

Operations Research
Solution of Assignment #1 – Model Formulation

1. ABC Company has canned apple and bottled juice as its products with profit margin of \$2 and \$1 respectively per unit. The following table indicates the labor, equipment, and material to produce each product per unit.

	Bottled Juice	Canned Apple	Total
Labor (man hours)	3	2	12
Equipment (machine hours)	1	2.3	6.9
Material (unit)	1	1.4	4.9

Formulate the problem specifying the product mix, which will maximize profit without exceeding the various levels of resources.

$$\begin{array}{ll}\text{. Maximize} & Z = X + 2 Y \\ \text{Subject to:} & 3 X + 2 Y \leq 12 \\ & X + 2.3 Y \leq 6.9 \\ & X + 1.4 Y \leq 4.9 \\ & X, Y \geq 0\end{array}$$

3. Decibel Electronics produces two products A and B that are sold on a weekly basis. The weekly production cannot exceed 25 for product A and 35 for product B. The company employs a total of 80 workers. Product A requires 2 man-weeks of labor whereas B requires only 1. A gives a profit of \$16 and B \$40. Formulate the above LPP.

$$\begin{array}{ll}\text{Maximize} & 16 A + 40 B \\ \text{Subject to:} & 2 A + B \leq 80 \\ & A \leq 25 \\ & B \leq 35 \\ & A, B \geq 0\end{array}$$

4. Martin Brando mixes pet food in his basement on a small scale. He advertises two types of pet food. Diet-Sup and Gro-More. Contribution from Diet-Sup is \$1.50 a bag and from Gro-More \$1.10 a bag. Both are mixed from two basic ingredients – a protein source and a carbohydrate source. Diet-Sup and Gro-More require ingredients in these amounts:

	Protein	Carbohydrate
Diet-Sup (7-Kg per bag)	4 Kg	3 Kg
Gro-More (3-Kg per bag)	2 Kg	1 Kg

Martin has the whole weekend ahead of him, but his sources of ingredients have closed. He checks his bins and finds he has 700 kilograms of protein source and 500 kilograms of carbohydrate. How many bags of each food should he mix to maximize his profits?

$$\begin{array}{ll}
 \text{Maximize} & z = 1.5 \text{ DS} + 1.1 \text{ GM} \\
 \text{Subject to:} & 4 \text{ DS} + 2 \text{ GM} \leq 700 \\
 & 3 \text{ DS} + \text{ GM} \leq 500 \\
 & \text{DS, GM} \geq 0
 \end{array}$$