

Example 3 Solve the following problem graphically:

- Minimise and Maximise $Z = 3x + 9y$... (1)
 subject to the constraints: $x + 3y \leq 60$... (2)
 $x + y \geq 10$... (3)
 $x \leq y$... (4)
 $x \geq 0, y \geq 0$... (5)

Solution First of all, let us graph the feasible region of the system of linear inequalities (2) to (5). The feasible region ABCD is shown in the Fig 12.4. Note that the region is bounded. The coordinates of the corner points A, B, C and D are (0, 10), (5, 5), (15, 15) and (0, 20) respectively.

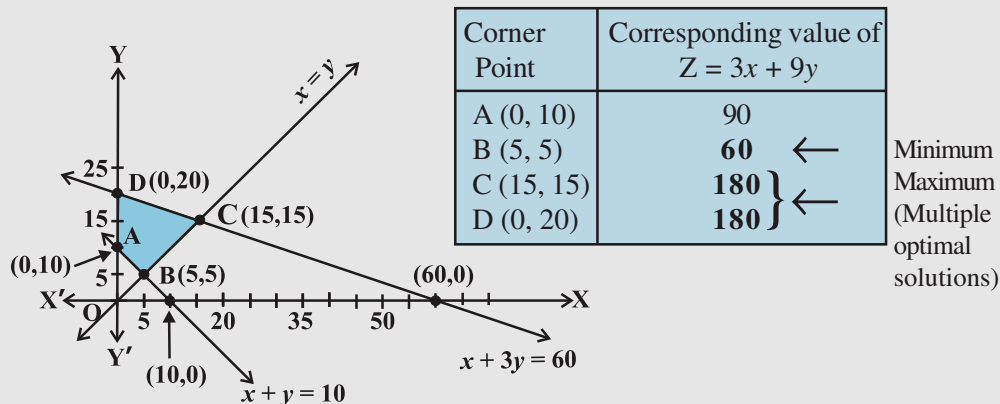


Fig 12.4

We now find the minimum and maximum value of Z. From the table, we find that the minimum value of Z is 60 at the point B (5, 5) of the feasible region.

The maximum value of Z on the feasible region occurs at the two corner points C (15, 15) and D (0, 20) and it is 180 in each case.

Remark Observe that in the above example, the problem has multiple optimal solutions at the corner points C and D, i.e. the both points produce same maximum value 180. In such cases, you can see that every point on the line segment CD joining the two corner points C and D also give the same maximum value. Same is also true in the case if the two points produce same minimum value.