



# ISDS 415

## Decision Support & Business Intelligence Systems

Linear Programming

By

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1. Kelson Sporting Equipment, Inc., makes two types of baseball gloves: a regular model and a catcher's model. The firm has 900 hours of production time available in its cutting and sewing department, 300 hours available in its finishing department, and 100 hours available in its packaging and shipping department. The production time requirements and the profit contribution per glove are given in the following table:

Model	Production Time (hours)			
	Cutting and Sewing	Finishing	Packaging and Shipping	Profit/Glove
Regular model	1	1/2	1/8	\$5
Catcher's model	3/2	1/3	1/4	\$8

Assuming that the company is interested in maximizing the total profit contribution, answer the following:

- a. What is the linear programming model for this problem?

Sol: Let R be the number of units for Regular model

Let C be the number of units of Catcher's model

$$\text{Max } 5R + 8C$$

Subject to:

$$\text{Cutting and Sewing: } 1R + \frac{3}{2}C \leq 900$$

$$\text{For Finishing: } \frac{1}{2}R + \frac{1}{3}C \leq 300$$

$$\text{For Packaging and Shipping: } \frac{1}{8}R + \frac{1}{4}C \leq 100$$

$$\text{Where } R \geq 0 \text{ and } S \geq 0$$

- b. Develop a spreadsheet model and find the optimal solution using Excel Solver. How many of each model should Kelson manufacture?**

Sol: After using Excel Solver we can see that the Kelson should manufacture 500 of regular model and 150 of Catcher's model.

- 2. The Sea Wharf Restaurant would like to determine the best way to allocate a monthly advertising budget of \$1,000 between newspaper advertising and radio advertising. Management decided that at least 25% of the budget must be spent on each type of media and that the amount of money spent on local newspaper advertising must be at least twice the amount spent on radio advertising. A marketing consultant developed an index that measures audience exposure per dollar of advertising on a scale from 0 to 100, with higher values implying greater audience exposure. If the value of the index for local newspaper advertising is 50 and the value of the index for spot radio advertising is 80, how should the restaurant allocate its advertising budget to maximize the value of total audience exposure?**

- a. Formulate a linear programming model that can be used to determine how the restaurant should allocate its advertising budget in order to maximize the value of total audience exposure.**

Sol: Let N be the newspaper advertising budget.

Let R be the radio advertising budget.

$$\text{Max } 50N + 80R$$

Subject to:

$$N + R \leq 1000$$

$$N \geq 250$$

$$R \geq 250$$

$$N \geq 2R$$

Where  $N \geq 0$  and  $R \geq 0$

**b. Develop a spreadsheet model and solve the problem using Excel Solver.**

Sol: After running the model in Excel Solver we get \$250 for Radio and \$750 for Newspaper.