



MATHS

BOOKS - OSWAAL PUBLICATION MATHS

(KANNADA ENGLISH)

LINEAR PROGRAMMING

Short Answer Type Questions

1. Define constraints in linear programming problems.



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2. Define optimal solution in linear programming problem.



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3. Define the feasible region.



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4. Define objective function in Linear Programming Problem.



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5. Define the term corner point of a feasible region in an LPP.

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6. Define Decision variables?

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Long Answer Type Questions Li

1. (Allocation problem) A cooperative society of farmers has 50 hectare of land to grow two crops X

and Y. The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively. To control weeds, a liquid herbicide has to be

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2. Minimize $Z = 3x + 2y$, subject to constraints are $x + 2y \leq 10$, $3x + y \leq 15$, and $x, y \geq 0$.

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3. Minimize and Maximize $Z = 3x + 9y$ subject to the constraints

$$x + 3y \leq 60$$

$$x+y \geq 10$$

$$x \leq y$$

$x \geq 0, y \geq 0$ by the graphical method .



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4. A diet is to contain at least 80 units of Vitamin A and 100 units of minerals. Two foods F1 and F2 are available. Food F1 costs Rs. 4 per unit and F2 costs Rs. 6 per unit. One unit of food F1 contains 3 units of Vitamin A and 4 units of minerals. One unit of food F2 contains 6 units of Vitamin A and 3 units of minerals. Formulate this as a linear programming problem and find graphically the minimum cost for diet that

consists of mixture of these two foods and also meets the minimal nutritional requirements.



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5. A manufacturer produces nuts and 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 Rs17.50



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6. One kind of cake requires 200 g of flour and 25 g of fat, and another kind of cake requires 100 g of flour and 50 g of fat. Find the maximum number of cakes which can be made from 5 kg of flour and 1 kg of fat assuming that there is no shortage of the other ingredients used in making the cakes.



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7. (Manufacturing problem) A manufacturing company makes two models A and B of a product. Each piece of Model A requires 9 labour hours for fabricating and 1

labour hour for finishing. Each piece of Model B requires 12 labour hours for fabricating a



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8. A furniture dealer deals in only two items - tables and chairs. He has 'Rs. 50000 invest and has storage place of at most 60 pieces. A table costs Rs. 2500 and chair Rs. 500. He estimates that from the sale of one table, he can make a profit of Rs. 250 and that from the sale of one chair a profit of Rs. 75. How many table and chair he should buy from the available money so as to maximise his total profit assuming that he can sell all the items which he buys.

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9. Minimise and Maximise $Z = x + 2y$, subject to constraints are

$$x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200 \text{ and } x, y \geq 0$$

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10. Minimise and Maximise $Z = x + 2y$, subject to constraints are

$$x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200 \text{ and } x, y \geq 0$$

.





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11. Determine graphically the minimum value of the objective function $z = -50x + 20y$, subject to the constraints.

$$2x - y \geq -5$$

$$3x + y \geq 3$$

$$2x - 3y \leq 12$$

$$x \geq 0, y \geq 0$$



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12. A dealer in rural area wishes to purchase a number of sewing machines. He has only Rs. 5,760 to invest

and has space for at most 20 items for storage. An electronic sewing machine cost him Rs. 360 and a manually operated sewing machine Rs. 240. He can sell an electronic sewing machine at a profit of Rs. 22 and a manually operated sewing machine at a profit of Rs. 18. Assuming that he can sell all the items that he can buy, how should he invest his money in order to maximize his profit? Make it as a LPP and solve it graphically.



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13. 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



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14. A company manufactures two types of sweaters :type A sweaters type B.It costs Rs 360 to make a type A sweater and Rs 120 to make a type B sweater.The company can make at most 300 sweaters and spend at most Rs72,000 a day.The number of sweaters of type A cannot exceed the number of sweaters of type B by more than 100.The company makes a profit of Rs

200 for each sweater of type A and Rs 20 for every sweater of type B. What is the maximum profit (in Rs.)?

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15. A dealer deals in two items A and B. He has Rs. 15000 to invest and a space to store almost 80 pieces. Item A costs him Rs 300 and item B costs him Rs. 150. He can sell items A and B at profits of Rs 40 and Rs 25 respectively. Assuming that he can sell all that he buys, formulate the above as a linear programming problem for maximum profit and solve it graphically.

