Unit 3
Co-ordinate Geometry

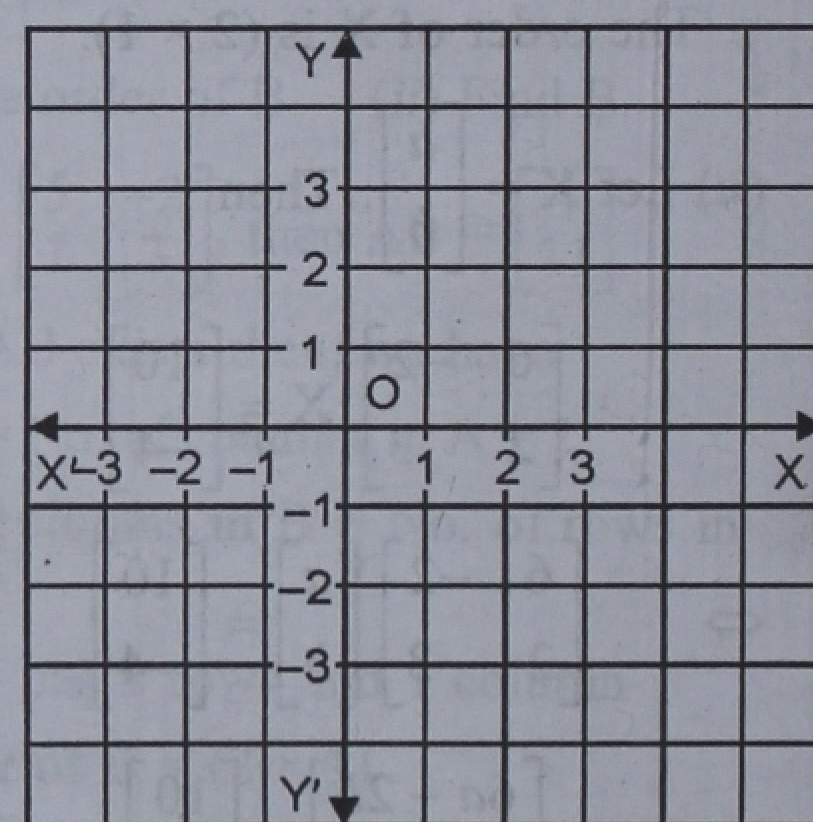
Chapter 12
Reflection

POINTS TO REMEMBER

1. Co-ordinate Axes

The position of a point in a plane is determined by two fixed mutually perpendicular straight line X′ OX and YOY′, intersecting each other at a point O.

These lines are called the **co-ordinate axes** or **Axes of Reference.**



The horizontal line X′OX is called the x-axis.

The vertical line YOY′ is called the y-axis.

The point O is called the **origin.**

We fix up a convenient unit of length and starting from the origin as zero, mark off equal distances on x-axis as well as y-axis.

The distances measured along OX and OY are taken as positive while those along OX′ and OY′ are taken as negative, as shown in the adjoining figure.

2. Co-ordinates of a Point

Let P be a point in a plane.

Let, the distance of P from y-axis = a units.

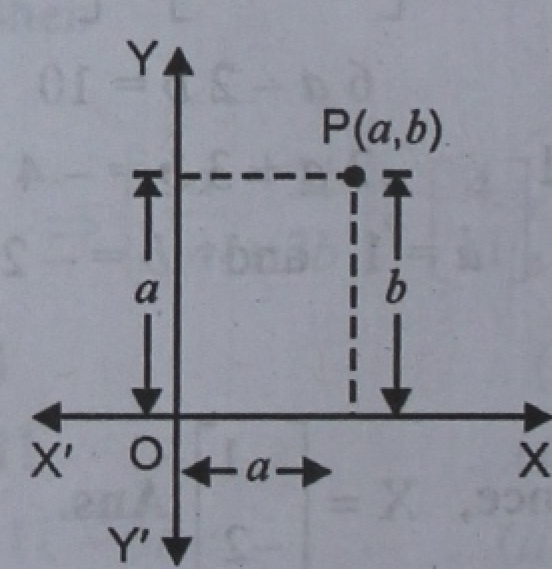
And, the distance of P from x-axis = b units.

Then, we say that the co-ordinates of P are (a, b).

a is called the x-co-ordinate or abscissa of P.

b is called the y-co-ordinate or ordinate of P.

We say that P (a, b) is a point.



Distance of any point on x-axis from x-axis is 0.

∴ Co-ordinates of each point on x-axis are $(x, 0)$.

Distance of any point on y-axis from y-axis is 0.

∴ Co-ordinates of each point on y-axis are $(0, y)$.

3. Equation of Lines :

About the equation of a line, we shall study in the next chapter. However, remember the following.

(*i*) The line $x = 0$ means *y*-axis.

(*ii*) The line $y = 0$ means *x*-axis.

(*iii*) The line $x = a$ means the line parallel to *y*-axis at a distance *a* from it.

(*iv*) The line $y = b$ means the line parallel to *x*-axis at a distance *b* from it.

4. Reflection :

Image of An Object In a Mirror

When an object is placed in front of a plane mirror, then its image is formed at the same distance behind the mirror as the distance of the object from the mirror.

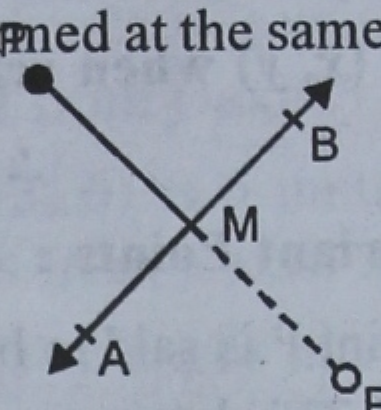


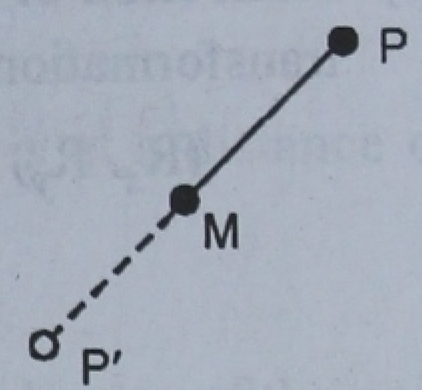
Image of a Point in a Line

For finding the image of a point P in a line AB, we consider the line as a plane mirror and P as the object. Now, we find a point P′ on the other side of AB, such that P′ is at the same distance from AB as P is from it.

Thus, the image of a point P in a line AB is a point P′ such that AB is the perpendicular bisector of PP′.

Thus, AB ⊥ PP′ and if PP′ cuts AB in M, then PM = MP′.

5. Image of a Point in a Point



The image of a point P in a point M is a point P′ such that M is the mid-point of PP′.

Reflection : The transformation R_l which maps a point P to its image P′ in a given line (or point) *l*, is called a reflection in *l*.

Thus R_l (P) = P′.

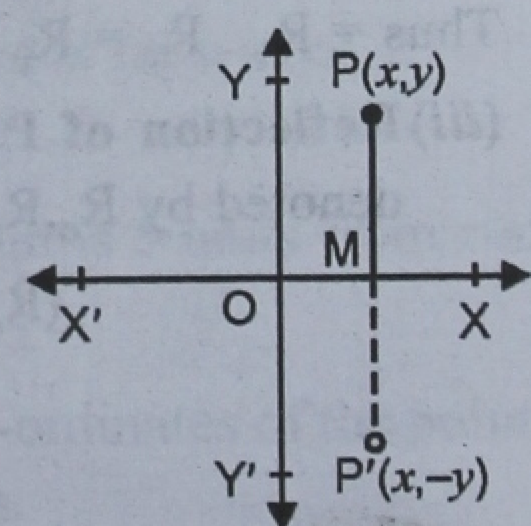
We shall represent :

(*i*) Reflection in *x*-axis by R_x ;

(*ii*) Reflection in *y*-axis by R_y ;

(*iii*) Reflection in the origin by R_o.

