CS 103000
Prof. Madeline Blount

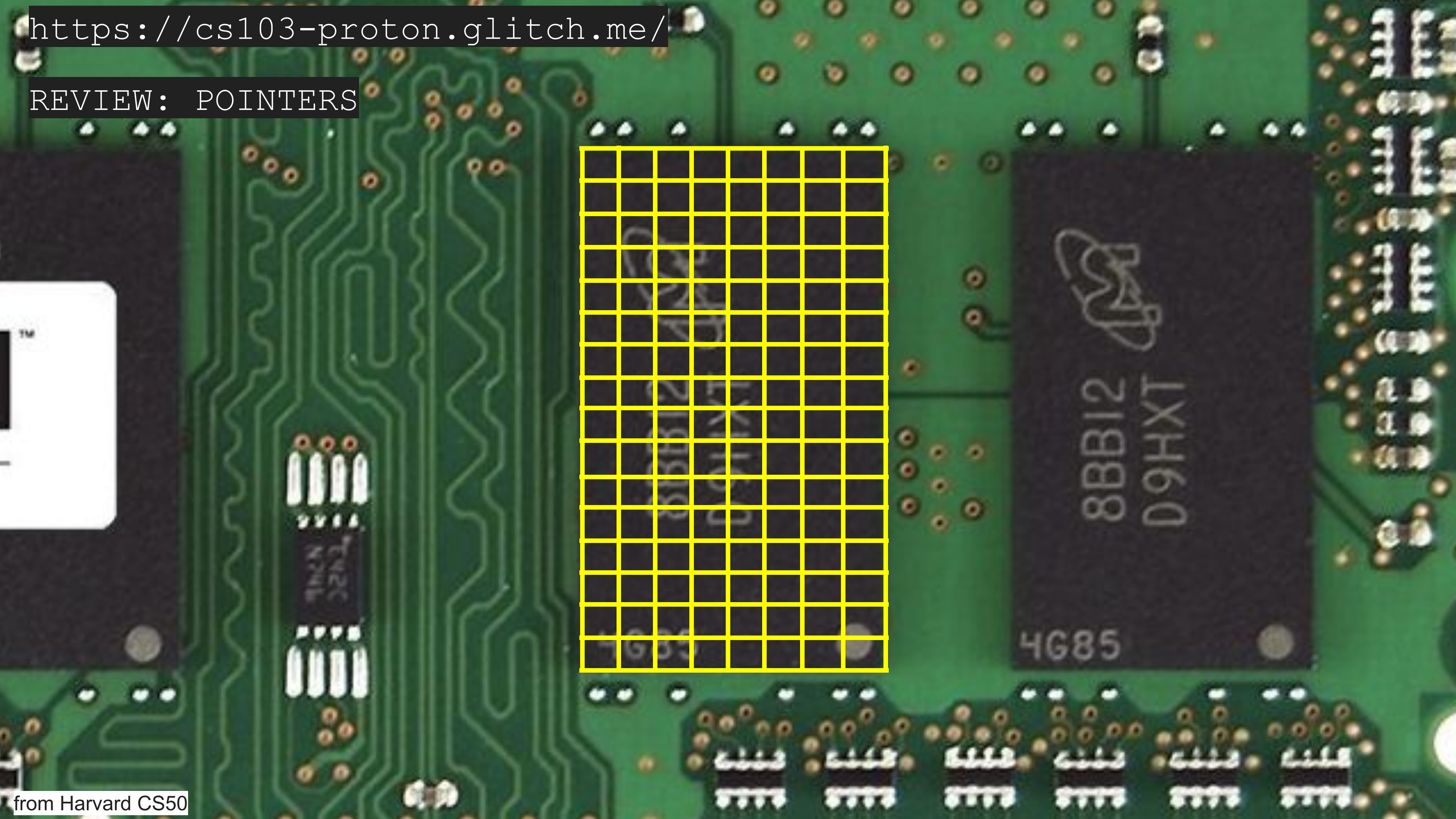
Week 13:
ALGORITHMS

attendance link:

https://cs103-proton.glitch.me/

Dall-E 2: cats learning C++ in the forest on ‘90’s technology https://cs103-proton.glitch.me/

REVIEW: POINTERS



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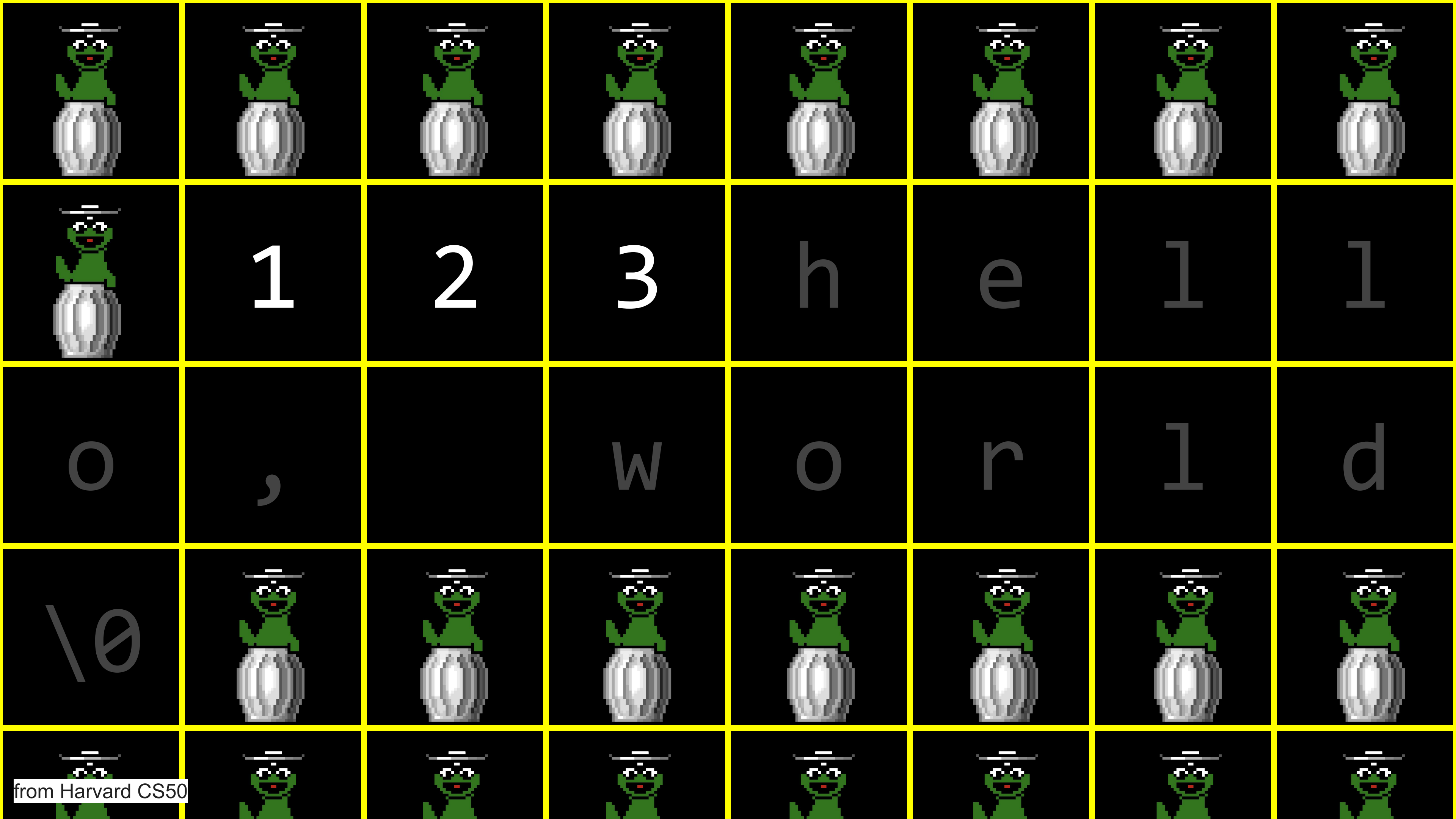
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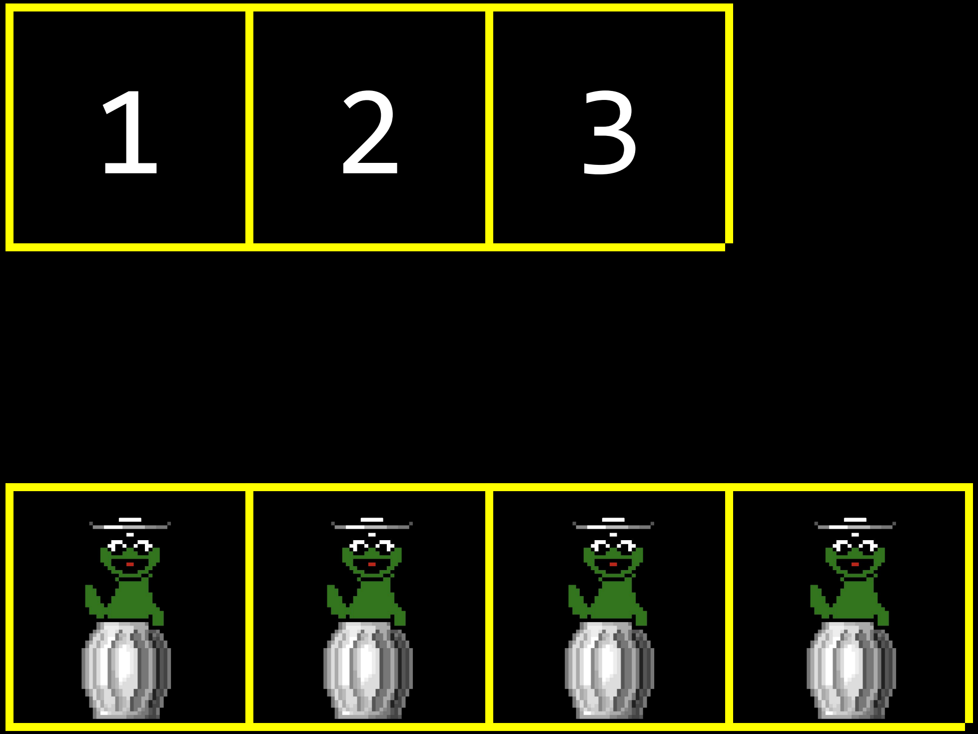

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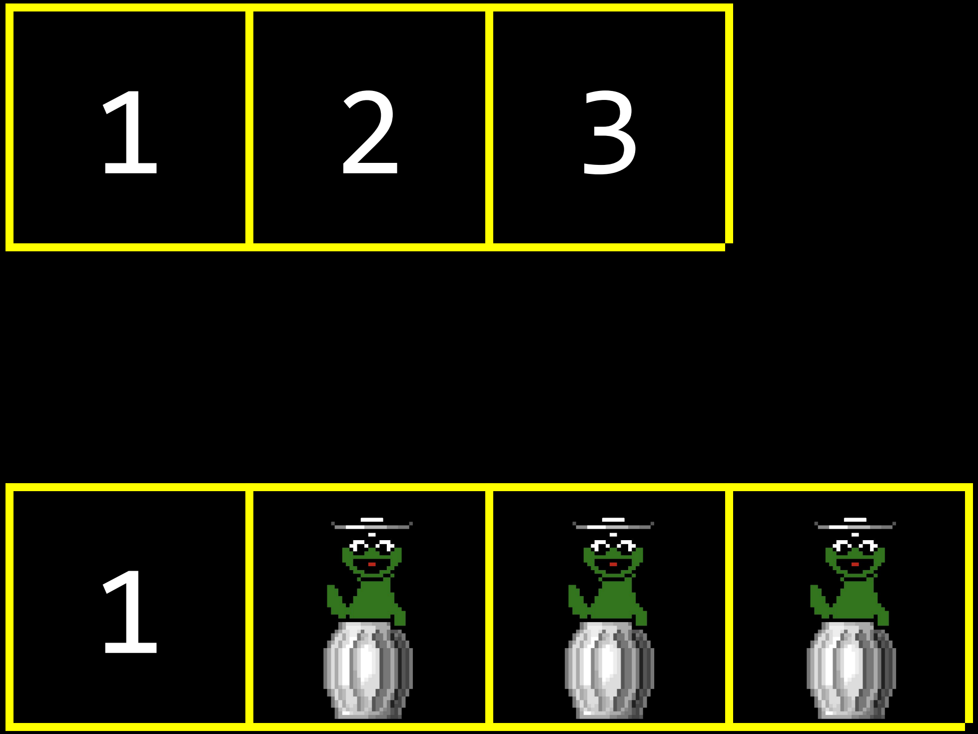

