

CHAPTER 10

REFLECTION

Exercise 10.1

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

(i) $(2, -5)$

(ii) $\left(\frac{-3}{2}, \frac{-1}{2}\right)$

(iii) $(-7, 0)$

Solution:

The co-ordinates of the images of the points under reflection in the x-axis will be:

(i) Image of $(2, -5)$ will be $(2, 5)$

(ii) Image of $\left(\frac{-3}{2}, \frac{-1}{2}\right)$ will be $\left(\frac{-3}{2}, \frac{1}{2}\right)$

(iii) Image of $(-7, 0)$ will be $(-7, 0)$

2. Find the co-ordinates of the images of the following points under reflection in the y-axis:

(i) $(2, -5)$

(ii) $\left(\frac{-3}{2}, \frac{1}{2}\right)$

(iii) $(0, -7)$

Solution:

The co-ordinates of the images of the points under reflection in the y-axis will be:

(i) Image of $(2, -5)$ will be $(-2, -5)$

- (ii) Image of $\left(\frac{-3}{2}, \frac{1}{2}\right)$ will be $\left(\frac{3}{2}, \frac{1}{2}\right)$
- (iii) Image of $(0, -7)$ will be $(0, -7)$

3. Find the co-ordinates of the images of the following points under reflection in the origin:

- (i) $(2, -5)$
- (ii) $\left(\frac{-3}{2}, \frac{-1}{2}\right)$
- (iii) $(0, 0)$

Solution:

The co-ordinates of the images of the points under reflection in the y-axis will be:

- (i) Image of $(2, -5)$ will be $(-2, 5)$
- (ii) Image of $\left(\frac{-3}{2}, \frac{-1}{2}\right)$ will be $\left(\frac{3}{2}, \frac{1}{2}\right)$
- (iii) Image of $(0, 0)$ will be $(0, 0)$

4. The image of a point P under reflection in the x-axis is $(5, -2)$. Write down the coordinates of P.

Solution:

Given that $(5, -2)$ are the co-ordinates of the image of a point P under x-axis.

Thus, the co-ordinates of P will be $(5, 2)$.

5. A point P is reflected in the x-axis. Co-ordinates of its image are $(8, -6)$.

- (i) Find the co-ordinates of P.

- (ii) Find the co-ordinates of the images of P under reflection in the y-axis.

Solution:

- (i) The co-ordinates of image of P which is reflected in x-axis are (8, -6).
(ii) The co-ordinates of image of P under reflection in the y-axis will be (-8, 6).

6. A point P is reflected in the origin. Co-ordinates of its image are (2, -5). Find

- (i) The co-ordinates of P.
(ii) The co-ordinates of the image of P in the x-axis.

Solution:

The co-ordinates of image of a point P which is reflected in origin are (2, -5), then

- (i) Co-ordinates of P will be (-2, 5)
(ii) Co-ordinates of the image of P in the x-axis will be (-2, -5).

7.

- (i) The point P (2, 3) is reflected in the line $x = 4$ to the point P'. Find the co-ordinates of the point p'.
(ii) Find the image of the point P (1, -2) in the line $x = -1$.

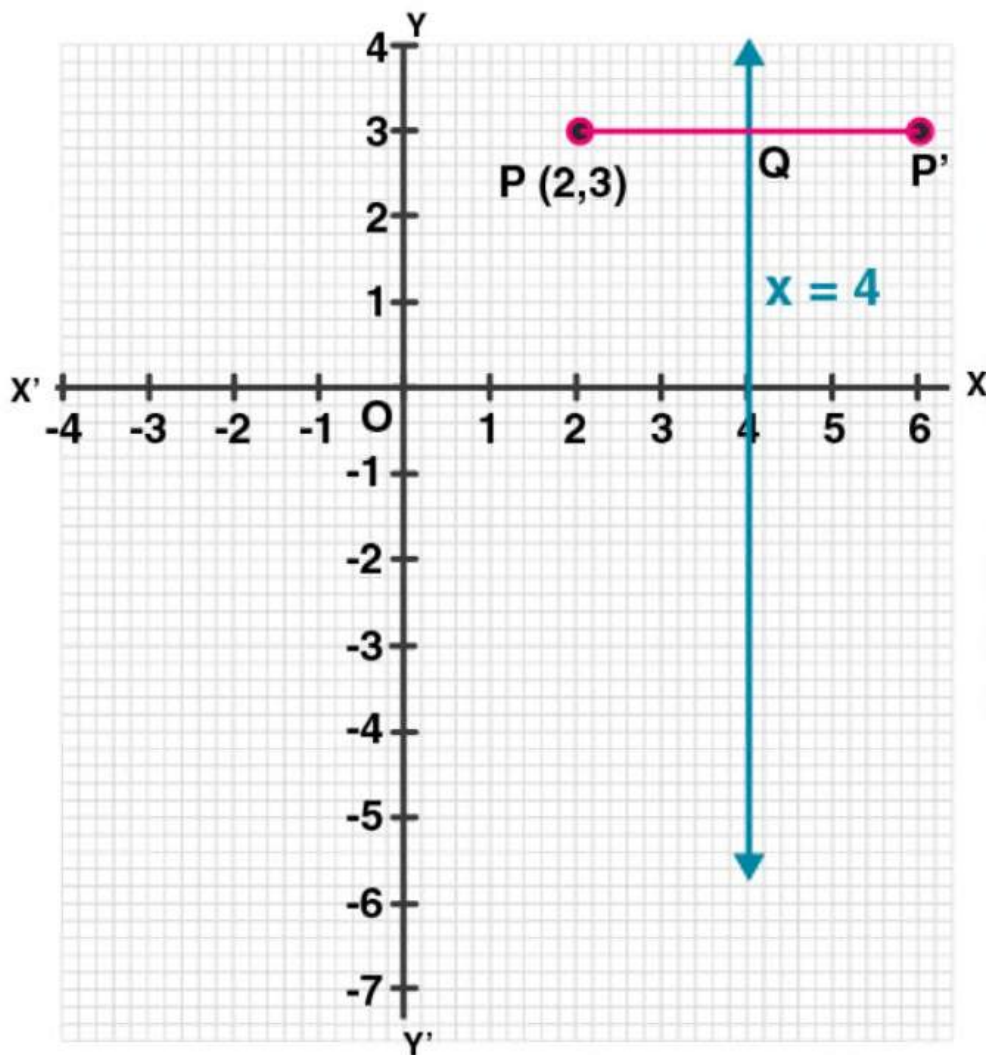
Solution:

- (i) The steps are:
(a) Draw axis XOX' and YOY' and take 1 cm = 1 unit
(b) Plot point P (2, 3) on it.
(c) Draw a line $x = 4$ which is parallel to y-axis.
(d) From P, draw a perpendicular on $x = 4$, which intersects $x = 4$ at Q.

(e) Produce PQ to P', such that $QP' = QR$.

Thus, P' is the reflection of P in the line $x = 4$

Hence, the co-ordinates of P' are (6, 3).



(ii) The steps are:

(a) Draw axis XOX' and YOY' and take 1 cm = 1 unit

(b) Plot point $P(2, 3)$ on it.

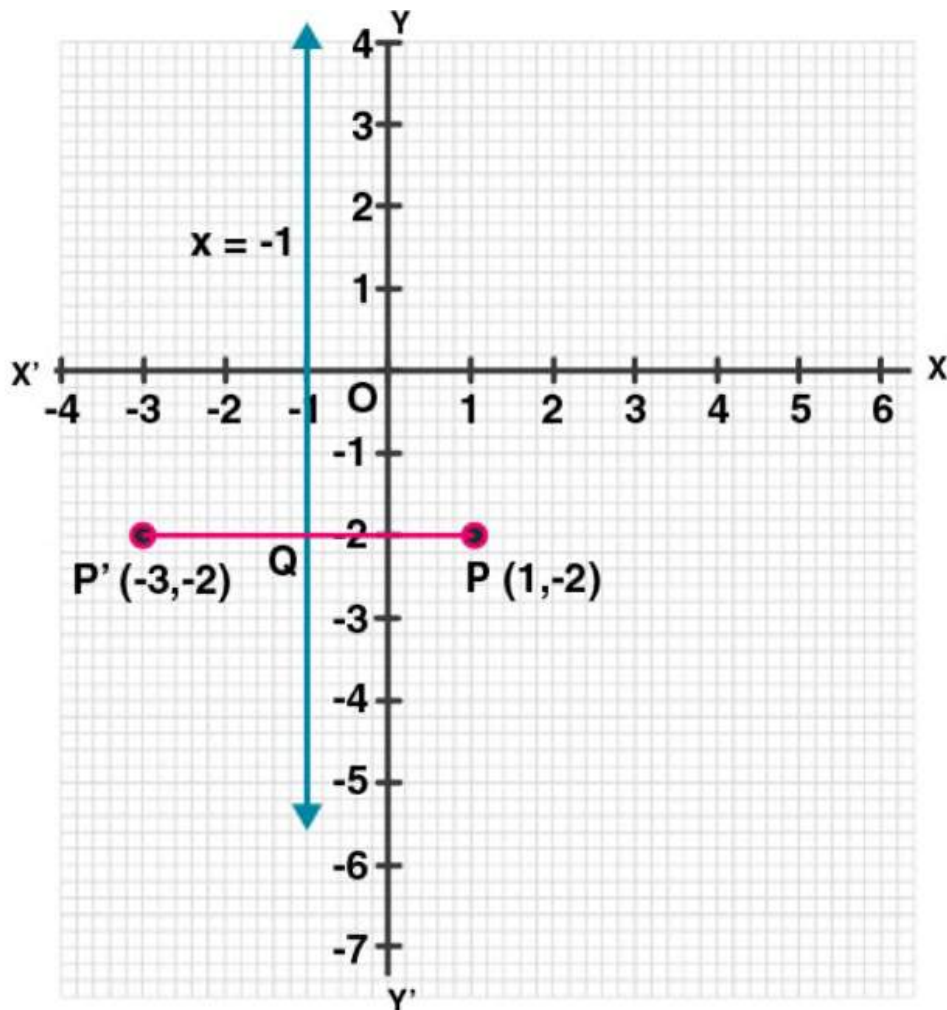
(c) Draw a line $x = 4$ which is parallel to y -axis.

(d) From P , draw a perpendicular on $x = 4$, which intersects $x = 4$ at Q .

(e) Produce PQ to P' , such that $QP' = QR$.

Thus, P' is the reflection of P in the line $x = 4$

Hence, the co-ordinates of P' are $(6, 3)$.



8.

