



## MATHS

### BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

### LINEAR PROGRAMMING

#### One Marks Questions

1. Define optimal solution in linear programming problem.



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2. Define feasible region in a linear programming Problem.

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3. Define the term "objective function" in an L.P.P.

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4. Define the term 'constrains' in a LPP .

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5. Define optimal solution in linear programming problem.

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6. Define the term Feasible Solution in a LPP.

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7. Define infeasible solution .

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



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## Six Marks Questions With Answer

1. Maximize  $Z = 3x + 4y$ , subject to the constraints are  $x + y \leq 4$ ,  $x \geq 0$  and  $y \geq 0$ .



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**2.** Minimize  $z = -3x + 4y$  subject to the constraints

$$x + 2y \leq 8$$

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

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



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**3.** Maximize  $Z = 5x + 3y$ , subject to constraints are

$$3x + 5y \leq 15, 5x + 2y \leq 10, x \geq 0 \text{ and } y \geq 0.$$



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4. Maximize  $Z = 3x + 5y$ , subject to constraints are

$$x + 3y \leq 3, x + y \leq 2 \text{ and } x, y \geq 0.$$



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5. Maximize  $Z = 3x + 2y$ , subject to constraints are

$$x + 2y \leq 10, 3x + y \leq 15, \text{ and } x, y \geq 0.$$



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6. Minimize  $Z = x + 2y$ , subject to constraints are

$$2x + y \geq 3, x + 2y \geq 6, \text{ and } x, y \geq 0. \text{ Show that}$$

the minimum of  $Z$  occurs at more than two point .



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7. Maximize and Minimize  $Z = 5x + 10y$ , subject to constraints are

$$x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0 \text{ and } x, y \geq 0$$

.



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8. 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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9. Minimize  $Z = -x + 2y$ , subject to constraints are  $x \geq 3$ ,  $x + y \geq 5$ ,  $x + 2y \geq 6$  and  $x, y \geq 0$ .

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10. Maximize  $Z = x + y$ , subject to constraints are  $x - y \leq -1$ ,  $-x + y \leq 0$  and  $x, y \geq 0$ .

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**11.** Reshma wishes to mix two types of food P and Q in such a way that the vitamin contents of the mixture contain at least 8 units of vitamin A and 11 units of vitamin B . Food P costs Rs 60 per kg and food Q costs Rs 80 per kg . Food P contains 3 units per kg of vitamin A and 5 units per kg of vitamin B while food Q contains 4 units per kg of vitamin A and 2 units per kg of vitamin B . determine the minimum cost of the mixture .



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**12.** One kind of cake requires 200 g of flour and 25 g of fat 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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**13.** A factory makes tennis rackets and cricket bats . A tennis racket takes 1.5 h of machine time and 3 h of craftman's time in its making while a cricket bat takes 3 h of machine time and 1 h of craftman' time . In a

day , the factory has the availability of not more than 42 h of machine time and 24 h of craftman's time

(a) What number of rackets and bats must be made, if the factory is to work at full capacity?

(b) If the profits on rackets and on bats is Rs 20 and Rs 10 respectively , find the maximum profit of the factory when it works at full capacity .



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**14.** A manufacturer produces nuts and bolts . It takes 1 hr of work on machine A and 3 hr on machine B to produce a package of nuts and bolts . He earns a profit of Rs 17.50 per package on nuts and Rs 7.00 per

package on bolts . How many package of each should be produced each most 12 h a day to maximize the profit?



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**15.** A factor 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 take 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 Rs 10. Assuming that he can sell all the screw he manufactures, how many packages of each type should the factory owner produced day in order to maximise his profit? Determine the maximum profit.



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## Try Yourself

1. A cottage industry manufactures pedestal lamps and wooden shades, each requiring the use of a

grinding cutting machine and a sprayer . It takes 2 h on grinding cutting machine and 3 h on the sprayer to manufacture a pedestal lamp . It takes 1 h on the grinding cutting machine and 2 h on the sprayer to manufacture a shade . On any day, the sprayer is available for at the most 20 h and the grinding cutting machine for at the most 12 h . The profit from the sale of a lamp is Rs 5 and that from a shade is Rs 3 . Assuming that the manufacture can sell all the lamps and should he schedule his daily production in order to miximize his profit ?



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2. A Company manufactures two types of novelty souvenirs made of plywood . Souvenirs of type A require 5 min each for cutting and 10 min each for assembling . Souvenirs of type B require 8 min each for cutting and 8 min each for assembling . There are 3 h 20 min available for cutting and 4 h for assembling . The profit is Rs 5 each for type A and Rs 6 each for type B souvenirs . How many souvenir of each type should the company manufacture in order to maximise the profit ?



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3. 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 computer which the merchant should stock to get maximum profit , if he does not want to invest more than Rs 70 laksh and if his profit on the desktop model is Rs 4500 and on portable model is Rs 5000.



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4. A diet is to contain atleast 80 units of vitamin A and 100 units of minerals . Two foods  $F_1$  and  $F_2$  are available . Food  $F_1$  costs Rs 4 per unit and food  $F_2$  costs Rs 6 per unit . One units of food  $F_1$  contains at 3 units of vitamin A and 4 units of minerals . One unit of food  $F_2$  contains 6 units of vitamin A and 3 units of minerals . Formulate this as a linear programming problem . find 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. There are two types of fertilizers  $F_1$  and  $F_2$  consists of 10% nitrogen and 6% phosphoric acid and  $F_2$  consists of 5% nitrogen and 10% phosphoric acid. After testing the soil conditions, a farmer finds that he needs atleast 14 kg of nitrogen and 14 kg of phosphoric acid for his crop. If  $F_1$  costs Rs. 6/kg and  $F_2$  costs Rs. 5 kg. Determine how much of each type fertilizer should be used so that nutrient requirements are met at a minimum cost. What is the minimum cost? Also show graphically.



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