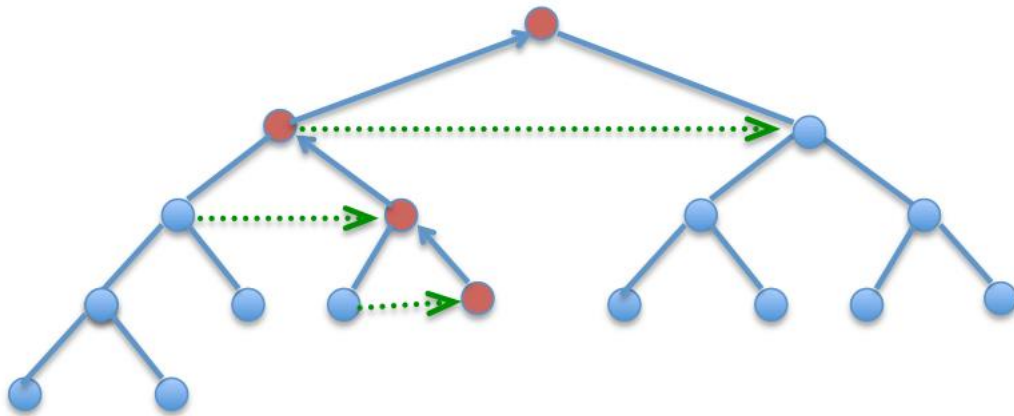


HOMEWORK 1 – Q3

MINGLANG XIE

z5228006

3. You are given 1024 apples, all of similar but different sizes and a small pan balance which can accommodate only one apple on each side. Your task is to find the heaviest and the second heaviest apple while making at most 1032 weighings. (20 points)



Solution: First, we divided the 1024 apples into 512 pairs. Weigh each pair of apples to find out the heaviest, then there would be 512 apples that are the heaviest and 512 apples are possible to be the second heaviest. Then divided 512 apples, which are the heaviest in previous weigh, into 256 pairs. This time we have 128 pairs of apples are the heaviest, and 128 pairs of apples are possible to be the second heaviest. Continue this process with 128,

64,42,16,8,4,2,1 pairs of apples, we finally make 1023 weighings, and find out the heaviest apple and 'the second heaviest' apple.

Last but not least, we need to weigh 'the second heaviest' apple with 9 apples that have been weighed with the heaviest apple, because these apples are only made weighed with the heaviest apples, they are possible to be the second heaviest apple.

Therefore, we only make 1032 weighings.