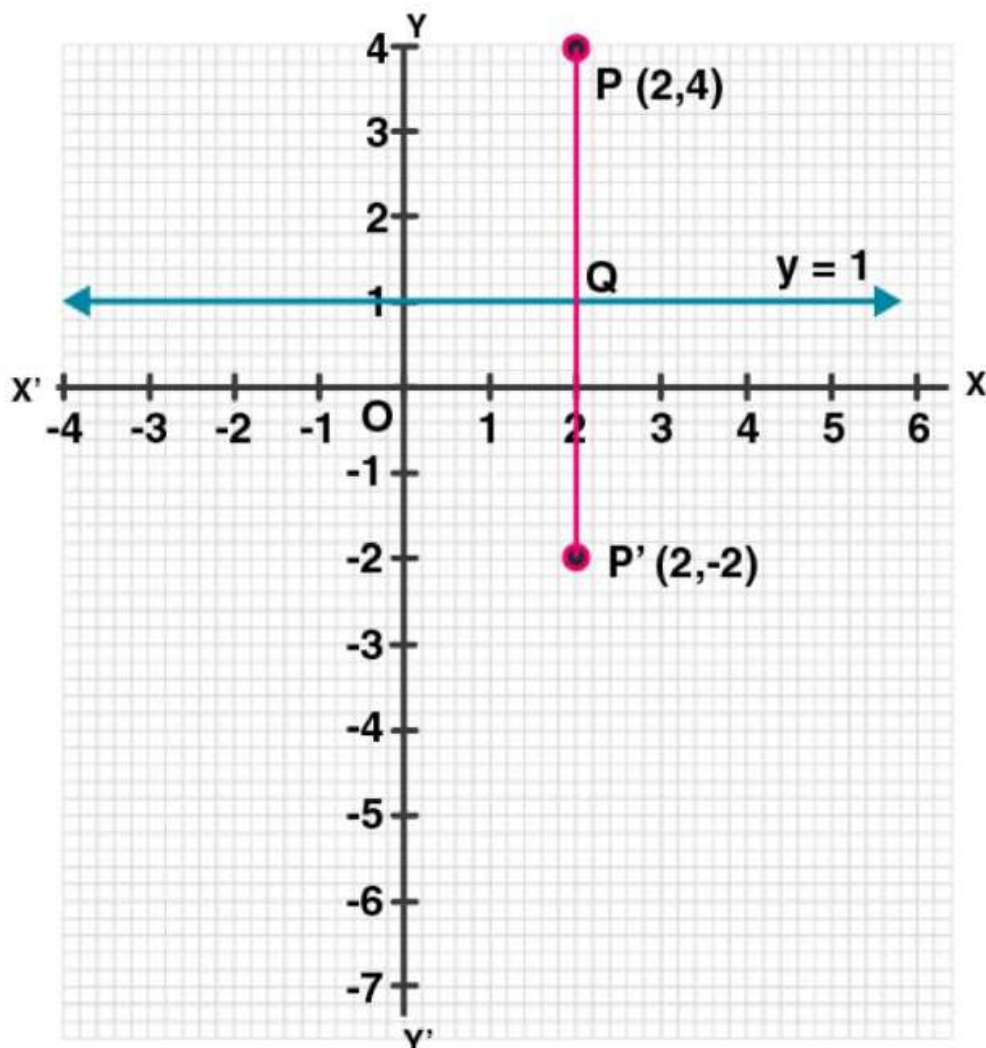
- (i) The point $P(2, 4)$ on reflection in the line $y = 1$ is mapped onto P' . Find the co-ordinates of P' .
- (ii) Find the image of the point $P(-3, -5)$ in the line $y = -2$.

Solution:

- (i) The steps are:
 - (a) Draw axis XOX' and YOY' and take $1 \text{ cm} = 1 \text{ unit}$
 - (b) Plot point $P(2, 4)$ on it.
 - (c) Draw a line $y = 1$ which is parallel to x -axis.

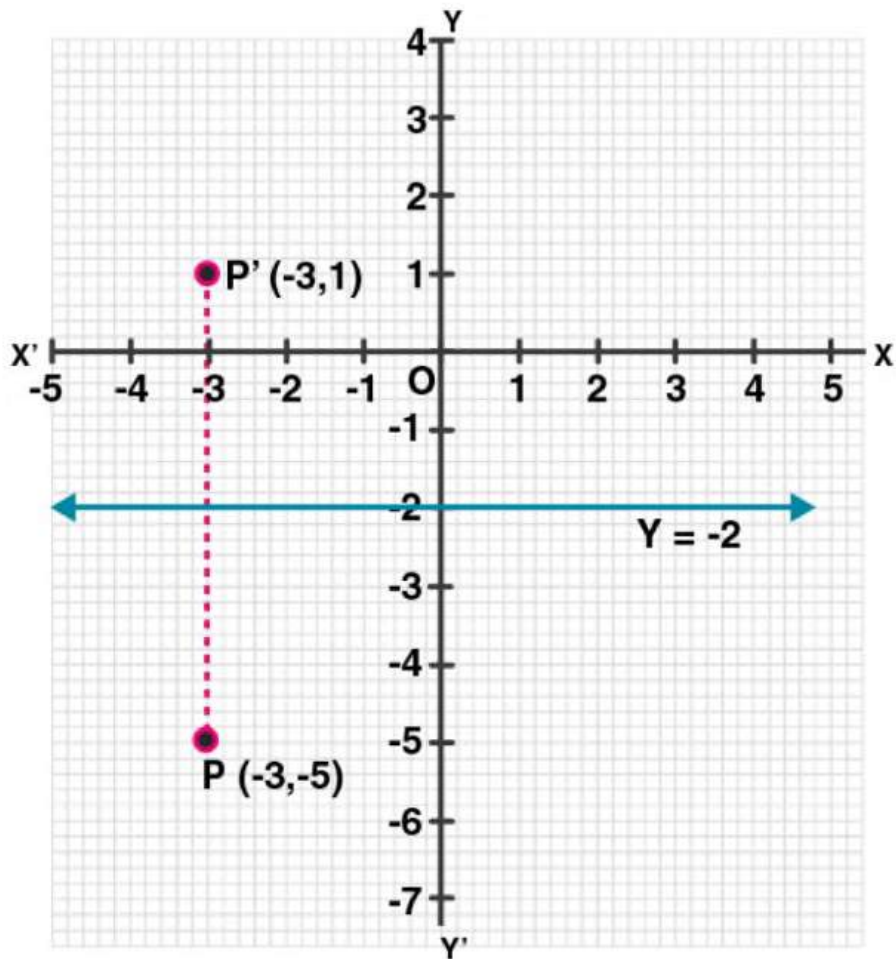
- (d) From P, draw a perpendicular on $y = 1$, meeting it at Q.
- (e) Produce PQ to P', such that $QP' = PQ$.

Therefore, P' is the reflection of P whose co-ordinates are (2, -2).



- (ii) The steps are:
 - (a) Draw axis XOX' and YOY' and take 1 cm = 1 unit
 - (b) Plot point P (-3, -5) on it.
 - (c) Draw a line $y = -2$ which is parallel to x-axis.
 - (d) From P, draw a perpendicular on $y = -2$, which meets it at Q.
 - (e) Produce PQ to P', such that $QP' = PQ$.

Therefore, P' is the image of P whose co-ordinates are (2, -2).



9. The point $P (-4, -5)$ on reflection in y -axis is mapped on P' on reflection in the origin is mapped on P'' . Find the co-ordinates of P' and P'' . Write down a single transformation that maps P onto P'' .

Solution:

Given, point $P (-4, -5)$

And, P' is the image of point P in y -axis.

Thus, the co-ordinates of P' will be $(4, -5)$.

Again,

P'' is the image of P' under reflection in origin.

Thus, the co-ordinates of P'' will be $(-4, 5)$.

The single transformation that maps P onto P'' is the x -axis.

10. Write down the co-ordinates of the image of the point $(3, -2)$ when:

- (i) Reflected in the x -axis.**
- (ii) Reflected in the y -axis.**
- (iii) Reflected in the x -axis followed by a reflection in the y -axis.**
- (iv) Reflected in the origin.**

Solution:

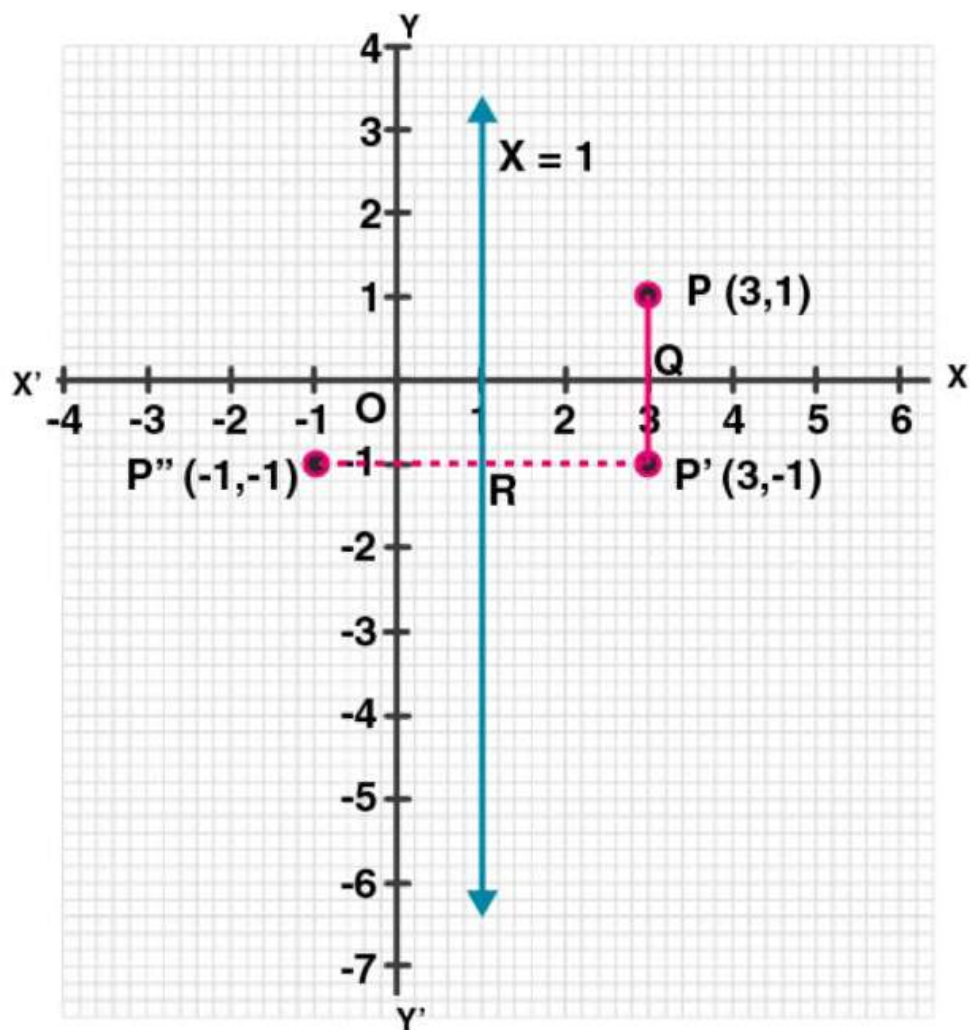
The co-ordinates of the given point are $(3, -2)$.

Now,

- (i) Co-ordinates of the image reflected in x -axis will be $(3, 2)$.
- (ii) Co-ordinates of the image reflected in y -axis will be $(-3, -2)$.
- (iii) Co-ordinates of the point reflected in x -axis followed by reflection in the y -axis will be $(-3, 2)$.
- (iv) Co-ordinates of the point reflected in the origin will be $(-3, 2)$.

11. Find the co-ordinates of the image of $(3, 1)$ under reflection in x -axis followed by a reflection in the line $x = 1$.

