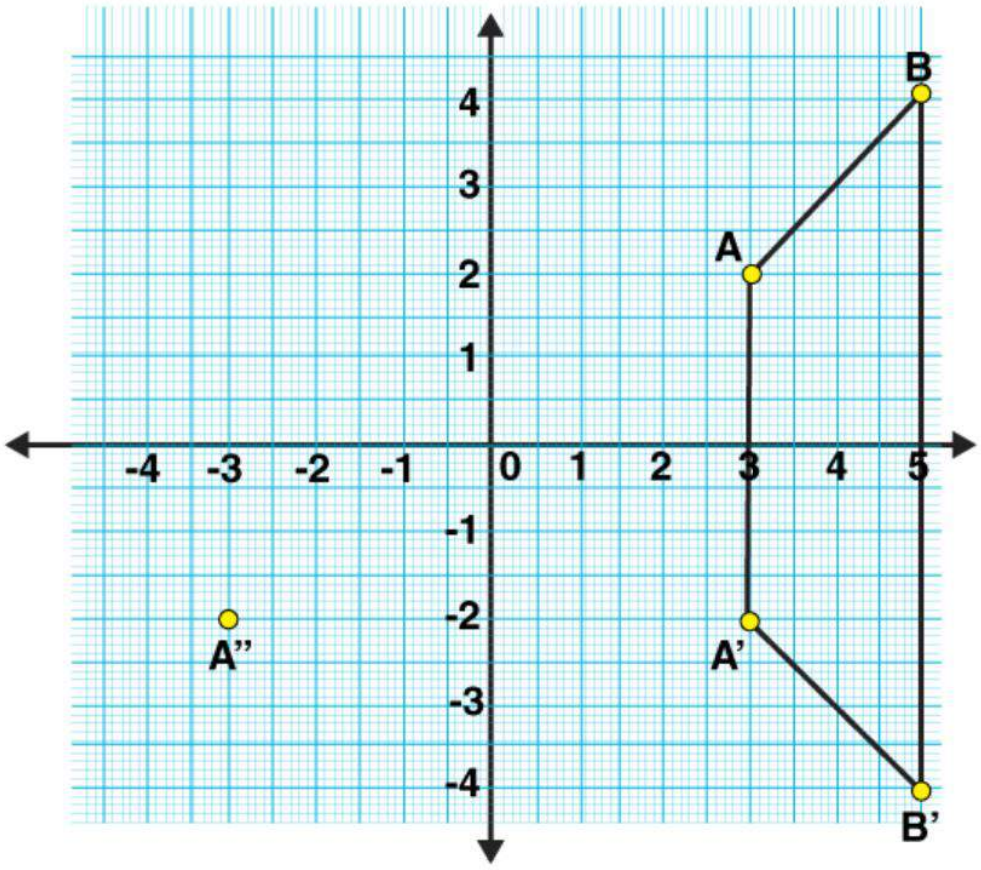
Exercise 12(B) Page No: 165

1. Attempt this question on graph paper.
(a) Plot A (3, 2) and B (5, 4) on graph paper. Take 2 cm = 1 unit on both the axes.
(b) Reflect A and B in the x-axis to A' and B' respectively. Plot these points also on the same graph paper.
(c) Write down:
(i) the geometrical name of the figure ABB'A';
(ii) the measure of angle ABB';
(iii) the image of A'' of A, when A is reflected in the origin.
(iv) the single transformation that maps A' to A''.
Solution:



(c)
(i) From the graph, it's clearly seen that ABB'A' is an isosceles trapezium.
(ii) The measure of angle ABB' is 45°.
(iii) A" = (-3, -2)
(iv) Single transformation that maps A' to A" is the reflection in y-axis.

2. Points (3, 0) and (-1, 0) are invariant points under reflection in the line L_1; points (0, -3) and (0, 1) are invariant points on reflection in line L_2.
(i) Name or write equations for the lines L_1 and L_2.

(ii) Write down the images of the points P (3, 4) and Q (-5, -2) on reflection in line L_1. Name the images as P' and Q' respectively.
(iii) Write down the images of P and Q on reflection in L_2. Name the images as P" and Q" respectively.
(iv) State or describe a single transformation that maps P' onto P".
Solution:

(i) We know that, every point in a line is invariant under the reflection in the same line.
As the points (3, 0) and (-1, 0) lie on the x-axis.
Thus, (3, 0) and (-1, 0) are invariant under reflection in x-axis.
Therefore, the equation of line L_1 is y = 0.
Similarly, (0, -3) and (0, 1) are also invariant under reflection in y-axis.
Therefore, the equation of line L_2 is x = 0.