(*a*) Reflection in *x*-axis



Let P(*x*, *y*) be a point in a plane. Draw PM ⊥ OX, meeting it at M.

Produce PM to P′ such that MP = MP′.

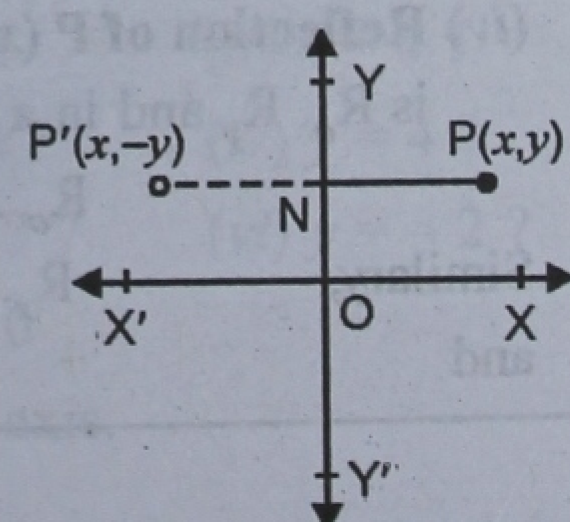
Then, P′ is the image of P when reflected in *x*-axis.

Clearly, the co-ordinates of P′ are P′ $(x, -y)$.

∴ P (x, y) when reflected in *x*-axis, has the image P′ $(x, -y)$.

$$\therefore \; R_x(x, y) = (x, -y).$$

(*b*) Reflection in *y*-axis



Let P (x, y) be a point in a plane.

Draw PN ⊥ OY meeting it at N.

Produce PN to P′ such that NP′ = NP.

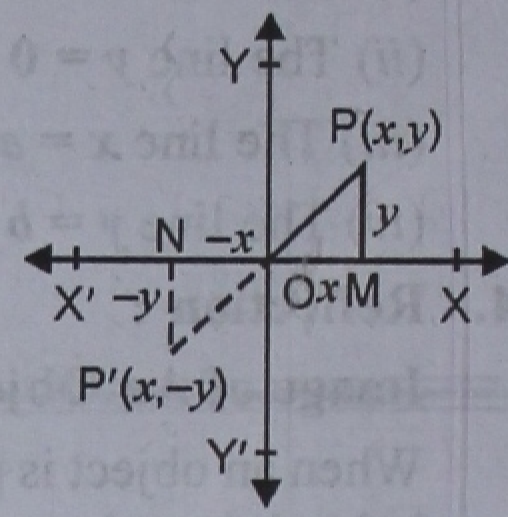
Then, P′ is the image of P when reflected in *y*-axis.

Clearly, the co-ordinates of P′ are P′ $(-x, y)$.

$\therefore$ P (x, y) when reflected in y-axis, has the image P′ $(-x, y)$.

$$\therefore\ R_y (x, y) = (-x, y)$$

(c) Reflection in the Origin



Let P (x, y) be a point in a plane.

Join PO and produce it to P′ such that OP′ = OP.

Then, P′ is the image of P when reflected in the origin.

Clearly, the co-ordinates of P′ and P′ $(-x, -y)$.

$\therefore$ P (x, y) when reflected in the origin, has the image P′ $(-x, y)$.

$$\therefore\ \mathbf{R_o (x, y) = (-x, y)}$$

6. Invariant Points :

A point P is said to be invariant with respect to a given line l, if the image of P in the line l is P itself. This happens when P lies on the line l.

7. Combination of Reflections :

(*i*) **Reflection of P (x, y) in y-axis followed by reflection in x-axis.** We denote the combined transformation by $R_x.R_y$ and operate it as under.

$$(R_x . R_y) (x, y) = R_x [R_y (x, y)]$$
$$= R_x (-x, y) \qquad [\because R_y (x, y) = (-x, y)]$$
$$= (-x, -y) = R_0 (x, y). \quad [\because R_x (-x, y) = (-x, -y)]$$
$$\therefore\ \mathbf{R_x . R_y = R_o}$$

(*ii*) **Reflection of P (x, y) in x-axis followed by reflection in y-axis :** We denote it by $R_y.R_x$ and in a manner similar as above, we can show that :

$$R_y . R_x = R_o$$

Thus = $R_x . R_y = R_y . R_x = R_o$.

(*iii*) **Reflection of P (x, y) in x-axis followed by reflection in origin :** Clearly, it will be denoted by $R_o.R_x$ and we have

$$(R_o.R_x) (x, y) = R_o [R_x (x,y)]$$
$$= R_o (x, -y)$$
$$= (-x, y) = R_y (x, y).$$
$$\therefore\ \mathbf{R_o . R_x = R_y}$$

(*iv*) **Reflection of P (x, y) in y-axis followed by reflection in origin :** The combined reflection is $R_o . R_y$ and in a manner similar as above, we can show that :

$$R_o . R_y = R_x$$

Similary, $\quad R_x . R_o = R_y$

and $\quad R_y . R_o = R_x$.

EXERCISE 12 (A)

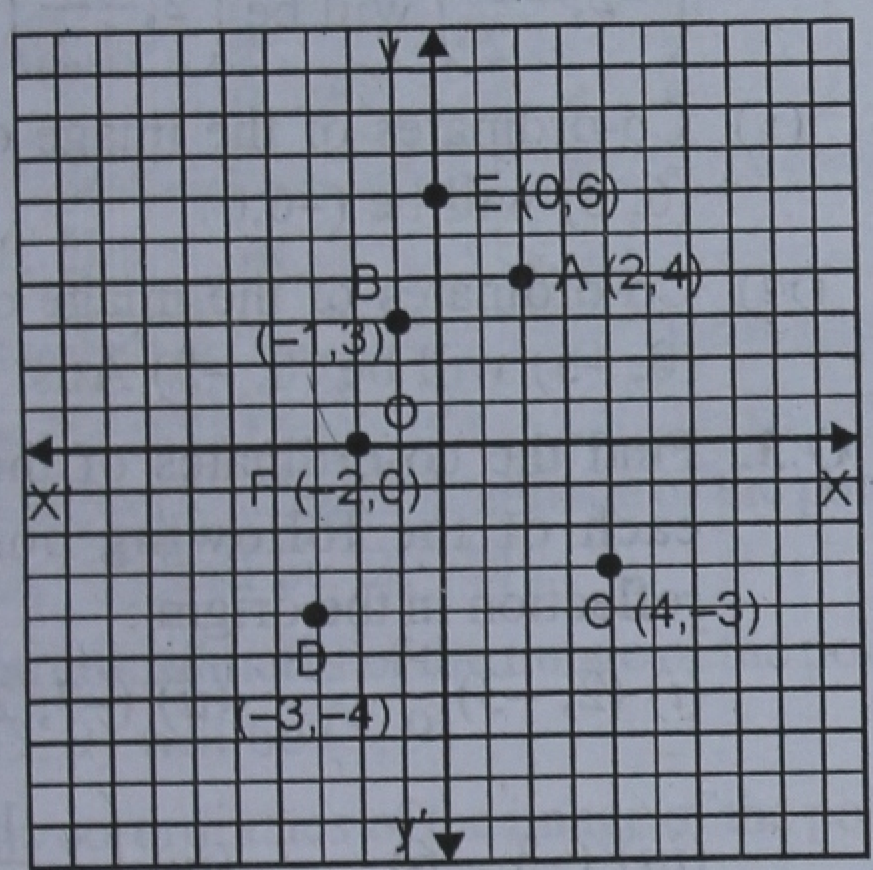
Q.1. Draw co-ordinate axes and represent the following points :

(*i*) A (2,4) (*ii*) B (–1, 3)

(*iii*) C (4, – 3) (*iv*) D (–3, –4)

(*v*) E (0, 6) (*vi*) F (–2, 0)

Sol. The points A, B, C, D, E and F are plotted on the graph by taking XOX′ and YOY′ as axes :



Q.2. On which axis does the following point lie ?

