# Computational Aspects of Optimization

## Knapsack evolution

Define in GAMS a model that solves the following knapsack problem:

You can choose only one of the following knapsack:

* Knapsack A: weight capacity 300, volume capacity 1000
* Knapsack B: weight capacity 500, volume capacity 700

In the chosen knapsack, you can put a combination of the following items in order to maximize the total benefit:

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Weight | Volume | Benefit |
| 1 | 4 | 20 | 4 |
| 2 | 5 | 19 | 5 |
| 3 | 6 | 18 | 3 |
| 4 | 7 | 17 | 4 |
| 5 | 8 | 16 | 5 |
| 6 | 9 | 15 | 6 |
| 7 | 10 | 14 | 2 |
| 8 | 11 | 13 | 3 |
| 9 | 12 | 12 | 7 |
| 10 | 13 | 11 | 3 |

You also must fulfill the following conditions:

* You have to pick at least one of the first 5 items.
* You can pick at most 2 unit of item 9.
* Item 1 and item 2 are mutually exclusive but you need at least one of them, i.e. you must pick at least one unit of either item 1 or item 2, you cannot pick none, you cannot pick both. Of the one you select, you have to pick at least 7 unit.
* Item 6 can be pick only if you pick both item 4 and item 5, but one unit of item 4 and one unit of 5 is enough to pick as much as you want of item 6.