PRACTICE PAPER 01 (2026-27)
CHAPTER 12 : LINEAR PROGRAMMING

SUBJECT: MATHEMATICS	**MAX. MARKS:** 40
CLASS: XII	**DURATION:** 1½ hrs

General Instructions:

(i) All questions are compulsory.

(ii) This question paper contains 20 questions divided into five Sections A, B, C, D and E.

(iii) Section A comprises 10 MCQs of 1 mark each (Q9 and Q10 are Assertion–Reason questions). Section B comprises 4 questions of 2 marks each. Section C comprises 3 questions of 3 marks each. Section D comprises 1 question of 5 marks with an internal choice. Section E comprises 2 case study based questions of 4 marks each, with internal choice in the last sub-part.

(iv) There is no overall choice. Internal choices have been provided where indicated.

(v) Use of calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. In a linear programming problem, the linear function $Z = ax + by$ which is to be maximised or minimised is called the

(a) constraint (b) objective function

(c) feasible region (d) optimal solution

2. The feasible region determined by $x \geq 0$, $y \geq 0$ and $x + y \leq 5$ is

(a) unbounded (b) empty

(c) bounded (d) a single point

3. The corner points of a feasible region are (0, 0), (4, 0) and (0, 3). The maximum value of $Z = 3x + 2y$ is

(a) 6 (b) 0

(c) 18 (d) 12

4. The maximum value of $Z = 5x + 3y$ subject to $x + y \leq 6$, $x \leq 4$, $x \geq 0$, $y \geq 0$ is

(a) 20 (b) 18

(c) 26 (d) 30

5. The minimum value of $Z = 2x + 3y$ subject to $x + y \geq 4$, $x \geq 0$, $y \geq 0$ is

(a) 8 (b) 12

(c) 0 (d) 4

6. A carpenter makes x chairs and y tables. A chair needs 2 hours and a table needs 3 hours of work, and at most 60 hours are available. The corresponding constraint is

(a) $3x + 2y \leq 60$ (b) $2x + 3y \leq 60$

(c) $2x + 3y \geq 60$ (d) $x + y \leq 60$

7. The corner points of the bounded feasible region of an LPP are (0, 0), (6, 0), (2, 4) and (0, 5). The number of points at which $Z = 3x + 6y$ is maximum is

(a) 1 (b) 2

(c) infinitely many (d) none

8. The constraints $x \geq 0$ and $y \geq 0$ in a linear programming problem are called

(a) objective constraints (b) structural constraints

(c) feasibility conditions (d) non-negative constraints

For Q9 and Q10, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. Assertion (A): If the feasible region of an LPP is unbounded, the objective function may have no maximum value.

Reason (R): An unbounded feasible region has no corner points.

10. Assertion (A): The feasible region of a linear programming problem is always a convex region.

Reason (R): Each linear inequality represents a half-plane, and the intersection of half-planes is convex.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. A manufacturer makes two types of toys, A and B. Each toy of type A needs 2 hours on machine I and 1 hour on machine II. Each toy of type B needs 1 hour on machine I and 2 hours on machine II. Each machine is available for at most 40 hours a day. The profit is ₹30 on each toy of type A and ₹20 on each toy of type B. Formulate this as a linear programming problem to maximise the profit (do not solve).

12. Find the corner points of the feasible region determined by $x + y \leq 6$, $x \leq 4$, $x \geq 0$, $y \geq 0$.

13. The corner points of the bounded feasible region of an LPP are (0, 0), (5, 0), (3, 4) and (0, 6). Find the maximum value of $Z = 4x + y$ and the point at which it occurs.

14. Maximise $Z = x + 2y$ subject to $x + y \geq 3$, $x \geq 0$, $y \geq 0$. Does a maximum value exist? Justify your answer.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Solve the following linear programming problem graphically:

Maximise $Z = 3x + 2y$ subject to $x + y \leq 40$, $2x + y \leq 60$, $x \geq 0$, $y \geq 0$.

16. Solve the following linear programming problem graphically:

Minimise $Z = 4x + 3y$ subject to $x + 2y \geq 8$, $3x + y \geq 9$, $x \geq 0$, $y \geq 0$.

17. A farmer has 20 acres of land on which he can grow wheat and rice. Wheat needs ₹200 per acre and 3 labour days per acre. Rice needs ₹300 per acre and 2 labour days per acre. He has at most ₹5000 to spend and at most 48 labour days. His profit is ₹1000 per acre of wheat and ₹1200 per acre of rice. Formulate this as a linear programming problem to maximise his profit (do not solve).

SECTION – D

Question 18 carries 5 marks.

18. A carpenter makes tables and chairs. Each table needs 4 hours of carpentry and 2 hours of finishing; each chair needs 3 hours of carpentry and 1 hour of finishing. At most 240 hours of carpentry and 100 hours of finishing are available per week. The profit is ₹60 on a table and ₹40 on a chair. How many tables and chairs should be made each week to maximise the profit? Formulate the problem and solve it graphically.

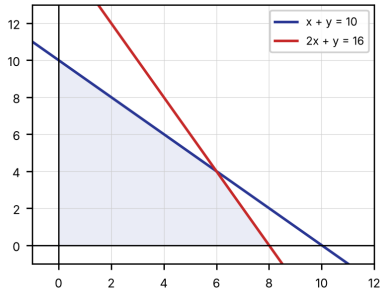
OR

Solve graphically: Minimise $Z = 40x + 50y$ subject to $2x + 3y \geq 12$, $4x + y \geq 12$, $x \geq 0$, $y \geq 0$.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. A bakery makes x cakes and y pastries each day. The oven can bake at most 10 items a day, so $x + y \le 10$. The labour available allows $2x + y \le 16$. The profit is ₹60 per cake and ₹40 per pastry. The shaded region in the figure is the feasible region.



Based on the above information, answer the following questions:

(i) Write the objective function to be maximised. (1)

(ii) Find the corner points of the feasible region. (1)

(iii) Find the number of cakes and pastries that give the maximum profit, and the maximum profit. (2)

OR

(iii) If the profit on a pastry rises to ₹60 (so $Z = 60x + 60y$), find the maximum profit and the number of optimal solutions. (2)

20. A kitchen mixes two foods, A and B, costing ₹10 and ₹15 per unit. Each unit of A gives 3 g of protein and 1 g of fibre. Each unit of B gives 1 g of protein and 3 g of fibre. The mix must contain at least 12 g of protein and at least 12 g of fibre. Let x units of A and y units of B be used.

Based on the above information, answer the following questions:

(i) Write the objective function and the constraints. (1)

(ii) Find the corner points of the feasible region. (1)

(iii) Find the minimum cost of the mix and the amounts of A and B used. (2)

OR

(iii) If the cost were to be maximised instead, would a maximum exist? Justify your answer. (2)

— End of Question Paper —