General 2D Bin Packing Problem

A difficult but interesting problem

Who are we?

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Introduction

General 2D Bin Packing Problem

Ok, I got “2D”, but what is “Bin Packing”?

Items

A lot of “rectangle” items,
generally in different sizes.
We need to transport them all.

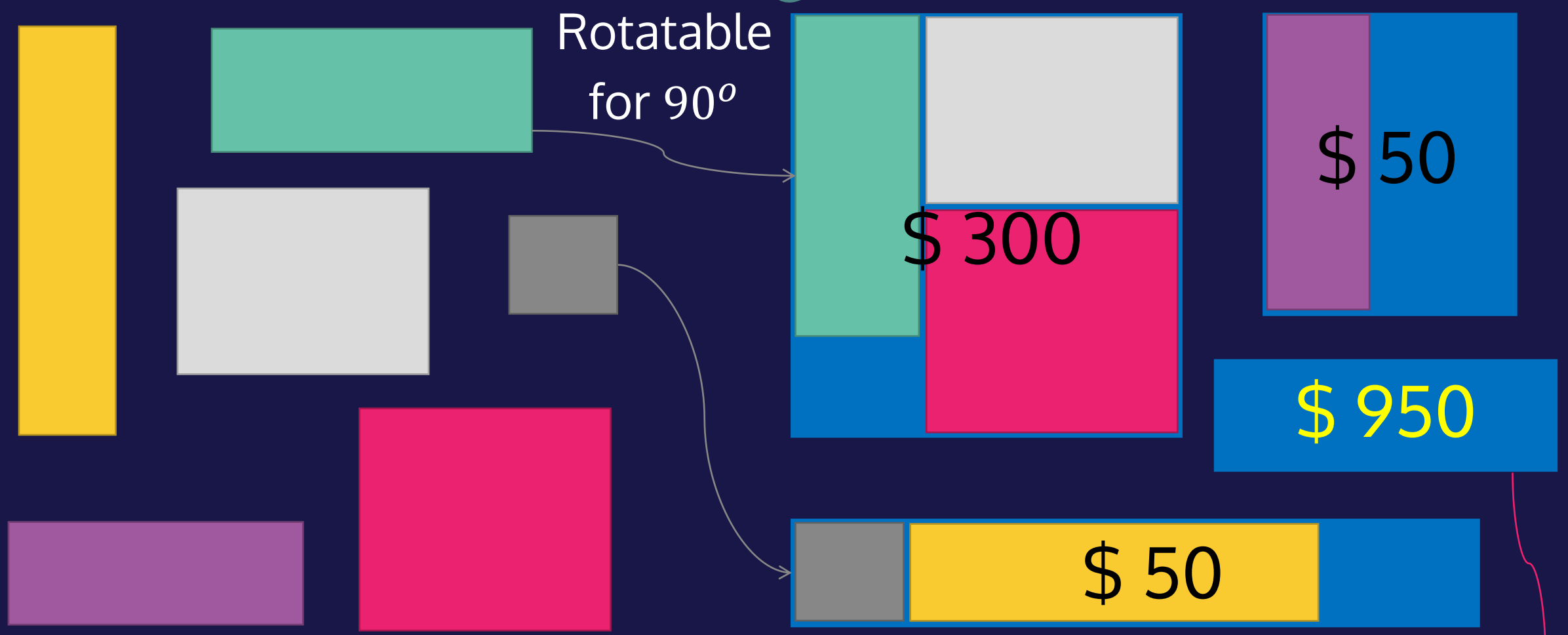
Don’t disappoint our customers.

