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LINEAR PROGRAMMING PROBLEMS

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TWO – PHASE SIMPLEX METHOD

- **DEFINITION**

- In Two Phase Method, the whole procedure of solving a linear programming problem (LPP)involving artificial variables is divided into two phases.
- In Phase 1, we solve an auxiliary LP problem to either get a feasible basis or conclude that (P) is infeasible.
- In Phase 2, we solve (P) starting from the feasible basis found in Phase 1 .
- Using simplex method make iterations till an optimal basic feasible solution for it is obtained.
- It may be noted that the new objective function is always of minimization type regardless of whether the given (original) L.P.P. is of maximization or minimization type.

- **Steps :**

Step-1:	**Phase-1** a. Form a new objective function by assigning zero to every original variable (including slack and surplus variables) and -1 to each of the artificial variables. eg. Max Z = - A_1 - A_2 b. Using simplex method, try to eliminate the artificial varibles from the basis. c. The solution at the end of Phase-1 is the initial basic feasible solution for Phase-2.
Step-2:	**Phase-2** a. The original objective function is used and coefficient of artificial variable is 0 (so artificial variable is removed from the calculation process). b. Then simplex algorithm is used to find optimal solution.

Revised Simplex Method

- **DEFINITION**

- The revised simplex method is mathematically equivalent to the standard simplex method but differs in implementation.
- In simplex method the entire simplex tableau is updated while a small part of it is used.
- Advantages over the tableau version:

1.Time and space are saved

2. Errors due to floating-point arithmetic are easier to control.

- **Steps :**

- Step 1 – Express the given problem in standard form – I

  Ensure all $b_i \geq 0$.
- Step 2 – Construct the starting table in the revised simplex form

  Express (1) in the matrix form with suitable notation
- Step 3 – Computation of Δ_j for a_1 (1) and a_2 (1)

  Δ_1 = first row of $B_1^{-1} * a_1$ (1)

  Δ_2 = first row of $B_1^{-1} * a_2$ (1)
- Step 4 – Apply the test of optimality Both Δ_1 and Δ_2 are negative.

  So find the most negative value and determine the incoming vector.
- Step 5 – Compute the column vector X_k

  $X_k = B_1^{-1} * a_1$
- Step 6 – Determine the outgoing vector.
- Step 7 – Determination of improved solution

  Column e_1 will never change, x_1 is incoming so place it outside the rectangular boundary.