Approximation Algorithms

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1. The Knapsack problem.

   (a) Modifying greedy so it is a $\frac{1}{2}$-approximation algorithm.

   (b) Strong **NP-hardness** and the existence of FPTAS.

2. The Bin-packing problem.

   (a) Problem definition.

   (b) Offline and online. Lower bounds on online.

   (c) Online algorithms - Next Fit. 2 approximation, First fit and analysis,

   (d) Best fit. $\frac{17}{10}$. Proof omitted.

   (e) Offline algorithms - First-fit decreasing. $\frac{4 \cdot OPT + 1}{3}$. Better analysis (omitted) $\frac{11 \cdot OPT}{9}$.