis and the image so obtained is reflected in y -axis. Find the vertices of the final image so formed.

Ans.The coordinates of the vertices of square $PQRS$ are $P (-1, 5)$, $Q (-5, 5)$, $R (-5, 1)$ and $S (-1, 1)$

When it is reflected in x -axis, the image of $PQRS$ will be $P'Q'R'S'$ and their co-ordinates will be $P'(-1, -5)$, $Q'(-5, -5)$, $R'(-5, -1)$ and $S'(-1, -1)$ and when it is again reflected in y -axis, the image will be $P''Q''R''S''$ and their co-ordinates will be $P''(1, -5)$, $Q''(5, -5)$, $R''(5, -1)$ and $S''(1, -1)$.

- 28.** A rectangle $ABCD$ with its vertices at $A (-2, -3)$, $B (2, -3)$, $C (2, 3)$ and $D (-2, 3)$ is rotated about the origin through 90° anticlockwise to take the new position $PQRS$. Find the co-ordinates of P , Q , R and S and draw the new figure.

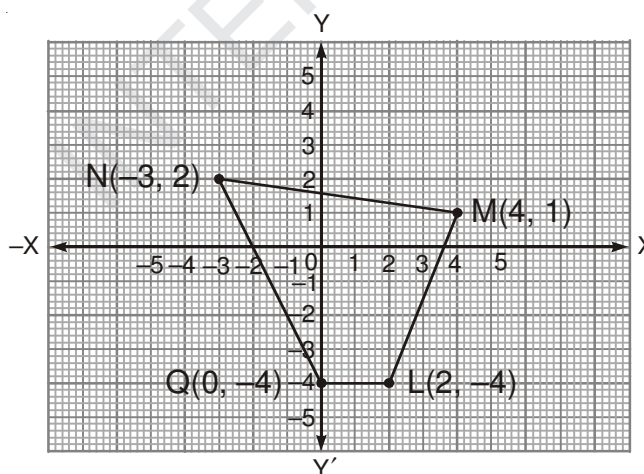
Ans.Given in rectangle $ABCD$, $A (-2, -3)$, $B (2, -3)$, $C (2, 3)$ and $D (-2, 3)$ is rotated through 90° anticlockwise then $PQRS$ rectangle is formed, then $P (3, -2)$, $Q (3, 2)$, $R (-3, 2)$ and $S (-3, -2)$.



29. A quadrilateral $ABCD$ with its vertices at $A(4, 2)$, $B(-1, 4)$, $C(-2, -3)$ and $D(4, 0)$ is rotated through 90° clockwise to take the new position $LMNQ$. Find the coordinates of L , M , N and Q and draw the new figure.

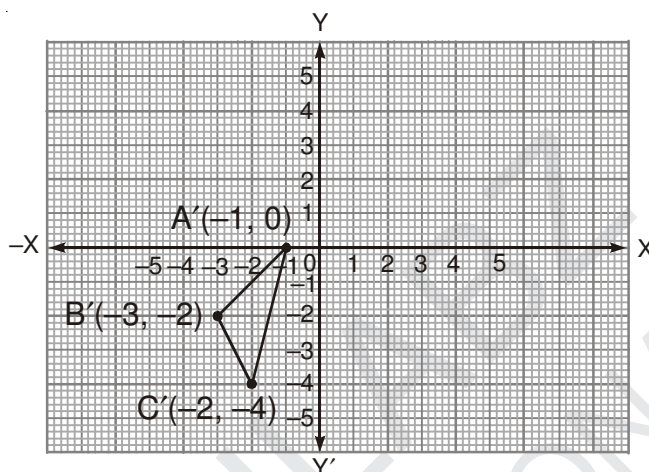
Ans. Given a quadrilateral $ABCD$ with its vertices $A(4, 2)$, $B(-1, 4)$, $C(-2, -3)$ and $D(4, 0)$ is rotated through 90° clockwise then quadrilateral $LMNQ$ is formed.

Then, coordinates of $L(2, -4)$, $M(4, 1)$, $N(-3, 2)$ and $Q(0, -4)$



30. A $\triangle ABC$ has its vertices at $A(1, 0)$, $B(3, 2)$ and $C(2, 4)$. This triangle is rotated about the origin through 180° to take the position $A'B'C'$. Find the co-ordinates of A' , B' and C' . Show the new figure on the graph paper.

Ans. The triangle ABC whose vertices are $A(1, 0)$, $B(3, 2)$ and $C(2, 4)$ is rotated about the origin through 180° , then the co-ordinates of the image of ΔABC will be $A'B'C'$ and co-ordinates will be $A'(-1, 0)$, $B'(-3, -2)$ and $C'(-2, -4)$.



31. Construct the image of ΔABC under a rotation about the origin O through 180° , the vertices of the triangle being at $A(3, -2)$, $B(3, 2)$ and $C(-2, 3)$.

Ans. The image of ΔABC under rotation about the origin O through 180° , will be $\Delta A'B'C'$. The co-ordinates of A' will be $(-3, 2)$, of $B'(-3, -2)$ and $C'(2, -3)$.

