

REVIEW FOR EXAM 1overall: Review hw 1,2,3

Look at sample exams

Look at lecture notes

Review 250 material which we've encountered

Coin Changing : (A) Greedy approach: take as many of largest coin as possible  
 repeat w/ next largest,  
 etc.

Not optimal in terms of # coins.

(B) Alg. for min. # coins: ALG. WILL BE GIVEN!

Understand the alg

Intuitively  $\rightarrow$  how does it work?Actually  $\rightarrow$  how does the alg. work?

Trace examples!

Asymptotics: O,  $\Omega$ ,  $\Theta$ (A) Defns of O,  $\Omega$ ,  $\Theta$ 

(B) Visual interpretation

(C) Proving using the defn

(D) Limit theorems &amp; L'Hôpital's Rule!

(E) Intuition & smaller vs bigger: 1,  $\lg n$ ,  $n$ , ...(F) Be careful! ex  $f(x) \neq \Omega(g(x)) \rightarrow f(x) = O(g(x))$ ex  $f(x) = O(g(x)) \rightarrow g(x) = \Omega(f(x))$ 

etc...

Rigorous Time

... which times n=1 cannot be ... ?

$$\sum_{i=1}^n i = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$

## Rigorous Time

(A) Which lines can/cannot be ignored?

(B) Given code. Calculate time required!  $\leftrightarrow$  Summations!

$$\sum_{i=1}^n i \cdot 2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=0}^n r^i = \frac{r^{n+1} - 1}{r - 1}$$

Sum ex  $\sum_{i=3}^n i = \left[ \sum_{i=1}^n i \right] - 1 - 2 = \dots$

$$\sum_{i=j}^n i = \left[ \sum_{i=1}^n i \right] - \left[ \sum_{i=1}^{j-1} i \right]$$

for  $i=1$  to  $n$   
do something  $2^i$  times  
end

}  $\sum_{i=1}^n 2^i$  times!

and variations!  
and nested!

## MCS (A) Brute Force

Understand pseudocode

Intuition

Time Complexity  $\Theta(n^2)$  and why?

trace examples!

## (B) Divide + Conquer

Understand pseudocode

Intuition

Time Complexity  $\Theta(n \lg n)$  and why?

trace examples!

## (C) Kadane's Alg

Understand pseudocode

Intuition

Time  $\Theta(n)$  and why?

Trace examples

## Bubble Sort

(A) Intuition

(B) Algorithm

(C) Time  $\Theta(n^2)$   $\leftrightarrow$  all cases! And when?

(B) Algorithm

(C) Time  $\Theta(n^2)$   $\leftrightarrow$  all cases! And why?

(D) Examples

(E) Stability, Aux Space, In-Place? And why or why not?

### Selection Sort

(A) Intuition

(B) Algorithm

(C) Time  $\Theta(n^2)$   $\leftrightarrow$  all cases! And why?

(D) Examples

(E) Stability, Aux Space, In-place? And why or why not?