Assignment 2

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1. The time complexity will always be $\Theta(n \lg n)$, since it needs time to generate the binary tree and going over the entire tree costs the time complexity of $\Theta(n)$.

2. (a) We can see that the smallest branch is always located on the α side, so the approximate depth of the smallest branch is close to $-\log_a n$ which equals to $-\frac{\lg_n}{\lg_a}$.In the same way, the largest branch is always located on the $1-\alpha$ side, so the approximate depth of the largest branch is close to $-\log_{1-a} n$ which equals to $-\frac{\lg_n}{\lg_{1-a}}$.

   (b) If the partition is going to be more balanced, then the selected value cannot be a member of the largest α group or the smallest α group, since $\alpha < \frac{1}{2}$. Consequently, if we wish to have more balanced partition, then we must select the value between the largest α group and the smallest α group. Then, the probability is close to $1-2\alpha$