I) FORMULATING LINEAR PROGRAMMING PROBLEMS

Formulating LPs is part "art" and part "science." However, there are guidelines that can be used in developing your ability to do it.

A. Understand the Problem Thoroughly.

This is so obvious that it might sound stupid. However, many people jump to the formulation before they really know what's going on. Read the problem once, fairly quickly, to get an overall feel for the decision at hand. Try to spot items that should be included in the model and items that can be ignored.

B. Write Verbal Statements on the Objective and All Constraints.

Identify the goal and what aspects of the problem limit that goal.

C. Define the Decision Variables.

What are the decisions? What does the decision maker control? What are the appropriate units for those decisions? As you gain experience you will learn that the way you define the decision variables can make writing constraints much easier or more difficult.

D. Translate into Mathematical Expressions. Make sure the units are consistent.

1. Write the Objective in terms of the decision variables.
2. Write the Constraints in terms of the decision variables.
   First write the right hand side of each constraint
   Next write the $\geq$ or $=$ or $\leq$ operator
   Finally write the left hand side of each constraint
3. Write the Non-Negativity Constraints

II) SOLUTION VIA GRAPHICAL METHOD

Steps in Solving LP Problem with 2 decision variables, say X and Y.

1) Formulate the LP model.

2) Let the axes represent the variables.

Variable Y

Variable X

3) Plot the constraints one by one.

If the constraint is of the inequality form, first assume it to be of the equality form. Then locate its two terminal points and join these two points with a straight line.
Location of the terminal points: Generally,
i) Let variable X = 0 and find the value of the variable Y.
ii) Let variable Y = 0 and find the value of the variable X.
(or ii) Let X = some positive value, find the value of Y)
Join the two points.

4) Find the feasible region. This is the region which the constraint satisfies.

Type of constraint	Feasible region will be
>=	above/to the right
<=	below/to the left
=	the line

Repeat this procedure for all the constraints.
Make sure that you each constraint.
Find the **common feasible region**.

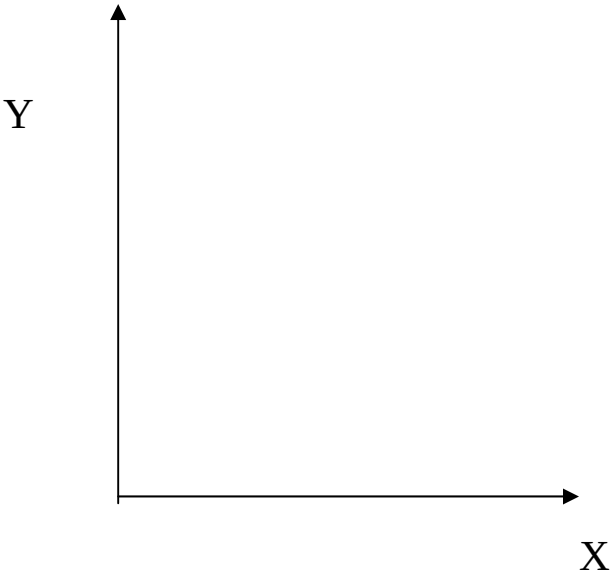
This is the region that satisfies **all** the constraints.

Example: Max: $Z = 3X + 2Y$

$X + Y \leq 4$

$2X + Y \geq 6$

$X , Y \geq 0$



5) Find the **vertices of the resultant polygon**.
This can be done by solving the line equations that meet at each of these vertices. (The optimal solution lies at one of the vertices of this polygon)

6) Determine the **optimal solution** by substituting the values of each of these vertices using the objective function.