

# Recitation - 02

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## Problem

Given  $n$  identical bottles of identical pills (each bottle contains an infinite number of pills). Out of  $n$  bottles,  $n - 1$  have 1 gram of pills, but one bottle has pills of the weight of 1.1 gram. Given a weight measurement scale, how would you find the heavy bottle? You can use the scale only once.

## Solution

Number each bottle from 1 to  $n$ . From  $i^{th}$  bottle take  $i$  pills. Weigh all the pills taken from the bottles. Note the summation as  $S'$ . If all the pills have the same weight, the expected weight should be  $S_n = n(n + 1)/2$ . We can find the bottle with 1.1 gram pills using the number  $d = \frac{S' - S_n}{0.1}$ . Here  $d$  is the number of the bottle that contains 1.1-gram pills.