(ii) P' = Image of P (3, 4) in L_1 = (3, -4)
And, Q' = Image of Q (-5, -2) in L_1 = (-5, 2)

(iii) P" = Image of P (3, 4) in L_2 = (-3, 4)
And, Q" = Image of Q (-5, -2) in L_2 = (5, -2)

(iv) Single transformation that maps P' onto P" is reflection in origin.

3. (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) As, M_x (x, y) = (x, -y)
P' (5, -2) = reflection of P (a, b) in x-axis.
Hence, the co-ordinates of P are (5, 2).
Thus, a = 5 and b = 2.

(ii) P" = image of P (5, 2) reflected in y-axis = (-5, 2)

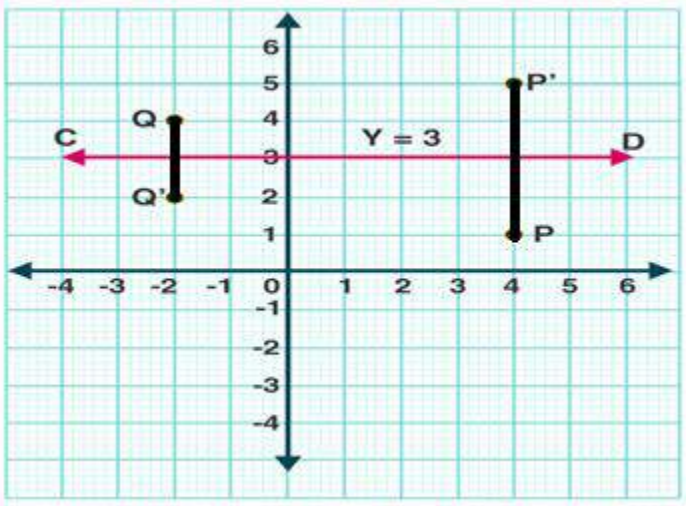
(iii) Single transformation that maps P' to P" is the reflection in origin.

4. The point (-2, 0) on reflection in a line is mapped to (2, 0) and the point (5, -6) on reflection in the same line is mapped to (-5, -6).
(i) State the name of the mirror line and write its equation.
(ii) State the co-ordinates of the image of (-8, -5) in the mirror line.
Solution:

(i) We know that, reflection of a point (x, y) in y-axis is (-x, y).
So, the point (-2, 0) when reflected in y-axis is mapped to (2, 0).
Hence, the mirror line is the y-axis and it's equation is x = 0.

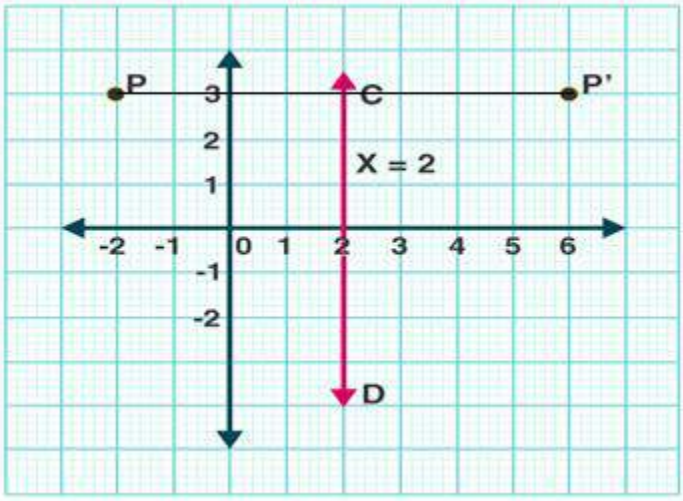
(ii) The co-ordinates of the image of (-8, -5) in the mirror line (i.e., y-axis) are (8, -5).

5. The points P (4, 1) and Q (-2, 4) are reflected in line y = 3. Find the co-ordinates of P', the image of P and Q', the image of Q.
Solution:



The line y = 3 is a line parallel to x-axis and at a distance of 3 units from it.
Let's mark the points P (4, 1) and Q (-2, 4).
Now from P, draw a straight line perpendicular to line CD and produce. Mark a point P' on this line which is at the same distance above CD as P is below it.
Thus, the co-ordinates of P' are (4, 5).
Similarly, from Q, draw a line perpendicular to CD and mark point Q' which is at the same distance below CD as Q is above it.
Hence, the co-ordinates of Q' are (-2, 2).