(*i*) P (3, 0) (*ii*) Q (0, 4)

(*iii*) R (–2, 0) (*iv*) S (0, –3)

Sol. (*i*) P (3, 0)

∵ Its $y = 0$

∴ P lies on x-axis.

(*ii*) Q (0, 4)

∵ Its $x = 0$,

∴ Q lies on y-axis.

(*iii*) R (–2,0)

∵ Its $y = 0$,

∴ R lies on x-axis.

(*iv*) S (0, –3)

∵ Its $x = 0$

∴ S lies on y-axis. **Ans.**

Q.3. Find the distance of each of the following points from x-axis and y-axis:

(*i*) A (7,4) (*ii*) B (3, –5)

(*iii*) C (–4, –2) (*iv*) D (–3, 6)

Sol.

(*i*) Point A is 4 units from x-axis and 7 units from y-axis.

(*ii*) Point B (3, –5) is 5 units from x-axis and 3 units from y-axis.

(*iii*) Point C (–4, –2) is 2 units from x-axis and 4 units from y-axis.

(*iv*) Point D (–3, 6) is 6 units from x-axis and 3 units from y-axis. **Ans.**

Q.4 A point lies on x-axis at a distance of 4 units from y-axis. What are its co-ordinates of this point ?

Sol. ∵ The point is on x-axis

∴ its $y = 0$

∵ The point is at a distance of 4 units from y-axis

∵ its $x = 4$

Hence, co-ordinates of the point will be (4, 0) **Ans.**

Q.5. A point lies on y-axis at a distance of 5 units from x-axis. What are the co-ordinates of this point ?

Sol. ∵ The point is on-y axis.

∴ its $x = 0$

∴ The point is 5 units from x-axis.

∴ its $y = 5$

Hence, co-ordinates of the point will be (0, 5) **Ans.**

Q.6. What do you mean by the line :

(*i*) $x = 0$? (*ii*) $x = 4$?

(*iii*) $y = 0$? (*iv*) $y = 4$?

(*v*) $x = -3$? (*vi*) $y = -2$?

Sol. (*i*) ∵ $x = 0$

∴ It is y-axis.

(*ii*) ∵ $x = 4$

∴ It is a line parallel to y-axis at a distance of 4 units to right of it.

(*iii*) $\because y = 0$

$\therefore$ It is x-axis.

(*iv*) $\because y = 4$

$\therefore$ It is a line parallel to x-axis at a distance of 4 units above x-axis.

(*v*) $\because x = -3$

$\therefore$ It is a line parallel to y-axis at a distance of 3 units to left of it.

(*vi*) $\because y = -2$

$\therefore$ It is a line parallel to x-axis at a distance of 2 units below x-axis. **Ans.**

EXERCISE 12 (B)

Q.1. Find the co-ordinates of the image of each of the following points under reflection in x-axis

(*i*) (5, 2) (*ii*) (2, –5)
(*iii*) (–6, 4) (*iv*) (–1, 0)
(*v*) (0, 7) (*vi*) (–3, –5)

Sol. $\because$ The reflection is in x-axis and $f_x(x, y) = (x, -y)$

$\therefore$ (*i*) Co-ordinates of the image of points (5, 2) will be (5, –2)

(*ii*) Co-ordinates of the image of points (2, –5) will be (2, 5)

(*iii*) Co-ordinates of the image of points (–6, 4) will be (–6, –4)

(*iv*) Co-ordinates of the image of points (–1, 0) will be (–1, 0)

(*v*) Co-ordinates of the image of points (0, 7) will be (0, –7)

(*vi*) Co-ordinates of the image of points (–3, –5) will be (–3, 5) **Ans.**

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

(*i*) (3,8) (*ii*) $\left(-\frac{3}{2}, 2\right)$
(*iii*) (5, –7) (*iv*) $\left(-2, -\frac{1}{2}\right)$
(*v*) (6, 0) (*vi*) (0, –5)

Sol. $\because$ The reflection is in y-axis and $R_y(x, y) = (-x, y)$

$\therefore$ (*i*) Co-ordinates of the image of the point (3, 8) will be (–3, 8)

(*ii*) Co-ordinates of the image of the point $\left(-\frac{3}{2}, 2\right)$ will be $\left(\frac{3}{2}, 2\right)$

(*iii*) Co-ordinates of the image of the point (5, –7) will be (–5, –7)

(*iv*) Co-ordinates of the image of the point $\left(-2, -\frac{1}{2}\right)$ will be $\left(2, -\frac{1}{2}\right)$

(*v*) Co-ordinates of the image of the point (6, 0) will be (–6,0)

(*vi*) Co-ordinates of the image of the point (0, –5) will be (0, –5) **Ans.**

Q.3. Find the co-ordinates of the image of each of the following points under reflection in the origin :

(*i*) (2, –3) (*ii*) (–7, 2)
(*iii*) (–3, –6) (*iv*) $\left(2, \frac{1}{2}\right)$
(*v*) $\left(\frac{5}{2}, 0\right)$ (*vi*) (0, 9)

Sol. $\because$ The reflection is in the origin and $R_o(x,y) = (-x, -y)$

$\therefore$ (*i*) Co-ordinates of the image of the point (2, –3) will be (–2, 3)

(*ii*) Co-ordinates of the image of the point (–7, 2) will be (7, –2)

(*iii*) Co-ordinates of the image of the point (–3, –6) will be (3, 6)

(*iv*) Co-ordinates of the image of the point $\left(2, \frac{1}{2}\right)$ will be $\left(-2, -\frac{1}{2}\right)$

(*v*) Co-ordinates of the image of the point $\left(\frac{5}{2}, 0\right)$ will be $\left(\frac{-5}{2}, 0\right)$

(*vi*) Co-ordinates of the image of the point (0, 9) will be (0, –9) **Ans.**

4. Find the co-ordinates of the image of each of the following points under reflection in the line $x = 0$:

(*i*) $\left(\frac{3}{2}, \frac{5}{2}\right)$ (*ii*) (–1, 2)

(*iii*) (0, –3) (*iv*) (–3, –7)

(*v*) (–5, 9) (*vi*) (2, 8)

Sol. ∵ The reflection is in the line $x = 0$ *i.e.* y-axis and $R_y(x, y) = (-x, y)$

∴ (*i*) The co-ordinates of the image of the point $\left(\frac{3}{2}, \frac{5}{2}\right)$ will be $\left(\frac{-3}{2}, \frac{5}{2}\right)$

(*ii*) The co-ordinates of the image of the point (–1, 2) will be (1, 2)

(*iii*) The co-ordinates of the image of the point (0, –3) will be (0, –3)

(*iv*) The co-ordinates of the image of the point (–3, –7) will be (3, –7)

(*v*) The co-ordinates of the image of the point (–5, 9) will be (5, 9)

(*vi*) The co-ordinates of the image of the point (2, 8) will be (–2,8) **Ans.**

Q. 5. Find the co-ordinates of the image of each of the following points under reflection in the line $y = 0$:

(*i*) (4, –7) (*ii*) (–7, 4)

(*iii*) (–3, –8) (*iv*) $\left(\frac{5}{2}, \frac{3}{2}\right)$

(*v*) (6, 7) (*vi*) (0, –3)

Sol. ∵ The reflection is the line $y = 0$ *i.e.* x –axis and $R_x(x, y) = (x, -y)$

∴ (*i*) The co-ordinates of the image of the point (4, –7) will be (4, 7).

