machine for at the most 12 hours. The profit from the sale of a lamp is Rs 5 and that from a shade is Rs 3. Assuming that the manufacturer can sell all the lamps and shades that he produces, how should he schedule his daily production in order to maximize his profit?

Answer

Let the cottage industry manufacture x pedestal lamps and y wooden shades. Therefore, $x \geq 0$ and $y \geq 0$

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

	Lamps	**Shades**	**Availability**
Grinding/Cutting Machine (h)	2	1	12
Sprayer (h)	3	2	20

The profit on a lamp is Rs 5 and on the shades is Rs 3. Therefore, the constraints are

$2x + y \leq 12$

$3x + 2y \leq 20$

Total profit, Z = $5x + 3y$

The mathematical formulation of the given problem is

Maximize Z = $5x + 3y$ … (1)

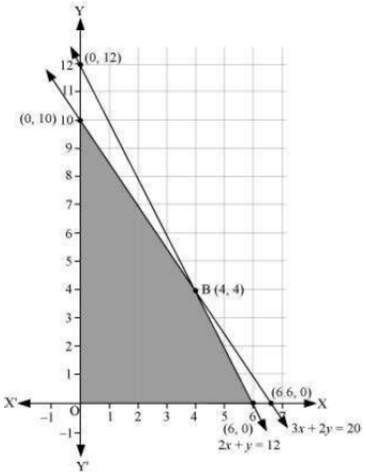
subject to the constraints,

$2x + y \leq 12$ … (2)

$3x + 2y \leq 20$ … (3)

$x, y \geq 0$ … (4)

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



The corner points are A (6, 0), B (4, 4), and C (0, 10).

The values of Z at these corner points are as follows

Corner point	**Z = 5x + 3y**	
A(6, 0)	30	
B(4, 4)	32	→ Maximum
C(0, 10)	30	

The maximum value of Z is 32 at (4, 4).

Thus, the manufacturer should produce 4 pedestal lamps and 4 wooden shades to maximize his profits.

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,

$x \geq 0$ and $y \geq 0$

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

	Type A	Type B	Availability
Cutting (min)	5	8	3 × 60 + 20 =200
Assembling (min)	10	8	4 × 60 = 240

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

$5x+8y \leq 200$

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

Total profit, Z = 5*x* + 6*y*

The mathematical formulation of the given problem is

Maximize Z = 5*x* + 6*y* … (1)

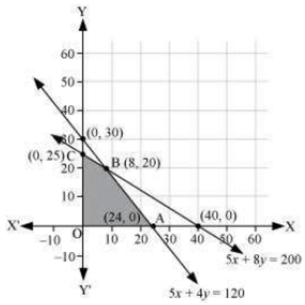
subject to the constraints,

$5x+8y \leq 200$ … (2)

$5x+4y \leq 120$ … (3)

x, *y* ≥ 0 … (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 = 5*x* + 6*y*	
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.

Question 8:

A merchant plans to sell two types of personal computers – a desktop model and a portable model that will cost Rs 25000 and Rs 40000 respectively. He estimates that the total monthly demand of computers will not exceed 250 units. Determine the number of units of each type of computers which the merchant should stock to get maximum profit if he does not want to invest more than Rs 70 lakhs and if his profit on the desktop model is Rs 4500 and on portable model is Rs 5000.

Answer

Let the merchant stock *x* desktop models and *y* portable models. Therefore,

$x \geq 0$ and $y \geq 0$

The cost of a desktop model is Rs 25000 and of a portable model is Rs 4000. However, the merchant can invest a maximum of Rs 70 lakhs.

$\therefore 25000x+40000y \leq 7000000$

$5x+8y \leq 1400$

The monthly demand of computers will not exceed 250 units.

$\therefore x+y \leq 250$

The profit on a desktop model is Rs 4500 and the profit on a portable model is Rs 5000.

Total profit, Z = 4500*x* + 5000*y*

Thus, the mathematical formulation of the given problem is

$\text{Maximum } Z = 4500x+5000y$ ...(1)

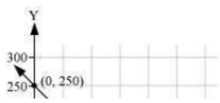
subject to the constraints,

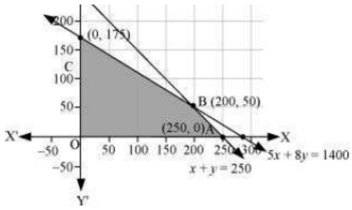
$5x+8y \leq 1400$ ...(2)

$x+y \leq 250$ ...(3)

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

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





The corner points are A (250, 0), B (200, 50), and C (0, 175).

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

Corner point	Z = 4500*x* + 5000*y*	

*********** END **********