Q3

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Answer:

As the figure shown below the question 3, we can use $2^n + n - 2$ comparisons. We place all the apples at the leaves of a complete binary tree and then compare apples pairwise and "promote" the large apple to the next level. We proceed in such a way until the root of the tree reached which will contain the largest apple. There are 1024 apples, so the depth of complete binary tree will be 10. Clearly, after comparisons there are $2^n - 1$ which is 1023 internal nodes thus also the same number of comparisons so far. For the second largest apple, we have to do the comparisons among the black nodes shown in the figure. There are 10 black nodes in total and it takes n – 1 which is 9 comparisons by brute force to find the second largest apple. Hence, it will take 1023 + 9 = 1032 comparisons in total.