(New Jersey) You are moving from New Jersey to Indiana and have rented a truck that can haul up to 1100 cubic feet of furniture. The volume and value of each item you are considering moving on the truck are given in the file P06_41.xlsx. Which items should you bring to Indiana?

	Bedroom set	Dining set	Stereo	Sofa	TV
Value	$60	$48	$14	$31	$10
Volume (cubic feet)	800	600	300	400	200

P06_41.xlsx

Discussion: -

Our objective is to decide which items should be carried in truck which gives you more benefit. So, our decision variable will be binary (1 means we are moving the item, 0 means we are carrying the item). When we decide whether we are carrying the item or not we can calculate the total value of the items you are considering moving on the truck. Here, our objective is to maximize the value and make sure you the volume of the items which you are carrying fits in the truck.

Mathematical Model: -

Parameters (Inputs):

$i \in 1,2,3,4,5 \qquad (i: Index\ for\ items)$
$C_i \ : \ Value\ of\ item\ i\ \{C_1 : \$60, C_2 : \$48, \dots C_5 : \$10\}$
$V_i \ : \ Volume\ of\ item\ i\ \{V_1\ 800, V_2 : 600, \dots V_5 : 200\}$
$V \ : \ Max\ Volume\ that\ a\ truck\ can\ carry; V = 1100$

Decision Variables:
$x_i : Decision\ on\ whether\ carrying\ item\ i\ or\ not$

Objective:

$$Maximize\ total\ \ profit = \sum_{i=1}^{5} (x_i * C_i)$$

Constraints:

$$\sum_{i=1}^{5} (x_i * V_i) \leq V \ ; \qquad (1)\ Max\ volume\ that\ a\ truck\ can\ carry$$

$$x_i \in \{0,1\} \qquad (2)\ Binary\ Constraint$$

Excel Implementation: Please find the attached spreadsheet for solution.

38[RA].xlsx

Knapsack [New Jersey]: IP-CH6-Q41

Prepared By: Ramesh Alla

	Bedroom set	Dining set	Stereo	Sofa	TV
Value	$60	$48	$14	$31	$10
Volume (cubic feet)	800	600	300	400	200
Decision To Carry	0	1	0	1	0
Maximize the Value	$ 79				
Total Volume	1000	<=	1100		

Inputs
Decision variables
Calculated Variables
Constraints
Objective