Question 3

Making all apples as leaves in a complete binary tree, promoting the bigger apple to the next level.
See the figure below, red leaves represent bigger apple.
There are 1024(2^10) apples so the tree has 1023(2^10 – 1) internal nodes and of depth 10.
Each internal node is a step of weighting so there are 1023 weighting to find the second heaviest apple.
Because the second heaviest is compared by heaviest apple which is in red nodes so the second heaviest apple must in black nodes and under this black node that apples must smaller or equal to the black nodes one. Using brute force to find the heaviest apple, as its depth is 10 so the comparison is 9(10 – 1).
In total, there are making at most 1032(1023 + 9).