The Bin Packing Problem

       The bin packing problem considers a set of bins all of the same cross-section and the same height.

       The problem is how to pack into the bins a number of boxes of the same cross-section as the bins but of varying heights, using as few bins as possible.

       The idea is to make the best possible use of the space available and avoid waste. We want to minimize the amount of waste.

Similar problems might be:
- Cutting lengths of wood from standard length planks
- Fitting vehicles into lanes on a car ferry

First fit Algorithm

Step 1: Take the boxes in the order listed and place the next box to be fitted in the **first** available bin.

Step 2: Repeat step 1 until all the boxes are in a bin.

e.g.
1) You have several bins that are 1.5 m tall and boxes of height:

$$0.8, 0.6, 0.7, 0.5, 0.9, 0.4, 0.3, 0.6, 0.5, 0.6 \ (m)$$

$$\text{Total height} = 5.9 \ m$$

$$\therefore \quad \text{minimum no. of bins} = 4$$

1.4	1.5	1.3	1.1	0.6
	0.3			
0.6	0.5	0.4	0.5	
0.8	0.7	0.9	0.6	0.6
1	2	3	4	5

This requires 5 bins. This is **no good** because the best solution only requires 4.

  (There is **no** algorithm for this problem that will always produce the best solution)

This is an **heuristic algorithm**.

i.e. it attempts to find a good fit.