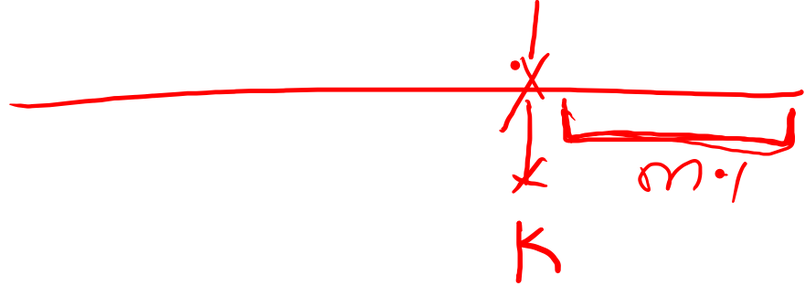
n^{12}



$n = 106 = 10^9$

m → largest.
$= 1000$.

K: Find Kand (m)

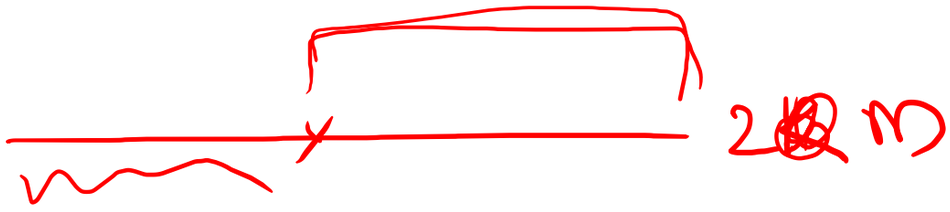
$K = n - m$

$\theta(n)$ space
$\theta(\infty)$ Time.

$\theta(1)$ ~~[illegible]~~ & Space

$\theta(k) \times \theta(n-k) = \theta(nk)$

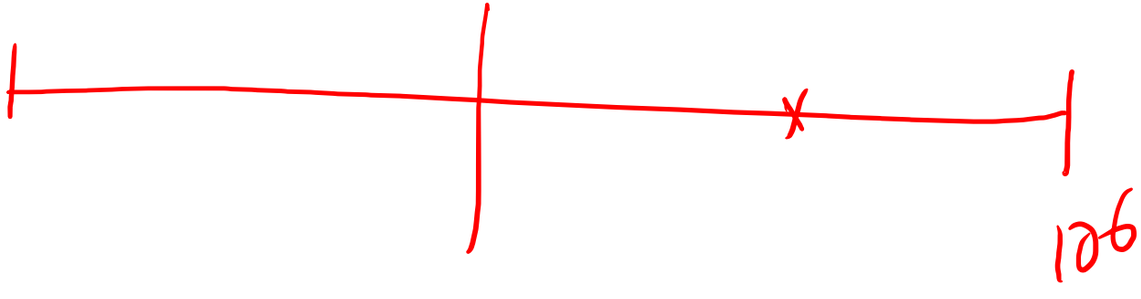
$m = 10^3$



$\theta(m)$

Space

$\theta(m)\ \frac{n}{m} = \theta(n)$ time.



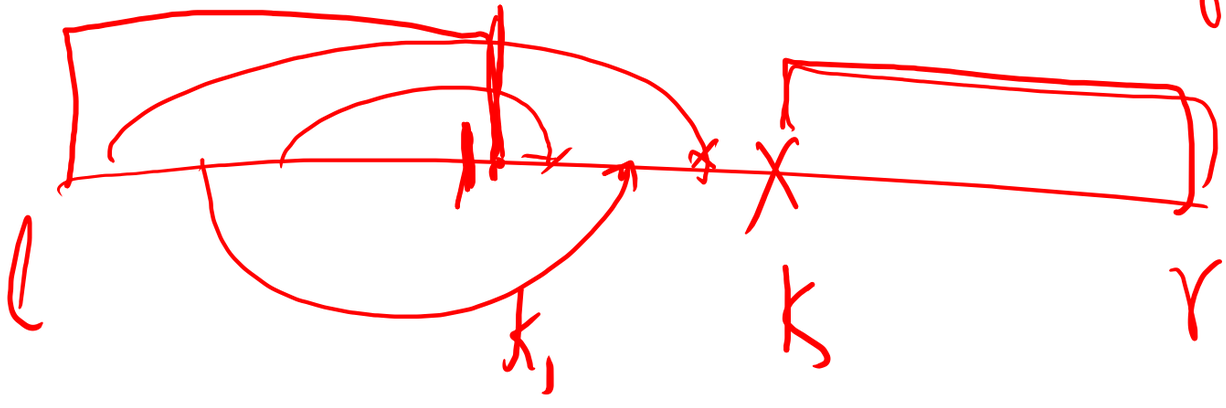
$\theta(n)$ time $\theta(n)$ space.

