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COMP9101 (T2-2020)
Homework 3 – Q5

Sort the chemicals in increasing order of weight W_i. Then, we produce the chemicals following this order which minimises the compensate for evaporation loss as small as possible. The prove is as follows:

Assume the initial weight of a chemical C_i is T_i. After k many days of the production, the weight left is $T_i \cdot (1-p)^k$ and its loss by evaporation is $T_i \cdot [1-(1-p)^k]$. As p is a fixed number, we can derive that after k many days, the larger value T_i is, the more evaporation loss is. Therefore, to minimise this loss, we should always produce the chemical with less weight earlier.

If we want to produce the chemical based on decreasing weight order, it seems that we can minimise the evaporation loss in the last few days. However, the evaporation loss of the first few productions will be extremely higher. For instance, think about the second production in this approach. Since p percent is lost per day and C_2 is the chemical with the second-largest weight, then C_2 will have a high amount of loss in each following $N-2$ days. But sadly, what we minimised is only one piece of evaporation loss in the penultimate day compared with the initial solution. Obviously, this approach is totally wrong. And similarly, any try that wants to produce a higher weight chemical earlier would cause such kind of problem.

Therefore, there is no better way than our initial solution. Prove completed.