AIDM Lab 3

January 2025

A couple are planning a hiking trip together. The husband carries a knapsack able to hold 20 kg of equipment, while the wife carries another knapsack able to hold 17 kg. There are several items that they would like to take on the trip, each with a weight and an estimated "benefit" (given by a number):

Item	Weight	Benefit
stove	7	10
lamp	6	9
axe	13	6
binoculars	4	3
rope	9	14

Part 1

Write an Integer Program to solve the problem of packing the two knapsacks without exceeding the knapsack capacities, while maximising benefit. (Hint: they only have one of each item, that may be packed in knapsack 1, or knapsack 2, or not packed at all.). Solve this problem with AMPL.

Part 2

Once you have the solution to the problem above, you may add some extra constraints to ensure that:

- if the husband carries the stove then he also carries the lamp

- the wife carries the axe if and only if the husband carries the rope

- it is impossible to pack both the lamp and the rope, whichever knapsacks are used

- if the husband carries both the stove and the lamp then the wife carries the binoculars

- if the stove and lamp are both packed then so are the binoculars, whichever knapsacks are used

There is no need to solve this extended problem.

Submit a Jupyter notebook containing only Part 1 of the lab before next week's **lecture**.