Practical 4
Linear Programming

Introduction

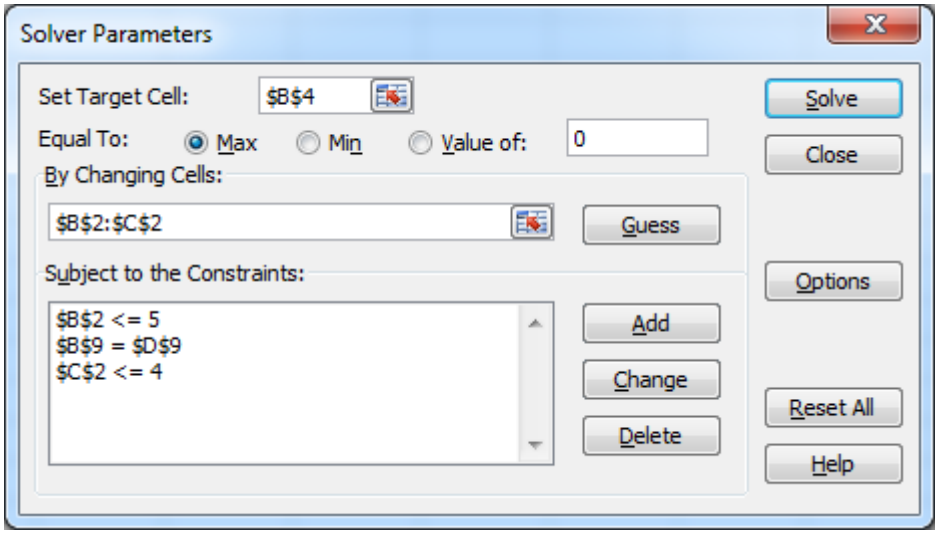
This practical allows you to formulate simple mathematical model in linear programming problems.

1. Using Excel spreadsheet to find the optimal solution of the following linear program:

(a) Max $1A + 2B$
s.t.

$1A \leq 5$
$1B \leq 4$
$2A + 2B = 12$
$A, B \geq 0$

Use the Solver add-in to define the various parameters:



(b) Max $5A + 2B$
s.t.

$1A - 2B \leq 420$
$1A + 3B \leq 610$
$6A - 1B \leq 125$
$A, B \geq 0$

(c) Max $2A + 3B$
s.t.

$5A + 5B \leq 400$
$-1A + 1B \leq 10$
$1A + 3B \geq 90$
$A, B \geq 0$

2. The Sea Wharf restaurant would like to determine the best way to allocate a monthly advertising budget of $1000 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 in order to maximize the value of total audience exposure?

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

   Step 1 : Define the objective function in this case assuming ,
   N = amount spent on newspaper advertising
   R = amount spent on radio advertising

   Step 2 : List down all the appropriate constraints

   Step 3 : construct the LP model in excel

   Step 4 : find the optimal solution using Solver add-in

3. As part of a quality improvement initiative, Consolidated Electronics employees complete a three-day training program on team building and a two-day training program on problem solving.

   The manager of quality improvement has requested that at least 8 training programs on team building and at least 10 training programs on problem solving be offered during the next 6 months. In addition, senior level management has specified that at least 25 training programs must be offered during this period.

   Consolidated Electronics engages a consultant to teach the training program. During the next quarter, the consultant has 84 days of training time available. Each training program on team building costs $10,000 and each training program on problem solving costs $8000.

   Formulate a linear programming model that can be used to determine the number of training programs on team building and the number of training programs on problem solving that should be offered in order to minimize total cost.

   Let T = number of training programs on team building, and
   P = number of training programs on problem solving

   - Define the objective function for this case
   - List down all the appropriate constraints
   - Construct the LP model in Excel
   - Use Solver add-in to find the optimal solution