General Information. Linear programming is concerned with maximizing or minimizing a certain quantity (like cost) whose variables are constrained by various linear inequalities. Linear programming is applicable to many problems in industry and science. In this project, you'll learn about the simplex method for solving such problems.

Key Words. Max-min problems, Feasible solution/region, Optimal solution, Decision variables, Objective function, Constraints, Simplex method, Standard Form, Slack variables.

References. Basic books on Operations Research (a branch of applied mathematics which studies these types of problems) are a good place to look for information.

Problems.

1. Seven patients require blood transfusions. We assume four blood types: A, AB, B, and O. Type AB is called the universal recipient; type O is called the universal donor. The blood supply and patient data is as follows:

Type	Supply	Cost per pint
A	7 pts	$ 1
AB	6 pts	$ 2
B	4 pts	$ 4
O	5 pts	$ 5

Patient	Blood Type	Need (pts)
1	A	2
2	AB	3
3	B	1
4	O	2
5	A	3
6	B	2
7	AB	1

   The problem is to ensure that each patient receives the required amount of the proper type of blood and to use the existing supply so that the cost of replacement is minimized. Formulate this as a linear programming problem, but don't actually solve it. Label the decision variables, objective function, and constraints.

2. Solve the following linear programming problem using the simplex method:

$$\text{Minimize:} z = -x_1 + x_2 + x_3, \text{subject to}$$
$$x_1 - 2x_2 + x_3 \leq 11$$
$$-2x_1 + x_3 = 1$$
$$x_1, x_2, x_3 \geq 0$$