GrabBro Formulation

The statement of the use case is on Mip Wise's website: mipwise.com/use-cases/grabbro.

NOTE: We intentionally left this formulation incomplete to promote the practice.

Input Data Model

Set of indices

- I - Set of locations (i and j for gorcery shops and H for the hotel).
- K - Set of grocery items.

Parameters

- p_{ik} - Cost of item k in shop i.
- c_{ij} - Transit cost between location i and j.

Decision Variables

- x_{ij} - Equals 1 if driver goes from location i to location j, 0 otherwise.
- y_{ik} - Equals 1 if Item k is bought from Shop i, 0 otherwise.

Constraints

- C1) Driver departs from the hotel:

$$\sum_j x_{Hj} = 1.$$

- C2) Driver must return to the hotel:

$$\sum_i x_{iH} = 1.$$

- C3) Flow balance constraint for each location:

$$\sum_i x_{il} = \sum_j x_{lj}, \quad \forall l \in I.$$

- C4) Must pick all items:

$$\text{TODO}.$$

- C5) If pick Item k from Shop i, then must visit Shop j:

$$\text{TODO}.$$

Objective

The objective is to minimize the total purchasing and travel cost.

$$\text{purchasing\_cost} = \text{TODO}.$$

$\text{transit\_cost} = \sum_{ij} c_{ij} x_{ij}.$

$$\min \text{purchasing\_cost} + \text{transit\_cost}.$$