(*ii*) The co-ordinates of the image of the point (–7, 4) will be (–7, –4).

(*iii*) The co-ordinates of the image of the point (–3, –8) will be (–3, 8).

(*iv*) The co-ordinates of the image of the point $\left(\frac{5}{2}, \frac{3}{2}\right)$ will be $\left(\frac{5}{2}, \frac{-3}{2}\right)$.

(*v*) The co-ordinates of the image of the point (6, 7) will be (6, –7)

(*vi*) The co-ordinates of the image of the point (0, –3) will be (0, 3) **Ans.**

Q. 6. The point P (–6, –3) on reflection in y-axis is mapped on P′. The point P′ on reflection in the origin is mapped on P″.

(*i*) Find the co-ordinates of P′.

(*ii*) Find the co-ordinates of P″.

(*iii*) Write down a single transformation that maps P onto P″.

Sol. (*i*) ∵ P′ is the image of the point P (–6, –3) in y-axis.

∴ The co-ordinates of P′ will be (6, –3) as $R_y(x, y) = (-x, y)$

(*ii*) Again, P″ is the image of the point P′ (6, –3) is the origin.

∴ The co-ordinates of P″ will be (–6, 3)

(*iii*) From (*i*) and (*ii*),

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

Q. 7. The point P (4, –7) is reflected in the origin to point P′. The point P′ is then reflected in x-axis to the point P″.

(*i*) Find the co-ordinates of P′.

(*ii*) Find the co-ordinates of P″.

(*iii*) Write down a single transformation that maps P onto P″.

Sol. (*i*) ∵ P′ is the image of the point P (4, –7) in the origin.

∴ The co-ordinates of P′ will be (–4, 7)

[∵ $R_o(x, y) = (-x, -y)$]

(*ii*) Again P″ is the image of the point P′ in the x-axis.

∴ co-ordinates of P″ will be (–4, –7) as $R_x(x, y) = (x, -y)$

(*iii*) From (*i*) and (*ii*),

The single transformation that maps P onto P″ is y-axis.

Q.8. Use a 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.

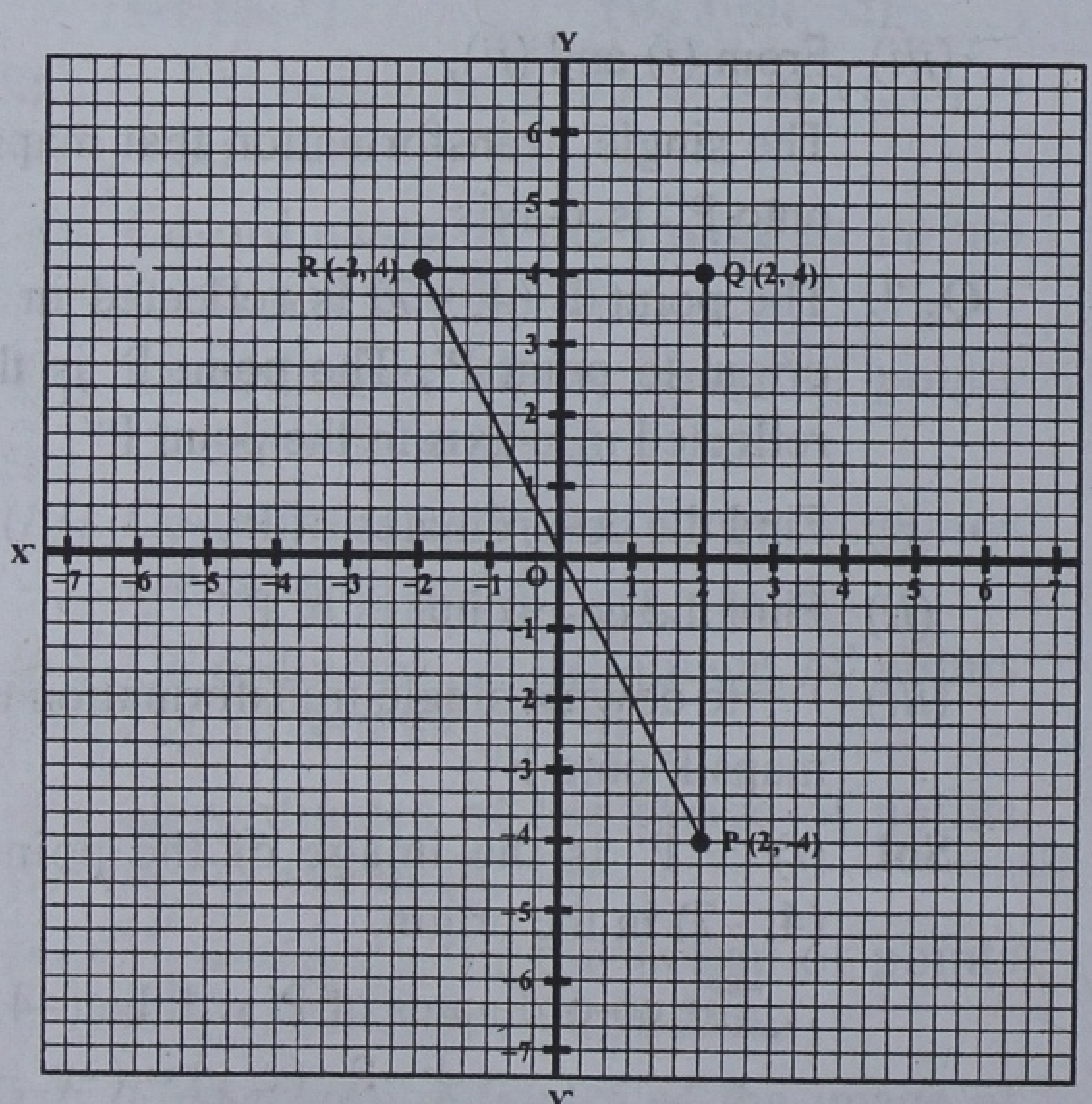
(iii) Name the figure PQR.

(iv) Find the area of figure PQR. **(2007)**

Sol. *(i)* Since the point Q is the reflection of the point P (2, – 4) in the line $x = 0$, the co-ordinates of Q are (2, 4).

(ii) Since R is the reflection of Q (2, 4) about the line $y = 0$, the co-ordinates of R are (– 2, 4).

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



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

$= \frac{1}{2} \times 4 \times 8 = 16$ sq. units.

Q. 9. *(i)* The vertices of a ΔABC are A (2, –3 (–1, 2) and C (3, 0). This triangl reflected in x-axis to form ΔA′B′C′. F the co-ordinates of A′, B′ and C′. Are two triangles congruent ?

