

## *Related Problems with Solutions*

### *Problem 2:*

**Question 7:**

A company manufactures two types of novelty souvenirs made of plywood. Souvenirs of type A require 5 minutes each for cutting and 10 minutes each for assembling. Souvenirs of type B require 8 minutes each for cutting and 8 minutes each for assembling. There are 3 hours 20 minutes available for cutting and 4 hours of assembling. The profit is Rs 5 each for type A and Rs 6 each for type B souvenirs. How many souvenirs of each type should the company manufacture in order to maximize the profit?

Answer

Let the company manufacture  $x$  souvenirs of type A and  $y$  souvenirs of type B.

Therefore,

$$x \geq 0 \text{ and } y \geq 0$$

The given information can be compiled in a table as follows.

	Type A	Type B	Availability
<b>Cutting (min)</b>	5	8	$3 \times 60 + 20 = 200$
<b>Assembling (min)</b>	10	8	$4 \times 60 = 240$

The profit on type A souvenirs is Rs 5 and on type B souvenirs is Rs 6. Therefore, the constraints are

$$5x + 8y \leq 200$$

$$10x + 8y \leq 240 \text{ i.e., } 5x + 4y \leq 120$$

$$\text{Total profit, } Z = 5x + 6y$$

The mathematical formulation of the given problem is

$$\text{Maximize } Z = 5x + 6y \dots (1)$$

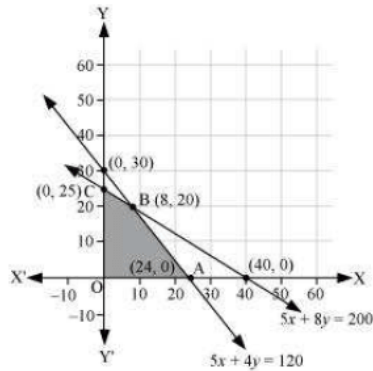
subject to the constraints,

$$5x + 8y \leq 200 \dots (2)$$

$$5x + 4y \leq 120 \dots (3)$$

$$x, y \geq 0 \dots (4)$$

The feasible region determined by the system of constraints is as follows.



The corner points are A (24, 0), B (8, 20), and C (0, 25).

The values of  $Z$  at these corner points are as follows.

Corner point	$Z = 5x + 6y$	
A(24, 0)	120	
B(8, 20)	160	→ Maximum
C(0, 25)	150	

The maximum value of  $Z$  is 200 at (8, 20).

Thus, 8 souvenirs of type A and 20 souvenirs of type B should be produced each day to get the maximum profit of Rs 160.