## 2D Bin packing testing

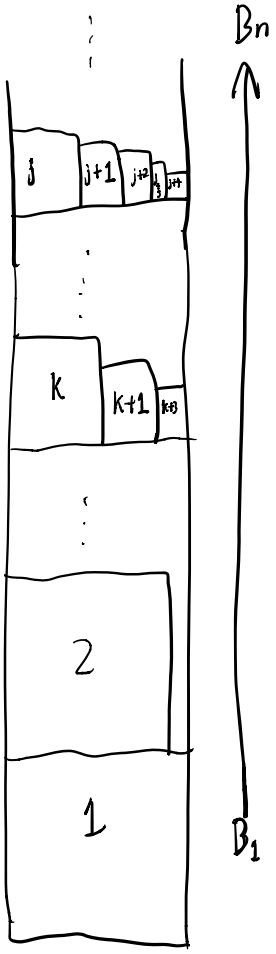
- We used NFDH (Next-fit-decreasing-height) as our packing algorithm
  - * Items $1, \ldots, n$ labeled in order
  - * normal $\Rightarrow$ width of the 2D bin

## Random case:

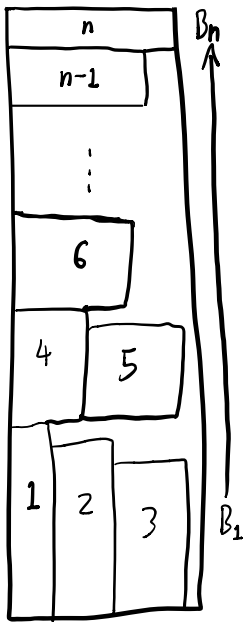
- All elements have random height and random width

## NFDH Cases: (For representation only; this is the approximation we make)

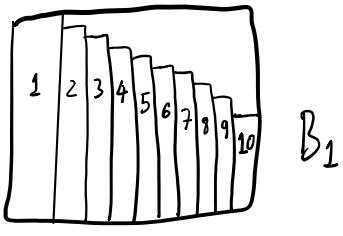
- Diagonal Case:
  - Largest to smallest
  - Height == Width for all items



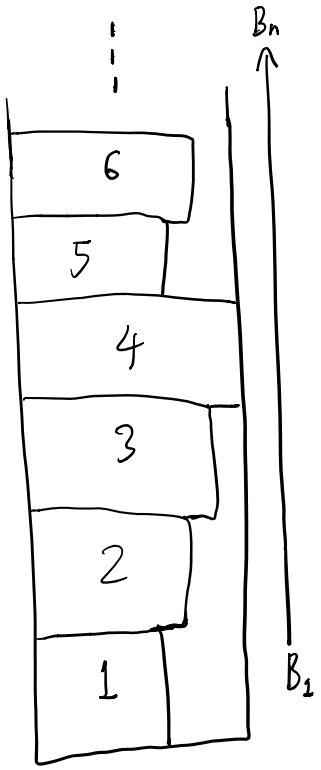

- Mismatched diagonal case
  - Really long but short to really tall but skinny
  - width of item = width of bin − height of item
  - No items of length or height 0




- Best case (normal = 10, size = 10)
  - All items can fit together in the same box

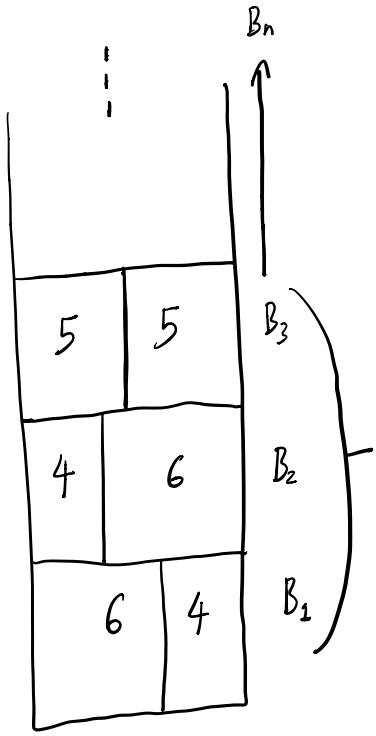


- Worst Case: (normal = 10, size = 10000)
  - Max # of items, no items can fit together in the same box



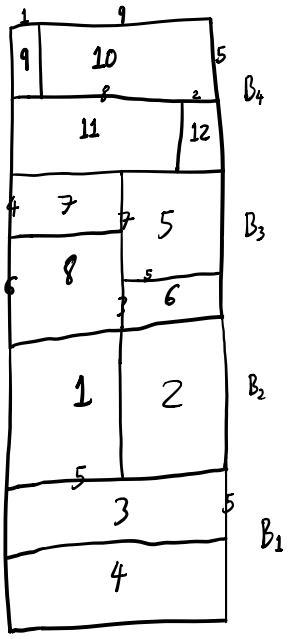

Optimal cases: (These are the ideal results; Our algorithms may not quite achieve this)

- All-Pairs case (normal=10)
  - Width of each item is $4 \leq S_i \leq 6$, s.t only 2 items will ever fit in one bin
  - Fixed height = 10
  - 1/3 of items are length 4, 1/3 are length 6, rest (1/3)+1 are length 5
  - Optimal solution should have no gaps



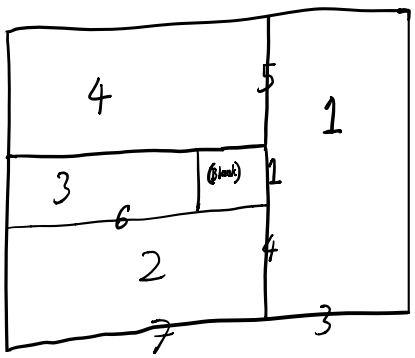

In an optimal solution, every bin should look like one of these

- Filled boxes, no gaps (Assume normal = 10)




- Every bin should look like one of these in an optimal case
- Width of every bin is 10

- Filled boxes with small gaps (normal = 10)




- Middle square "box" is blank whitespace
- Every bin should look like this in an optimal case
- Width of every bin is 10

- Trivial Case!
  - All items are the exact width and height of 1 bin
  - No whitespace! Items should fit perfectly in bins