(ii) The points P (–2,4), Q (3, –1) and (6, 2) are the vertices of a triangle. ΔP is reflected in y-axis to form ΔP′Q′ Find the co-ordinates of P′, Q′ and R

Sol. *(i)* Vertices of ΔABC are A (2, –3), B (2) and C (3, 0)

Plot the points A (2, –3), B (–1, 2) and C 0) on the graph

Join AB, BC and CA

A (2, –3) is reflected in x-axis to A′ (2,

B (–1, 2) is reflected to B′ (–1, –2) in x-a

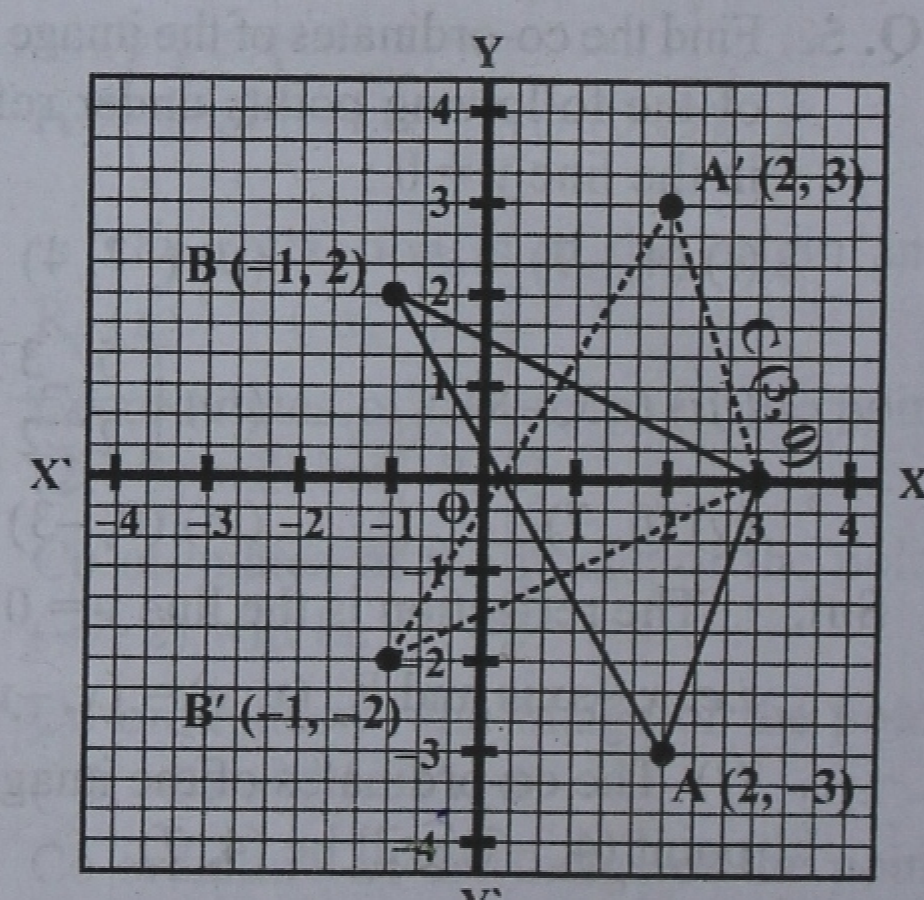
$\because$ C (3, 0) is on x-axis

$\therefore$ The image of C will be C′ (3, 0)

Now ΔABC is reflected in ΔA′B′C in x-a

$\therefore$ Co-ordinates of A′ are (2, 3), of B′ (–1, - and C′ (3, 0)

We see that ΔA′B′C is congruent to ΔAB



(ii) $\because$ ΔPQR is reflected in y-axis and c ordinates are P (–2, 4), Q (3, –1) and R (2) P′, Q′ and R′ are the images of points Q and R respectively in y-axis.

$\therefore$ Co-ordinates of P′, the image of (–2,4) will be (2, 4), The co-ordinates of Q′ the image of Q (3, –1) will be (–3, –1) and co-ordinates of R′, the image of R (6,2) will be (–6, 2)**Ans.**

Q.10. A (4, –2), B (0, 6) and C (–3,5) are the vertices of a triangle. ΔABC is reflected in the *y*-axis and then reflected in the origin. Find the co-ordinates of the final images of the vertices.

Sol. The vertices of a ΔABC are A(4, –2), B (0, 6), C (–3, 5) ΔABC is reflected in the *y*-axis.

∴The co-ordinates of A′, the image of A (4, –2) will be (–4, –2) and the co-ordinates of B′, the image of B (0, 6) are (0, 6) and the coordinates of C′, the image of C (–3, 5) are (3, 5). By joining them we get Δ A′B′C′, the reflection of ΔABC in *y*-axis.

Again, the ΔA′B′C′ is reflected in origin.

The co-ordinates of A″, the image of A′ (–4, 2) will be (4, 2), the co-ordinates of B″, the image of B′ (0,6) will be (0, –6) and the co-ordinates of C″, the image of C′ (3, 5) will be (–3, –5).

Q. 11. Use a graph paper for this question.

The point P (5, 3) was reflected in the origin to get the image P′.

(*i*) Write down the coordinates of P′.

(*ii*) If M is the foot of the perpendicular from P to the *x*-axis, find the coordinates of M.

(*iii*) If N is the foot of the perpendicular from P′ to the *x*-axis, find the coordinates of N.

(*iv*) Name the figure PMP′N.

(*v*) Find the area of the figure PMP′N.

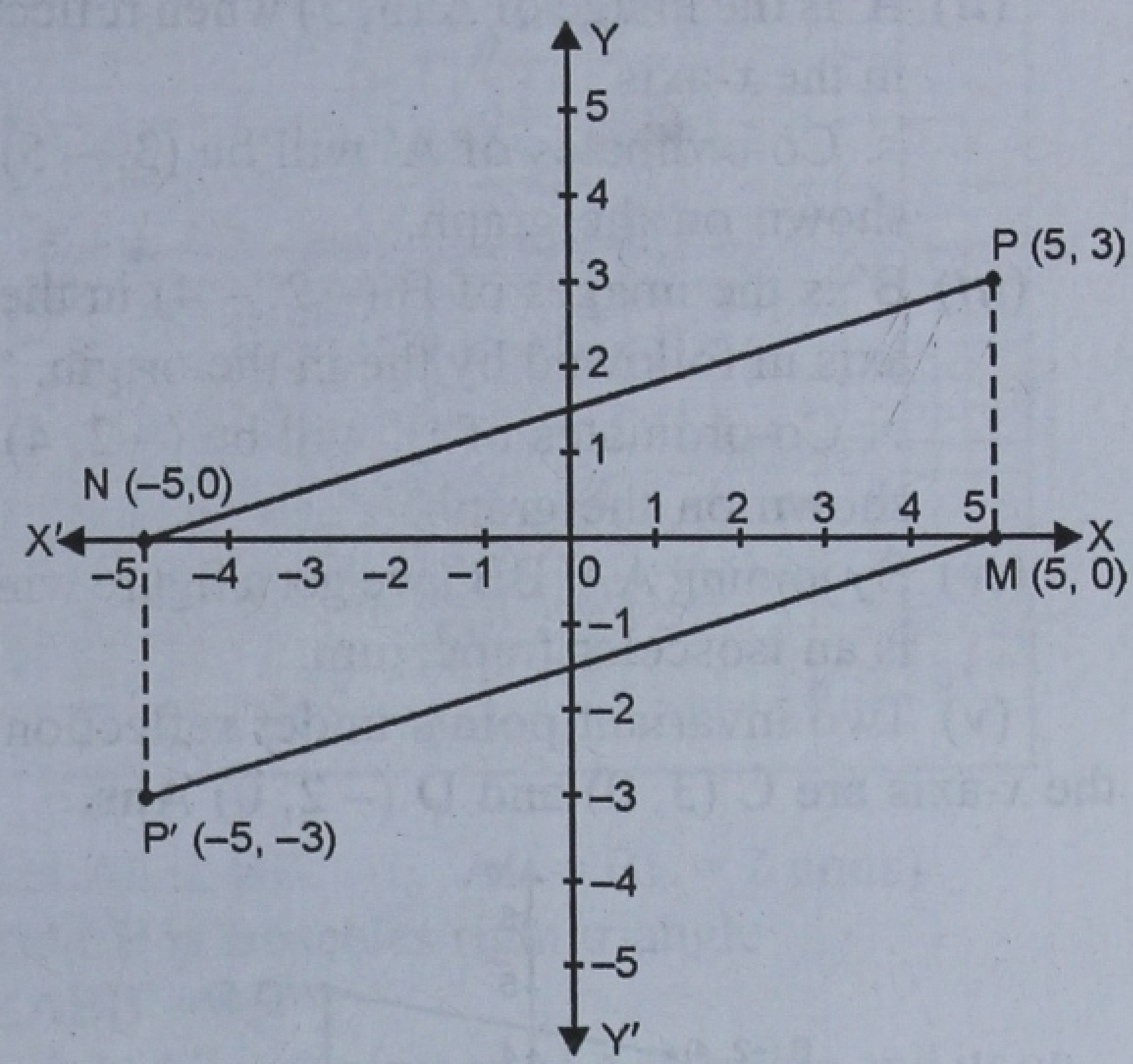
(2001)