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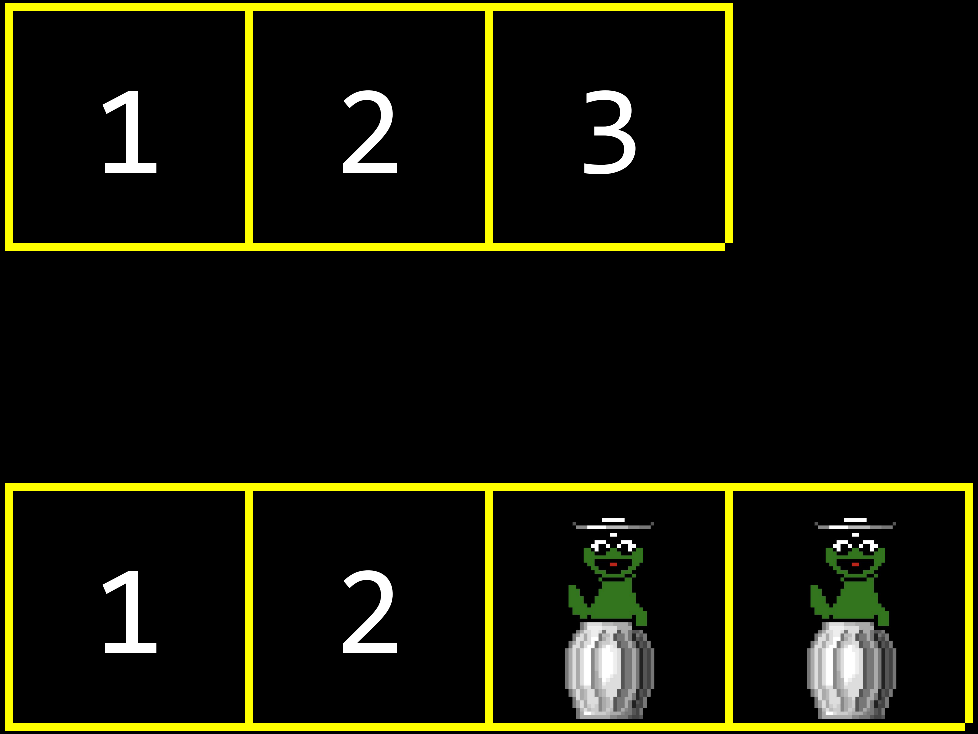


from Harvard CS50

1	2	3

1	2	3	

from Harvard CS50

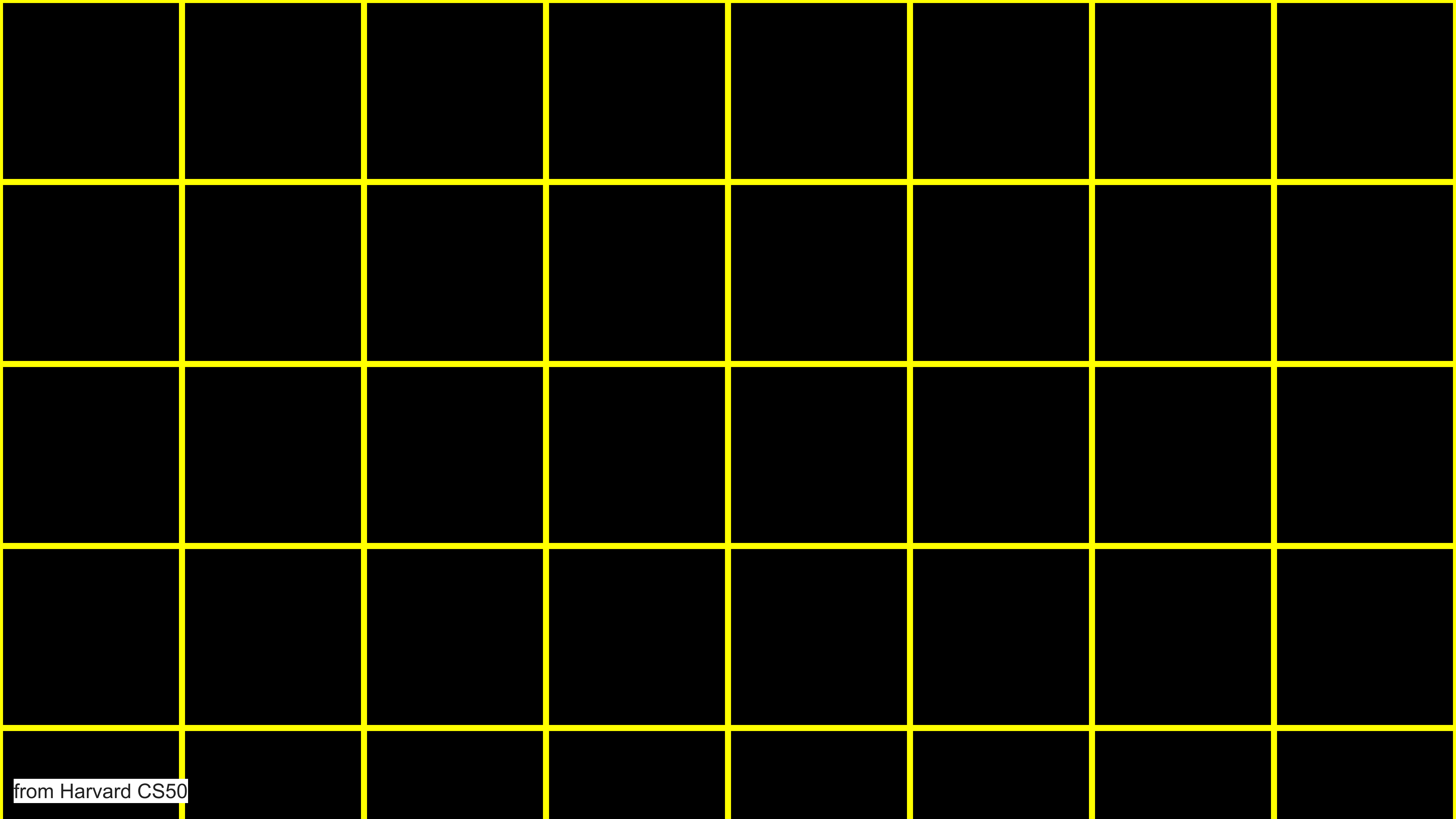
1	2	3

1	2	3	4

from Harvard CS50

1	2	3	4

linked lists



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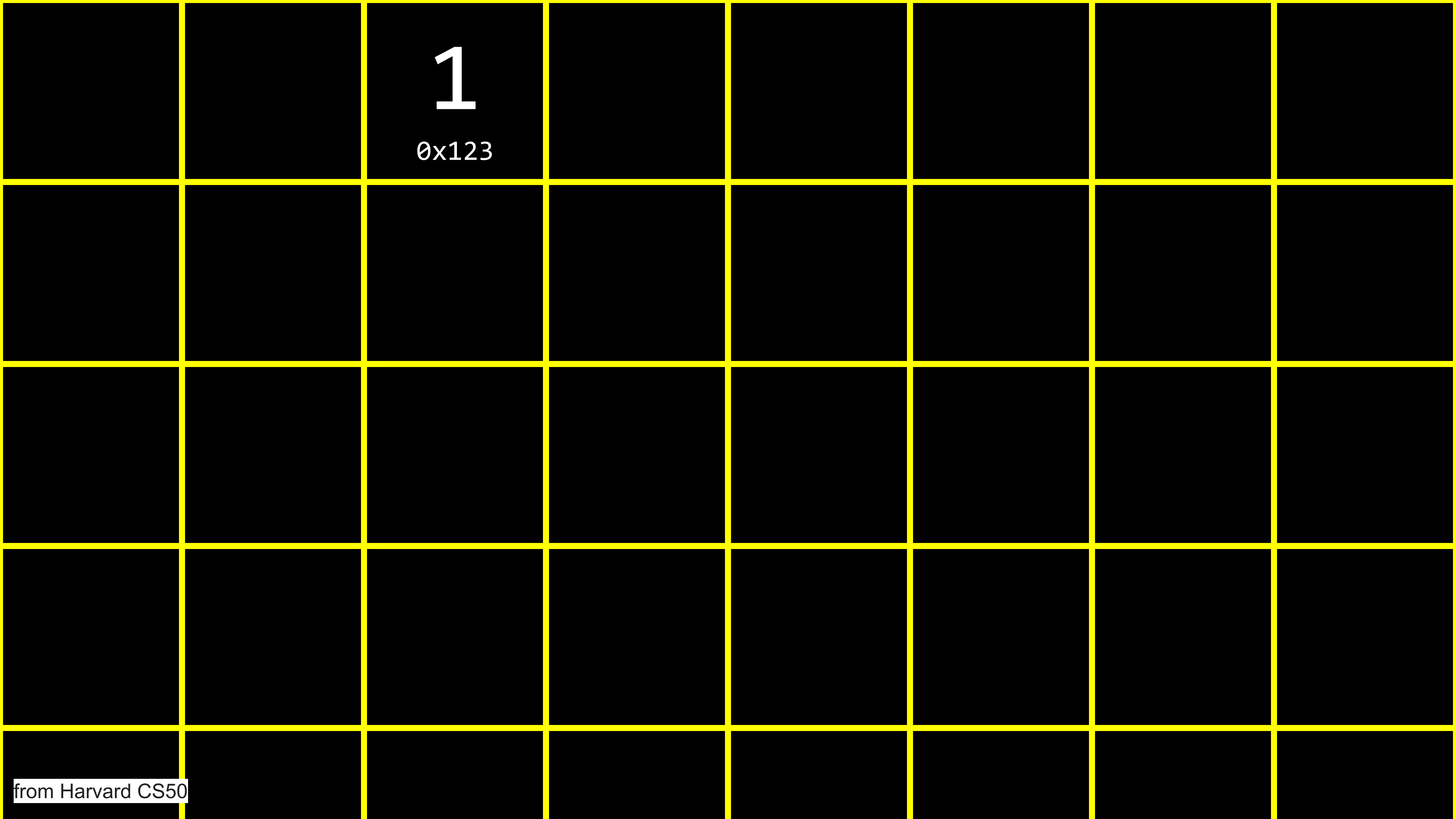

