Integer Programming. Four projects are available for investment. The projects require the cash flows and yield the net present values (in millions) shown below. If $6 million is available now for investment, find the investment plan that maximizes NPV.

Cash outflows and NPVs of projects (in millions)				
	Project 1	Project 2	Project 3	Project 4
Cash outflow	$3	$5	$2	$4
NPV	$5	$8	$3	$7

Discussion.

This is an example of an integer programming model. The basic objective if fairly simple, i.e. to maximize the NPV. We must decide choosing which of the investment projects will help us achieve this. We assume that investments to these projects can be made only once. In most Integer programming models, one of the decision variables is always a binary variable, in this case it is the decision whether a project must be chosen. We must ensure that when choosing the projects, the amounts we invest in it do not exceed the capital available, this will be one of the constraints.

Model.

Parameters:

C_i : *Cash outflow required by investment* i, *where* $i \in (1,2,3,4)$

P_i: *NPV from project* i , *where* $i \in (1,2,3,4)$

A: *Available capital*

Decisions:

x_i: *Whether investment* i *should be chosen, where* $i \in (1,2,3,4)$

Objective: *Maximize Revenue*

$max \sum_i \ x_i * P_i$

Constraints:

$\sum_i \ x_i * C_i \ \leq A$ (1) Total investments not more than

$n_i \ \geq 0$ (2) Non - negative amount invested

$x_i \in \{0,1\}$ (3) Binary decision

Optimal Solution. The following is the solution obtained from Excel Solver.

A maximum NPV of $10 million dollars can be attained by choosing a project as shown below.

Project data				
Cash outflows and NPVs of projects (in millions)				
	Project 1	Project 2	Project 3	Project 4
Cash outflow	$3	$5	$2	$4
NPV	$5	$8	$3	$7
Decision				
Whether to choose project	0	0	1	1
Objective	10			
Availibility	6	<=	6	