Sol. (*i*) Points P (5, 3) is reflected to P′ in the origin.

∴ Co-ordinates of P′ will be (– 5, – 3).

(*ii*) PM ⊥ on *x*-axis.

∴ Co-ordinates of P′M will be (5, 0)



(*iii*) P′N ⊥ on *x*-axis

∴ Co-ordinates of N will be (– 5, 0).

(*iv*) PM, MP′ P′N and NP are joined which form a parallelogram PM = P′N.

(*v*) Area of ||gm PMP′N

= 2 (Area of ΔPMN)

$= 2\left(\frac{1}{2} \times 10 \times 3\right)$ Sq. cm

= 30 Sq. cm **Ans.**

Q. 12. Use a graph paper for this question.

(*i*) Plot the points A (3, 5) and B (– 2, – 4). Use 1 cm = 1 unit on both axes.

(*ii*) A′ is the image of A when reflected in the *x*-axis, write down the coordinates of A′ and plot it on the graph paper.

(*iii*) B′s is the image of B when reflected in the *y*-axis, followed by reflection in the origin. Write down the coordinates of B′ and plot it on the graph paper.

(*iv*) Write down the geometrical name of the figure AA′BB′.

(*v*) Name two invariant points under reflection in the *x*-axis. **(1999)**

Sol. (*i*) Points A (3, 5) and B (– 2, – 4) have been plotted on the graph.

(*ii*) A′ is the image of A (3, 5) when reflected in the *x*-axis.

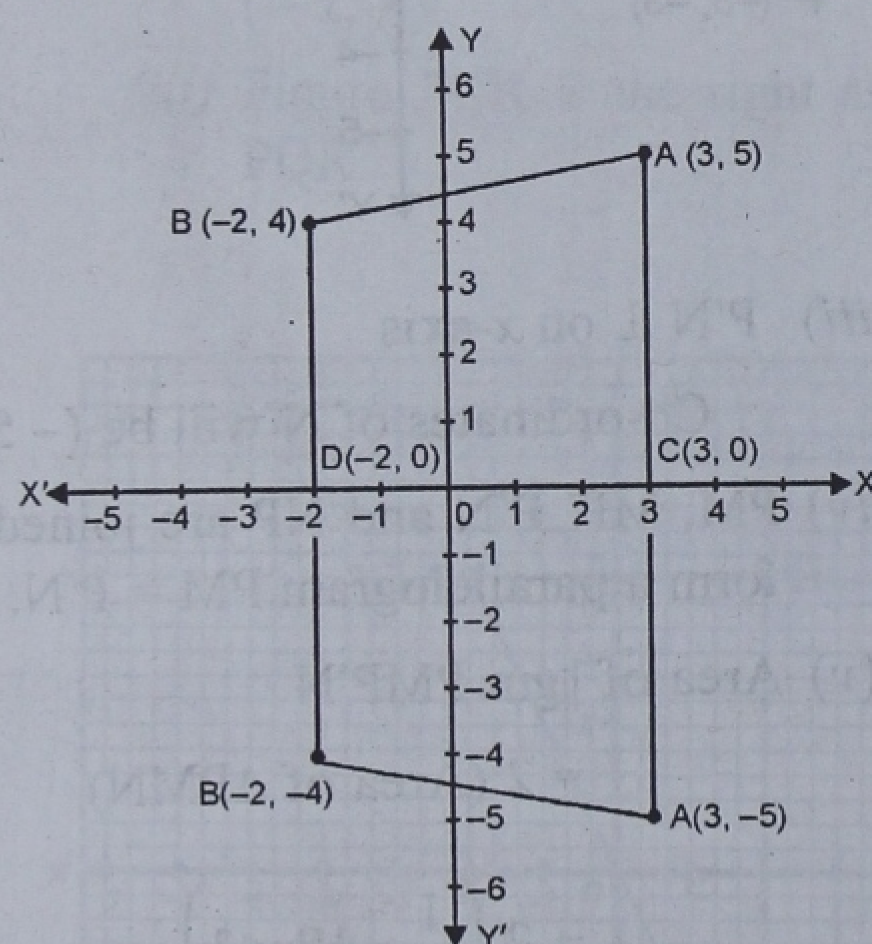
∴ Co-ordinates of A′ will be (3, – 5) as shown on the graph.

(*iii*) B′ is the images of B (– 2, – 4) in the *y*-axis in followed by the in the origin.

∴ Co-ordinates of B′ will be (– 2, 4) as shown on the graph.

(*iv*) By joining AA′ BB′, we get a figure which is an isosceles trapezium.

(*v*) Two invariant points under reflection in the *x*-axis are C (3, 0) and D (– 2, 0) **Ans.**



Q.13. The point (–4,0) on reflection in a line is mapped as (4, 0) and the point (3, –2) on reflection in the same line is mapped as (–3, –2).

(*i*) Name the mirror line.

(*ii*) Write the co-ordinates of the image of (–5, –3) in the mirror line.

Sol. Let the point A (–4, 0) is reflected in a line whose image is A′ (4, 0) and point B (3, –2) is reflected in the same line whose image is B′ (–3, –2).

(*i*)Now, we see that sign of *x*-ordinate is change.

∴ The line of mirror will be *y*-axis.

(*ii*) Similarly the co-ordinates of image of the point (–5, –3) will be (5, –3) **Ans.**

Q.14. A point P is its own image under the reflection in a line *l*. Describe the position of the point P with respect to the line *l*.

Sol. ∵ P is the own image under the reflection in a line *l*

∴ P lies on *l*.

Hence, the position of the point P is P itself.

Q.15. Points (5, 0) and (–2,0) are invariant points under reflection in the line L_1. Points (0, –2) and (0, 3) are invariant points on reflection in line L_2.

(*i*) Name the lines L_1 and L_2.

(*ii*) Write down the images of points P (2, 3) and Q (–5, –3) on reflection in L_1. Name the images as P′ and Q′ respectively.