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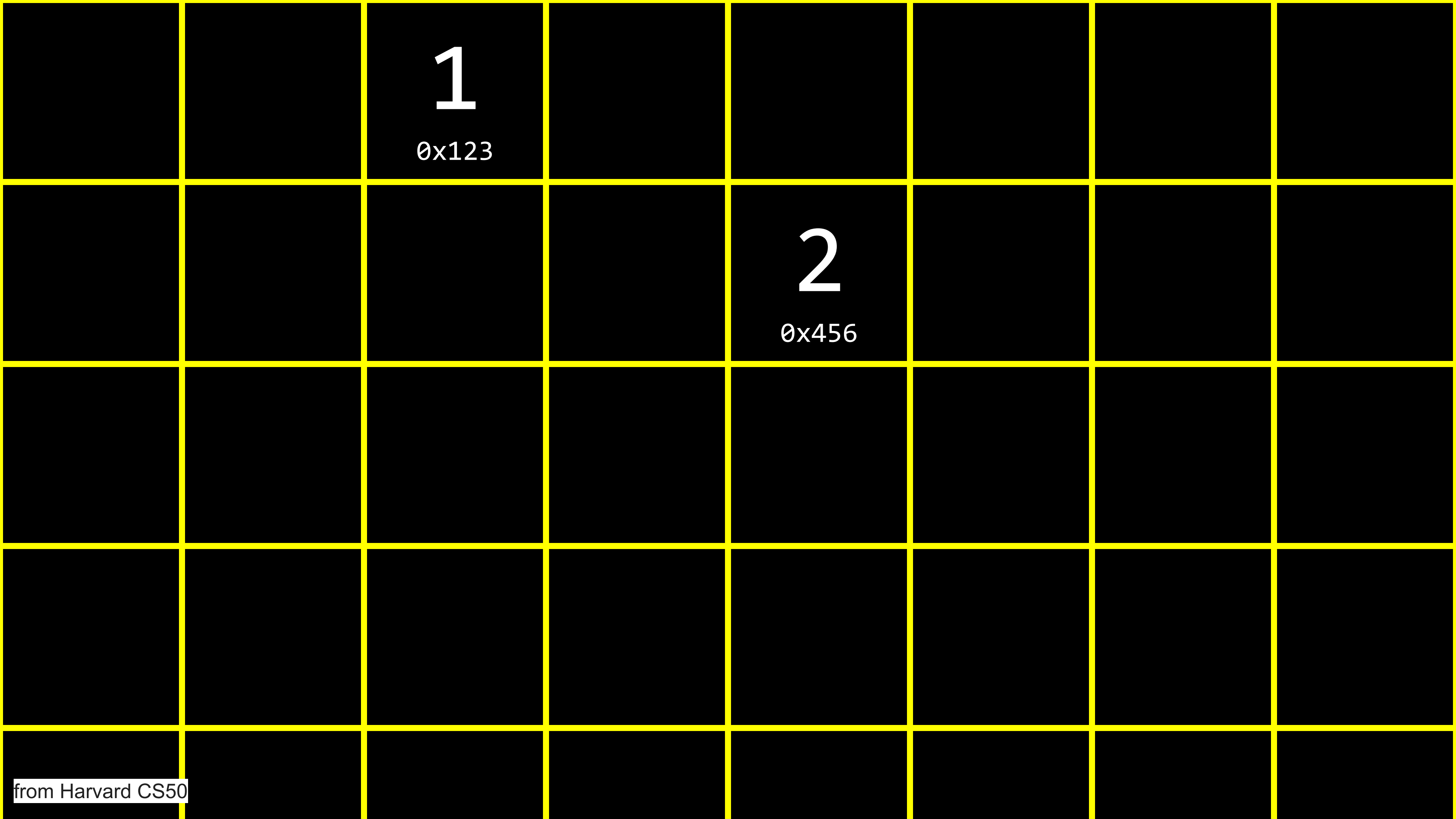
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2
0x456
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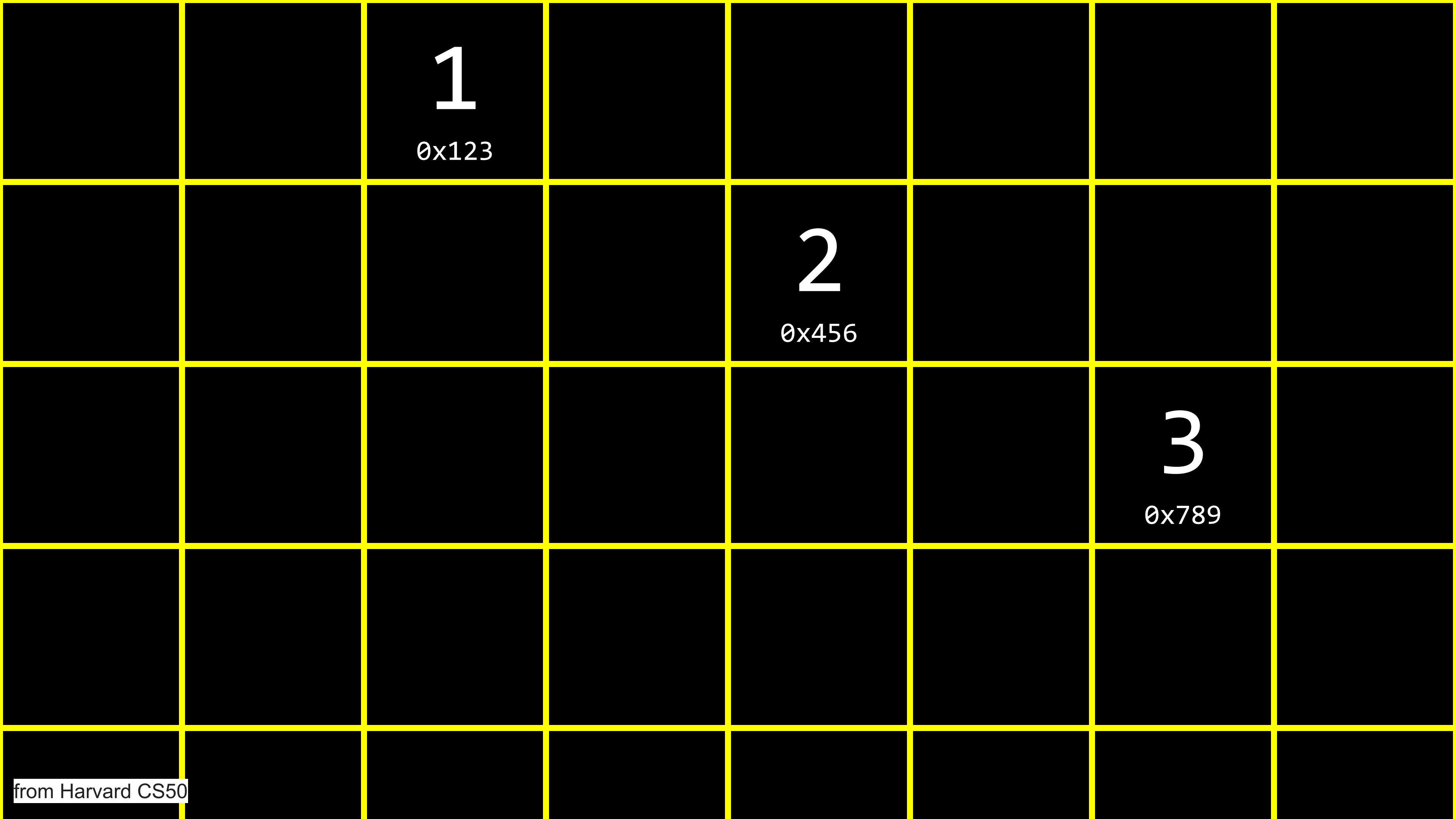
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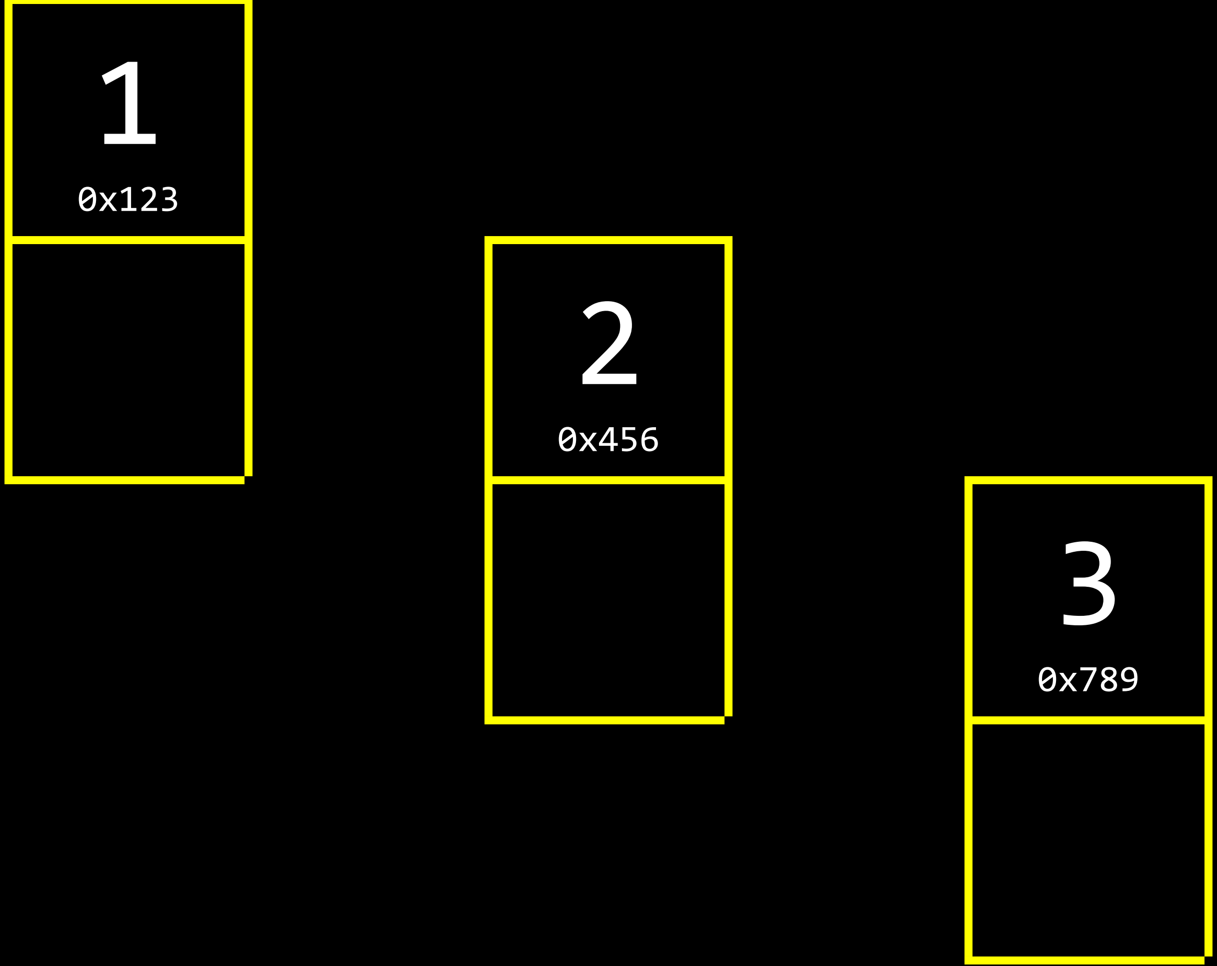

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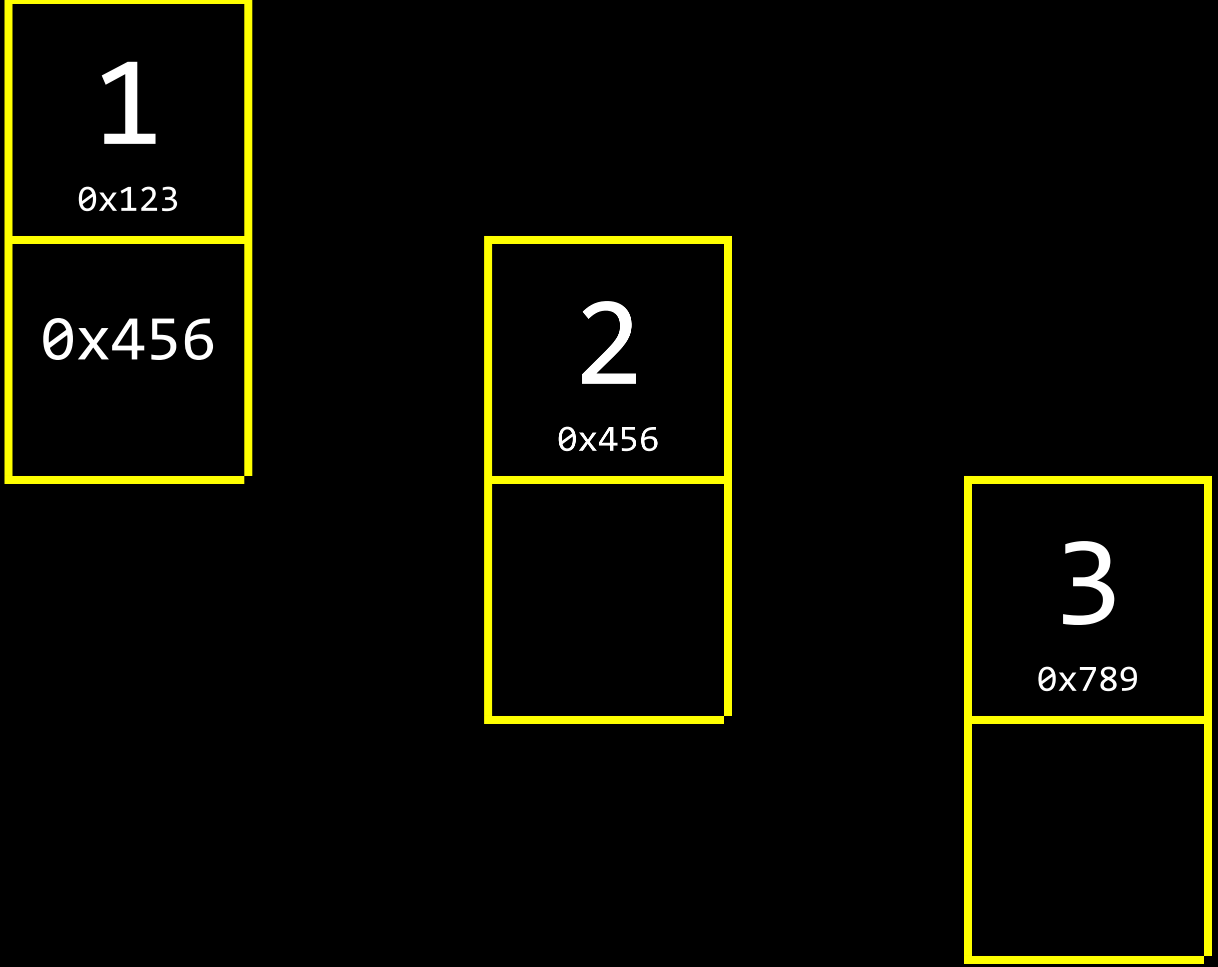