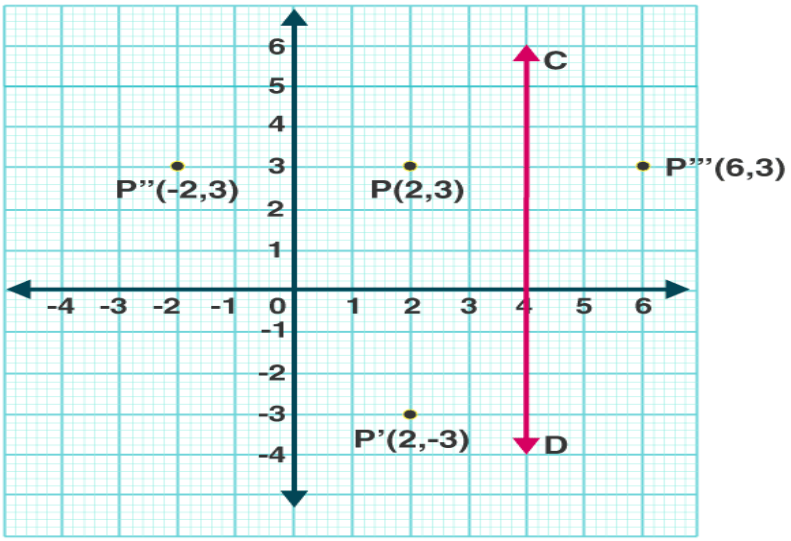
6. A point P (-2, 3) is reflected in line x = 2 to point P'. Find the coordinates of P'.
Solution:



The line x = 2 is a line parallel to y-axis and at a distance of 2 units from it.
Let's mark the point P (-2, 3).

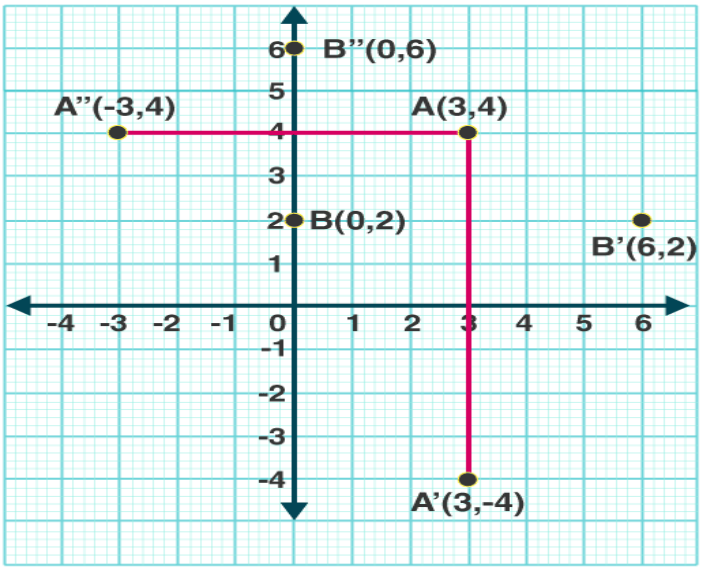
From P, draw a straight line perpendicular to line CD and produce. Mark a point on this line which is at the same distance to the right of CD as P is to the left of it.
Hence, the co-ordinates of P' are (6, 3).

7. A point P (a, b) is reflected in the x-axis to P' (2, -3). Write down the values of a and b. P" is the image of P, reflected in the y-axis. Write down the co-ordinates of P". Find the co-ordinates of P''', when P is reflected in the line, parallel to y-axis, such that x = 4.
Solution:



A point P (a, b) is reflected in the x-axis to P' (2, -3).
We know that, M_x (x, y) = (x, -y)
Hence, the co-ordinates of P are (2, 3).
And thus, a = 2 and b = 3.
P" = Image of P reflected in the y-axis = (-2, 3)
P''' = Reflection of P in the line (x = 4, a line parallel to y-axis and at a distance of 4 units from it) = (6, 3)

8. Points A and B have co-ordinates (3, 4) and (0, 2) respectively. Find the image:
(a) A' of A under reflection in the x-axis.
(b) B' of B under reflection in the line AA'.
(c) A" of A under reflection in the y-axis.
(d) B" of B under reflection in the line AA".
Solution:



(a) A' = Image of A under reflection in the x-axis = (3, -4)
(b) B' = Image of B under reflection in the line AA' (x = 3) = (6, 2)
(c) A'' = Image of A under reflection in the y-axis = (-3, 4)
(d) B'' = Image of B under reflection in the line AA'' (y = 4) = (0, 6)