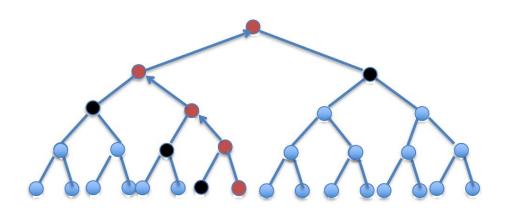
z5242692

Chenqu Zhao

COMP9101 (T2-2020)

Homework 1 – Q3



Place all the apples at the leaves in a complete binary tree, compare the weight of each pair and "promote" the heavier apple (marked in red) to the next level. Proceed in such a way until reach the root of a tree, which contains the heaviest apple. During each promotion, the number of nodes is eliminated by a half and each node remaining means a weighing. There are 10 levels in total excluding the bottom level leads to $\left(\frac{1-2^{10}}{1-2}\right) \cdot 1 = 1023$ weighings so far.

The second heaviest apple must be among the black nodes which were compared with the heaviest apple along the way. All apples underneath black nodes cannot be heavier than the apples in black nodes. There is a black node at every level except the top level, which gives us overall 10 black nodes. Do 10 - 1 = 9 weighings to find the heaviest apple among them by brute force.

In total this is 1023 + 9 = 1032 weighings.