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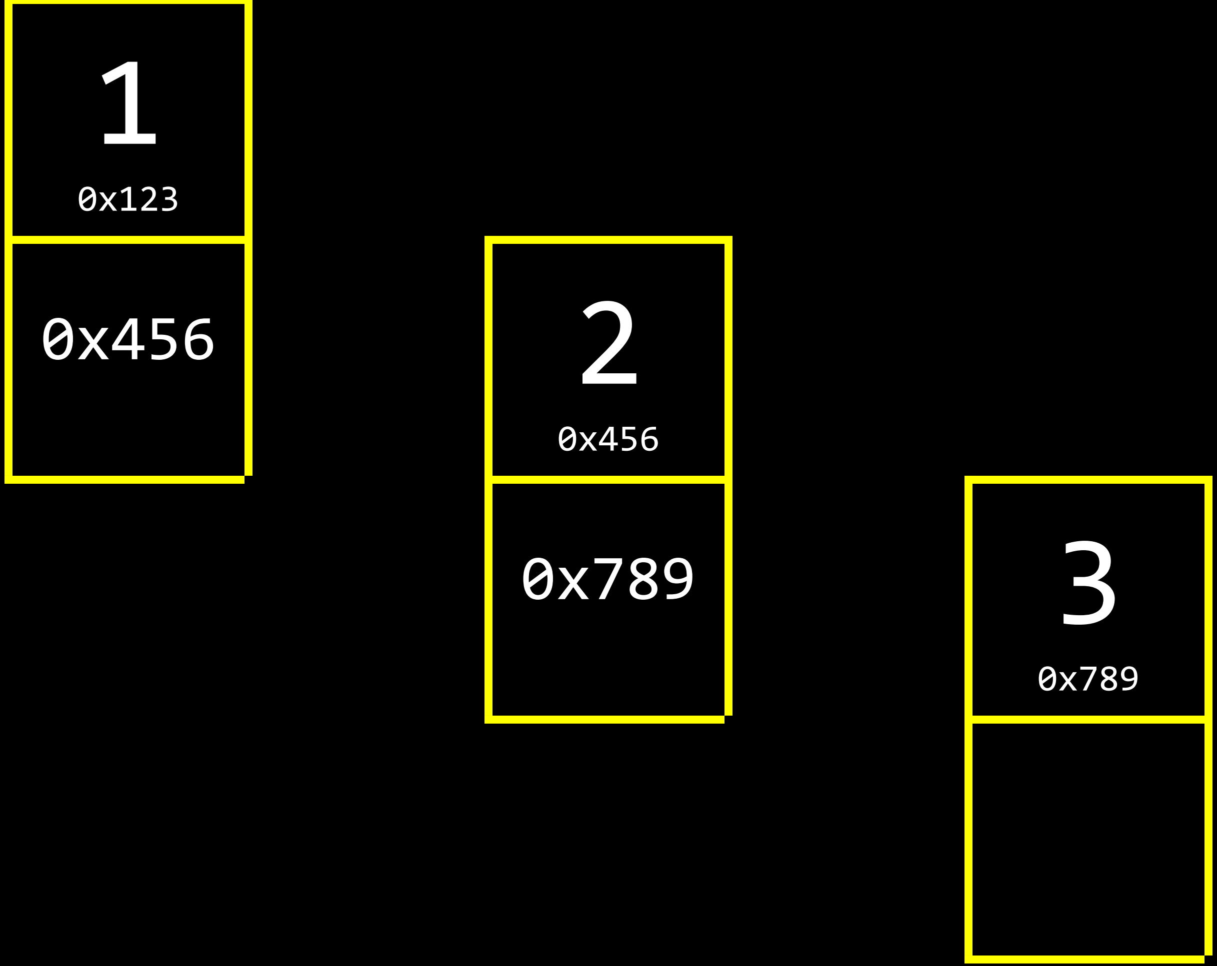

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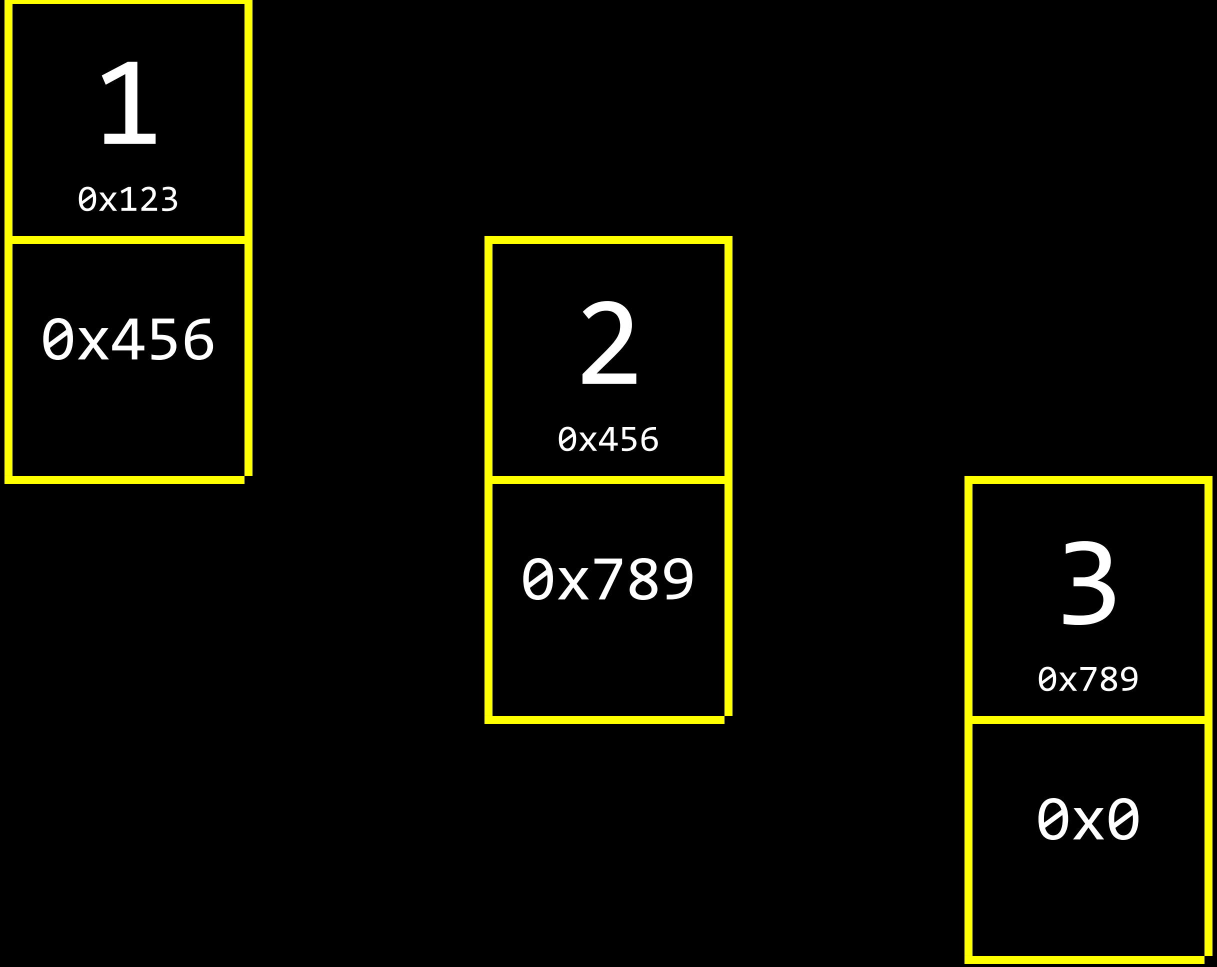

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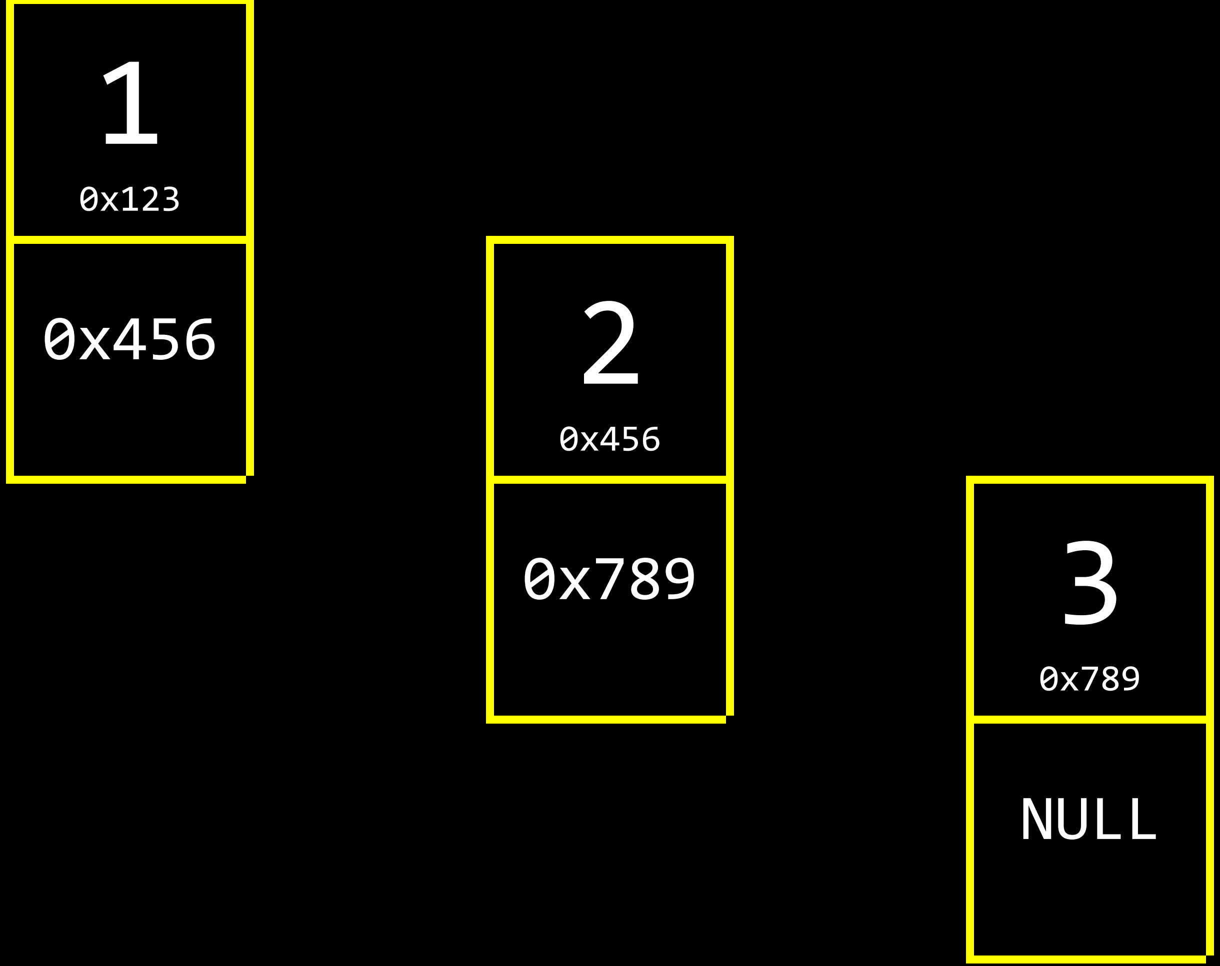

