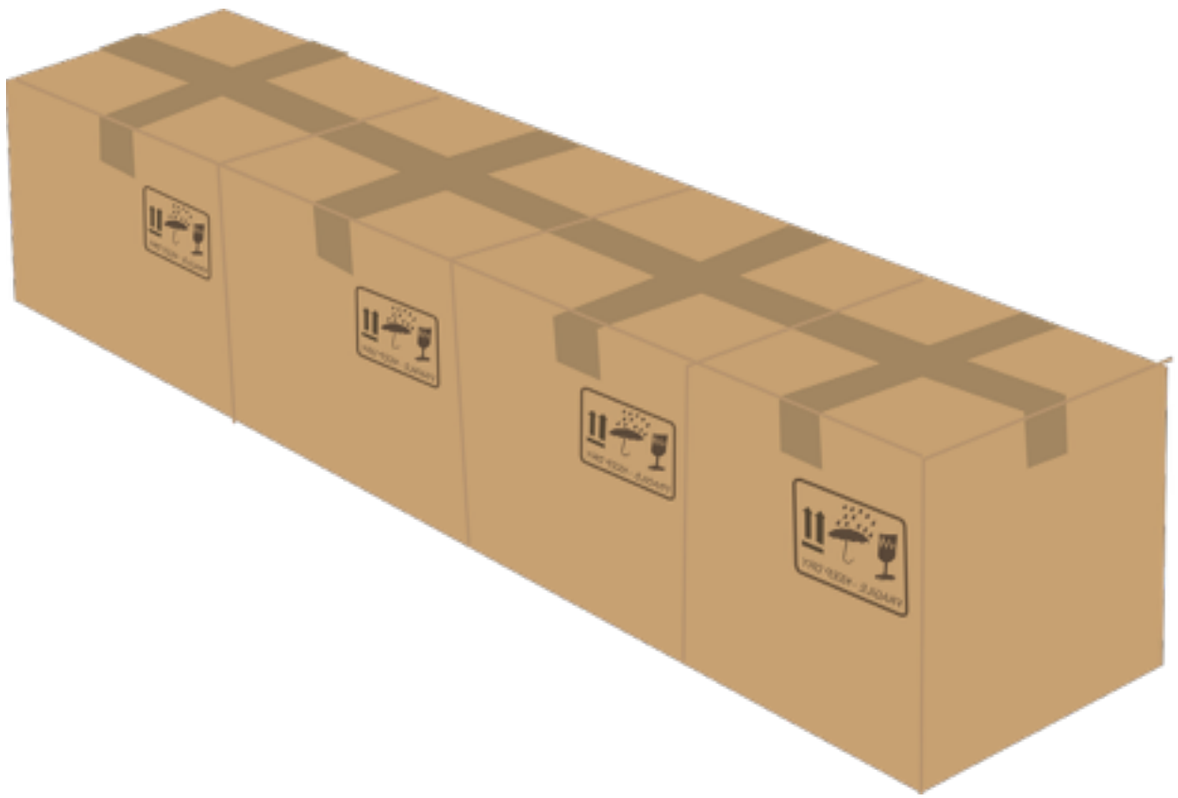
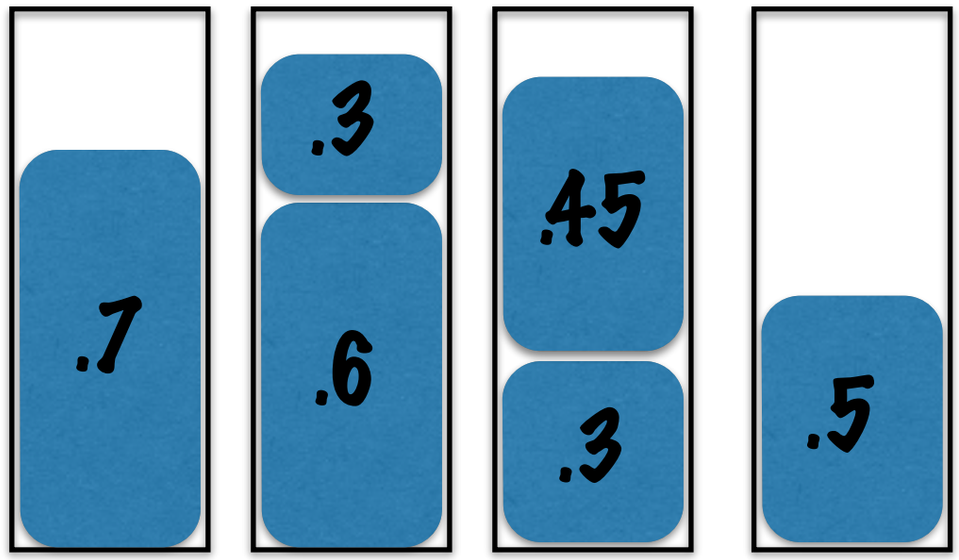
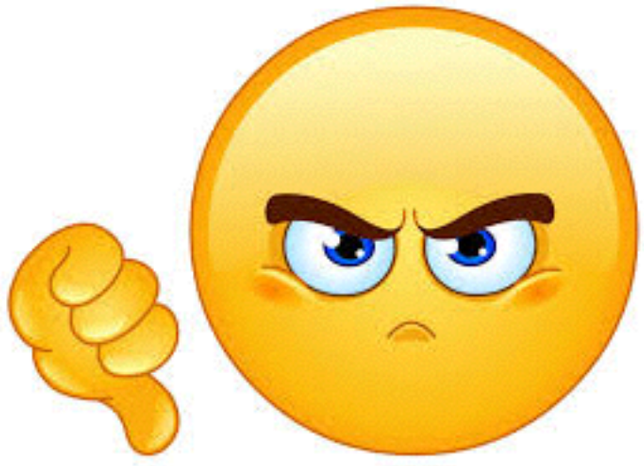
Bin packing, linear programming and rounding





Remember:

To analyze output vs. OPT, focus on LP value...



