Answer

Let the fruit grower use *x* bags of brand P and *y* bags of brand Q.

The problem can be formulated as follows.

Minimize *z* = 3*x* + 3.5*y* ... (1)

subject to the constraints.

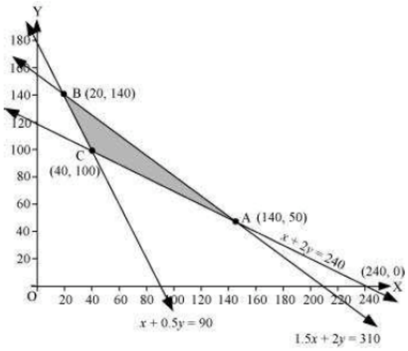
$x + 2y \geq 240$ ...(2)

$x + 0.5y \geq 90$ ...(3)

$1.5x + 2y \leq 310$ ...(4)

$x, y \geq 0$ ...(5)

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



The corner points are A (240, 0), B (140, 50), and C (20, 140).

The values of *z* at these corner points are as follows.

Corner point	z = 3x + 3.5y	
A (140, 50)	595	
B (20, 140)	550	
C (40, 100)	470	→ Minimum

The maximum value of *z* is 470 at (40, 100).

Thus, 40 bags of brand P and 100 bags of brand Q should be added to the garden to minimize the amount of nitrogen.

The minimum amount of nitrogen added to the garden is 470 kg.

Question 9:

Refer to question 8. If the grower wants to maximize the amount of nitrogen added to the garden, how many bags of each brand should be added? What is the maximum amount of nitrogen added?

Answer

Let the fruit grower use *x* bags of brand P and *y* bags of brand Q.

The problem can be formulated as follows.

Maximize *z* = 3*x* + 3.5*y* ... (1)

subject to the constraints,

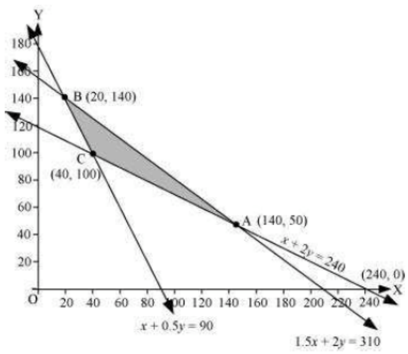
$x + 2y \geq 240$ ...(2)

$x + 0.5y \geq 90$ ...(3)

$1.5x + 2y \leq 310$ ...(4)

$x, y \geq 0$ ...(5)

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



The corner points are A (140, 50), B (20, 140), and C (40, 100).

The corner points are A (140, 50), B (20, 140), and C (40, 100).

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

Corner point	**z = 3*x* + 3.5*y***	
A (140, 50)	595	→ Maximum
B (20, 140)	550	
C (40, 100)	470	

The maximum value of z is 595 at (140, 50).

Thus, 140 bags of brand P and 50 bags of brand Q should be used to maximize the amount of nitrogen.

The maximum amount of nitrogen added to the garden is 595 kg.

Question 10:

A toy company manufactures two types of dolls, A and B. Market tests and available resources have indicated that the combined production level should not exceed 1200 dolls per week and the demand for dolls of type B is at most half of that for dolls of type A. Further, the production level of dolls of type A can exceed three times the production of dolls of other type by at most 600 units. If the company makes profit of Rs 12 and Rs 16 per doll respectively on dolls A and B, how many of each should be produced weekly in order to maximize the profit?

Answer

Let x and y be the number of dolls of type A and B respectively that are produced per week.

The given problem can be formulated as follows.

Maximize $z = 12x + 16y$ ... (1)

subject to the constraints,

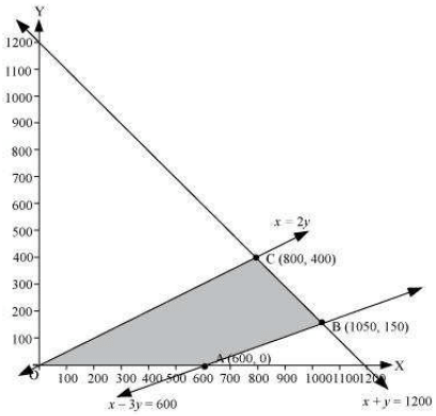
$$x + y \le 1200 \qquad ...(2)$$

$$y \le \frac{x}{2} \Rightarrow x \ge 2y \qquad ...(3)$$

$$x - 3y \le 600 \qquad ...(4)$$

$$x,\ y \ge 0 \qquad ...(5)$$

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



The corner points are A (600, 0), B (1050, 150), and C (800, 400).

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

Corner point	**z = 12*x* + 16*y***	
A (600, 0)	7200	
B (1050, 150)	15000	
C (800, 400)	16000	→ Maximum

The maximum value of z is 16000 at (800, 400).

Thus, 800 and 400 dolls of type A and type B should be produced respectively to get the maximum profit of Rs 16000.

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