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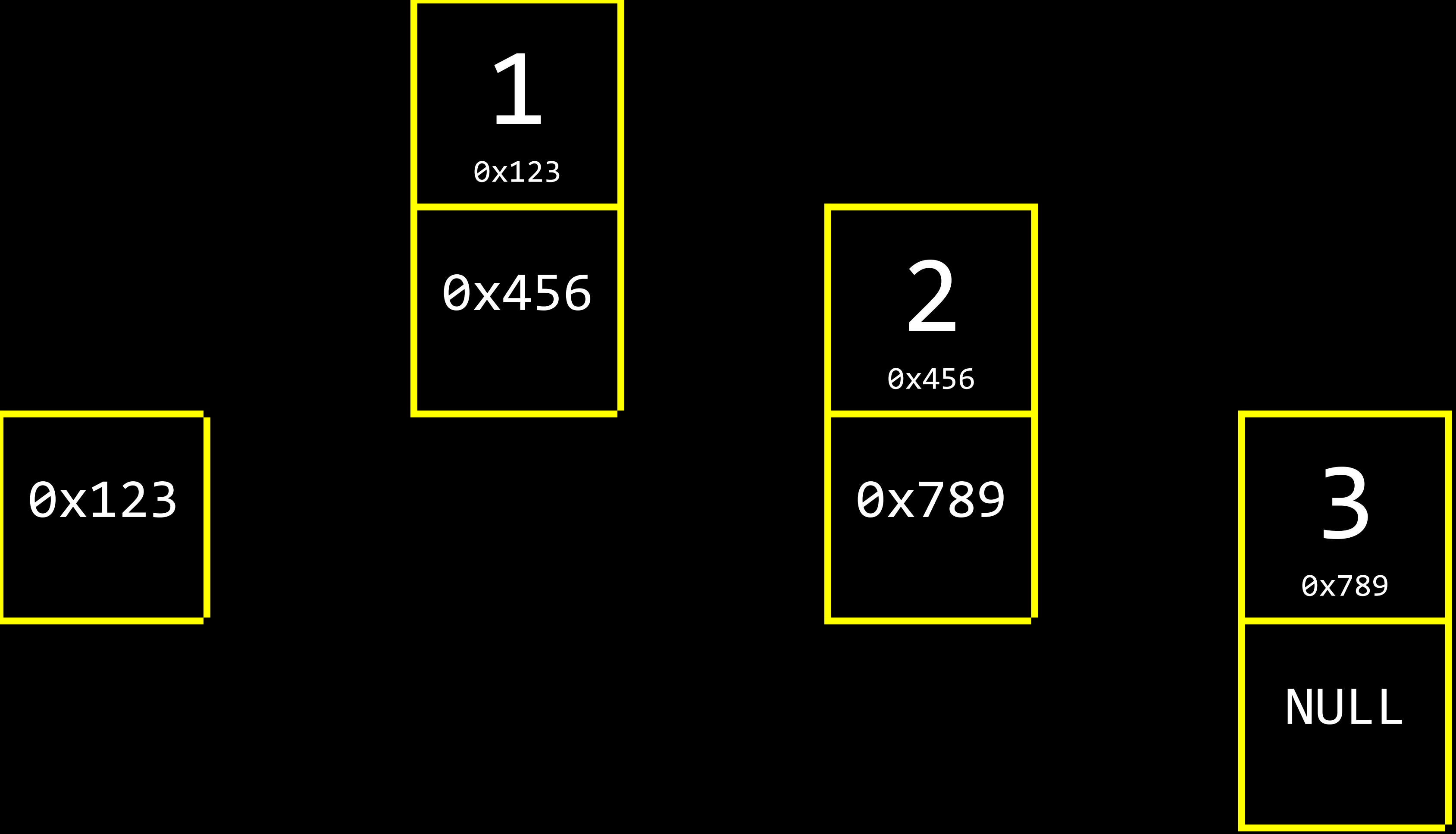

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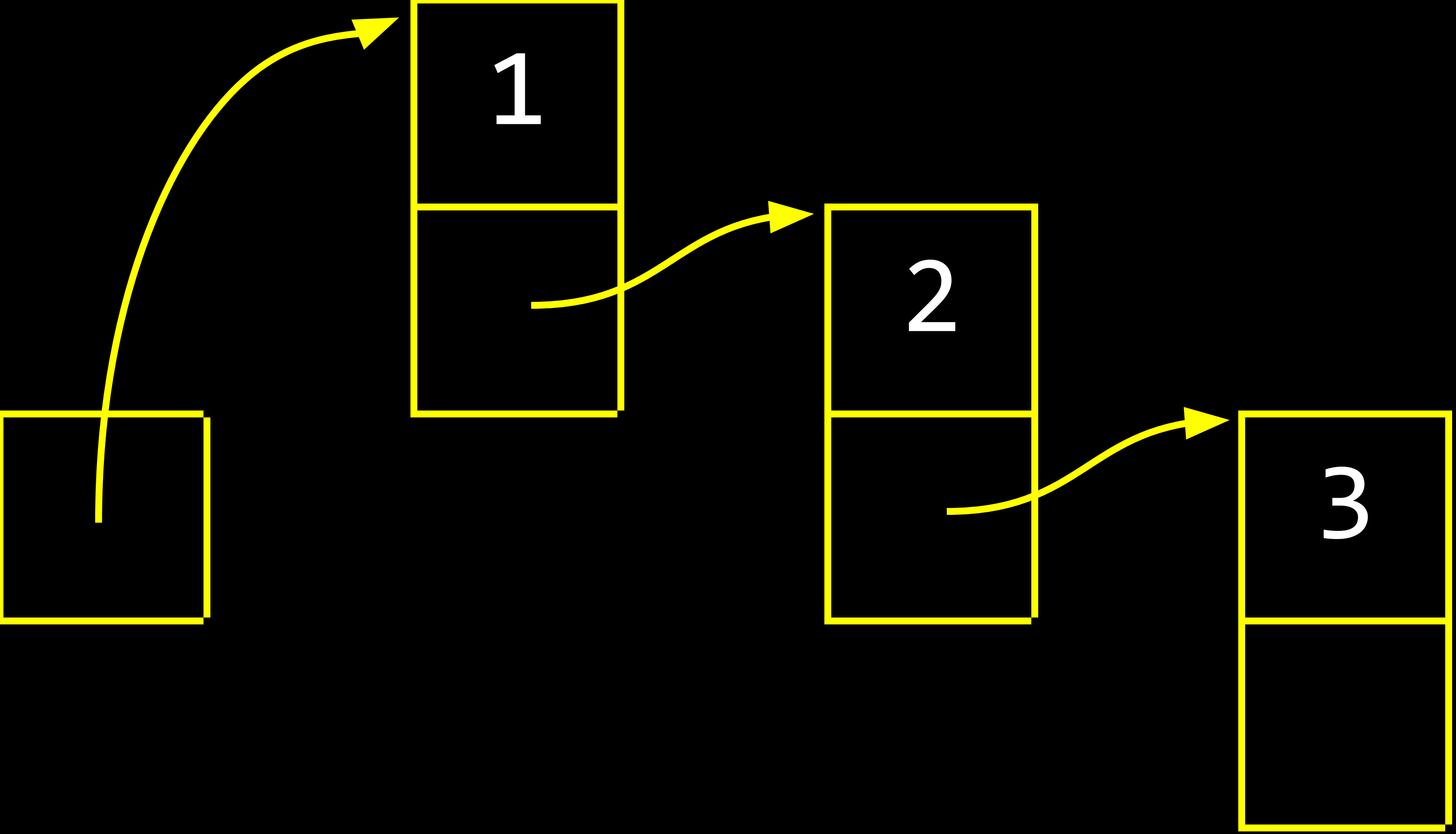

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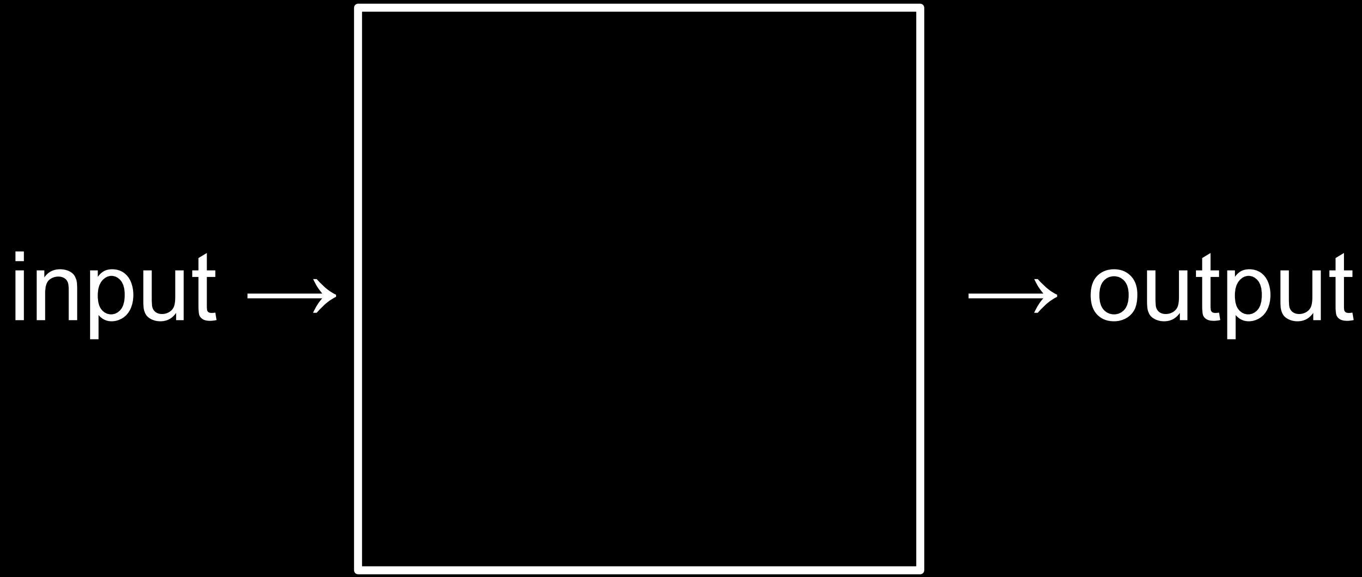
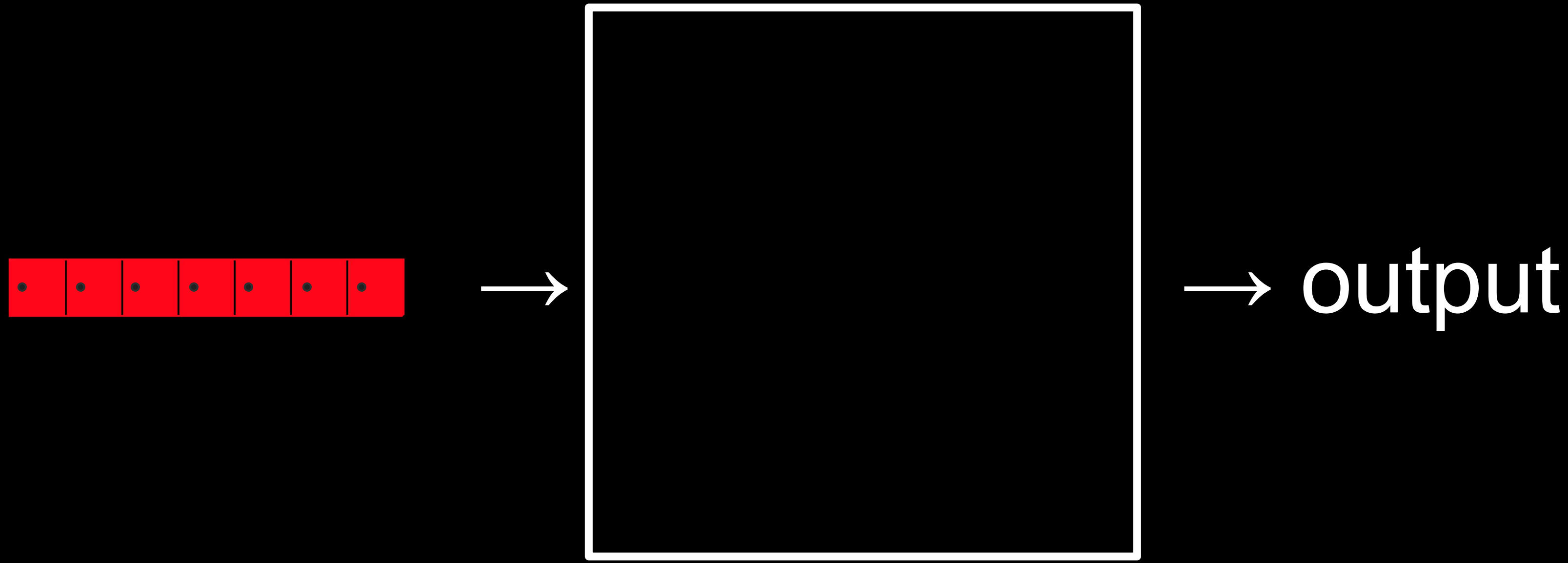


