

CNPS 10

10-10-08

ATTRIBUTES OF ALGORITHMS

- CONCISENESS ✓
- CLARITY
- ELEGANCE
- EFFICIENCY

EX. 1.) $\sum_{i=1}^n$

2.) $SUM \leftarrow 0$

3.) $i \leftarrow 1$

4.) while $i \leq n$

5.) $SUM \leftarrow SUM + i$

6.) $i \leftarrow i + 1$

7.) print SUM

8.) stop

EX 1.) $\sum_{i=1}^n$

2.) print $\frac{n(n+1)}{2}$

3.) stop

FAET:

$$1 + 2 + 3 + \dots + (n-1) + n = \frac{n(n+1)}{2}$$

Proof:

$$\text{LHS } S = 1 + 2 + 3 + \dots + (n-2) + (n-1) + n$$

$$S = n + (n-1) + (n-2) + \dots + 3 + 2 + 1$$

$$S + S = (n+1) + (n+1) + (n+1) + \dots + (n+1) + (n+1) + (n+1)$$

$$\therefore 2S = n(n+1)$$

$$\therefore S = \frac{n(n+1)}{2} \quad \text{///}$$

Exercise:

a.) Show $1 + 3 + 5 + \dots + (2n-1) = ? ? ?$

b.) Show $2 + 4 + 6 + \dots + 2n = ? ? ?$

Efficiency

- Space

- Time:

Problems

1.) Are we Timing Algorithm on Computer ?

2.) We expect Different Results for

Different inputs

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DEFAL WIND (1) :

COUNT THE # OF INSTRUCTIONS EXECUTED,
NOT ALL INSTRUCTIONS ARE EQUAL THOUGH

EX. if $a < b$

$a \leftarrow b$

else

print c

INSTEAD WIZ WILL PICK A BASIC OPERATION
(OR A PARAMETER OPERATION) AND COUNT #

OF TIMES IT IS EXECUTED.

DFAL WITH (2)

WE CONSIDER 3 MEASURES OF RUN TIME

Worst Case: max # of Basic OPS. Over All inputs of size n .

Best Case: min#

Average Case: Avg. #

RECALL: - SEQ. SEARCH

INPUT: $n, a_1, \dots, a_n, target$

OUTPUT: pos i where target is found, or 0.

1.) get $n, a_1, \dots, a_n, \text{target}$

2.) $i \leftarrow 1$

3.) $\text{found} \leftarrow \text{false}$

4.) while ($i \leq n$ and not found)

if $a_i = \text{target}$

$\text{found} \leftarrow \text{true}$

else $j \leftarrow i+1$

9.) if not found

10.) $i \leftarrow 0$

11.) print i

12.) stop

← BASIC OP.
COMPARISON

will count # of
comparisons performed
in Best worst &
AVG. CASES.