(*iii*) Write down the images of points P and Q on reflection in L_2. Name the images as P″ and Q″ respectively.

(*iv*)Describe a transformation that maps P′ onto P″.

Sol.(*i*) ∵ Points (5, 0) and (–2,0) are invariant points under reflection in the line L_1.

∴ These line are L_1

∵ Their *y*-co-ordinates are zeros.

∴ They lie on *x*-axis

Hence, line L_1 is *x*-axis.

Again, points (0, –2) and (0, 3) are invari- ant point under reflection in the line L_2.

∴ They lie on the line L_2.

∵ Then *x*-co-ordinates are zeros.

∴ The line L_2 is *y*-axis.

(*ii*)Let P′ and Q′ be the images of the points P (2, 3) and Q (–5, –3) in *x*-axis respectively.

∴ The co-ordinates of P′ will be (2, –3) and the co-ordinates of Q′ will be (–5, 3)

(*iii*) Let P″ and Q″ be the images of points P (2, 3) and Q (–5, –3) in *y*-axis respectively.

∴The co-ordinates of P″ will be (–2, 3) and the co-ordinates of Q″ will be (5, –3).

(*iv*) Transformation that maps P′ onto P″ is R_o *i.e.* origin as R_o, $(x, y) = (-x, -y)$ **Ans.**

Q. 16. P and Q have co-ordinates (0, 5) and (– 2, 4).

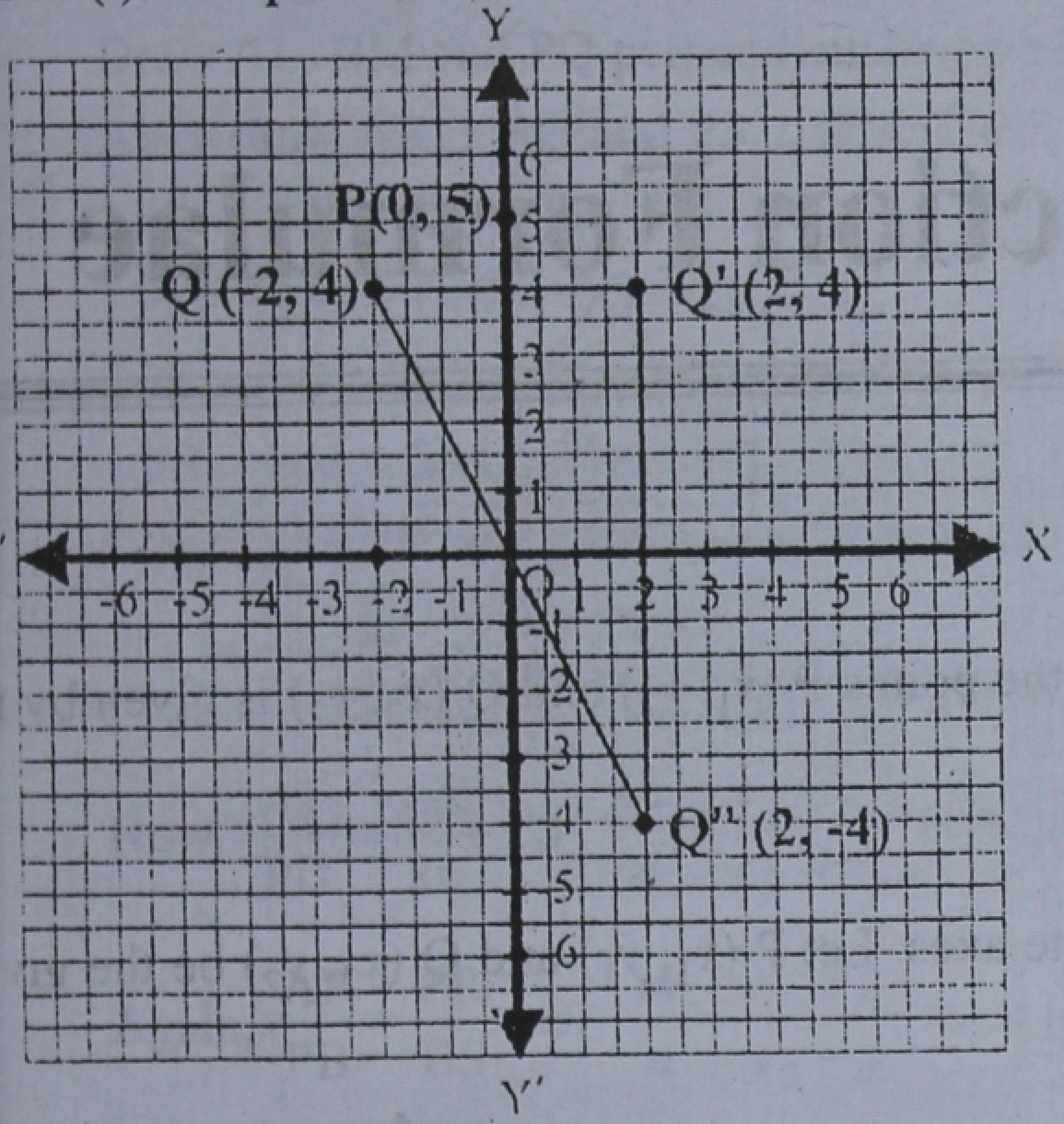
(*i*) P is invariant when reflected in an axis. Name the axis.

(*ii*) Find the image of Q on reflection in the axis found in (*i*).

(*iii*) (0, *k*) on reflection in the origin is invariant. Write the value of *k*.

(*iv*) Write the co-ordinates of the image of Q, obtained by reflecting it in the origin followed by reflection in *x*-axis.

Sol.(*i*) Two points P (0, 5) and Q (–2, 4) are given



As the abscissa of P is 0.

∴It is invarient when is reflected in *y*-axis.

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

∴ Co-ordinate of Q′ will be (2, 4)

(*iii*)∵ (0, *k*) on reflection in the origin is invarient.

∴ co-ordinates of image will be (0, 0).

∴ $k = 0$

(*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′ **Ans.**

(*i*) Plot the points A (3,2) and B (5, 4) on a graph paper.

(*ii*) Reflect A and B in the *x*-axis to A′ and B′ respectively. Plot A′ and B′ on the same graph paper.

(*iii*) Write down :

(*a*)the geometrical name of the figure ABB′A′ ;

(*b*) m∠ABB′ ;

(*c*) the image A″ of A when reflected in the origin;