from Harvard CS50

algorithm

from Harvard CS50

SEARCH



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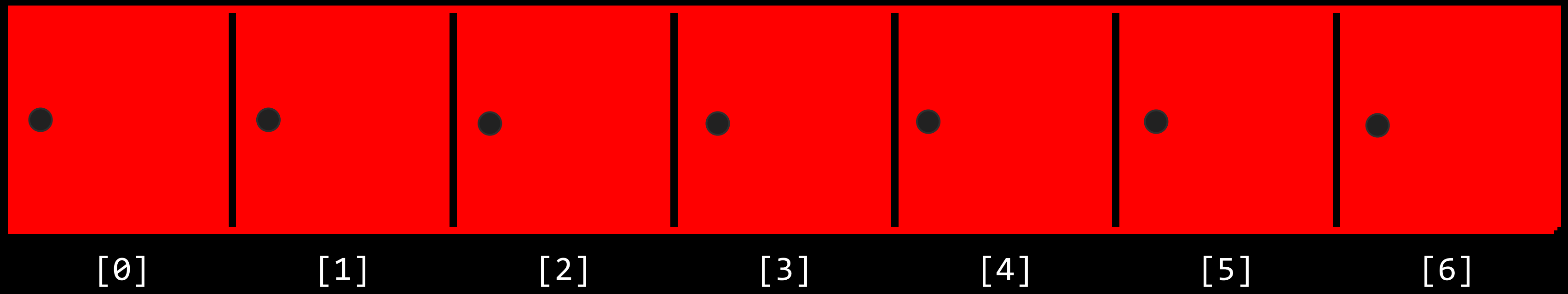
SEARCH



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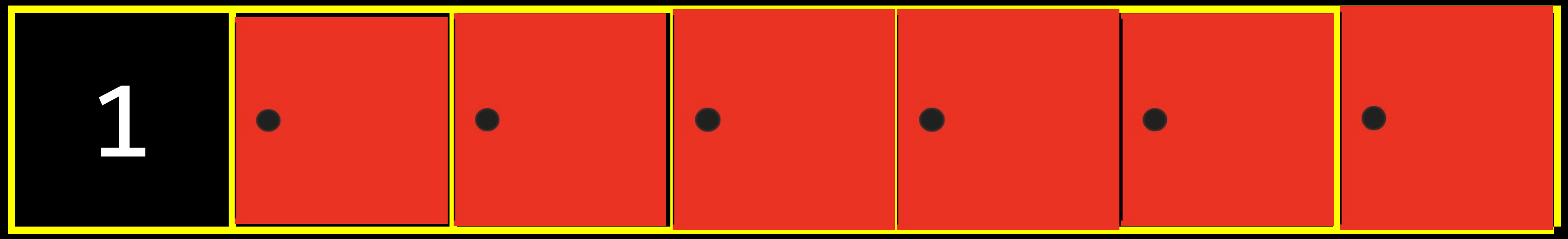
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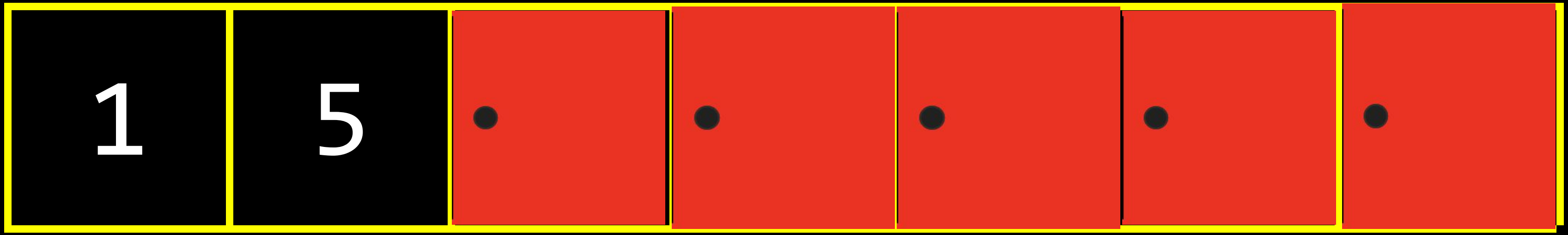
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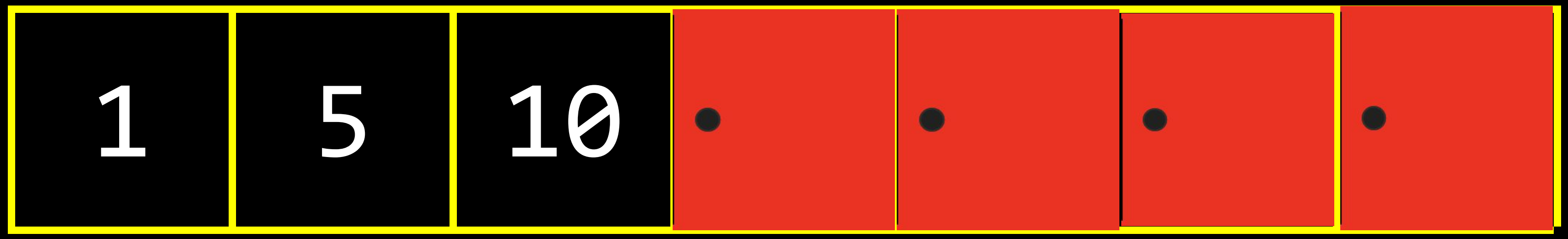
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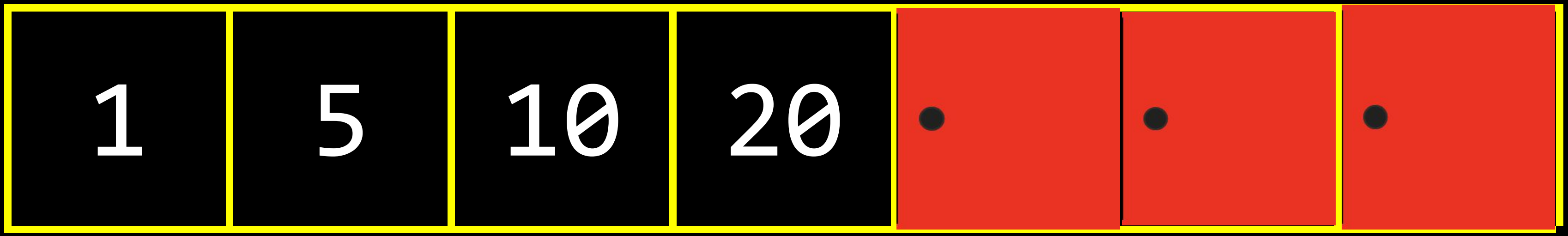
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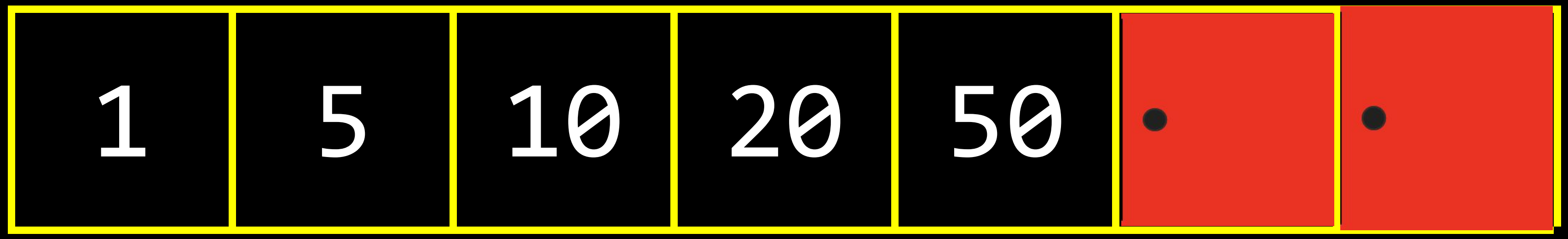
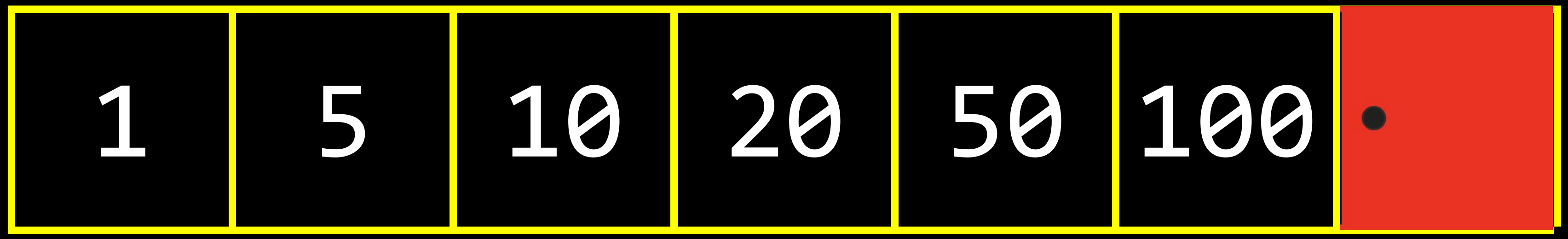
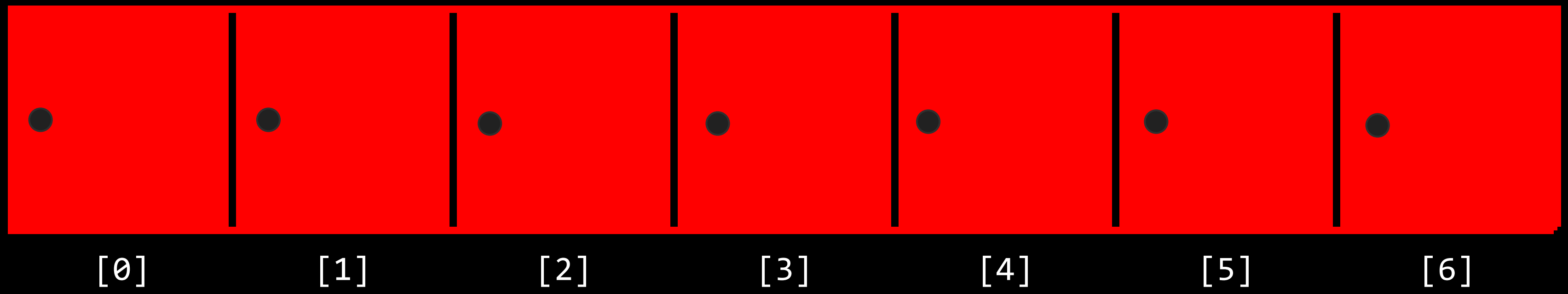
20


