

COMP3121 Homework Q3

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1 Answer

Here we can make a tree type tournament structure to determine the highest weighted apple. To get the highest weight apple on top root node, we need to make $n - 1$ comparisons. The second highest weighted apple will have only lost to the highest weighted apple in any comparison through out the whole tree. We go down the path of the highest apple at root node comparing the apples it defeated to come on top. There are $\log(n)$ number of apples as there are $\log(n) + 1$ levels in the tree. To find the highest weighted apple in these $\log(n)$ apples, it will take us $\log(n) - 1$ comparisons, Hence the total comparisons needed to find the highest and second highest apple is:

$$n - 1 + \log(n) - 1$$

Using $n = 1024$ in the equation we get:

$$\begin{aligned} 1024 - 1 + \log(1024) - 1 \\ = 1023 + 10 - 1 \\ = 1032 \end{aligned}$$

Hence, it takes 1032 comparisons at most to find the 1st and 2nd highest weighted apples.