

# Data Structures

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*How you organize your information*







| <i><b>Storage Medum</b></i> | <i><b>Access Time</b></i> |
|-----------------------------|---------------------------|
| CPU Register                | ~1 ns                     |
| L1 Cache                    | 3-10 ns                   |
| L2 Cache                    | 25-50 ns                  |
| RAM                         | 30-90 ns                  |
| Hard Drive                  | 5-20 ms                   |
| CDs & DVDs                  | 100-5000 ms               |
| Tape Drive                  | 10-180s                   |
| Network                     | 60ms - Infinity           |

636

M1045  
to  
M1140



M1045 Mahler, Gustav, 1860-1911.

M21

B6

Blumine; symphonic movement. Bryn Mawr, Pa., T.  
Presser Co., 1968, \*1967.

score (20 p.) 28 cm. 2.00

Rejected 2d movement of the composer's First symphony.  
Duration: about 8 min.

✓ 1. Orchestral music.

✓ 1. Title.

M1045.M21B6 1968-

79-203119

Library of Congress

69 (12)

M

# Primitive Data Types

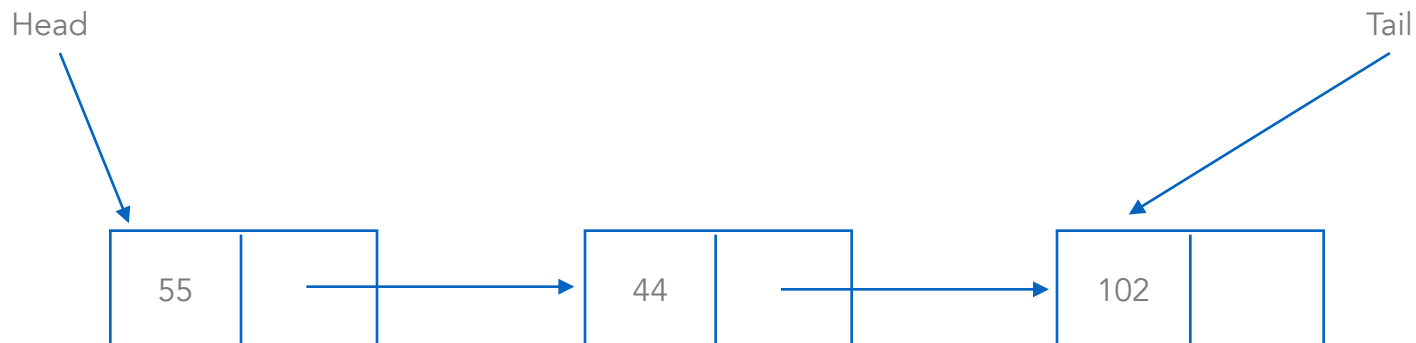
- Boolean
- Float
- Integer

# Arrays

- Traditional Arrays
  - Fixed amount of space in memory
  - Array size must be known in advance
- Dynamic Arrays
  - Used in high level languages like Javascript, Ruby, etc
  - Grow as needed



