

Linear Programming — CBSE Pattern Test 1

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

Test 1 — 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)

- The function to be maximised or minimised in an LPP is called the
 - objective function
 - constraint
 - feasible region
 - vertex
- The conditions $x \geq 0, y \geq 0$ in an LPP are called
 - non-negativity constraints
 - objective functions
 - vertices
 - slack variables
- The optimum value of the objective function occurs at
 - a corner point of the feasible region
 - the origin
 - any interior point
 - the midpoint
- The corner point method evaluates the objective function at
 - each vertex
 - the centroid
 - the origin only
 - the axes
- While formulating an LPP, variables are usually
 - non-negative
 - negative
 - zero
 - complex
- Constraints in a word problem represent
 - limited resources
 - profits
 - vertices
 - objectives
- If the feasible region is unbounded, the objective may have
 - no maximum

- (B) only a vertex
 - (C) a unique maximum always
 - (D) no minimum
8. If two corner points give the same optimal value, the problem has
- (A) infinitely many solutions
 - (B) no solution
 - (C) a unique solution
 - (D) no feasible region
9. Define the objective function of an LPP.
10. Where does the optimum value of the objective function occur?

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

11. What are non-negativity constraints?
12. What is the corner point method?
13. What do the constraints represent in a word problem?
14. When does an LPP have infinitely many solutions?

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

15. Evaluate $Z = 3x + 5y$ at the vertices $(0, 0)$, $(4, 0)$, $(0, 4)$.
16. List the steps of the corner point method.
17. Formulate an LPP for maximising profit where each unit of product A needs 2 hours and B needs 3 hours, with 100 hours available.
18. Explain when an LPP has multiple optimal solutions.

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

19. Maximise $Z = 4x + 3y$ subject to $x + y \leq 8$, $x, y \geq 0$ using the corner point method.
20. Minimise $Z = 2x + 3y$ subject to $x + 2y \geq 4$, $x, y \geq 0$. Discuss the special case where the objective function is parallel to a constraint.

Answer Key (Marking Scheme)

- Q1 — (A) objective function. Q2 — (A) non-negativity constraints. Q3 — (A) a corner point of the feasible region. Q4 — (A) each vertex.
- Q5 — (A) non-negative. Q6 — (A) limited resources. Q7 — (A) no maximum. Q8 — (A) infinitely many solutions.
- Q9 — The linear function to be optimised.
- Q10 — At a corner (vertex) of the feasible region.
- Q11 — The constraints $x \geq 0$, $y \geq 0$.
- Q12 — Evaluating the objective at each vertex to find the optimum.
- Q13 — Limited availability of resources.
- Q14 — When the objective is parallel to a constraint boundary.
- Q15 — $Z = 0, 12, 20$.
- Q16 — Graph the region, find vertices, evaluate Z at each, choose optimum.

Q17 — Maximise profit subject to $2x + 3y \leq 100$, $x, y \geq 0$.

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

Q19 — Max $Z = 32$ at $(8, 0)$.

Q20 — Min $Z = 4$ at $(4, 0)$ or $(0, 2)$; multiple optimal solutions along the boundary.