

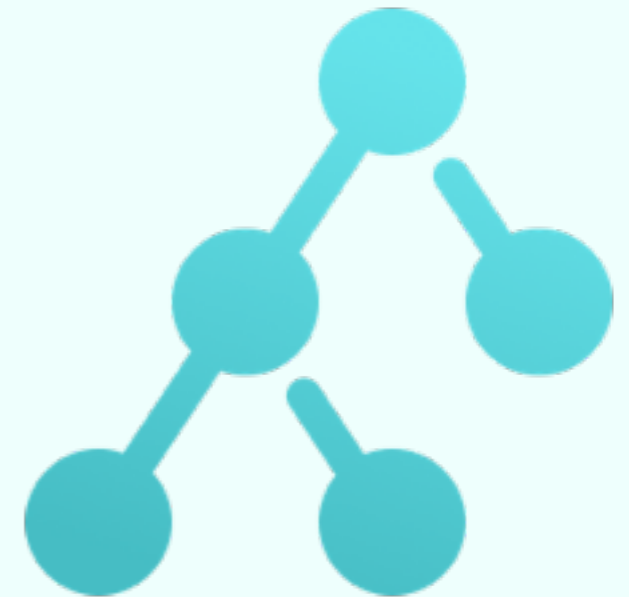


# Data Structures

## Exercise Session



Marco Vassena



# Exercise 1.11 a

Prove:

$$\sum_{i=1}^{N-2} F_i = F_N - 2$$

$$N \geq 2$$



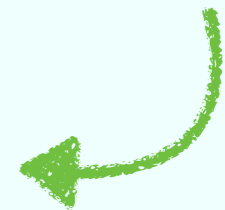
Where:

$$F_0 = 1$$

$$F_1 = 1$$

$$F_{k+1} = F_k + F_{k-1}$$

Fibonacci  
number



# Exercise 2.1

Order the following functions by growth rate:

$N$	$2^N$	$N \log N$
$\text{SQRT}(N)$	$2^{N/2}$	$N \log \log N$
$N^{1.5}$	$37$	$N \log^2 N$
$N^2$	$N^2 \log N$	$N \log(N^2)$
$2/N$	$N^3$	$\log(N)$

Which functions grow at the same rate?

## 2.2) True or False

$$T_1(N) = O(f(N))$$

$$T_2(N) = O(f(N))$$

A.  $T_1(N) + T_2(N) = O(f(N))$



B.  $T_1(N) - T_2(N) = o(f(N))$



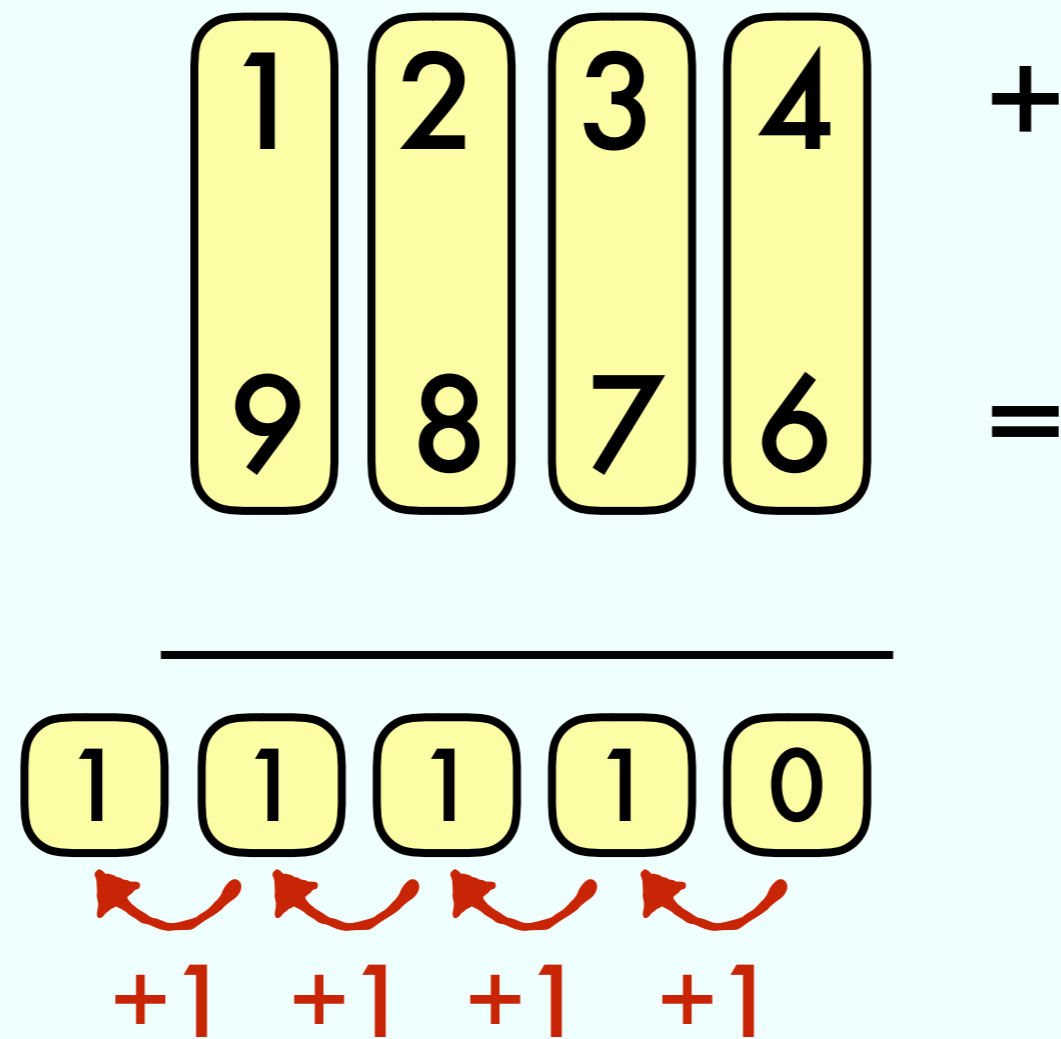
C.  $T_1(N) / T_2(N) = O(1)$



D.  $T_1(N) = O(T_2(N))$



# Exercise 2.10



# Exercise 2.10

Find the running time for adding two  $N$ -digit integers:

$$\begin{array}{rcccc} x_N & \dots & x_1 & + \\ y_N & \dots & y_1 & = \\ \hline z_{N+1} & z_N & \dots & z_1 \end{array}$$

# Exercise 2.10

Find the running time for multiplying two  $N$ -digit integers:

$$\begin{array}{r} x_N \quad \dots \quad x_1 \quad \times \\ y_N \quad \dots \quad y_1 \quad = \\ \hline z_{2N} \quad \dots \quad z_N \quad \dots \quad z_1 \end{array}$$

# Exercise 2.15

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Given an integer array  $A$



Such that

$$A_0 < A_1 < \dots < A_{N-2} < A_{N-1}$$

Is there index  $i$ , such that

$$A_i = i$$