$\theta(n \log n)$ time $\theta(n)$ space.

$\theta(n)$ time $\theta(10^6)$ space!

$l+r-(k+1)+1$ 1 2 3 2 3 4

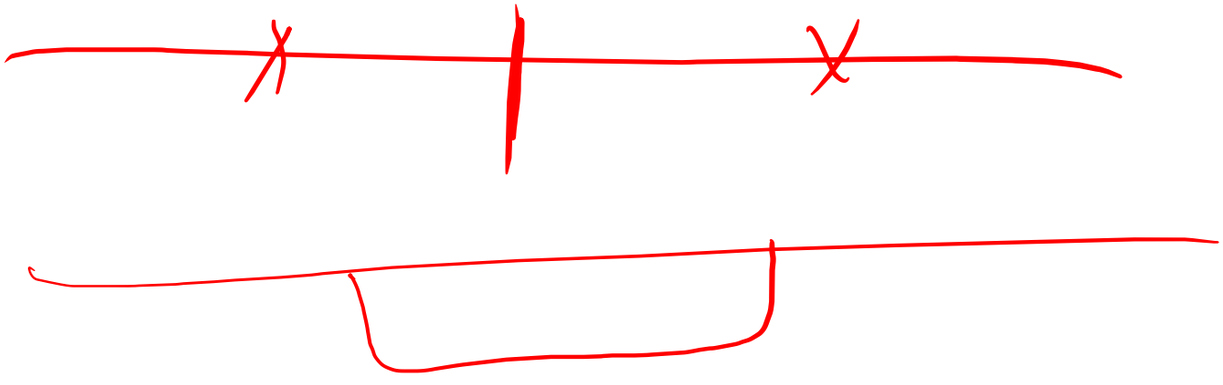
rank $< r-k+1$ 6 4 2 3 2 1



rank $> r-k+1$

$l+r-k_1+1$

$a_0 - - - a_{n-1}$



$n/2+1$

$\Theta(n)$

$\Theta(n \log n)$

$n/5+1$ $n/3+1$

$\theta(n)$

```
c=0
i -> 0 to n
    if(c==0) {a=a_i; c++;}
    else if (a==a_i) c++;
    else c--;
```