1
5
10
20
50


1
5
10
20
50
100

1	5	10	20	50	100	500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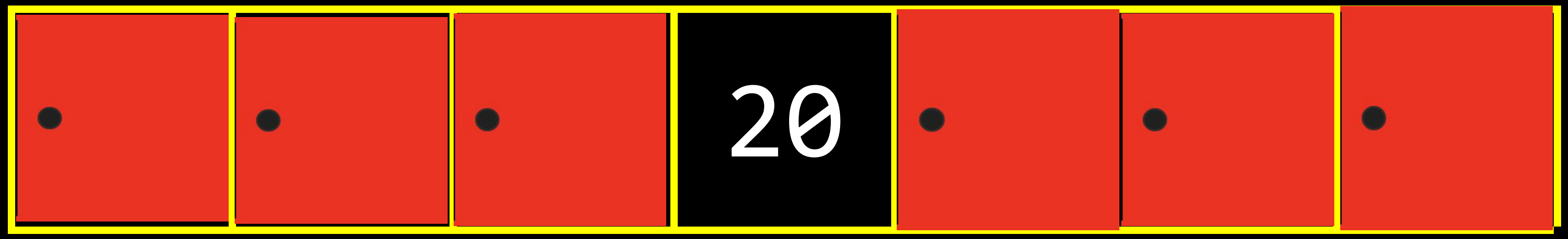
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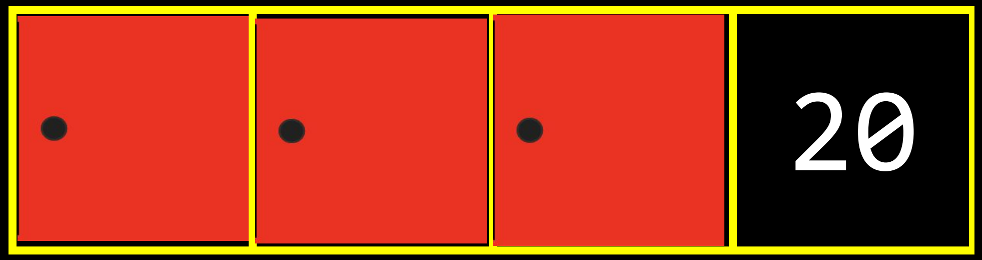
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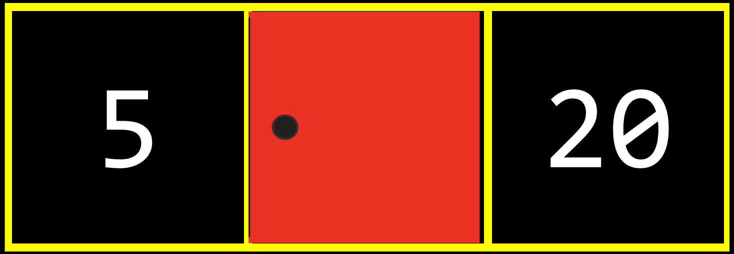

5
20

5	10	20

1	5	10	20	50	100	500

from Harvard CS50

<u>LINEAR SEARCH: “brute force”</u>

- check every element
- move onto next element

<u>BINARY SEARCH: “divide and conquer”</u>

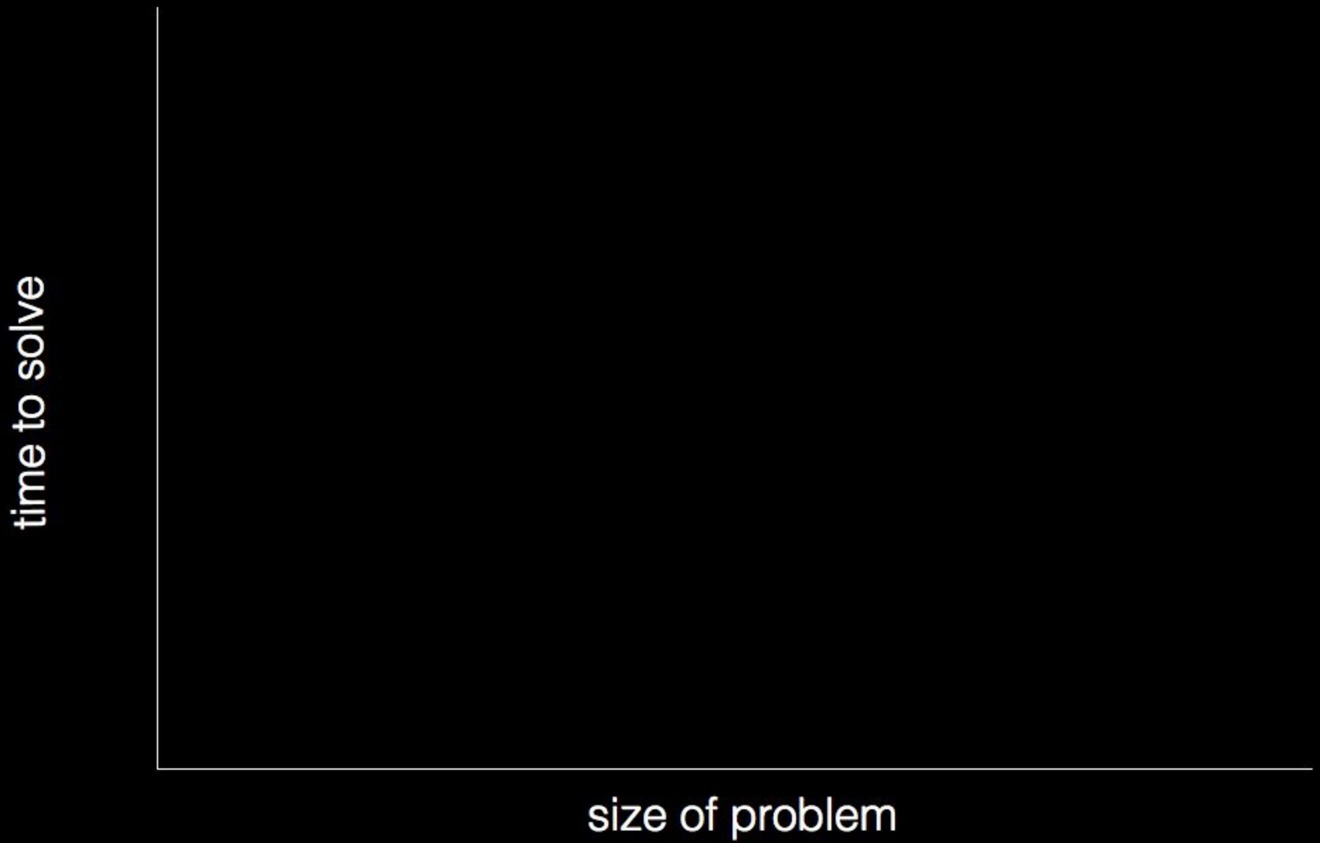
- sorted list
- check middle of list
- if search term > middle, **binary search** to the right
- if search term < middle, **binary search** to the left

recursion: when a process invokes itself

🔎 **BINARY SEARCH:**

- sorted list

- are there any doors left to check? if not, **return!**
- check middle of list - if there, **return!**
- if search term > middle, **binary search** to the right
- if search term < middle, **binary search** to the left



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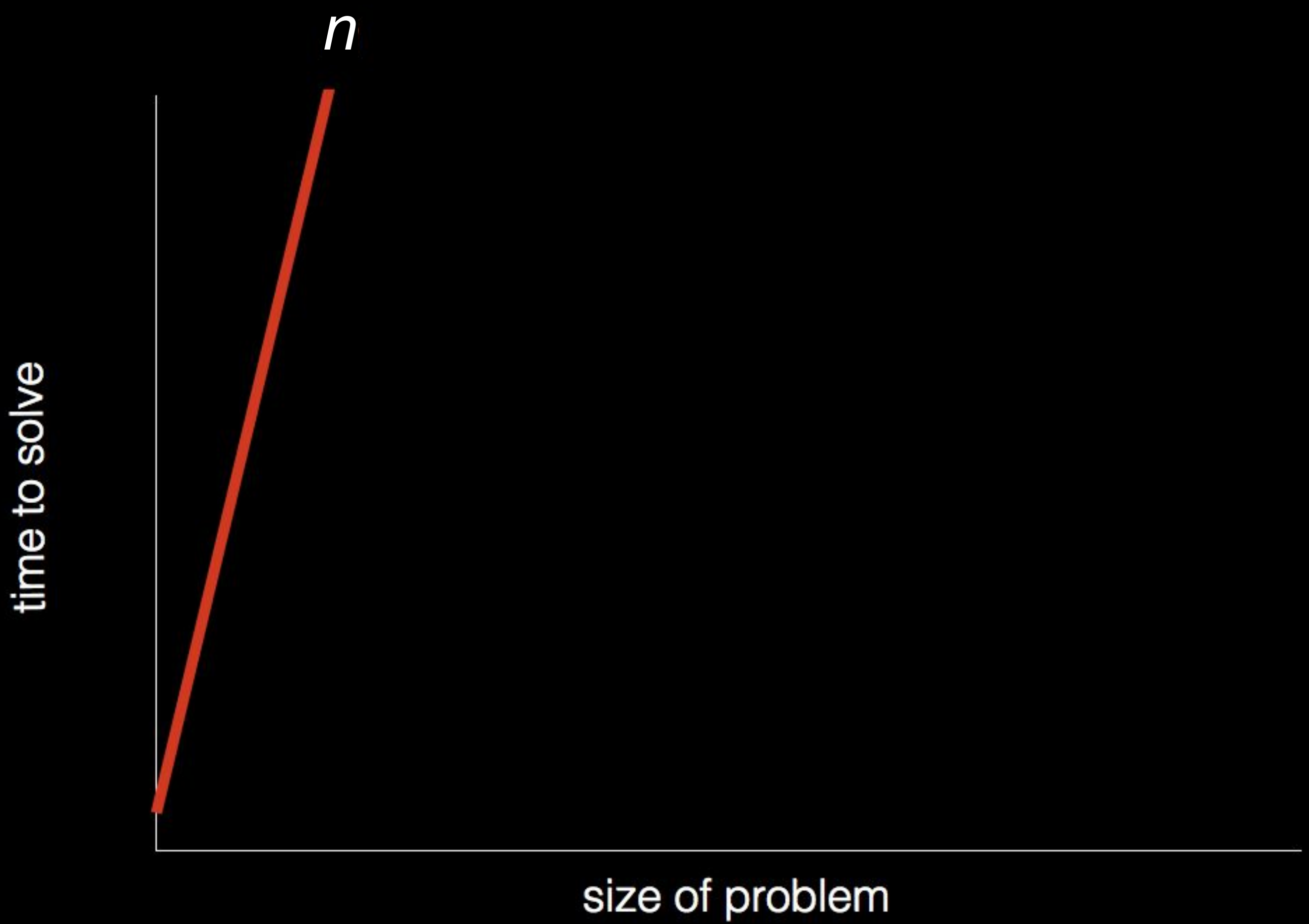