Try next meta-tool: special cases

What if items are smaller than 1/3*capacity?

.2,.3,.25,.33,.24,.29,.33,.2,...

What does **Next Fit** do?

.2+.3+.25=.75

.33+.24+.29=.86

.33+.2=.53

The next item will fit in bin 3:

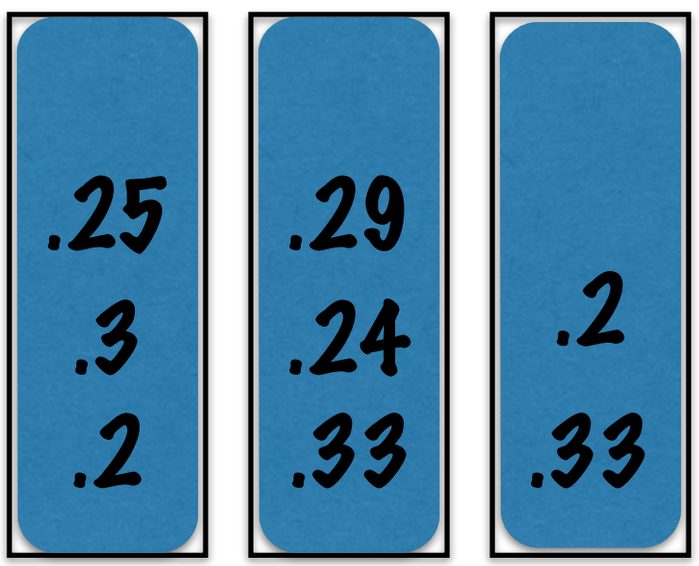
.53+(something less than 1/3) <1

Next Fit when items are smaller than 1/3*capacity

Bin filled to < 2/3 : next item fits

so:

only close bin when filled to > 2/3



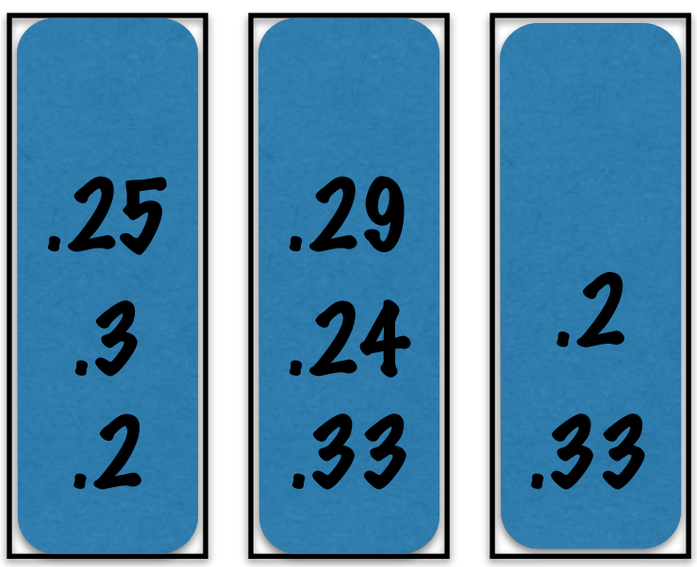
All bins except last are filled to > 2/3

Next Fit when items are smaller than 1/3*capacity

All bins except last are filled to > 2/3

Total size > 2/3 * (#bins -1)

But Total size < OPT



Combine:

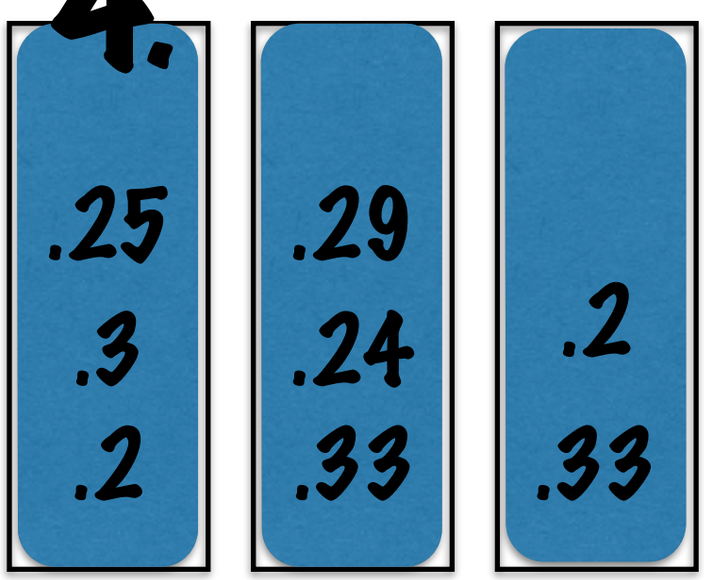
#bins < 3/2 * OPT + 1

Theorem:

when items are smaller than 1/3*capacity, Next Fit uses at most 1 + (3/2) OPT bins

Message

1. From example to structural observation
2. With observation, upper bound algorithm
3. With different argument, lower bound OPT
4. Combine



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