# MATHS

# BOOKS - ARIHANT PRAKASHAN

# LINEAR PROGRAMMING

## Practice Questions Exams Textbook S Other Imp Questions 1 Mark Questions

**1.** Write the solution of the following LPP

Maximise $Z = x + y$

Subject to $3x + 4y \leq 12, x \geq 0, y \geq 0$

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**2.** Write the maximum value of $x + y$ subject to $2x + 4y \leq 6, x \geq 0, y \geq 0.$

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**3.** Shade the feasible region for the inequations $2x + 3y \leq 6, x \geq 0, y \geq 0$ in a rough figure.

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**4.** Write the solution of the following LPP

Maximise $Z = 2x + 3y$

Subject to $x, y \geq 0, x + y \leq 1.$

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**5.** Show that feasible region for the following constarints in a graph $2x + y \leq 4, x \geq 0y \geq 0.$

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**6.** State the feasible solution.

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**7.** Shade the feasible region for the inequations $2x + 3y \leq 6, x \geq 0, y \geq 0$ in a rough figure.

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**8.** Mention the quadrant in which the solution of an LPP with two decision variables lies when the graphical method is adopted.

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**9.** Define objective function.

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**10.** Show graphically the feasible region for the following constraints

$3x + y \leq 6, x, y \geq 0.$

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**11.** Corner points of the feasible region determined by the system of linear constraints

are (0,3), (1,1) and (3,0). Let $Z = px + qy$, where $p, q > 0$.

Find the condition in p and q, so that the minimum of Z occurs at (3,0) and (1,1).

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**12.** Show the feasible region for the following constraints $3x + y \leq 2, x \geq 0, y \geq 0$

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**13.** What happens when the objective function attains optimum value at more than one points?

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**14.** What happens when the objective function attains optimum value at infinity?

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## Practice Questions Exams Textbook S Other Imp Questions 4 Marks Questions

**1.** Two types of food X and Y re mixed to prepare a mixture is such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin X. These vitamines are avialalbe in 1kg of food as per table below. 1kg of food X costs Rs 16 and 1kg of food Y costs Rs 20. Formulate the L. P. P. so as to determine the least cost of the mixture containing the required

amound of vitamins.

| Food | Vitamins | | |
|---|---|---|---|
| | A | B | C |
| X | 1 | 2 | 3 |
| Y | 2 | 2 | 1 |

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**2.** Sole the following LPP graphically

Minimize $Z = 4x + 3y$

subject to $2x + 5y \geq 10$and $x, y \geq 0$.

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**3.** Find the feasible region of the system

$2y - x \leq 0, 6y - 3x \leq 21, x \geq 0, y \geq 0$

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**4.** Solve the following LPP graphically

Maximize, $Z = 20x + 30y$

Subject to $3x + 5y \leq 15$

$x, y \geq 0.$

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**5.** Find the feasible region of the following system

$2x + y \geq 6, x - y \leq 3, x \geq 0, y \geq 0$

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**6.** Sole the following LPP graphically

Maximise $Z = 6x_1 + 7x_2$

Subject to $x_1 + 2x_2 \geq 2, x_1, x_2 \geq 0.$

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**7.** Find the feasible region the the following system of equations $2y - x \geq 0, 6y - 3x \leq 21, x \geq 0, y \geq 0.$

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**8.** Maximise $Z = 50x_1 + 60x_2$

Subject to $2x_1 + 3x_2 \leq 6, x_1, x_2 \geq 0.$

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**9.** Find the feasible region the the following system of equations $2y - x \geq 0, 6y - 3x \leq 21, x \geq 0, y \geq 0.$

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## Practice Questions Exams Textbook S Other Imp Questions 6 Marks Questions

**1.** Solve the following LPP

Minimise $Z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$x_1, x_2 \geq 0.$

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**2.** Solve the following LPP graphically

Maximize, $Z = 5x_1 + 3x_2$

Subject to $3x_1 + 5x_2 \leq 15$

$5x_1 + 2x_2 \leq 10$

$x_1, x_2 \geq 0$

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**3.** Solve the following LPP graphically

Maximise $Z = -10x + 2y$

Subject to $-x + y \geq -1,$

$x + y \leq 6,$

$y \leq 5, x, y \geq 0$

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**4.** Solve the following LPP

Maximise $Z = 20x + 10y$

Subject to $x + 2y \leq 40,$

$3x + y \geq 30,$

$4x + 3y \geq 60,$

$x, y \geq 0.$

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**5.** Solve the following LPP

Minimise $Z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$x_1, x_2 \geq 0.$

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**6.** Solve the following LPP graphically

Maximize, $Z = 20x + 30y$

Subject to $3x + 5y \leq 15$

$x, y \geq 0.$

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**7.** Solve the following LPP graphically

Maximise $Z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \leq 400$

$2x_1 + x_2 \leq 600$

$x_1, x_2 \geq 0.$

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**8.** Maximise $Z = 5x + 11y$

Subject to $x + 4y \leq 30, 5x + 2y \geq 60$and $x \geq 0, y \geq 0.$

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**9.** A dietician wishes to mix two types of foods $f_1$ and $f_2$ in such a way that the vitamin contents of the mixture contain atleast "6"units of vitamin A and "8"units of vitamin B. Foof $f_1$ contains

"2"units/kg of vitamin A and "3"units/kg of vitamin B while foof $f_2$ contains "3"units/kf of vitamin A and "2"units/kg of vitamin B. Food $f_1$ costs Rs "50"per kg and food $f_2$ costs Rs "75"per kg. Formulate the problem as an LPP to minimise the cost of mixture. (Diet Problem)

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**10.** Maximise $Z = 5x_1 + 7x_2$

Subject to $x_1 + x_2 \leq 4$,

$5x_1 + 8x_2 \leq 24$

and $10x_1 + 7x_2 \leq 35, x_1, x_2 \geq 0.$

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## Chapter Test 1 Mark Questions

**1.** Draw the following convex polygons on the graph paper and indicate it by shading and mention the vertices.

$x + y \leq 5, x + y \geq 2, x, y \geq 0$

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**2.** Draw the following convex polygons on the graph paper and indicate it by shading and mention the vertices.