# Linked Lists



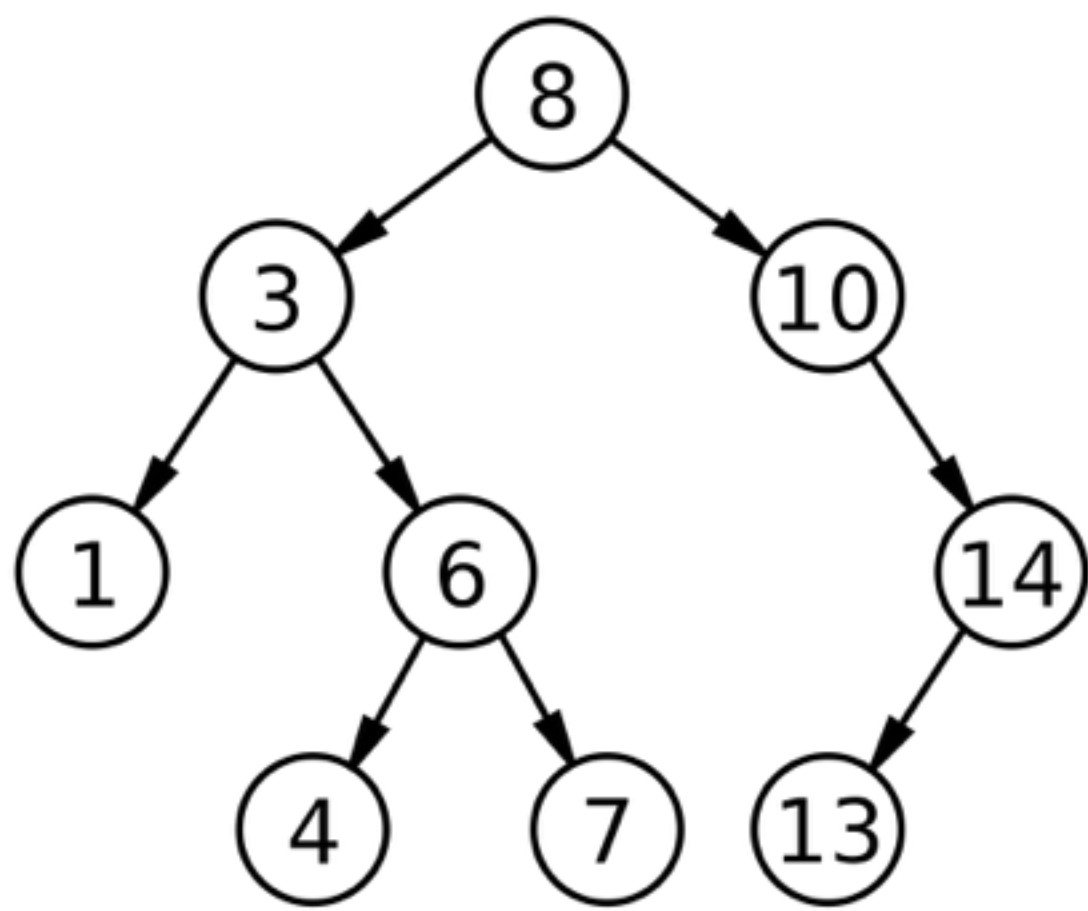


$O(n)$

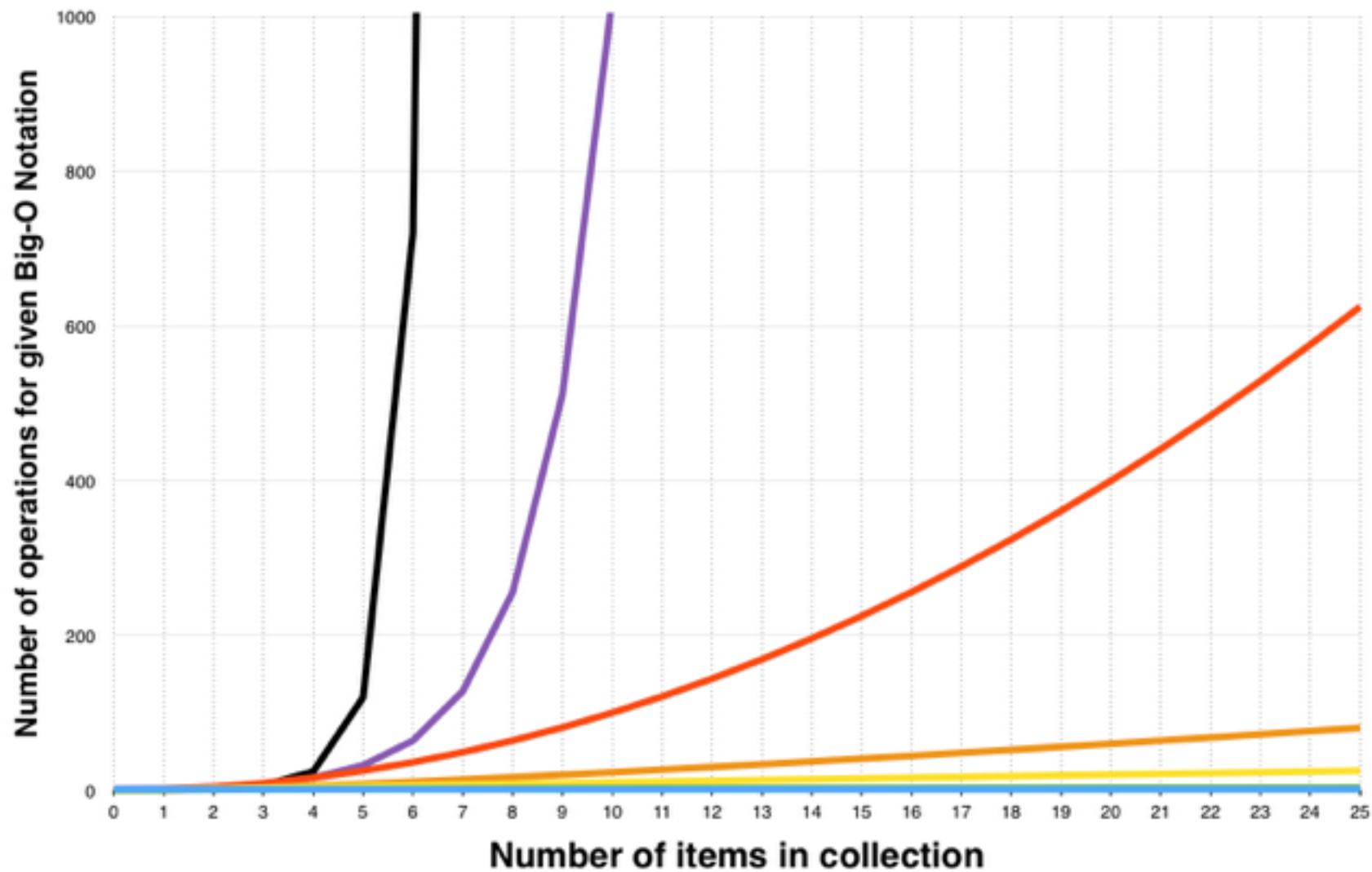
|                               | <i><b>Access</b></i> | <i><b>Search</b></i> | <i><b>Insert</b></i> | <i><b>Delete</b></i> |
|-------------------------------|----------------------|----------------------|----------------------|----------------------|
| <i><b>Array</b></i>           |                      |                      |                      |                      |
| <i><b>Linked<br/>List</b></i> |                      |                      |                      |                      |