Solution:



The steps are:

- (i) Draw axis XOX' and YOY' and take $1 \text{ cm} = 1 \text{ unit}$
- (ii) Plot a point $P(3, 1)$.
- (iii) Draw a line $x = 1$, which is parallel to y -axis.
- (iv) From P , draw a perpendicular on x -axis meeting it at Q .
- (v) Produce PQ to P' , such that $QP' = PQ$, then P' is the image of P in x -axis. Then co-ordinates of ' P ' will be $(3, -1)$.
- (vi) From P' , draw a perpendicular on $x = 1$ meeting it at R .
- (vii) Produce $P'R$ to P'' such that $RP'' = P'R$.

Thus, P'' is the image of P' in the line $x = 1$

Hence, the co-ordinates of P'' are $(-1, -1)$.

12. If $P' (-4, -3)$ is the image of a point P under reflection in the origin, find

(i) The co-ordinates of P .

(ii) The co-ordinates of the image of P under reflection in the line $y = -2$.

Solution:

(i) Given, reflection of P is $P' (-4, -3)$ in the origin

Thus, the co-ordinates of P will be $(4, 3)$

Now,

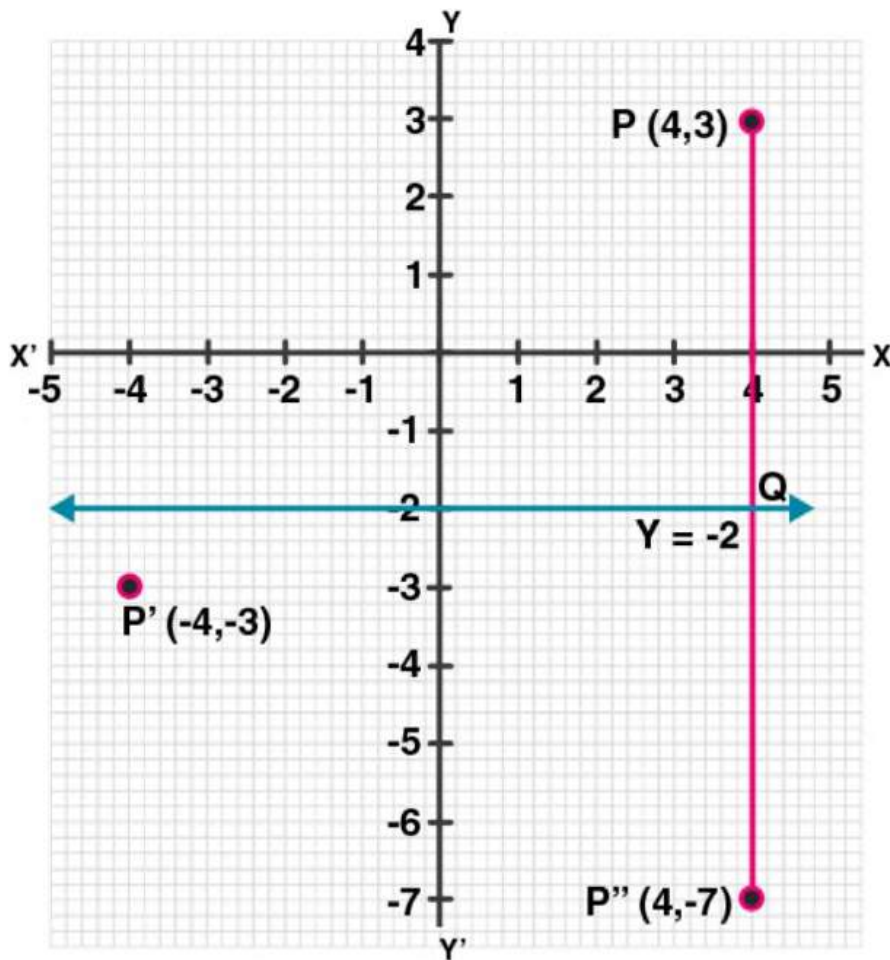
Draw a line $y = -2$, which is parallel to x -axis.

(ii) From P , draw a perpendicular on $y = -2$ meeting it at Q

Produce PQ to P'' such that $QP'' = PQ$

Thus, P'' will be the image of P in the line $y = -2$

Hence, the co-ordinates of P'' will be $(4, -7)$.



13. A point $P(a, b)$ is reflected in the x -axis to $P'(2, -3)$, write down the value of a and b . P'' is the image of P , when reflected in the y -axis. Find the co-ordinates of P'' . When P is reflected in the line parallel to y -axis such that $x = 4$.

Solution:

$P'(2, -3)$ is the reflection of $P(a, b)$ in the x -axis

Hence, the co-ordinates of P' will be $(a, -b)$ but P' is $(2, -3)$.

On comparing, we get $a = 2, b = 3$

Thus, the co-ordinates of P will be $(2, 3)$

And,

P'' is the image of P when reflected in y -axis.

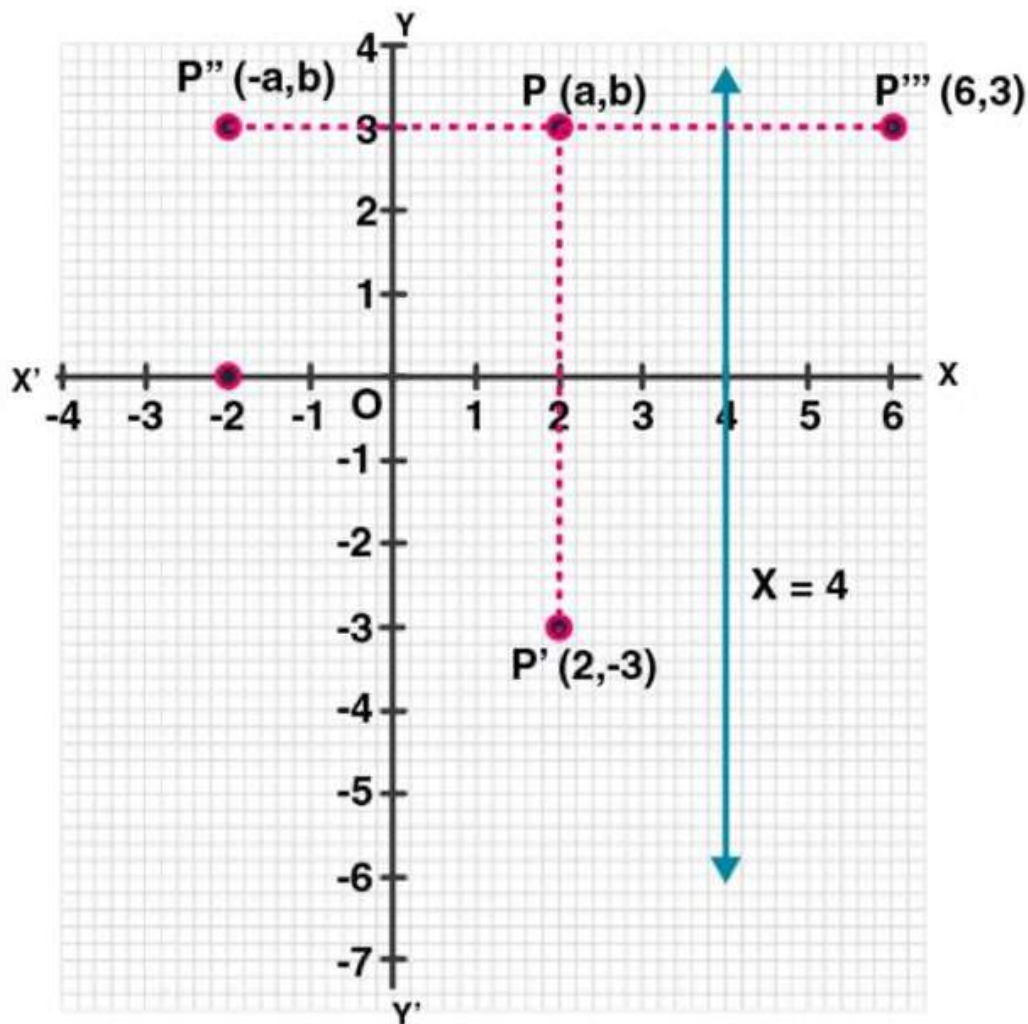
Hence, the co-ordinate of P'' will be $(-2, 3)$

Now, draw a line $x = 4$, which is parallel to y -axis.

As P'' is the image of P when it reflected in the line $x = 4$.

So, P'' is its reflection.

Thus, the co-ordinates of P'' will be $(6, 3)$.



14.

- (i) Point $P(a, b)$ is reflected in the x -axis to $P'(5, -2)$. Write down the values of a and b .

- (ii) **P'' is the image of P when reflected in the y-axis. Write down the co-ordinates of P''.**
- (iii) **Name a single transformation that maps P' to P''.**

Solution:

- (i) Image of P (a, b) reflected in the x-axis to P' (5, -2)

So, the co-ordinates of P will be (5, 2)

Hence, $a = 5$ and $b = 2$

- (ii) P'' is the image of P when reflected in the y-axis

Thus, its co-ordinates will be (-5, -2).

- (iii) The single transformation that maps P' to P'' is the origin.

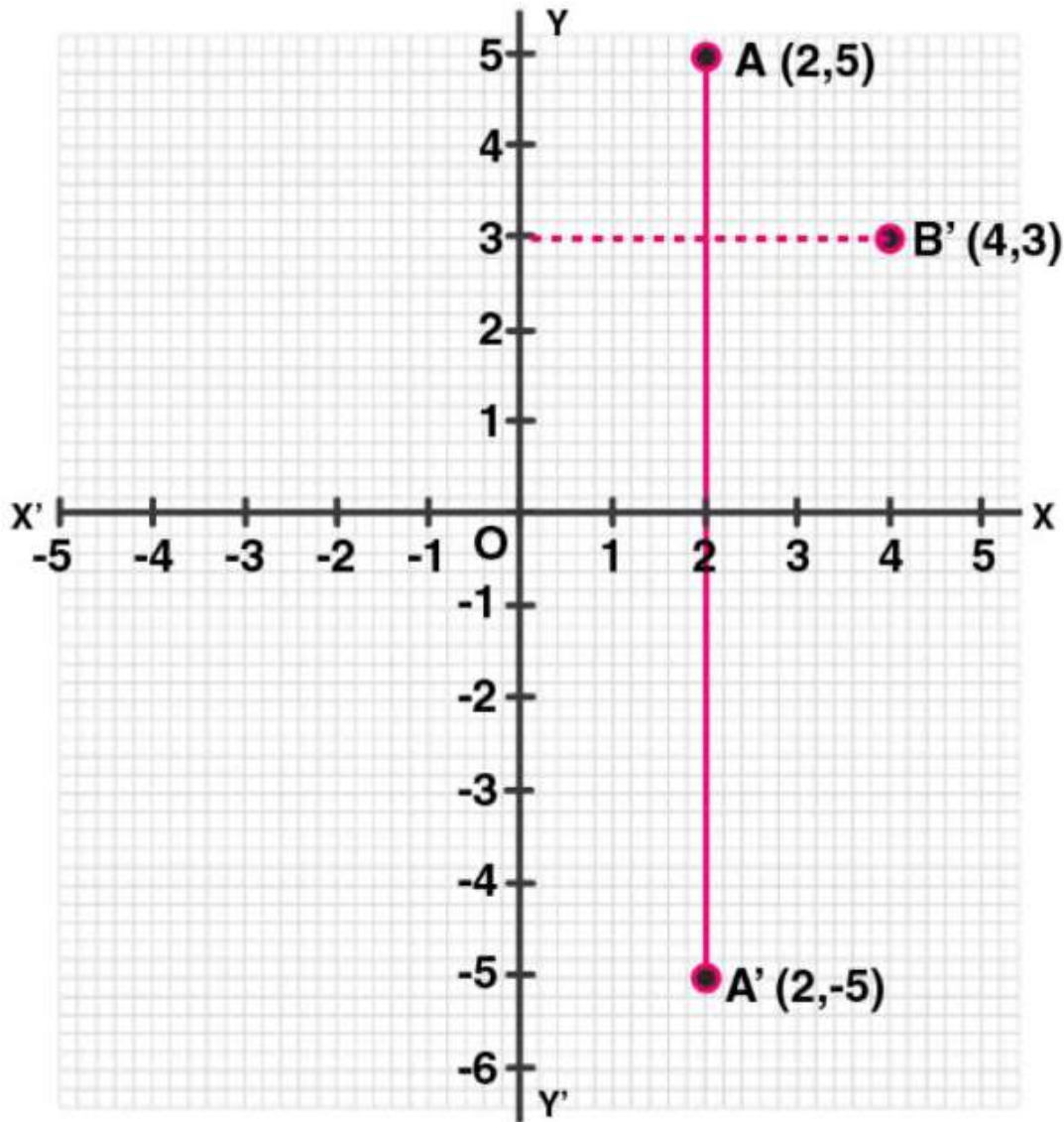
15. Points A and B have co-ordinates (2, 5) and (0, 3). Find

