Selection

Select max? $n-1$ comparisons

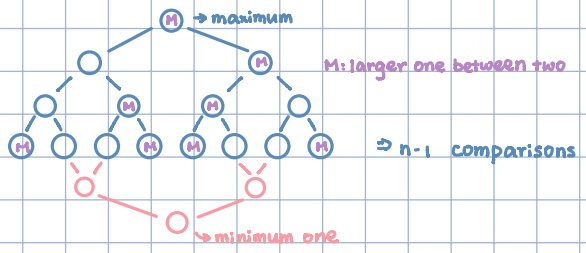
Assume you found the max, how many comaprisons to find the min?

an additional $\frac{n}{2}-1$ comparisons

If you got the max... how many additional comparisons for the second max? $O(\log n)$

Selecting the k^{th} max $n+k\log n$

Tournament tree



Example: Find 7^{th} minimum number

pivot→ 8 1 5 9 2 10 4 17 20

1 5 2 4 8 9 10 17 20 → has to be here

pivot→ 9 10 17 20 → find second largest

pivot→ 10 17 20

10 answer

```
Randomized Select(A,p,r,i)
    if p=r then
        return A(p)
    q = Randomized Partition(A,p,r)
    k = q-p+1
    if i ≤ k then
        Randomized Select(A,p,q,i)
    else
        Randomized Select(A,p,q,i-k)
```

Run time: $T(n) \le \frac{1}{n}\left[T(\max(1,n-1)) + \sum_{k=1}^{n-1} T(\max(k,n-k))\right] + \Theta(n)$

$= O(n)$ run time expected