Branch-and-bound Example (L16)

1   Today...

- This example is part of Lesson 16, Branch-and-bound.

2   Branch-and-bound Example

Solve the following IP using branch-and-bound.

$$\begin{aligned}
\text{(P1)} \quad z_{IP}^{*} = \max \;\; & 8x + 7y \\
\text{s.t.} \quad & -18x + 38y \leq 133 \\
& 13x + 11y \leq 125 \\
& 10x - 8y \leq 55 \\
& x, y \in \mathbb{Z}^{\geq 0}
\end{aligned}$$

- Use Python to solve LP relaxations of subproblems

- Branching Rules

  - Always select the active node with the largest upperbound for branching.
  - Branch on x if it is fractional. Otherwise branch on y.

- Book-keeping

  - Keep track of the:
    - incumbent solution $\underline{x}$, global lower bound $\underline{z}$, global upper bound, and MIP gap.
  - Draw the branch-and-bound tree:
    - Record local upper bound (z) and optimal solution ($\mathbf{x}$) for each LP subproblem.
    - Label each edge with the constraint that is added to form the child subproblem.
    - Label the status of each node: active, branched, fathomed
  - Use the provided diagram to illustrate the (relaxed) feasible region of each subproblem.

incumbent solution ($\underline{x}$)   global lower bound ($\underline{z}$)   global upper bound   MIP gap

B & B Tree