- (i) **The image A' of A under reflection in the x-axis.**
- (ii) **The image B' of B under reflection in the line AA'.**

Solution:

Given, co-ordinates of A are (2, 5) and of B are (0, 3).

- (i) Co-ordinates of A', the image of A reflected in the x-axis will be (2, -5)
- (ii) Co-ordinates of B', the image of B under reflection in the line AA' will be (4, 3).



16. Plot the points A (2, -3), B (-1, 2) and C (0, -2) on the graph paper. Draw the triangle formed by reflecting these points in the x-axis. Are the two triangle congruent?

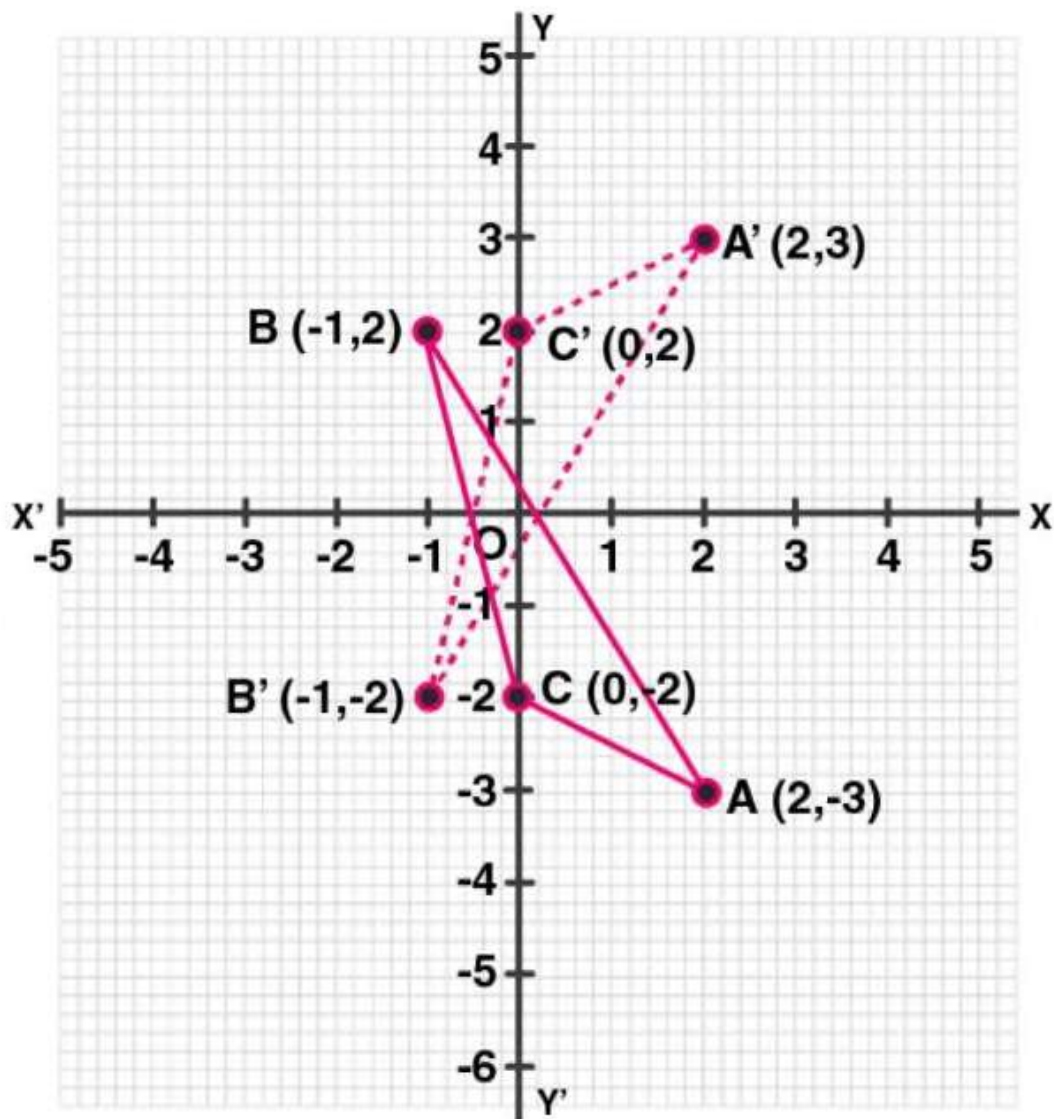
Solution:

The points A (2, -3), B (-1, 2) and C (0, -2) has been plotted on the graph paper as shown and are joined to form a triangle ABC.

Hence, the co-ordinates of the images of A, B and C reflected in x-axis will be A' (2, 3), B' (-1, -2), C' (0, 2) respectively.

And, these are joined to form another $\triangle A'B'C'$

Yes, these two triangles are congruent.



- 17. The points (6, 2), (3, -1) and (-2, 4) are the vertices of a right-angle triangle. Check whether it remains a right-angled triangle after reflection in the y-axis.**

Solution:

Let A (6, 2), B (3, -1) and C (-2, 4) be the points of the right-angled triangle.

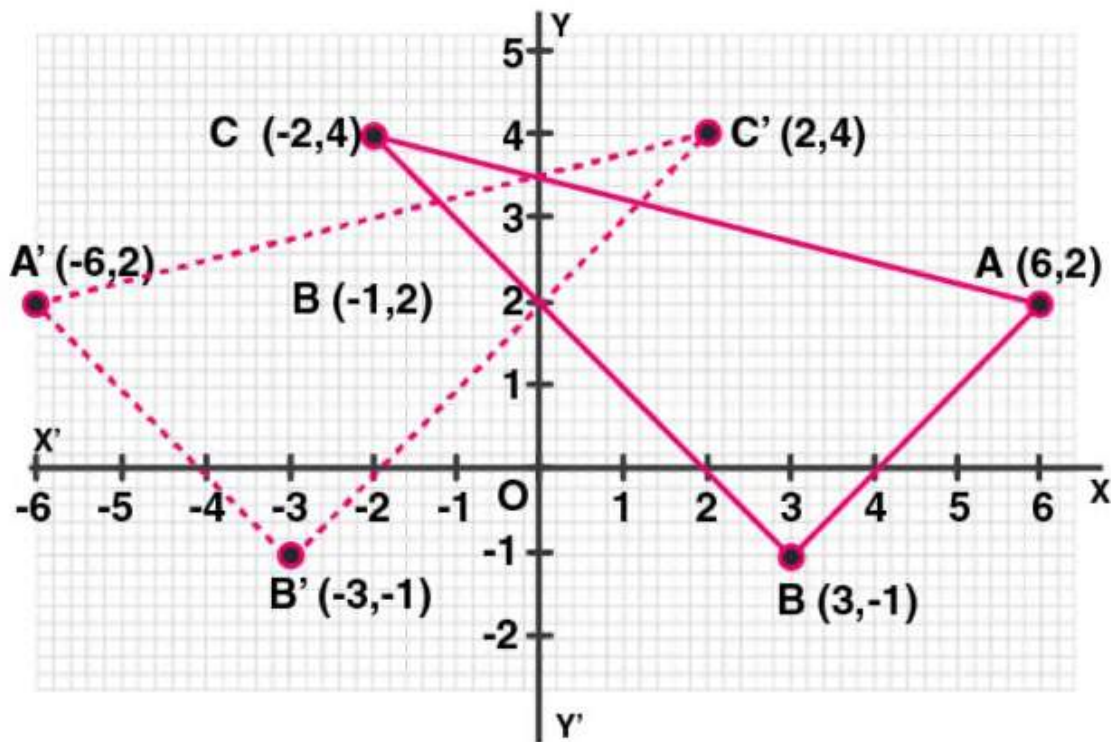
Then,

The co-ordinates of the images of A, B, C reflected in y-axis will be:

$A' (6, 2)$, $B' (3, -1)$ and $C' (-2, 4)$

Hence, by joining these points

We see that $\triangle A'B'C'$ is also a right-angled triangle.



18. The triangle ABC where A (1, 2), B (4, 8), C (6, 8) is reflected in the x-axis to triangle A'B'C'. The triangle A'B'C' is then reflected in the origin to triangle A''B''C''. Write down the co-ordinate of A''B''C''. Write down a single transformation that maps ABC onto A''B''C''.

Solution:

Given,

The co-ordinates of $\triangle ABC$ are A (1, 2) B (4, 8), C (6, 8)

These vertices are reflected in x-axis as A', B' and C'

Hence, their co-ordinates are $A' (1, 2)$ $B' (4, 8)$, $C' (6, 8)$.

Now,

A' , B' and C' are again reflected in origins to form a $\Delta A''B''C''$.

Hence, the co-ordinates will be $A'' (-1, 2)$ $B'' (-4, 8)$, $C'' (-6, 8)$.

The single transformation that maps ABC onto $A''B''C''$ is y -axis.