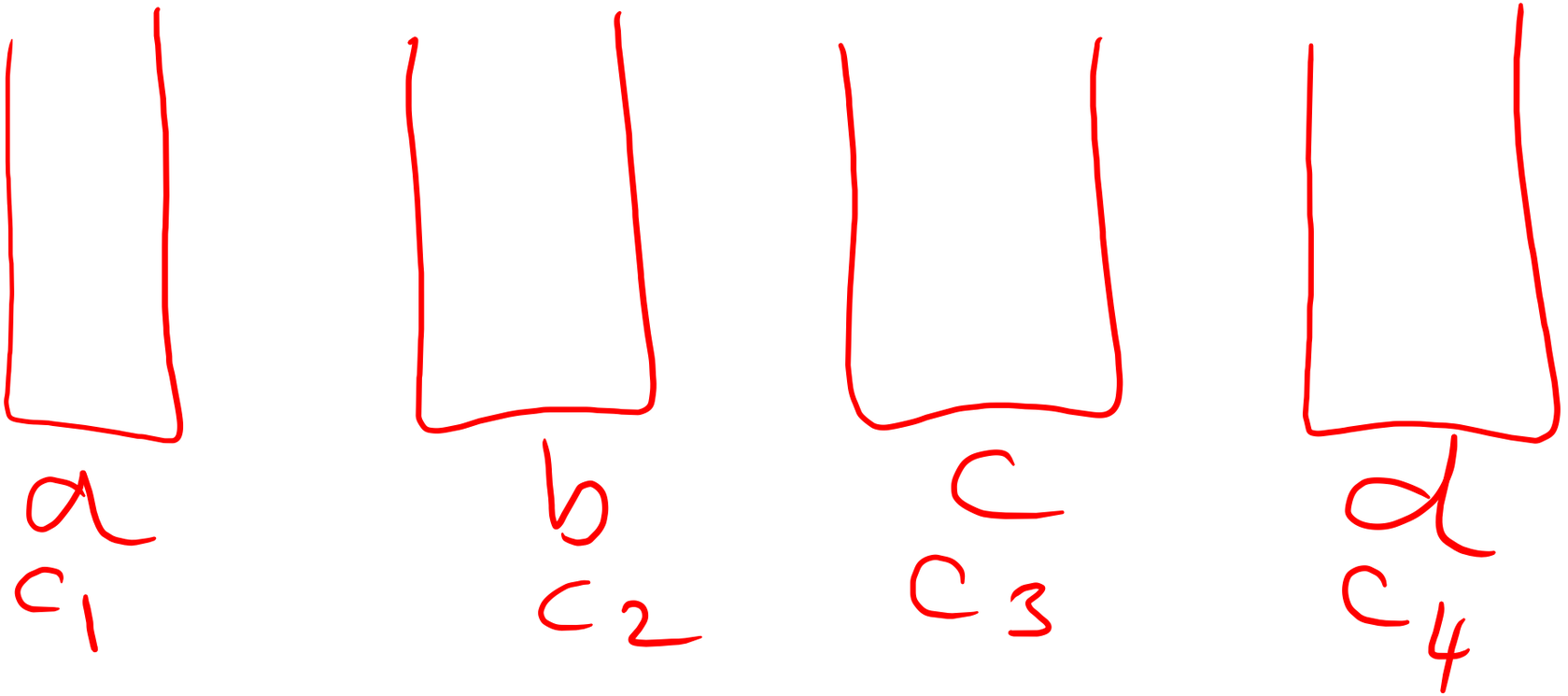
a

```
c=0
i -> 0 to n
if(a_i==a) c++;
if(c>n/2) Print a is majority
```

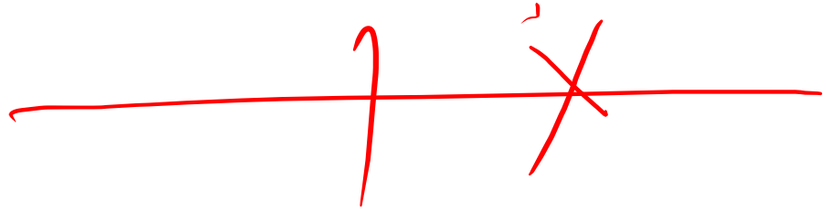
$\frac{x}{}$

$\frac{n}{5}+1$.

$\Rightarrow 5 x \frac{n}{5}+1$

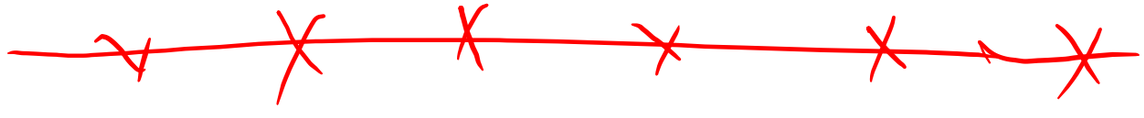


$q_0 \quad - \quad - \quad \cdots q_{n-1}$



$< n/2$

$\Omega(n)$.



$\Theta(n)$

$k < n/2$

$\Omega(n)$

$1/2 \times 1/2 = 1/4 < 1/2$

$3/4$

$1 - \frac{1}{2^k}$ $k = \log n$

$\theta(\log n)$ $n = 10^6$

$1 - 1/n$ $1/10^6$

Randomized.

$\Theta(n)$
$\Theta(n \log n)$

Las Vegas

Always Correct,
but probably fast.

- RQS
- RFindRank.
- Hashing.

Monte Carlo.

Always fast, but
~~Pro~~ Correct with high probability.

- $\Phi < n/2$ $O(k^2)$
- primality. $\Theta(k^6)$

$k = \frac{c}{2}(\log n)^2$

$\frac{1}{2^k} = \frac{1}{n^{2c}}$

$\frac{1}{nc} < \frac{1}{104}$