

**BHARATIYA VIDYA BHAVAN'S V M PUBLIC SCHOOL, VADODARA**

**QUESTION BANK**

**CHAPTER -12. LINEAR PROGRAMMING**

1. An airplane can carry a maximum of 200 passengers. A profit of Rs. 400 is made on each first class ticket and a profit of Rs. 300 is made on each economy class ticket. The airlines reserves at least 20 seats for the first class. However at least 4 times as many passengers prefer to travel by economy class than the first class. Determine how many of each type ticket must be sold in order to maximize the profit for the airline? What is the maximum profit?

2. A dietician wishes to mix together two kinds of food X and Y in such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin C. The Vitamin contents of one Kg food is given below.

Food	Vitamin A	Vitamin B	Vitamin C
X	1	2	3
Y	2	2	1

One Kg of food X costs Rs. 16 and one Kg of food Y cost Rs. 20. Find the least cost of the mixture Which will produce the required diet.

3. A factory makes tennis rackets and cricket bats. A tennis rackets takes 1.5 hours of machine time and 3 hours of craftsman's time in its making while a cricket bat takes 3 hours of machine time and 1 hour of craftsman's time. In a day, the factory has the availability of not more than 42 hours of machine time and 24 hours of craftsman's time. (i) What number of rackets and bats must be made if the factory is to work at full capacity? (ii) If the profit on a racket and on a bat is Rs. 20 and Rs. 10 respectively, find the maximum profit of the factory when it works at full capacity.

4. Solve the given linear programming problem graphically:

Minimise  $Z = 6x + 3y$  subject to constraints:  $4x + y \geq 80$ ,  $x + 5y \geq 115$ ,  $3x + 2y \leq 150$  and  $x, y \geq 0$ .

5. A merchant plans to sell two types of personal computers-a desktop model and a portable model that will cost Rs 25,000 and 40,000 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. 4,500 and on portable model is Rs. 5000.

6. Solve the given linear programming problem graphically: Minimize  $Z = x - 5y + 20$

Subject to constraints:  $x - y \geq 0$ ,  $-x + 2y \geq 2$ ,  $x \geq 3$ ,  $y \leq 4$  and  $x, y \geq 0$ .

7. David wants to invest Rs 12000 in bond A and B .According to the rules he has to invest at least Rs 2000 in bond A and at least Rs 4,000 in bond B .If the rate of interest on bond A is 8% per annum and

rate of interest on bond B is 10 % per annum, how much amount he should invest in each of the bonds A and B to earn maximum yearly income? Also, determine the maximum yearly income.

8. A co-operative society of farmers has 50 hectares of land to grow two crops A and B. The profits from A and B per hectare are estimated as Rs. 10,500 and Rs. 9000 respectively. To control weeds, a liquid herbicide has to be used for crops A and B at the rate of 20 litres and 10 litres per hectare, respectively. Further not more than 800 litres of herbicides should be used to order to protect fish and wild life using a pond which collects drainage from this land. Keeping in mind that protection of fish and other wild life is more important than earning profit, how much land should be allocated to each crop so as to maximize the total profit? Form an LPP from the above and solve graphically. Do you agree with the message that the protection of wild life is utmost necessary to preserve the balance in environment?

9. If a young man rides his motor cycle at 25km/hour, he had to spend Rs 2per km on petrol with very little pollution in the air. If he rides it at a faster speed of 40km per hour the petrol cost increases at Rs. 5 per km and rate of pollution also increases. He has Rs 100 to spend on petrol and wishes to find what is the maximum distance he can travel within one hour. Express this problem as a L.P.P. and solve it graphically to find the distance to be covered with different speeds. Which mode of transport you suggest to a young man and why?

10. A manufacturer produces two types of steel trunks. He has two machines A and B. the first type of trunk requires 5 hours on machine A and 3 hours on machine B. The second type of trunk requires 3 hours on machine A and 2 hours on machine B. Machines A and B can work at most for 18 hours and 15 hours per day respectively. He earns a profit of Rs 30 and Rs 25 per trunk on the first type and second type respectively. How many trunks of each type must be make each day to make the maximum profit.

11. In a mid day meal programme, an NGO wants to provide vitamin rich diet to the students of one school. The dietician wishes to mix together two types of food X and Y in such a way that the mixture contains atleast 8 units of vitamin A and 10 units of vitamin C. Food X contains 2 units/kg of vitamin A and 1units/kg of vitamin C. Food Y contains 1 unit/kg of vitamin A and 2 units/kg of C. One Kg of food X costs Rs. 50 andone Kg of food Y costs Rs. 70. Formulate the problem as LPP and solve it graphically for the minimum cost of such a mixture.

12. A factory owner purchases two types of machines A and B for his factory. The requirements and limitations for the machines are as follows:

machine	Area occupied by the machine	Labour force for each machine	Daily output (in units)
A	1000 sq. m	12 men	60
B	1200 sq. m	8 men	40

He has an area of 9000 sq. available and 72 skilled men who can operate the machines. How many machines of each type should he buy to maximize the daily output?

13. . If a young man rides his motor cycle at 25kmperhour, he had to spend Rs 2per km on petrol with very little pollution in the air. If he rides it at a faster speed of 40km per hour and rate of pollution also increases, he has Rs 100 to spend on petrol and wishes to find what is the maximum distance he can travel within one hour. Express this problem as a L.P.P., and solve it graphically to find the distance to be covered with different speeds. What value is indicated in this question?

14. A diet for a sick person must contain at least 4,000 units of vitamin ,50 units of minerals and 1,400 units of calories. Two foods X and Y are available at a cost of Rs. 4 and Rs 3 per unit respectively. One unit of food X contains 200 units of vitamins , 1 unit of minerals and 40 units of calories, whereas one unit of food y contains 100 units of vitamins , 2 units of minerals and 40 units of calories. Find what combination of X and Y should be used to have least cost satisfying the requirements.

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