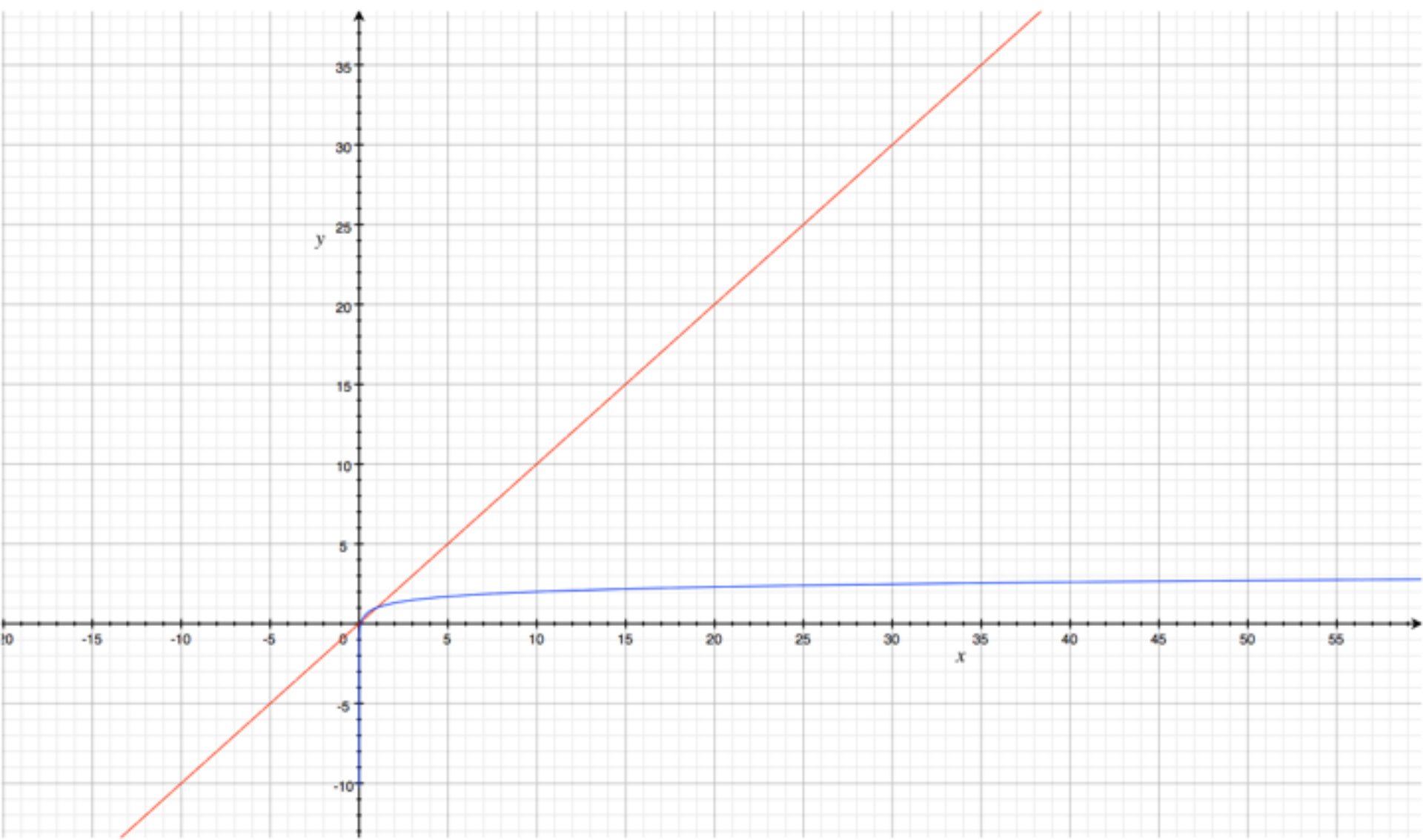
|                           | <i><b>Access</b></i> | <i><b>Search</b></i> | <i><b>Insert</b></i> | <i><b>Delete</b></i> |
|---------------------------|----------------------|----------------------|----------------------|----------------------|
| <i><b>Array</b></i>       | 1                    | n                    | n                    | n                    |
| <i><b>Linked List</b></i> | n                    | n                    | 1                    | 1                    |





—  $O(1)$  —  $O(\log n)$  —  $O(n)$  —  $O(n \log n)$  —  $O(n^2)$  —  $O(2^n)$  —  $O(n!)$







Zeke Alexander Nierenberg

October 11, 2014 - @ 

### Early 20th century hash table

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4 mutual friends


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**Zeke Alexandre Nierenberg**  
October 11, 2014 · 0


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Adam Keller  
Emily Flynn  
Jo Nguyen  
Tessa Livingston Seagull  
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Rhona Silverbush  
Joe Aranda  
Yasmine Abulhab

and 9 others like this.

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Keenan Smarty McFly Villani-Holland

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Jake Rogers

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Remy Schwartz

Remy Schwartz likes Mike Stone's post.

Mike Stone

Mike Stone likes Dan Chapley's post.

Mary Hannah Duhon

Mary Hannah Duhon likes Arnaud Jean's post.

Melanie Leish

Melanie Leish likes GANYC's post.

These friends aren't sure you know them.

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