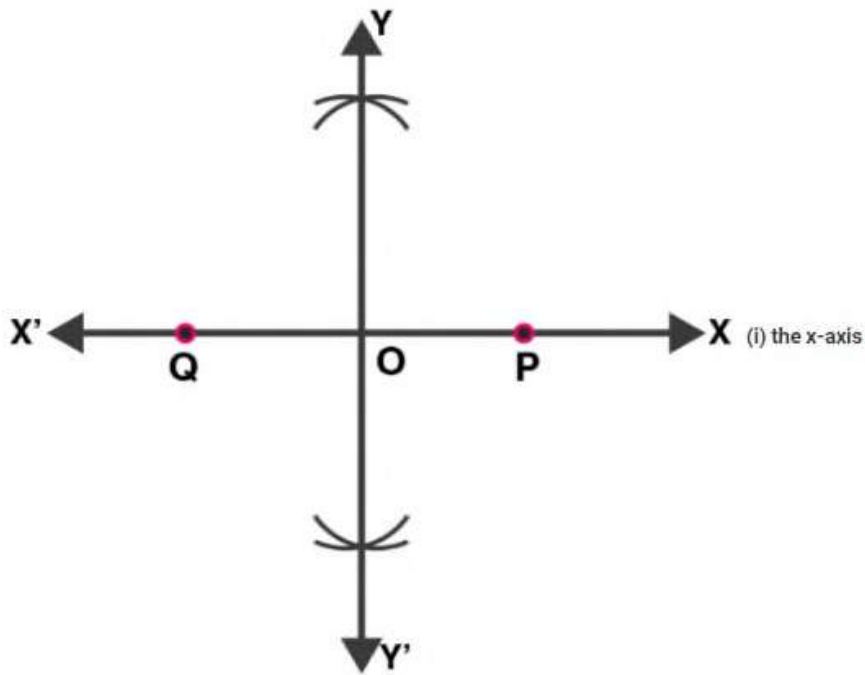
**19. The image of a point P on reflection in a line l is point P' .
Describe the location of the line l .**

Solution:

The line will be the right bisector of the line segment joining P and P' .

20. Given two points P and Q , and that (1) the image of P on reflection in the y -axis is the point Q and (2) the midpoint of PQ is invariant on reflection in x -axis. Locate:

- (i) The y -axis and
- (ii) The origin



Solution:

Given, Q is the image of P on reflection in y-axis and mid-point of PQ is invariant on reflection in x-axis.

- (i) X-axis will be the line joining the points P and Q.
- (ii) The line perpendicular bisector of line segment PQ is the y-axis.
- (iii) The origin will be the mid-point of line segment PQ.

21. The point $(-3, 0)$ on reflection in a line is mapped as $(3, 0)$ and the point $(2, -3)$ on reflection in the same line is mapped as $(-2, -3)$.

- (i) Name the mirror line.**
- (ii) Write the co-ordinates of the image of $(-3, -4)$ in the mirror line.**

Solution:

Given,

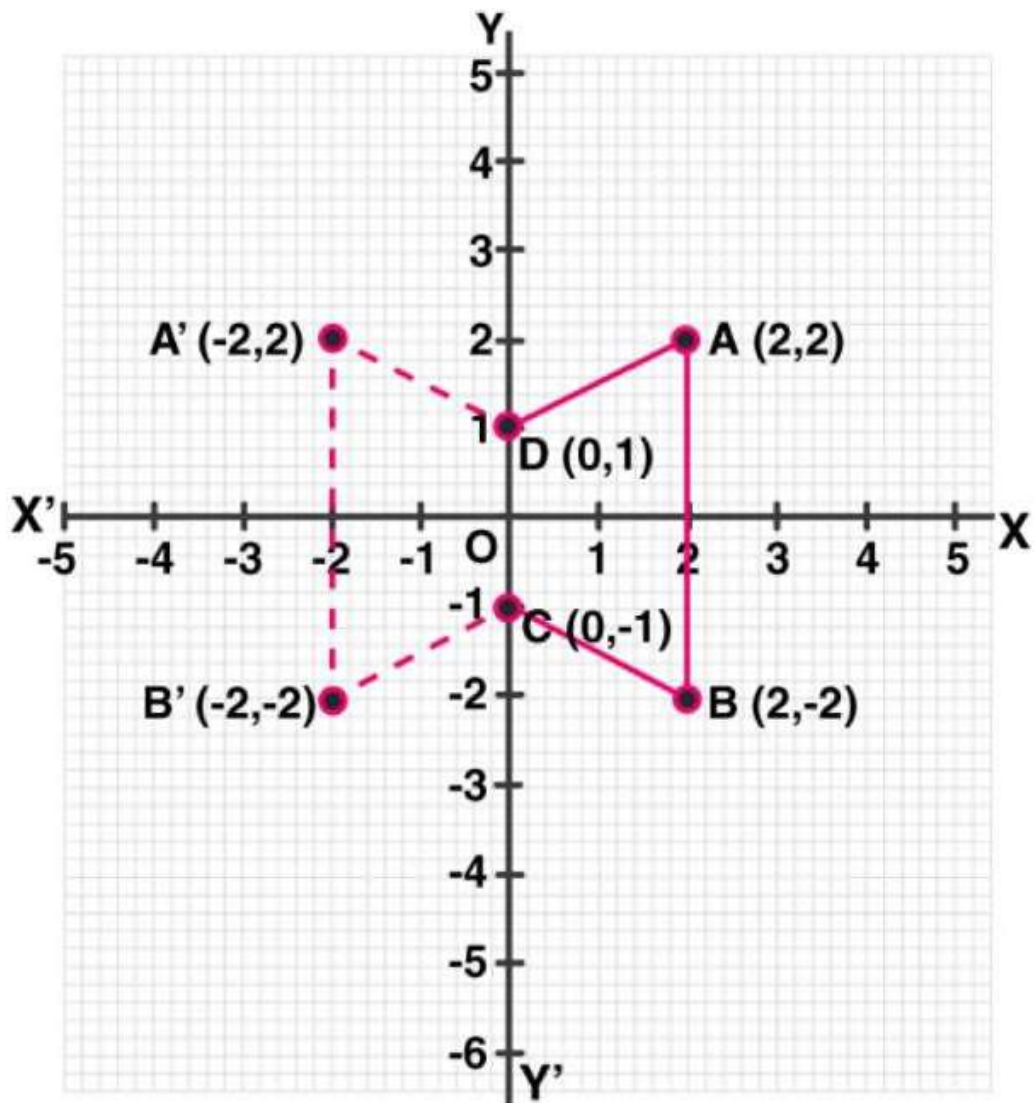
The point $(-3, 0)$ is the image of point $(3, 0)$ and point $(2, -3)$ is image of point $(-2, -3)$ reflected on the same line.

- (i) Clearly, it's seen that the mirror line will be y -axis.
- (ii) The co-ordinates of the image of the point $(-3, -4)$ reflected in the same line i.e. y -axis will be $(3, -4)$.

22. Use graph paper for this (take 2 cm = 1 unit along both x and y -axis). ABCD is a quadrilateral whose vertices are A $(2, 2)$, B $(2, -2)$, C $(0, -1)$ and D $(0, 1)$.

- (i) Reflect quadrilateral ABCD on the y -axis and name it as A'B'CD.**
- (ii) Write down the coordinates of A' and B'.**
- (iii) Name two points which are invariant under the above reflection.**
- (iv) Name the polygon A'B'CD.**

Solution:

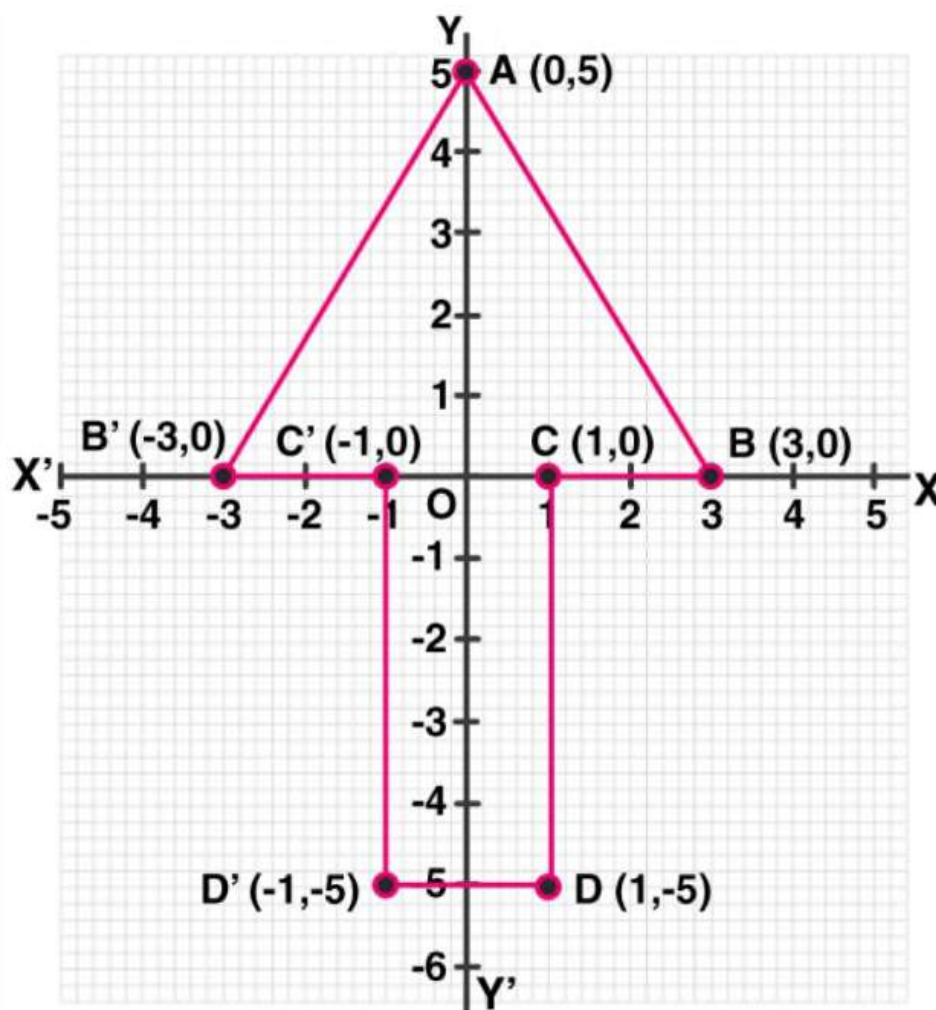


- (i) Quadrilateral ABCD is reflected on the y-axis and named as A'B'CD.
- (ii) As A' is the reflection of A (2, 2) about the line $x = 0$ (y-axis)
Thus, the co-ordinates of A' are (-2, 2).
And, as B' is the reflection of B (2, -2) about the line $x = 0$ (y-axis)
Thus, the coordinates of B' are (-2, -2).
- (iii) Points C (0, -1) and D (0, 1) are invariant under the above reflection.
- (iv) The polygon A'B'CD is a trapezium since $A'B' \parallel CD$.

23. Use a graph sheet for this question. Take 1 cm = 1 unit along both x and y-axis.

- (i) Plot the point: A (0, 5), B (3, 0), C (1, 0) and D (1, -5).**
- (ii) Reflect the points B, C and D on the y-axis and name them as B', C' and D' respectively.**
- (iii) Write down the coordinates of B', C' and D'.**
- (iv) Join the points A, B, C, D, D', C', B', A in order and give a name to the closed figure ABCDD'C'B'.**

Solution:



- (i) Point A (0, 5), B (3, 0), C (1, 0) and D (1, -5) are plotted on the graph sheet.**

- (ii) Points B, C and D are reflected on the y-axis and named as B', C' and D' respectively.
- (iii) The coordinates of B' are (-3, 0), C' (-1, 0) and D' (-1, -5).
- (iv) Points A, B, C, D, D', C', B', A are joined in order and the closed figure comes out to be an arrow marks (Or a heptagon).

