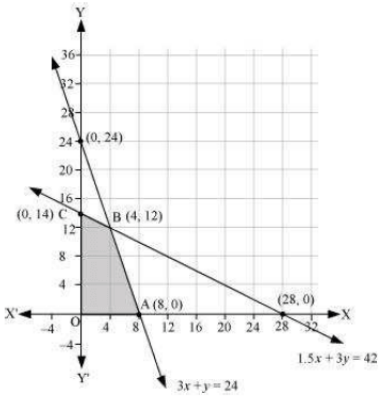
$3x + y \leq 24$ ... (3)

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

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



The corner points are A (8, 0), B (4, 12), C (0, 14), and O (0, 0).

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

Corner point	Z = 20x + 10y	
A(8, 0)	160	
B(4, 12)	200	→ Maximum
C(0, 14)	140	
O(0, 0)	0	

Thus, the maximum profit of the factory when it works to its full capacity is Rs 200.

Question 4:

A manufacturer produces nuts ad bolts. It takes 1 hour of work on machine A and 3 hours on machine B to produce a package of nuts. It takes 3 hours on machine A and 1 hour on machine B to produce a package of bolts. He earns a profit, of Rs 17.50 per package on nuts and Rs. 7.00 per package on bolts. How many packages of each should be produced each day so as to maximize his profit, if he operates his machines for at the most 12 hours a day?

Answer

Let the manufacturer produce x packages of nuts and y packages of bolts. Therefore,

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

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

	Nuts	Bolts	Availability
Machine A (h)	1	3	12
Machine B (h)	3	1	12

The profit on a package of nuts is Rs 17.50 and on a package of bolts is Rs 7. Therefore, the constraints are

$x+3y \leq 12$

$3x+y \leq 12$

Total profit, $Z = 17.5x + 7y$

The mathematical formulation of the given problem is

Maximise $Z = 17.5x + 7y$ ... (1)

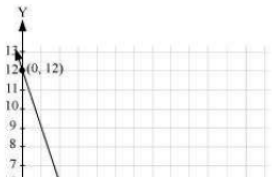
subject to the constraints,

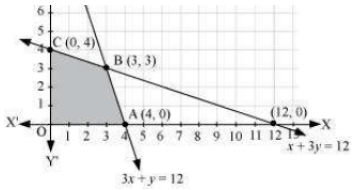
$x + 3y \leq 12$ ... (2)

$3x + y \leq 12$ ... (3)

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

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





The corner points are A (4, 0), B (3, 3), and C (0, 4).

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

Corner point	Z = 17.5x + 7y	
O(0, 0)	0	
A(4, 0)	70	
B(3, 3)	73.5	→ Maximum
C(0, 4)	28	

The maximum value of Z is Rs 73.50 at (3, 3).

Thus, 3 packages of nuts and 3 packages of bolts should be produced each day to get the maximum profit of Rs 73.50.

Question 5:

A factory manufactures two types of screws, A and B. Each type of screw requires the use of two machines, an automatic and a hand operated. It takes 4 minutes on the automatic and 6 minutes on hand operated machines to manufacture a package of screws A, while it takes 6 minutes on automatic and 3 minutes on the hand operated machines to manufacture a package of screws B. Each machine is available for at the most 4 hours on any day. The manufacturer can sell a package of screws A at a profit of Rs 7 and screws B at a profit of Rs10. Assuming that he can sell all the screws he manufactures, how many packages of each type should the factory owner produce in a day in order to maximize his profit? Determine the maximum profit.

Answer

Let the factory manufacture x screws of type A and y screws of type B on each day.

Therefore,

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

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

	Screw A	Screw B	Availability
Automatic Machine (min)	4	6	4 × 60 =120
Hand Operated Machine (min)	6	3	4 × 60 =120

The profit on a package of screws A is Rs 7 and on the package of screws B is Rs 10.

Therefore, the constraints are

$4x+6y \leq 240$

$6x+3y \leq 240$

Total profit, Z = 7x + 10y

The mathematical formulation of the given problem is

Maximize Z = 7x + 10y ... (1)

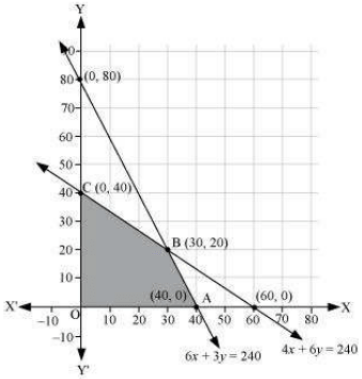
subject to the constraints,

$4x+6y \leq 240$ ... (2)

$6x+3y \leq 240$ ... (3)

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

The feasible region determined by the system of constraints is



The corner points are A (40, 0), B (30, 20), and C (0, 40).

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

Corner point	Z = 7x + 10y	
A(40, 0)	280	
B(30, 20)	410	→ Maximum

C(0, 40)	400	

The maximum value of Z is 410 at (30, 20).

Thus, the factory should produce 30 packages of screws A and 20 packages of screws B to get the maximum profit of Rs 410.

Question 6:

A cottage industry manufactures pedestal lamps and wooden shades, each requiring the use of a grinding/cutting machine and a sprayer. It takes 2 hours on grinding/cutting machine and 3 hours on the sprayer to manufacture a pedestal lamp. It takes 1 hour on the grinding/cutting machine and 2 hours on the sprayer to manufacture a shade. On any day, the sprayer is available for at the most 20 hours and the grinding/cutting

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