

Activity 13

OBJECTIVE

To verify that the graph of a given inequality, say $5x + 4y - 40 < 0$, of the form $ax + by + c < 0$, $a, b > 0$, $c < 0$ represents only one of the two half planes.

MATERIAL REQUIRED

Cardboard, thick white paper, sketch pen, ruler, adhesive.

METHOD OF CONSTRUCTION

1. Take a cardboard of a convenient size and paste a white paper on it.
2. Draw two perpendicular lines $X'OX$ and $Y'OY$ to represent x -axis and y -axis, respectively.
3. Draw the graph of the linear equation corresponding to the given linear inequality.
4. Mark the two half planes as I and II as shown in the Fig. 13.

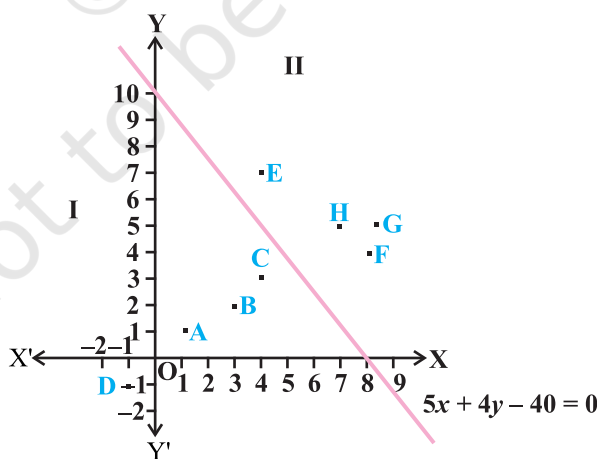


Fig. 13

DEMONSTRATION

1. Mark some points O(0, 0), A(1, 1), B(3, 2), C(4, 3), D(-1, -1) in half plane I and points E(4, 7), F(8, 4), G(9, 5), H(7, 5) in half plane II.
2. (i) Put the coordinates of O (0,0) in the left hand side of the inequality.

$$\text{Value of LHS} = 5(0) + 4(0) - 40 = -40 < 0$$

So, the coordinates of O which lies in half plane I, satisfy the inequality.

- (ii) Put the coordinates of the point E (4, 7) in the left hand side of the inequality.

Value of LHS = $5(4) + 4(7) - 40 = 8 < 0$ and hence the coordinates of the point E which lie in the half plane II does not satisfy the given inequality.

- (iii) Put the coordinates of the point F(8, 4) in the left hand side of the inequality. Value of LHS = $5(8) + 4(4) - 40 = 16 < 0$

So, the coordinates of the point F which lies in the half plane II do not satisfy the inequality.

- (iv) Put the coordinates of the point C(4, 3) in the left hand side of the inequality.

$$\text{Value of LHS} = 5(4) + 4(3) - 40 = -8 < 0$$

So, the coordinates of C which lies in the half plane I, satisfy the inequality.

- (v) Put the coordinates of the point D(-1, -1) in the left hand side of the inequality.

$$\text{Value of LHS} = 5(-1) + 4(-) - 40 = -49 < 0$$

So, the coordinates of D which lies in the half plane I, satisfy the inequality.

- (iv) Similarly points A (1, 1), lies in a half plane I satisfy the inequality. The points G (9, 5) and H (7, 5) lies in half plane II do not satisfy the inequality.

Thus, all points O, A, B, C, satisfying the linear inequality $5x + 4y - 40 < 0$ lie only in the half plane I and all the points E, F, G, H which do not satisfy the linear inequality lie in the half plane II.

Thus, the graph of the given inequality represents only one of the two corresponding half planes.

OBSERVATION

Coordinates of the point A _____ the given inequality (satisfy/does not satisfy).

Coordinates of G _____ the given inequality.

Coordinates of H _____ the given inequality.

Coordinates of E are _____ the given inequality.

Coordinates of F _____ the given inequality and is in the half plane _____.

The graph of the given inequality is only half plane _____.

APPLICATION

This activity may be used to identify the half plane which provides the solutions of a given inequality.

NOTE

The activity can also be performed for the inequality of the type $ax + by + c > 0$.