24. Use graph paper for this question.

- (i) The point P (2, -4) is reflected about the line $x = 0$ to get the image Q. Find the co-ordinates of Q.
- (ii) Point Q is reflected about the line $y = 0$ to get the image R. Find the co-ordinates of R.
- (iii) Name the figure PQR.
- (iv) Find the area of figure PQR.

Solution:

- (i) As the point Q is the reflection of the point P (2, -4) in the line $x = 0$.

Thus, the co-ordinates of Q are (2, 4).

- (ii) As R is the reflection of Q (2, 4) about the line $y = 0$,

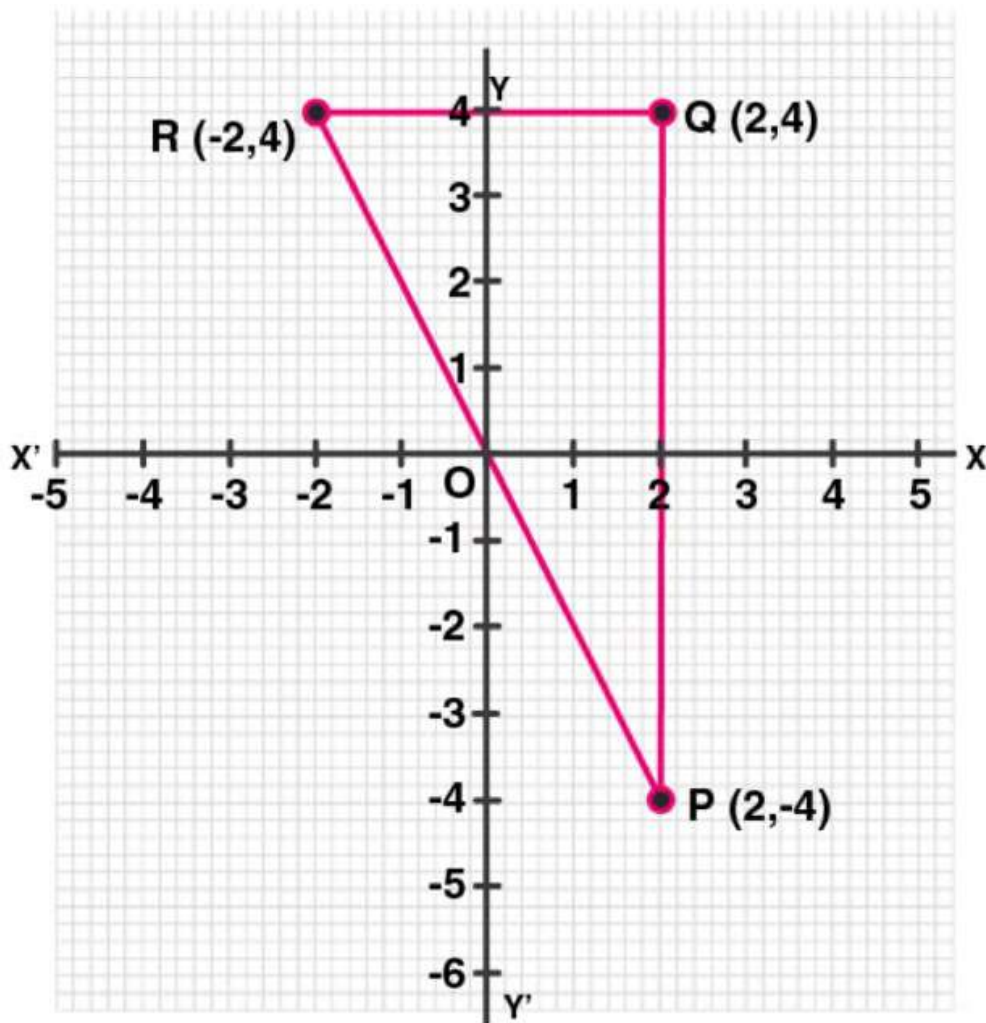
Thus, the co-ordinates of R are (-2, 4).

- (iii) Figure PQR is the right-angled triangle PQR.

- (iv) Area of $\Delta PQR = \frac{1}{2} \times QR \times PQ$

$$= \frac{1}{2} \times 4 \times 8$$

$$= 16 \text{ sq. units.}$$



- 25. Using a graph paper, plot the points A (6, 4) and B (0, 4).**
- Reflect A and B in the origin to get the images A' and B'.**
 - Write the co-ordinates of A' and B'.**
 - State the geometrical name for the figure ABA'B'.**
 - Find its perimeter.**

Solution:

Points A (6, 4) and B (0, 4) are plotted on a graph paper.

- A and B are reflected in the origin to get images A' and B'.
- Hence,

The co-ordinates of A' are (-6, 4)

The co-ordinates of B' are (0, -4)

(iii) The geometrical name for ABA'B' is parallelogram

(iv) From the figure in graph paper, we see that

Length of AB = A'B' = 6 units

And, BB' = 8 units

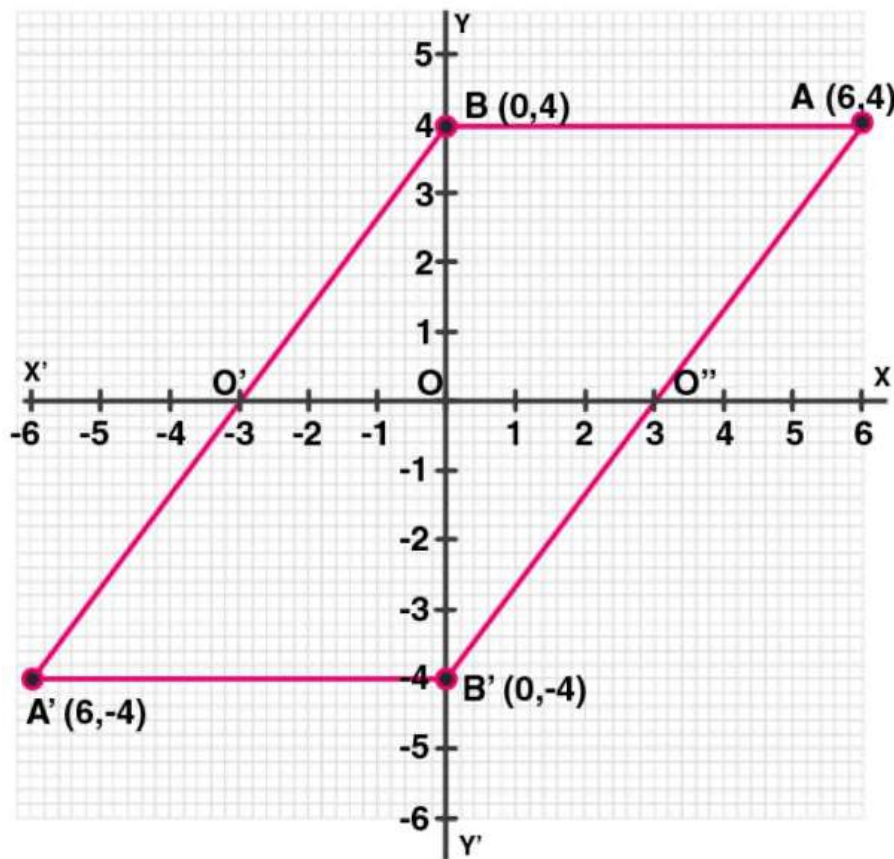
In $\triangle ABB'$, by Pythagoras theorem

$$(AB')^2 = AB^2 + (BB')^2$$

$$= 6^2 + 8^2$$

$$= 36 + 64 = 100$$

$$AB' = \sqrt{100} = 10 \text{ units.}$$



Hence, the perimeter of ABA'B' = $(6 + 10 + 6 + 10) = 32$ units.

26. Use graph paper to answer this question.

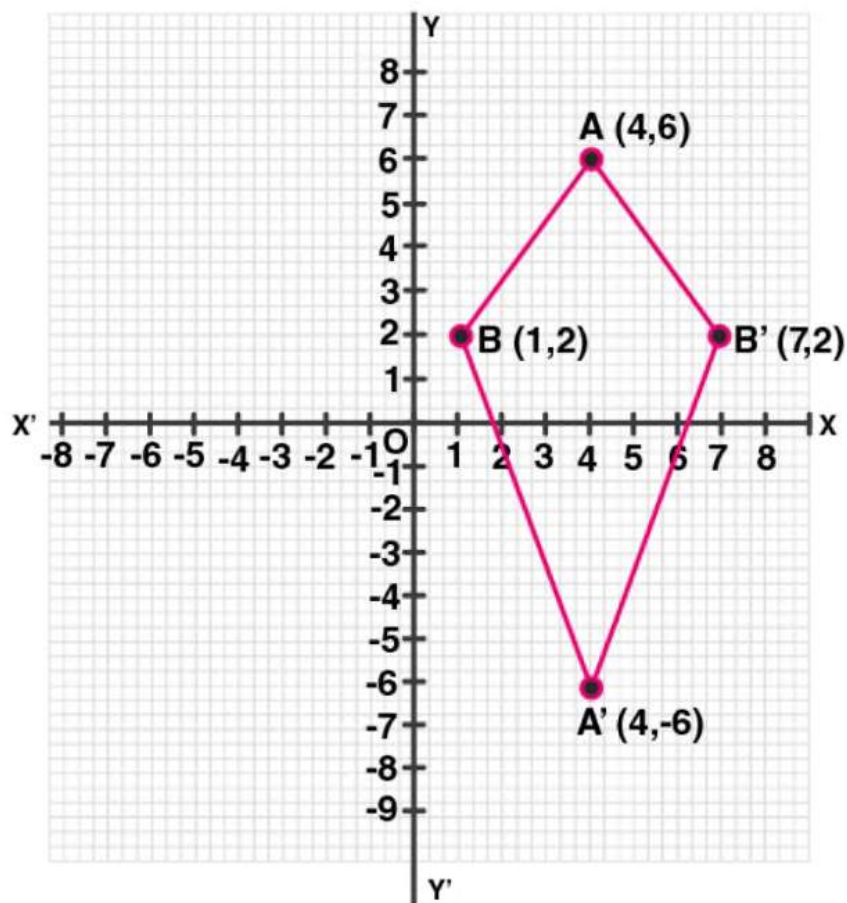
- (i) Plot the points A (4, 6) and B (1, 2).**
- (ii) If A' is the image of A when reflected in x-axis, write the co-ordinates of A'.**
- (iii) If B' is the image of B when B is reflected in the line AA'. Write the co-ordinates of B'.**
- (iv) Give the geometrical name for the figure ABA'B'.**

Solution:

- (i) Plotting the points A (4, 6) and B (1, 2) on the given graph.
- (ii) The co-ordinates of the image of A when reflected in axis are A'(4, -6).
- (iii) The co-ordinates of the image of B when reflected in the line AA' and B' = (7, 2).
- (iv) it's seen that in the quadrilateral ABA'B', we have

$$AB = AB' \text{ and } A'B = A'B'$$

Thus, ABA'B' is a kite.