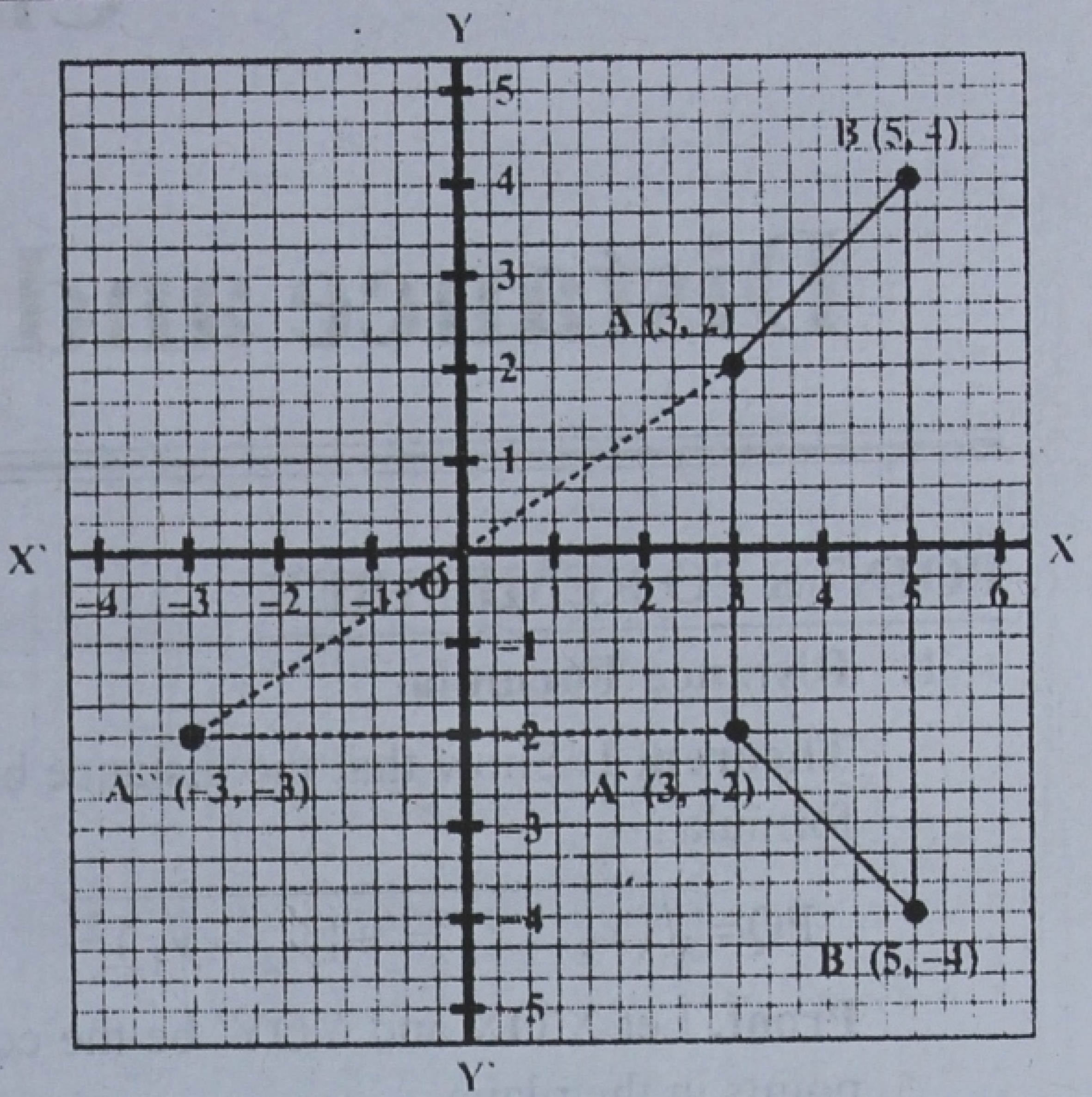
(*d*) the single transformation that maps A′ to A″.

Sol. (*i*) The points A (3, 2) and B(5, 4) have been plotted on the graph.

(*ii*) A′ and B′ are the images of A and B respectively is *x*-axis.

∴co-ordinates of A′ (3,–2) and of B(5, –4) respectively.

(*iii*)(*a*) By joining them in order, the figure ABB′A, so-formed is a trapezium



(*b*)Let AL ⊥ BB′ (∵ AL = BL = 2 units)

∴ ΔALB is isosceles right triangle

∴ ∠ABB′ = 45°

(*c*) A″ is the image of A in origin and its co-ordinates are (–3, –2)

(*d*) The single transformation that maps A′ to A″ to *y*-axis. **Ans.**

Q. 18. Use graph paper to answer this question :

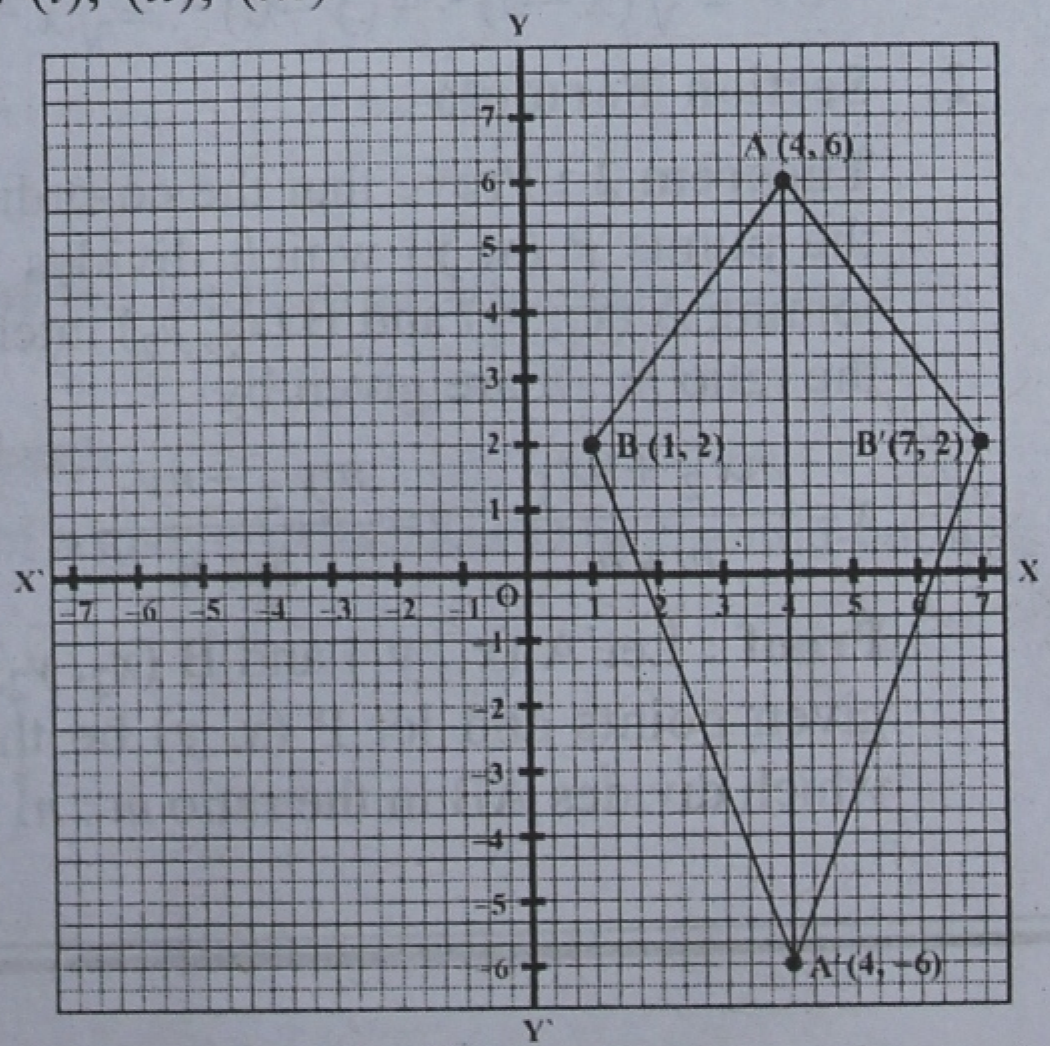
(*i*) Plot the points A (4, 6) and B (1, 2).

(*ii*) A' is the image of A when reflected in *x*-axis.

(*iii*) B′ is the image of B when B is reflected in the line AA′.

(*iv*) Give the geometrical name for the figure AB A′B′.

Sol. (*i*), (*ii*), (*iii*)



(*iv*) Figure ABA′B′ is a kite.