Class 12 Maths Chapter 12: Linear Programming - Notes, Important Questions and MCQs (2026-27)

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These Class 12 Maths Chapter 12 notes cover “Linear Programming” from the NCERT Mathematics Part II textbook (2026-27): linear programming problems and their terminology – objective function, decision variables, constraints, feasible region and optimal solution – and solving LPPs graphically by the corner point method for bounded and unbounded regions – with tables, a fully worked example, Q&A, 10 MCQs and a free PDF.

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Chapter Overview

Linear programming deals with finding the maximum or minimum value of a linear function, called the objective function $Z = ax + by$, subject to linear inequalities called constraints, together with non-negativity restrictions $x \geq 0$, $y \geq 0$.

The common region satisfying all constraints is the feasible region. By the corner point theorem, if an optimal value exists, it occurs at a corner (vertex) of the feasible region, so we evaluate Z at each corner.

Important Topics and Concepts

Terminology

- Objective function: linear function $Z = ax + by$ to be maximised or minimised.
- Decision variables: x and y.
- Constraints: linear inequalities on the variables.
- Non-negativity: $x \geq 0$, $y \geq 0$.
- Feasible region: common region of all constraints; points in it are feasible solutions.
- Optimal solution: feasible point giving the optimal value of Z.

Formulating an LPP

- Identify decision variables.
- Write the objective function in terms of them.
- Translate each limitation into a linear inequality.
- Add non-negativity restrictions.
- Example: maximise profit subject to limited labour and machine hours.

Corner Point Method

- 1. Draw the lines of the constraints and shade the feasible region.
- 2. Find the corner points (by solving pairs of equations).
- 3. Evaluate Z at each corner point.
- 4. Bounded region: the largest value is the maximum, the smallest the minimum.
- The feasible region is always a convex polygon (or unbounded convex region).

Unbounded Feasible Region

- A maximum or minimum may not exist.
- If M is the largest corner value, M is the maximum if the open half-plane $ax + by > M$ has no common point with the feasible region.
- If m is the smallest corner value, m is the minimum if $ax + by < m$ has no common point with the region.
- Otherwise Z has no maximum (or minimum).

Special Cases

- If two adjacent corners give the same optimal value, every point on the segment joining them is optimal.
- If the feasible region is empty, there is no feasible solution.
- Bounded regions always have both maximum and minimum.

Worked Example

Board-pattern practice.

Corner point	$Z = 3x + 9y$
(0, 10)	90
(5, 5)	60 – minimum
(15, 15)	180 – maximum
(0, 20)	180 – maximum

Problem

Constraints for the table above.

- Maximise and minimise $Z = 3x + 9y$ subject to $x + 3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x \geq 0$, $y \geq 0$.
- The feasible region is bounded with corners (0, 10), (5, 5), (15, 15), (0, 20).
- Minimum $Z = 60$ at (5, 5).
- Maximum $Z = 180$ at both (15, 15) and (0, 20), so every point on the segment joining them is optimal.

LPP Terms

Term	Meaning
Objective function	$Z = ax + by$ to optimise
Constraints	Linear inequalities
Feasible region	Common shaded region
Feasible solution	Point in feasible region
Optimal solution	Feasible point giving best Z
Corner point	Vertex of feasible region

Important Definitions and Terms

Term	Meaning
Linear programming	Optimising a linear function under constraints
Objective function	Function to be maximised or minimised
Decision variables	Variables x, y to be decided
Constraints	Restrictions as linear inequalities
Non-negativity	$x \geq 0$, $y \geq 0$
Feasible region	Region satisfying all constraints
Infeasible solution	Point outside feasible region
Optimal value	Maximum or minimum of Z
Bounded region	Enclosed in a circle
Unbounded region	Extends indefinitely

Short Answer Questions

Q1. What is an objective function?

A linear function $Z = ax + by$ to be maximised or minimised.

Q2. What is a feasible region?

The common region determined by all constraints including non-negativity.

Q3. State the corner point theorem.

Q4. Does a bounded feasible region always have a maximum?

