

CLASS 12 MATHEMATICS — FORMULA SHEET

Chapter 12 : Linear Programming (NCERT)

12.1 Basic Terms

Term	Meaning
Linear programming problem (LPP)	Optimising (max/min) a linear function under linear constraints
Objective function	$Z = ax + by$ (the quantity to maximise/minimise)
Decision variables	x, y (the unknowns to be found)
Constraints	Linear inequalities restricting x, y
Non-negative restrictions	$x \geq 0, y \geq 0$
Optimal value	The maximum or minimum value of Z

12.2 Feasible Region & Solutions

Concept	Meaning
Feasible region	Region satisfying ALL constraints (incl. $x, y \geq 0$)
Feasible solution	Any point inside or on the feasible region
Infeasible region	Region not satisfying the constraints
Bounded region	Can be enclosed in a circle (has finite extent)
Unbounded region	Extends infinitely in some direction
Corner point (vertex)	Point where constraint boundaries intersect
Optimal solution	The corner point giving the best Z value

12.3 Corner Point Method (Working Rule)

Step	Action
Step 1	Formulate the LPP (objective function + constraints)
Step 2	Plot the constraints and shade the feasible region
Step 3	Find all corner points (vertices) of the feasible region
Step 4	Evaluate $Z = ax + by$ at each corner point
Step 5 (bounded)	Largest value = maximum, smallest = minimum
Step 6 (unbounded)	Check if optimum exists using open half-plane test

12.4 Unbounded Region — Special Checks

Case	Rule
Maximum (unbounded)	If $ax + by > M$ has points in feasible region, no max exists
Minimum (unbounded)	If $ax + by < m$ has points in feasible region, no min exists
Otherwise	The value M (or m) is the optimal value

Case	Rule
Multiple optimal solutions	If two corner points give the same optimal Z, every point on that edge is optimal

12.5 Types of LPP

Type	Goal
Manufacturing problem	Maximise profit / production
Diet problem	Minimise cost while meeting nutrient needs
Transportation problem	Minimise the cost of transporting goods
Allocation problem	Best allocation of limited resources

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Objective function	$Z = ax + by$ — the linear quantity you maximise or minimise.
Feasible region	Satisfies ALL constraints, including $x \geq 0$ and $y \geq 0$.
Optimum at corners	The max/min of Z always occurs at a CORNER point of the feasible region.
Corner point method	Evaluate Z at every vertex ; pick the largest (max) or smallest (min).
Bounded region	A bounded feasible region always has both a max and a min.
Unbounded check	For unbounded regions, test the open half-plane to confirm the optimum exists.
Multiple solutions	Equal Z at two corners → every point on that edge is optimal.
Always sketch	Plot constraints carefully ; the feasible region drives the whole answer.