

Linear Programming — CBSE Pattern Test 2

Class 12 Maths · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 2 — CBSE Pattern (90 minutes, 40 marks)

Class 12 Maths · Linear Programming · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.
(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.
(3) For MCQ questions choose the single correct option; for VSA answers write a single line.
(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. A linear programming problem has an objective function that is
 - (A) linear
 - (B) quadratic
 - (C) cubic
 - (D) constant
2. The set of all feasible points is called the
 - (A) feasible region
 - (B) objective region
 - (C) constraint set
 - (D) vertex set
3. For a bounded feasible region, the maximum of a linear objective function occurs at
 - (A) a vertex
 - (B) a side
 - (C) the interior
 - (D) the origin
4. If the feasible region is unbounded, a maximum may
 - (A) not exist
 - (B) always exist
 - (C) equal zero
 - (D) be negative
5. The first step in formulating an LPP is to
 - (A) identify decision variables
 - (B) find the objective
 - (C) graph the region
 - (D) find vertices
6. A word problem is translated into
 - (A) inequalities and an objective
 - (B) equalities only
 - (C) a matrix
 - (D) a single equation
7. If the objective function is parallel to a constraint boundary, the problem may have
 - (A) multiple optimal solutions

- (B) no solution
 - (C) a unique solution
 - (D) unbounded region
8. An infeasible LPP has
- (A) no feasible region
 - (B) one vertex
 - (C) many vertices
 - (D) an unbounded region
9. Define the feasible region of an LPP.
10. What is an infeasible LPP?

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. State whether the objective function of an LPP is always linear.
12. When may the maximum of an LPP not exist?
13. Why are the variables of an LPP non-negative?
14. Give an example of an unbounded feasible region.

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. Graph the feasible region for $x + y \leq 4$, $x \geq 0$, $y \geq 0$.
16. Maximise $Z = 4x + 3y$ subject to $x + y \leq 8$, $x, y \geq 0$ using the corner point method.
17. Write the constraints for a diet problem mixing two foods.
18. Explain when an LPP has multiple optimal solutions.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. Formulate and solve: A factory makes two products with machine-hour limits.
20. Explain why an unbounded feasible region may still have a finite minimum. Discuss the special case where the objective function is parallel to a constraint.

Answer Key (Marking Scheme)

- Q1 — (A) linear. Q2 — (A) feasible region. Q3 — (A) a vertex. Q4 — (A) not exist.
- Q5 — (A) identify decision variables. Q6 — (A) inequalities and an objective. Q7 — (A) multiple optimal solutions. Q8 — (A) no feasible region.
- Q9 — The set of all points satisfying all constraints.
- Q10 — An LPP with an empty feasible region (no solution).
- Q11 — Yes, always linear.
- Q12 — When the feasible region is unbounded in the direction of improvement.
- Q13 — Because quantities cannot be negative.
- Q14 — E.g. $x + y \geq 1$, $x, y \geq 0$ is unbounded away from the origin.
- Q15 — Region bounded by axes and $x + y = 4$.
- Q16 — Max $Z = 32$ at $(8, 0)$.
- Q17 — Nutrient minimums as inequalities, cost as objective.

Q18 — When the objective is parallel to a constraint boundary.

Q19 — Formulate; solve by corner points; report optimum.

Q20 — Minimum occurs at a vertex nearest the origin; parallel objective gives multiple optimal solutions along the boundary.