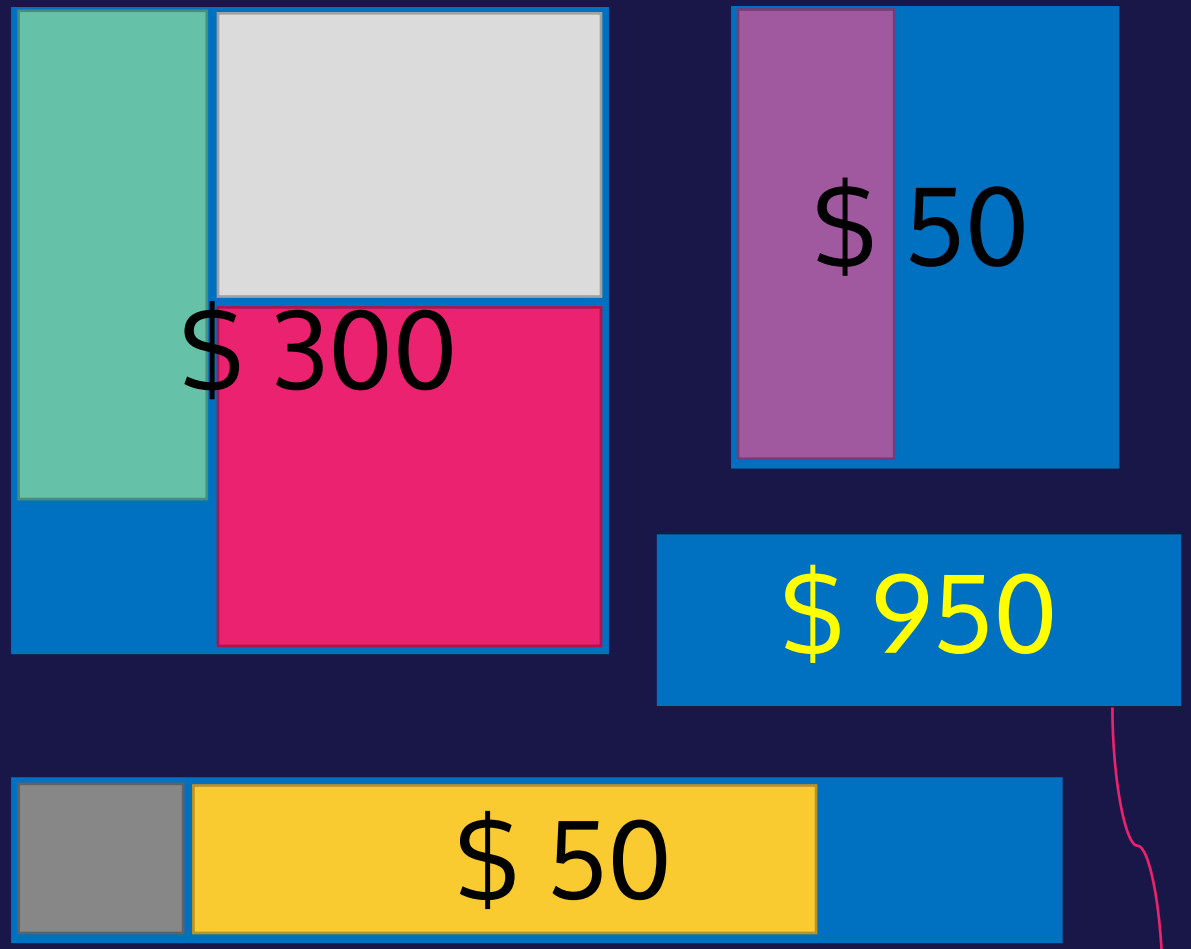
Cars

We have no car, so we rent some.

We can refund if we don't use a car.

In general, the cars have different sizes and costs.


Rotatable
for 90º
$ 300
$ 50
$ 950
$ 50
Cost = 300 + 50 + 50 = 400
Refund!



Cost and Objective

The total cost

= sum of rental fees of used cars

We want to minimize this cost.

Cost = 300 + 50 + 50 = 400

Remark

- Each item has a size
- Each car has a size capacity and a cost
- Each item must be in one car
- All items in a car must somehow fit it orthogonally, in which items are rotatable for 90^o
- Cost is the sum of fees of all used cars, minimize it

But why “General 2D Bin Packing”?

“Bin”

In articles and papers, instead of “car”, they wrote “bin”.

“2D”

The first version of this problem is one-dimensional, each item “weight” instead of “size”. It is already an NP-hard problem.

“General”

There are variations like:

- The cost is the number of cars used (rental fee = 1)
- Items are not rotatable

Which are much simpler.

Formal definition

Something something...