Yes, both maximum and minimum exist.

Q5. How is the maximum checked in an unbounded region?

By checking that ax + by > M has no common point with the region.

Q6. What are decision variables?

The variables (x, y) whose values are to be determined.

Q7. What if two corners give the same maximum?

All points on the segment joining them are optimal.

Q8. What are non-negativity restrictions?

$x \geq 0$ and $y \geq 0$.

Long Answer Questions

Q1. Solve graphically: maximise $Z = 4x + y$ subject to $x + y \leq 50$, $3x + y \leq 90$, $x \geq 0$, $y \geq 0$.

Draw $x + y = 50$ and $3x + y = 90$.

Corner points: (0, 0), (30, 0), (20, 30), (0, 50).

Z values: 0, 120, 110, 50.

Maximum Z = 120 at (30, 0).

Feasible region is bounded.

Q2. Minimise $Z = -3x + 4y$ subject to $x + 2y \leq 8$, $3x + 2y \leq 12$, $x \geq 0$, $y \geq 0$.

Corners: (0, 0), (4, 0), (2, 3), (0, 4).

Z: 0, –12, 6, 16.

Minimum Z = –12 at (4, 0).

Region is bounded.

So –12 is the minimum.

Q3. Explain the corner point method.

Graph the constraints.

Identify feasible region.

Find corner points.

Evaluate Z at each corner.

Choose max/min; check unbounded case.

MCQs with Answers

1. Optimal value of an LPP occurs at(a) centre (b) corner point (c) origin always (d) any pointAnswer: (b) corner point

2. Feasible region of an LPP is(a) concave (b) convex (c) circular (d) empty alwaysAnswer: (b)

3. $x \geq 0$, $y \geq 0$ are(a) objective (b) non-negativity restrictions (c) decision variables (d) optimalAnswer: (b) non-negativity restrictions

4. Bounded feasible region has(a) only maximum (b) both max and min (c) neither (d) only minimumAnswer: (b) both max and min

5. $Z = 2x + 3y$ at (1, 2)(a) 8 (b) 7 (c) 5 (d) 6Answer: (a) 8

6. Common region of constraints(a) infeasible region (b) feasible region (c) optimal region (d) null regionAnswer: (b) feasible region

7. Two corners with equal max $Z \Rightarrow$(a) no solution (b) infinitely many optimal points (c) unique solution (d) errorAnswer: (b) infinitely many optimal points

8. Objective function is(a) quadratic (b) linear (c) cubic (d) exponentialAnswer: (b) linear

9. Unbounded region may have(a) always max (b) no max (c) always min (d) bothAnswer: (b) no max

10. Max $Z = 4x + y$ with corners (0,0), (30,0), (20,30), (0,50)(a) 110 (b) 120 (c) 50 (d) 0Answer: (b) 120

Quick Revision Points

- Terms: objective, constraints, feasible region.
- Formulation steps.
- Corner point theorem.
- Bounded: max and min exist.
- Unbounded: half-plane test.
- Equal values on adjacent corners.

Chapter Summary

A linear programming problem optimises a linear objective function $Z = ax +$ by subject to linear constraints and non-negativity. The feasible region is the convex region satisfying all constraints.

By the corner point method, Z is evaluated at each vertex of the feasible region. Bounded regions always have a maximum and minimum, while for unbounded regions the result is confirmed using the open half-plane test.

Exam Tips and PYQ Pattern

- Draw graphs neatly with scale.
- Label all corner points.
- Make a corner-point table.
- Use the half-plane test for unbounded regions.
- Check constraints with a test point.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 12 Mathematics Part II textbook, prescribed in the CBSE 2026-27 syllabus.

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Yes. Use the free PDF link at the top of this page – no signup needed.

What is the corner point method?

A graphical method that evaluates the objective function at each corner of the feasible region to find the optimal value.

When does an LPP have no maximum?

When the feasible region is unbounded and the half-plane ax + by > M meets the feasible region.

Conclusion

Linear Programming is a sure 5-mark graph question. Practise the corner point table and save the free PDF.

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Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE maths educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

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