$2x + y \leq 4, x + 2y \geq 2, x, y \geq 0$

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**3.** Define the optimal value.

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**4.** Solve graphically $4x + 7y \leq 28$

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**5.** Check whether the region given by $2x + 5y \geq 1$ is a bounded region.

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**6.** Write the maximum value of $2x + 3y$, subject to $x + y \geq 3, x \geq 0, y \geq 0$.

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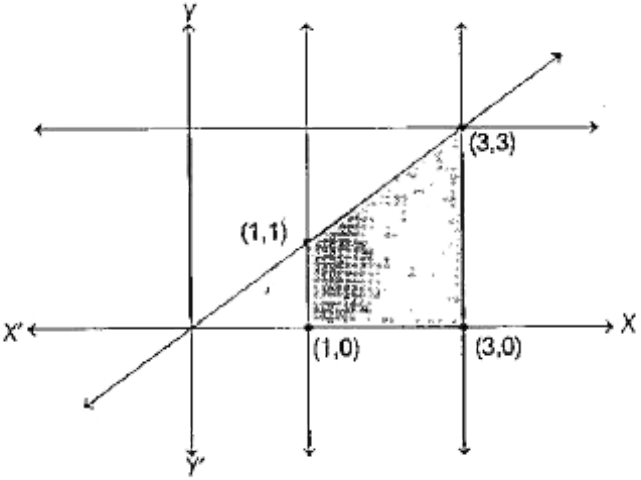
**7.** Find the minimum value of $Z = 2x + y$ in the following region.

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## Chapter Test 4 Marks Questions

**1.** Find the feasible region of $x - 2y \geq 0, 3x - 6y \leq 0, x, y \geq 0.$

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**2.** Maximise $Z = 30x + 20y$

Subject to $x + y \leq 1, 6x + 2y \leq 3, x, y \geq 0.$

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**3.** Find the feasible region of

$-0.5x + y \leq 2, x + y \geq 2, -x + 5y \geq 0, x, y \geq 0$

.

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**4.** Solve the following problem graphically

Minimise $Z = -3x + 4y$

Subject to $x + 2y \leq 8, 3x + 2y \leq 12$ and $x \geq 0, y \geq 0.$

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**5.** Minimise $Z = x - 7y + 190,$ subject to constraints $x + y \leq 8, x \leq 5, y \leq 5, x + y \geq 4$

and $x, y \geq 0$.

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**6.** Find the feasible region of $x - y \leq -1, -x + y \leq 0$ and $x, y \geq 0$.

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Chapter Test 6 Marks Questions

**1.** Determine graphically, the minimum value of the objective function $Z = -50x + 20y$ Subject to the constraints $2x - y \geq -5, 3x + y \geq 3, 2x - 3y \leq 12$and $x \geq 0, y \geq 0.$

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**2.** Solve the following problem graphically

Maximise $Z = 3x + 9y$

Subject to

$x + 3y \leq 60, x + y \geq 10, x \leq y$ and

xge0,yge0`.

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**3.** Solve the following problem graphically

Maximise $Z = x + y$

Subject to $x - y \leq -1, -x + y \leq 0$and

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

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**4.** Maximise $Z = x + 2y$

Subject to

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

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

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**5.** Maximise $Z = -10x + 2y$

Subject to $-x + y \geq -1, x + y \leq 6, y \leq 5$and

$x, y \geq 0.$

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**6.** Minimise $Z = 5x + 2y$

Subject to

$-0.5x + y \leq 2, x + y \geq 2, \ -x + 5y \geq 5$and

$x, y \geq 0.$

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**7.** Solve the following linear programming problem graphically

Maximum $Z = 60x + 15y$

Subject to constraints $x + y \leq 30, 3x + y \leq 90$

and $x, y \geq 0.$

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**8.** A merchant sells two models X and Y of TV with cost price ₹ 25000 and ₹ 50000 Per set respectively. He gets a profit of ₹ 1500 on model X and ₹ 2000 on model Y . The sales connot exceed 20 sets in a month. If he cannot invest more than 6 lakh rupees, formulate the problem of determining the number of sets of each type he must keep in stock for maximum profit.

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**9.** A company manufactures and sells two models of lamps $L_1$ and $L_2$, the profit being ₹ 15 and ₹ 10 respectively. The process involves two workers $W_1$ and $W_2$ who are available for this kind of work 100 hours and 80 hours per month respectively, $W_1$ assembles,$L_1$ in 20 and L_2 in 30 minutes.W_2 [aomts L_1 in 20 and L-2 in 10 minutes. Assuming that all lamps made can be sold, formulate the LPP for determining the productions figures for maximum proft.

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**10.** A man plans to start a poultry farm by investing at most ₹ 3000. He can buy old hens for ₹80 each and young ones for ₹ 140 each, but he cannot house more than 30 hens. Old hens lay 4 eggs per week ,each ell bing sold at ₹5. It costs ₹ 5 to feed an old hen and ₹8 to feed a young hen per week. Formulate his problem determining the number of hens of each type he should buy so as to earn a proft of more than ₹ 300 per week.

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