27. The points A (2, 3), B (4, 5) and C (7, 2) are the vertices of $\triangle ABC$.
- Write down the co-ordinates of A_1, B_1, C_1 if $\triangle A_1, B_1, C_1$ is the image of $\triangle ABC$ when reflected in the origin.
 - Write down the co-ordinates of A_2, B_2, C_2 if $\triangle A_2, B_2, C_2$ is the image of $\triangle ABC$ when reflected in the x-axis.
 - Assign the special name to the quadrilateral BBC_2B_2 and find its area.

Solution:

Given, point A (2, 3), B (4, 5) and C (7, 2) are the vertices of $\triangle ABC$.

And, A_1, B_1, C_1 are the images of A, B and C reflected in the origin.

(i) Hence,

Co-ordinates of $A_1 = (-2, -3)$

Co-ordinates of $B_1 = (-4, -5)$ and

Co-ordinates of $C_1 = (-7, -2)$

(ii) Now,

Co-ordinates of A_2, B_2, C_2 the images of A, B and C when reflected in x-axis are:

$A_2 (2, -3), B_2 (4, -5), C_2 (7, -2)$

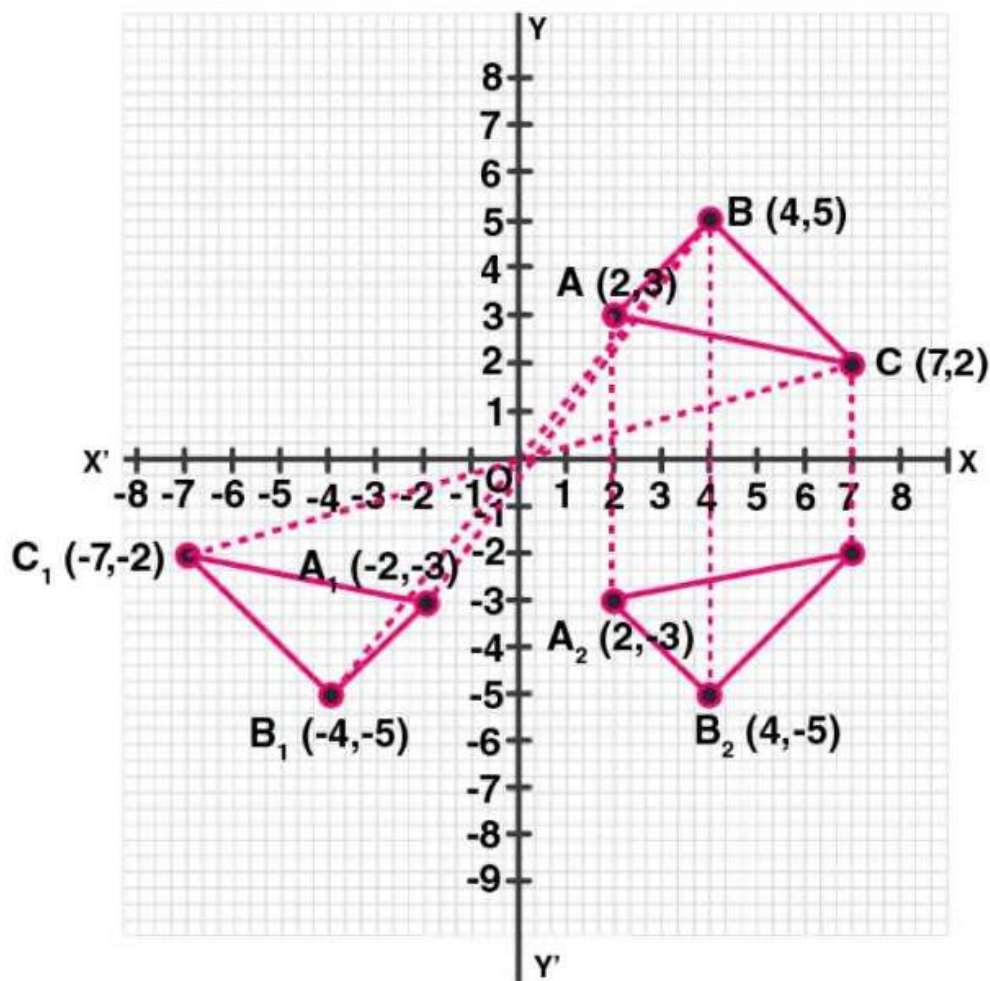
(iii) The quadrilateral formed by joining the points, $BB_2C_2B_2$ is an isosceles trapezium and its area is

$$= \frac{1}{2} (BB_2 + CC_2) \times 3$$

$$= \frac{1}{2} (10 + 4) \times 3$$

$$= \frac{1}{2} \times 14 \times 3$$

$$= 21 \text{ sq. units}$$



28. The point P (3, 4) is reflected to P' in the x-axis and O' is the image of O (origin) in the line PP'. Find:

- (i) The co-ordinates of P' and O'.**
- (ii) The length of segments PP' and OO'.**
- (iii) The perimeter of the quadrilateral POP'O'.**

Solution:

Given,

P' is the image of P (3, 4) reflected in x-axis and O' is the image of O the origin in the line P'P.

- (i) Hence, co-ordinates of P' are (3, -4) and co-ordinates of O' reflected in PP' are (6, 0).**

(ii) Length of $PP' = 8$ units and $OO' = 6$ units.

(iii) Perimeter of $POP'O'$ is $(4 \times OP)$ units.

Let Q be the point of intersection of diagonals OO' and PP' .

So, $OQ = 3$ units and $OP = 4$ units.

Hence,

$$OP = \sqrt{(OQ)^2 + (PQ)^2}$$

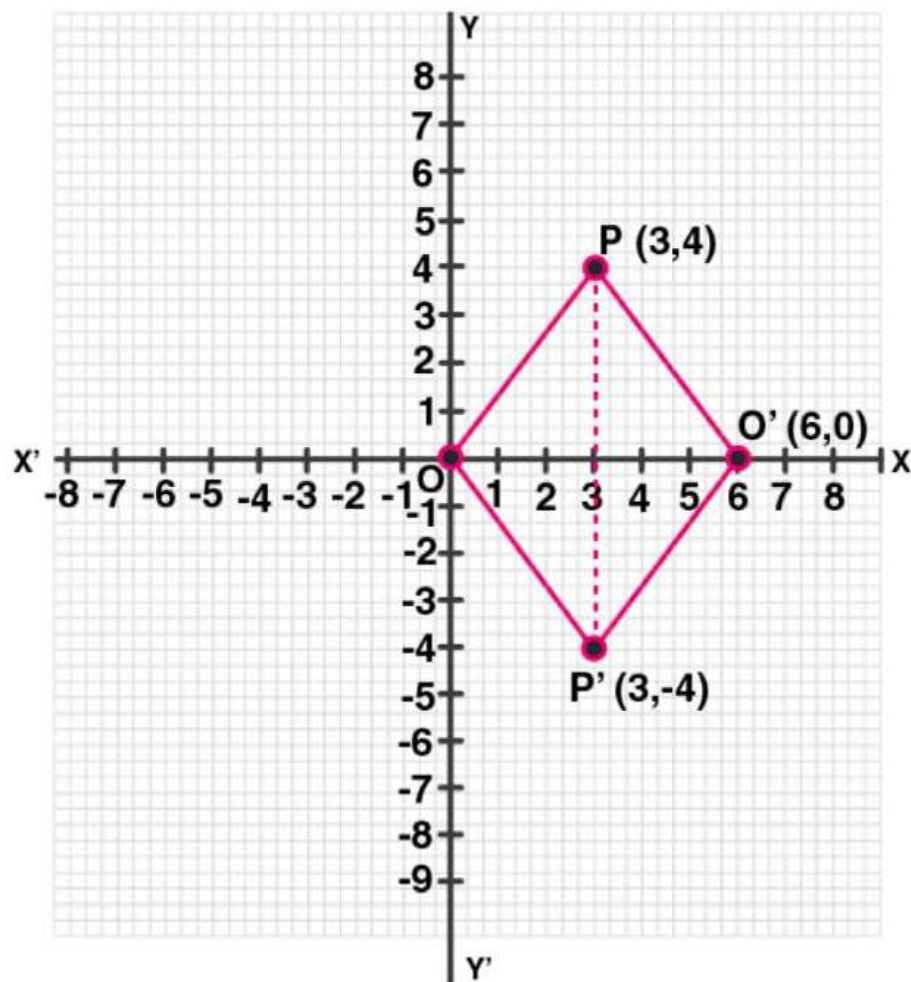
$$= \sqrt{(3^2 + 4^2)}$$

$$= \sqrt{(9 + 16)}$$

$$= \sqrt{25}$$

$$= 5 \text{ units}$$

Thus, the perimeter of $POP'O' = 4 \times 5 = 20$ units.



29. Use a graph paper for this question. (Take 10 small divisions = 1 unit on both axes). P and Q have co-ordinates $(0, 5)$ and $(-2, 4)$.
- P is invariant when reflected in an axis. Name the axis.
 - Find the image of Q on reflection in the axis found in (i).
 - $(0, k)$ on reflection in the origin is invariant. Write the value of k .
 - Write the co-ordinates of the images of Q , obtained by reflecting it in origin followed by a reflection in x -axis.

Solution:

Given, two point $P(0, 5)$ and $Q(-2, 4)$

- As the abscissa of P is 0. It is invariant when is reflected in y -axis.

(ii) Let Q' be the image of Q on reflection in y -axis.