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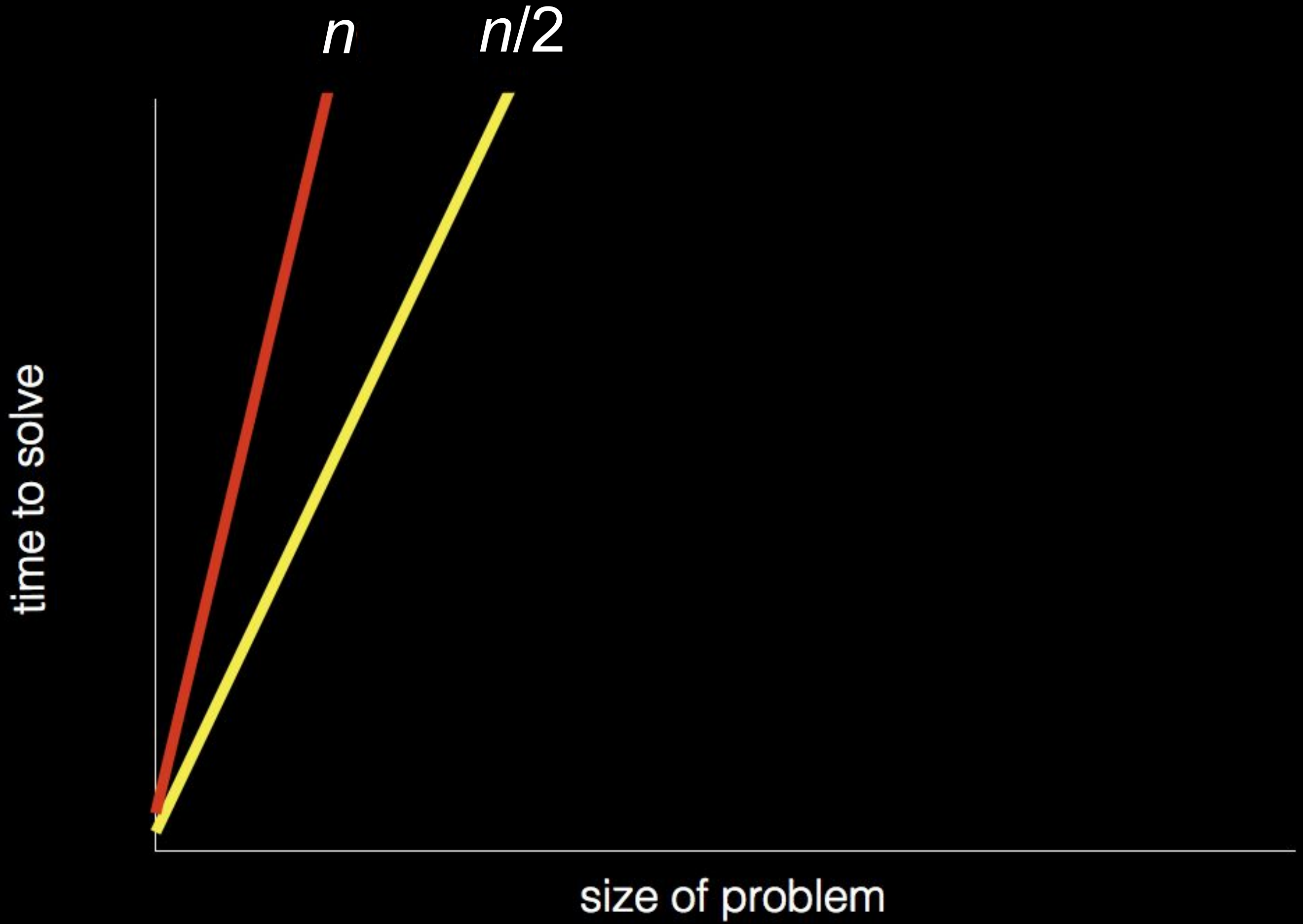

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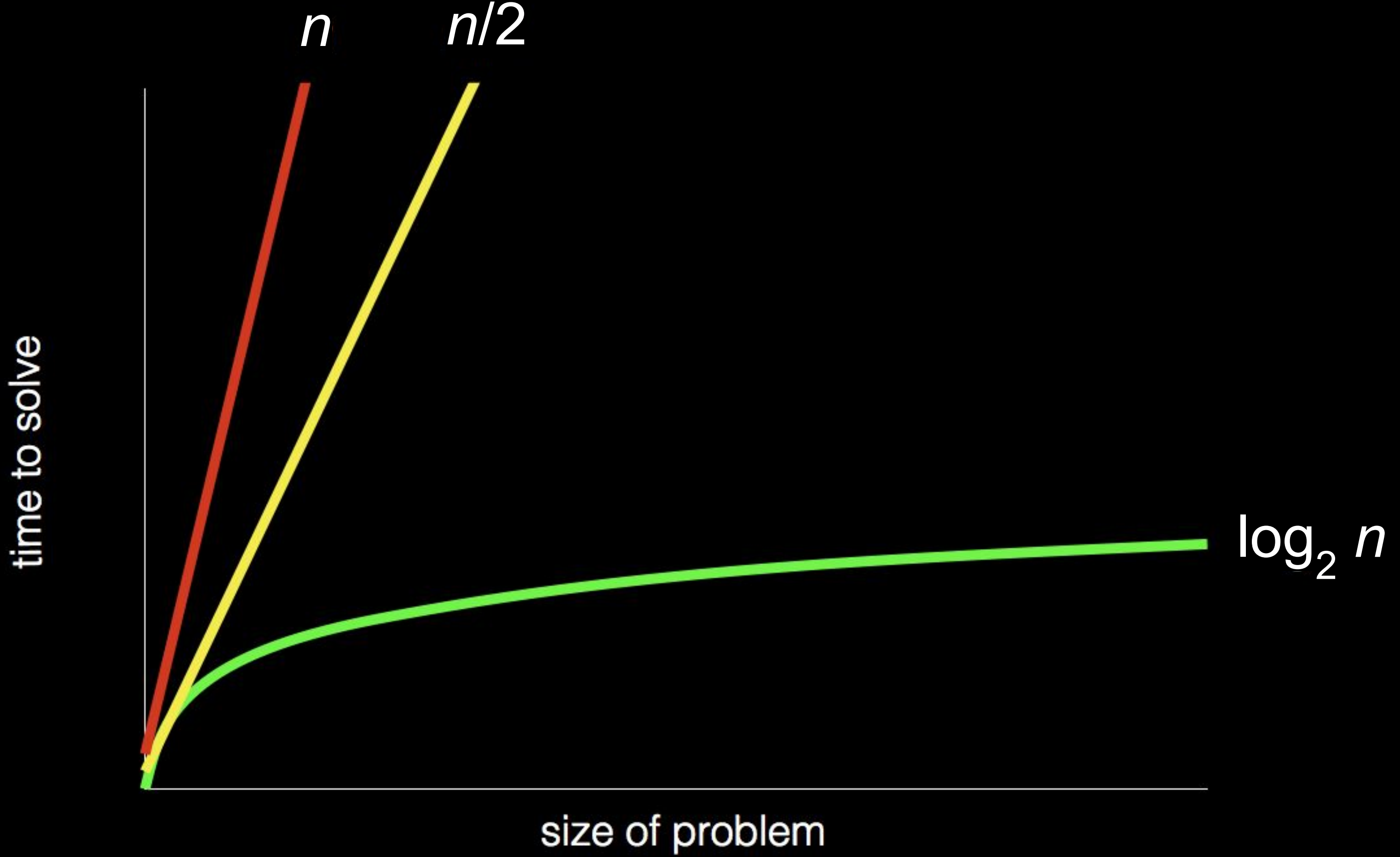

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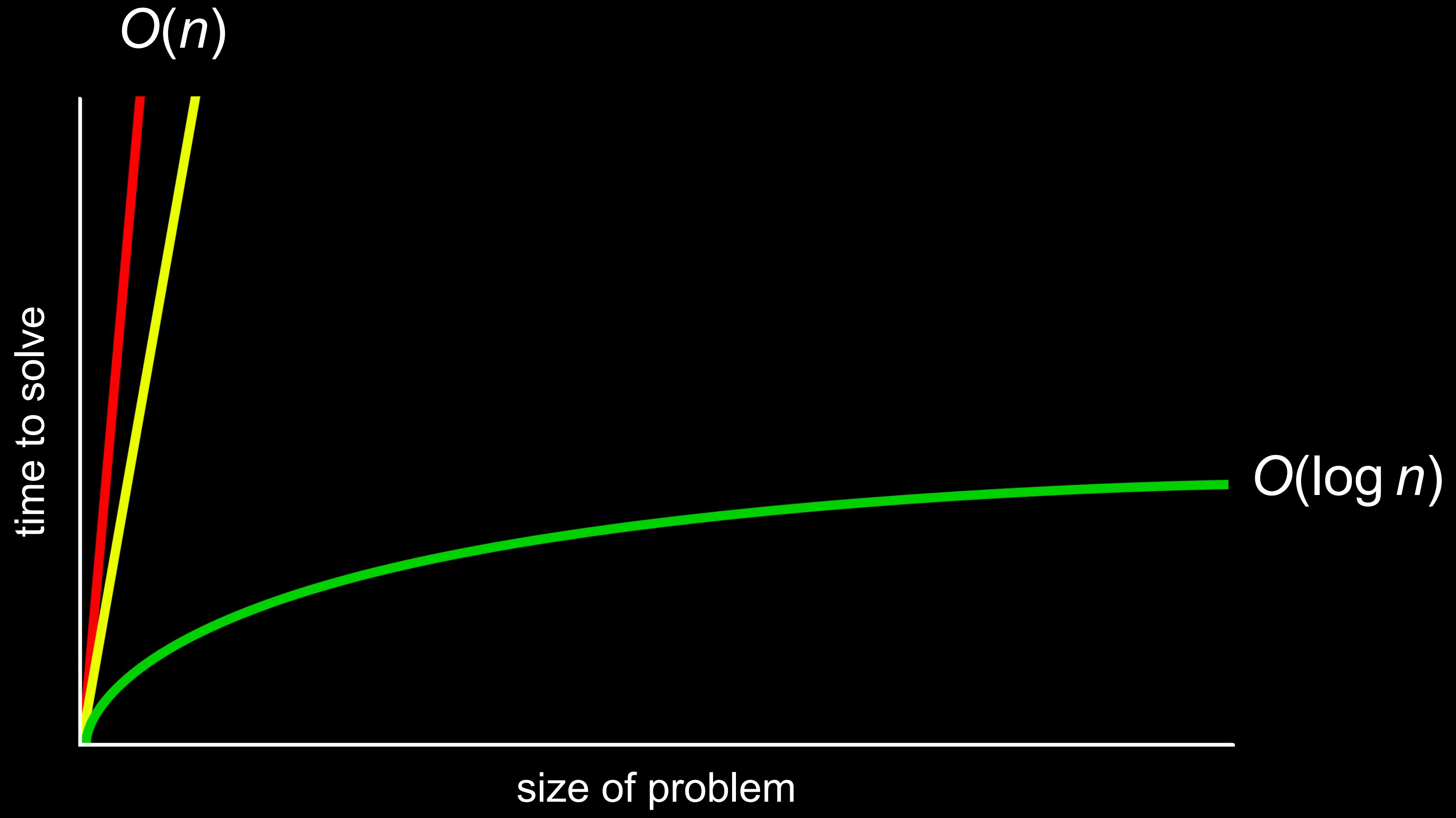

from Harvard CS50

o

$O(n^2)$

$O(n \log n)$

$O(n)$

$O(\log n)$

$O(1)$

from Harvard CS50

$O(n^2)$

$O(n \log n)$

$O(n)$ linear search

$O(\log n)$

$O(1)$

from Harvard CS50

$O(n^2)$	
$O(n \log n)$	
$O(n)$	linear search
$O(\log n)$	binary search
$O(1)$	

Ω

$\Omega(n^2)$

$\Omega(n \log n)$

$\Omega(n)$

$\Omega(\log n)$

$\Omega(1)$

$\Omega(n^2)$

$\Omega(n \log n)$

$\Omega(n)$

$\Omega(\log n)$

$\Omega(1)$ linear search

$\Omega(n^2)$

$\Omega(n \log n)$

$\Omega(n)$

$\Omega(\log n)$

$\Omega(1)$ linear search, binary search