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16. A dietician wishes to mix two types of foods in such a way that the vitamin contents of the mixture contains at least 8 units of vitamin A and 10 units of vitamin C. Food I contains 2 units/kg of vitamin A and 1 units/kg of vitamin C while Food II contains 1 unit/kg of vitamin A and 2 units/kg of vitamin C. It costs Rs.5 per kg to purchase Food I and Rs.7 per kg to purchase Food II. Determine the minimum cost of such a mixture. Formulate the above as a LPP and solve it graphically.



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17. A company produces soft drinks that has a contract which requires that a minimum of 80 units of the chemical A and 60 units of the chemical B go into each bottle of the drink. The chemicals are available in prepared mix packets from two different suppliers. Supplier S had a packet of mix of 4 units of A and 2 units of B that costs Rs.10. The supplier T has a packet of mix of 1 unit of A and 1 unit of B costs Rs.4. How many packets of mixed from S and T should the company purchase to honour the contract requirement and yet minimize cost? Make a LPP and solve graphically.



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18. A factory makes tennis rackets and cricket bats. A tennis racket takes 1.5 hours of machine time and 3 hours of craftsmans time in its making while a cricket bat takes 3 hours of machine time and 1 hour of craftsmans time. In a day, the factory has the availability of not more than 42 hours of machine time and 24 hours of craftsmans time. If the profit on a racket and on a bat is Rs. 20 and Rs. 10 respectively, find the number of tennis rackets and crickets bats that the factory must manufacture to earn the maximum profit. Make it as an L.P.P. and solve graphically.



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19. A merchant plans to sell two types of personal computers a desktop model and a portable model that will cost Rs. 25,000 and Rs. 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 his profit on the desktop model is Rs. 4,500 and on the portable model is Rs. 5,000. Make an L.P.P. and solve it graphically.



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20. An aeroplane can carry a maximum of 200 passengers. A profit of Rs 1000 is made on each executive class ticket and a profit of Rs 600 is made on each economy class ticket. The airline reserves at least 20 seats for executive class. However, at le



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21. A diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods A and B are available at a cost of Rs. 5 and Rs. 4 per unit respectively. One unit of food A contains 200 units of vitamins, 1 unit of minerals and 40 units of calories whereas one unit of

food B contains 100 units of vitamins, 2 units of minerals and 40 units of calories. Find what combination of the food A and B should be used to have least cost but it must satisfy the requirements of the sick person.

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22. A company sells two different products A and B. the two products are produced in a common production proce is which has a total capacity of 500 hours ofusing man power. It takes 5 hours to produce a unit of A and 3 hours to produce a unit of B. The demand in the market shows that the maximum

number of units of a that can be sold is 70 and that of B is 125. Profit on each of unit a is 20 Rs and on B is 125. How many units of A and B should be produced to to maximise the profit.



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23. A dealer deals in two items A and B He has Rs. 15000 to invest and a space to store almost 80 pieces Item A costs him Rs 300 and item B costs him Rs. 150 He can sell items A and B at profits of Rs 40 and Rs 25 respectively Assuming that he can sell all that he buys formulate the above as a linear programming problem for maximum profit and solve it graphically

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24. If a young man rides his motorcycle at 25 km/hr, he has to spend 2 per kilometer on petrol if per he rides it at a faster speed of 40 km/hr the petrol cost increases to 5 per kilometer. He has 100 to spend on petrol and wishes to find the maximum distance he can travel within one hours. Express this as a linear programming problem and then solve it.

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25. A manufacturer considers that men and women workers are equally efficient and so he pays them at the same rate. He has 30 and 17 units of workers male and female and capital respectively, which he uses to produce two types of goods A and B. To produce one unit of A, 2 workers and 3 units of capital are required while 3 workers and 1 unit of capitals required to produce one unit of B. If A and B are priced at 100 rupeya and 120 rupeya per unit respectively, how should he use his resources to maximize the total revenue ? Form the above as an LPP and solve it graphically .



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26. An aeroplane can carry a maximum of 200 passengers. A profit of Rs.500 is made on each executive class ticket out of which 20% will go to the welfare fund of the employees. Similarly a profit of Rs.400 is made on each economy ticket out of which 25% will go for the improvement of facilities provided to economy class passengers. In both cases, the remaining profit goes to the airlines fund. The airline reserves at least 20 seats for executive class. However at least four times as many passengers prefer to travel by economy class than by the executive class. Determine how many tickets of each type must be sold in order to maximise the net profit of the airline. Make the above as an LPP and solve graphically. Do

you think, more passengers would prefer to travel by such an airline than by others?



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