

## 2-2 Treasure Hunting

(Monday, April 2, 2018 ~ Saturday, April 7, 2018)

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Problem of the Week (Monday, April 2, 2018 ~ Saturday, April 7, 2018)

- (a) Given an array  $A[0 \cdots n - 1]$ , to determine whether there is a value that *occurs more than  $\lfloor n/k \rfloor$  times* in  $\Theta(n \lg k)$  time and  $\Theta(k)$  extra space.
- (b) Prove that the *lower bound* of this problem is  $\Theta(n \lg k)$ .

# TIP#1

(Monday, April 2, 2018)

Take  $k = 2$ .

$\Theta(n)$  time &  $\Theta(1)$  space

# TIP#2

(Tuesday, April 3, 2018)

## Definition ( $k$ -simplified Multiset)

Consider a multiset  $\mathcal{M}$ . A  *$k$ -simplified multiset* for  $\mathcal{M}$  is a multiset derived from  $\mathcal{M}$  by repeating *deleting  $k$  distinct elements* from it until no longer possible.

## Theorem

*The only values that **may** occur more than  $\lfloor n/k \rfloor$  times in  $\mathcal{M}$  of  $n$  elements are the values in a  $k$ -simplified multiset for  $\mathcal{M}$ .*

Prove this theorem. Take  $k = 2$  again. Design an  $\Theta(n)$  algorithm for  $k = 2$ . Design an **algorithm skeleton** for general  $k$  (ignoring  $\Theta(n \lg k)$ ).

Thank  
You!



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