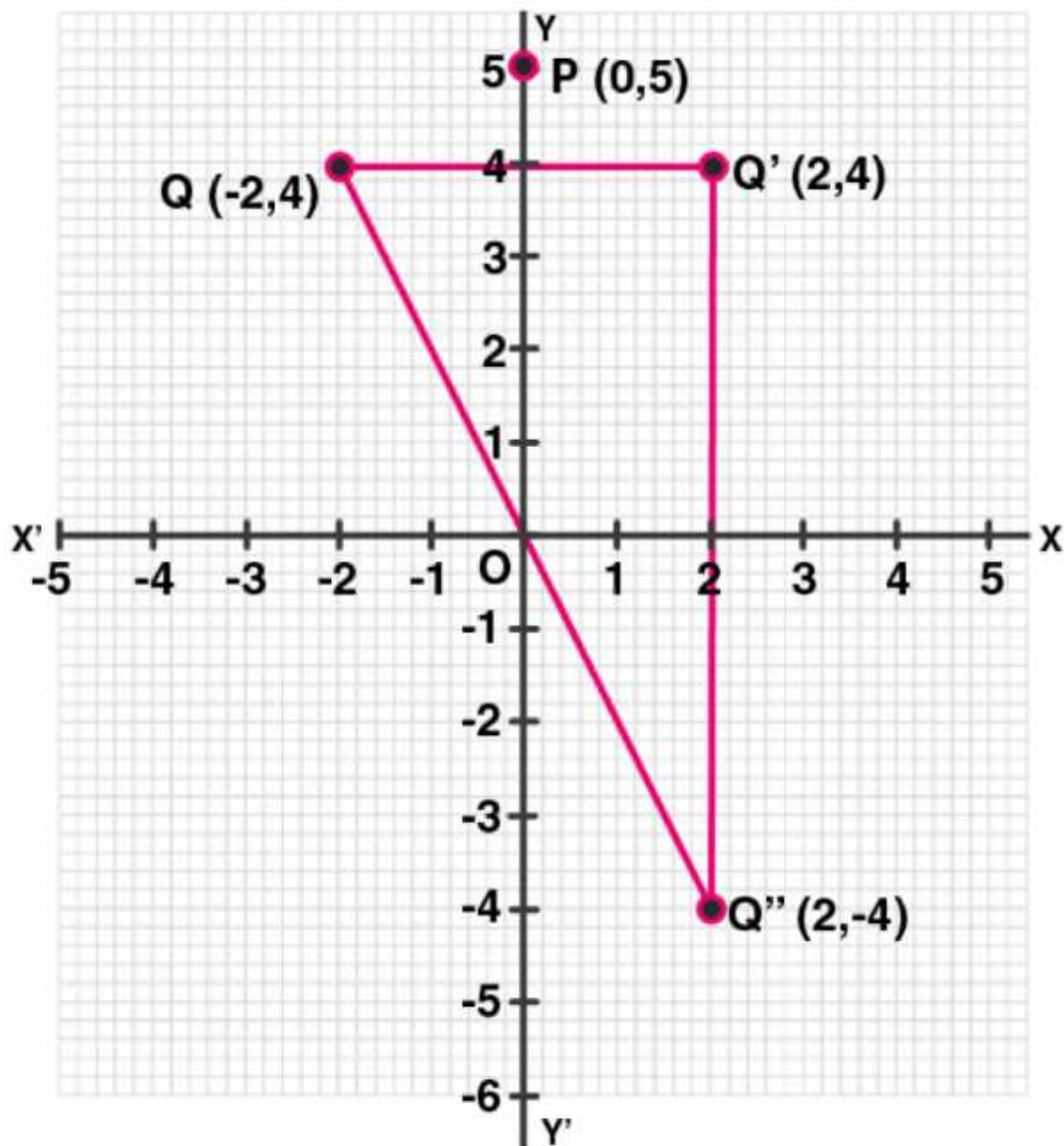
Thus, the co-ordinate of Q' will be $(2, 4)$

(iii) $(0, k)$ on reflection in the origin is invariant.

So, the co-ordinates of images will be $(0, 0)$

Hence, $k = 0$

(iv) The reflection of Q in the origin is the point Q'' and its co-ordinates will be $(2, -4)$ and reflection of $Q'' (2, -4)$ in x -axis is $(2, 4)$ which is the point Q' .



CHAPTER TEST

- 1. The point P (4, -7) on reflection in x-axis is mapped onto P'. Then P' on reflection in the y-axis is mapped onto P''. Find the co-ordinates of P' and P''. Write down a single transformation that maps P onto P''.**

Solution:

Given,

P' is the image of P (4, -7) reflected in x-axis.

Thus, the co-ordinates of P' are (4, 7)

Again P'' is the image of P' reflected in y-axis.

Hence, the co-ordinates of P'' are (-4, 7)

Therefore, single transformation that maps P and P'' is in the origin.

- 2. The point P (a, b) is first reflected in the origin and then reflected in the y-axis to P'. If P' has co-ordinates (3, -4), evaluate a, b.**

Solution:

The co-ordinates of image of P (a, b) reflected in origin are (-a, -b).

Again, the co-ordinates of P' which is image of the above point (-a, -b) reflected in the y-axis are (a, -b).

But the co-ordinates of P' are (3, -4)

Thus, $a = 3$ and $-b = -4 \Rightarrow b = 4$

- 3. A point P (a, b) becomes (-2, c) after reflection in the x-axis, and P becomes (d, 5) after reflection in the origin. Find the values of a, b, c, and d.**

Solution:

Given, point P (a, b) and the image of P (a, b) after reflected in the x-axis be (a, -b)

But it is given as (-2, c)

Thus, $a = -2, c = -b$

Next,

If P is reflected in the origin, then its co-ordinates will be (-a, -b)

But it is given as (d, 5)

Thus,

$$-b = 5 \Rightarrow b = -5,$$

$$d = -a = -(-2) = 2,$$

$$c = -b = -(-5) = 5$$

Thus,

$$a = -2, b = -5, c = 5 \text{ and } d = 2$$

- 4. A (4, -1), B (0, 7) and C (-2, 5) are the vertices of a triangle. $\triangle ABC$ is reflected in the y-axis and then reflected in the origin. Find the co-ordinates of the final images of the vertices.**

Solution:

Given, A (4, -1), B (0, 7) and C (-2, 5) are the vertices of $\triangle ABC$.

$\triangle ABC$ after reflecting in y-axis, the co-ordinates of points will be $A'(-4, -1), B'(0, 7), C'(2, 5)$.

Again, when $\Delta A'B'C'$ reflecting in origin.

The co-ordinates of the images of the vertices will be $A''(4, 1)$,
 $B''(0, -7)$, $C''(-2, -5)$.

5. The points A (4, -11), B (5, 3), C (2, 15) and D (1, 1) are the vertices of a parallelogram. If the parallelogram is reflected in the y-axis and then in the origin, find the co-ordinates of the final images. Check whether it remains a parallelogram. Write down a single transformation that brings the above change.

Solution:

Given, points A (4, -11), B (5, 3), C (2, 15) and D (1, 1) are the vertices of a parallelogram.

After reflecting in y-axis, the images of these points will be

$A'(-4, 11)$, $B'(-5, 3)$, $C'(-2, 15)$ and $D'(-1, 1)$

Again, reflecting these points in origin, the image of these points will be $A''(4, -11)$, $B''(5, -3)$, $C''(2, -15)$ and $D''(0, -1)$

Yes, the reflection of a single transformation is in the x-axis.

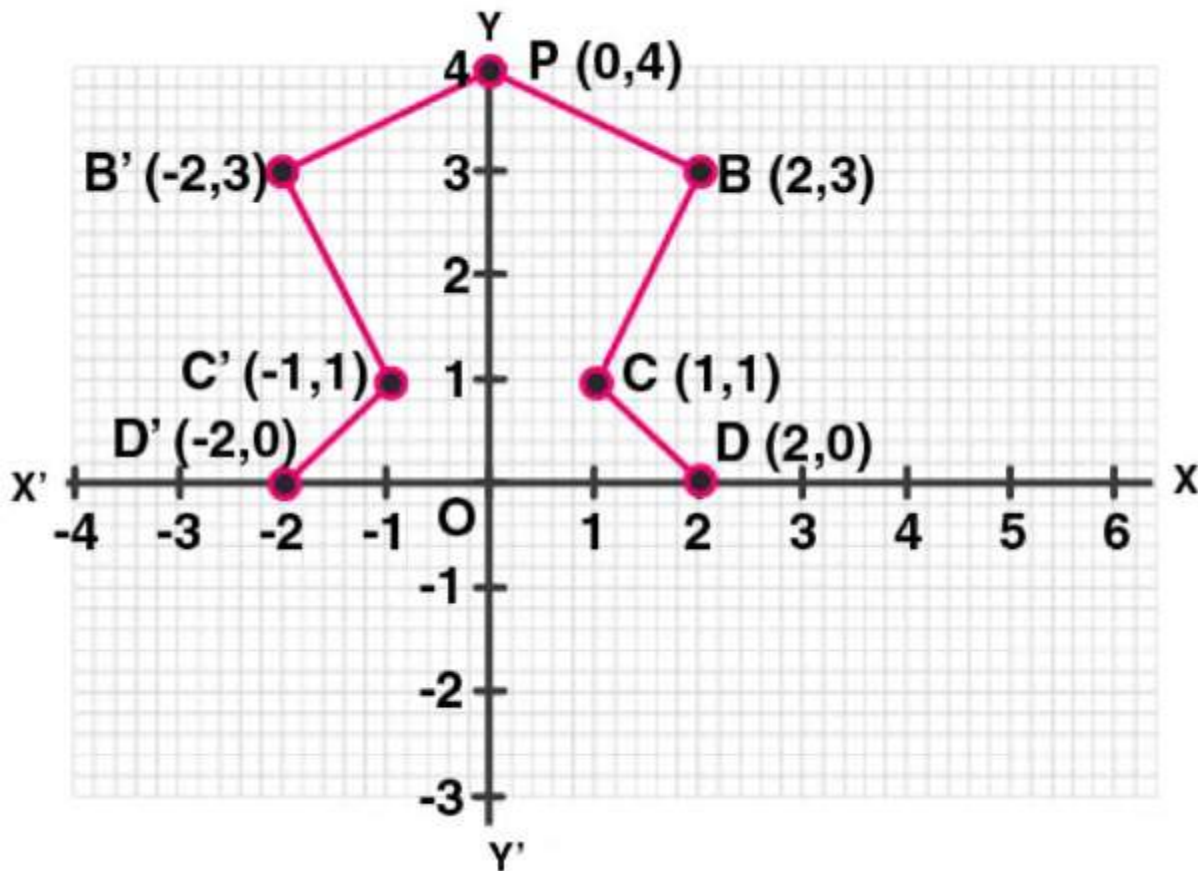
6. Use a graph paper for this question (take 2 cm = 1 unit on both x and y axes).

- (i) Plot the following points: A (0, 4), B (2, 3), C (1, 1) and D (2, 0)**
- (ii) Reflect points B, C, and D on y-axis and write down their coordinates. Name the images B', C', D' respectively.**
- (iii) Join points A, B, C, D, D', C', B' and A in order, so as to form a closed figure. Write down the equation of line of symmetry of the figure formed.**

Solution:

- (i) On graph: A (0, 4), B (2, 3), C (1, 1) and D (2, 0)
- (ii) Point after reflection on y-axis are $B' = (-2, 3)$, $C' = (-1, 1)$ and $D' = (-2, 0)$
- (iii) The point A, B, C, D, D', C', B' and A in order to form a closed figure.

Hence, the equation of the line of symmetry is $x = 0$.



7. The triangle OAB is reflected in the origin O to triangle OA'B'. A' and B' have coordinates (-3, -4) and (0, -5) respectively.

- (i) Find the co-ordinates of A and B.
- (ii) Draw a diagram to represent the given information.
- (iii) What kind of figure is the quadrilateral ABA'B'?
- (iv) Find the co-ordinates of A'', the reflection of A in the origin followed by reflection in the y-axis.

- (v) Find the co-ordinates of B'', the reflection of B in the x-axis followed by reflection in the origin.

Solution:

Given,

$\triangle OAB$ is reflected in the origin O to $\triangle OA'B'$ and the co-ordinates of A' = (-3, -4) and B' = (0, -5).

- (i) Hence, the co-ordinates of A will be (3, 4) and of B will be (0, 5).
- (ii) The diagram representing the given information has been drawn here.
- (iii) The figure in the diagram is a rectangle.
- (iv) The co-ordinates of B', the reflection of B in the x-axis is (0, -5) and co-ordinates of B'', the reflection in origin of the points (0, -5) will be (0, 5).
- (v) The co-ordinates of the points, the reflection of A in the origin are (-3, -4) and co-ordinates of A'', the reflected in y-axis of the point (-3, -4) and (-3, 4).

