Mathematical Programming
Graded assignment 1 - Column generation

Please conform to the following instructions:

1. Hand in a report as pdf file.

    (a) Use the tile "`GA1_Report_<your studentnumber>.pdf`", (for example "`GA1_Report_123456.pdf`").

    (b) At the start of your report mention your name and student number.

    (c) The report must be clearly written, concise and complete.

    (d) Use between 1 and 3 pages.

2. Hand in the used code in a zip file.

    (a) Use the title "`GA1_Code_<your studentnumber>.zip`", (for example "`GA1_Code_123456.zip`").

3. Hand in your report and code through Canvas.

Assignment

In this assignment, we consider the bin packing problem as can be found in the lecture slides. An instance of the bin packing problem can be found in `BinPackingInstance.txt`. The aim is to apply a column generation algorithm to this instance, to solve the LP relaxation of the bin packing problem, using the formulation presented in the lecture slides. We slightly modify the formulation as follows. Replace the equality constraints with inequalities, such that each item should be packed in at least one bin.

For your convenience, feel free to use the file `BinPackingInstance.java`. *It contains a class to represent a bin packing instance, and it can be used to read* `BinPackingInstance.txt`.

a. Why is the modified formulation of the bin packing problem also correct?

b. Initialize the **restricted master problem** using the packings provided in `InitialPackings.txt`. Solve the initial restricted master problem and report the solution.

c. Describe the **pricing problem** and explain how you solve it.
  Make it easy on yourself! Solving the pricing problem may be done exactly or heuristically.

d. Perform 7 iterations of the **column generation** algorithm. At each iteration, report

   1. the solution value of the restricted master problem,

   2. the new packing that is added to the restricted master problem,

   3. the reduced cost of the new packing.