CS 103000
Prof. Madeline Blount

Week 13:
POINTERS

Dall-E 2: cats learning C++ in the forest on ‘90’s technology

THE MYSTIQUE OF POINTERS

tricky but IMPORTANT …

https://www.youtube.com/watch?v=2ybLD6_2gKM

THE MYSTIQUE OF POINTERS

tricky but IMPORTANT …

https://www.youtube.com/watch?v=DTxHyVn0ODg

THE MYSTIQUE OF POINTERS

tricky but IMPORTANT …

https://www.youtube.com/watch?v=t5NszblerYc

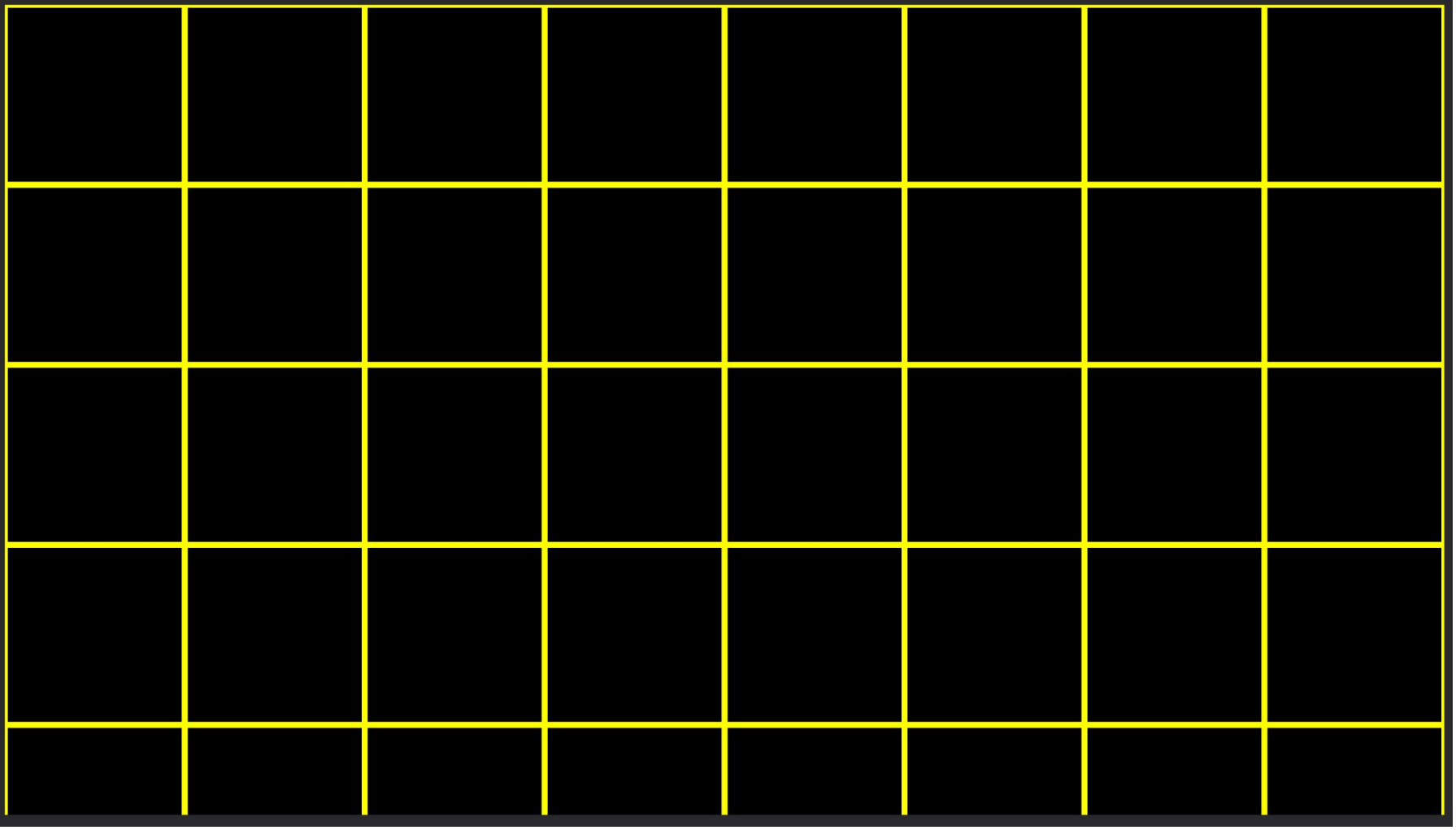
THE MYSTIQUE OF POINTERS

tricky but IMPORTANT …

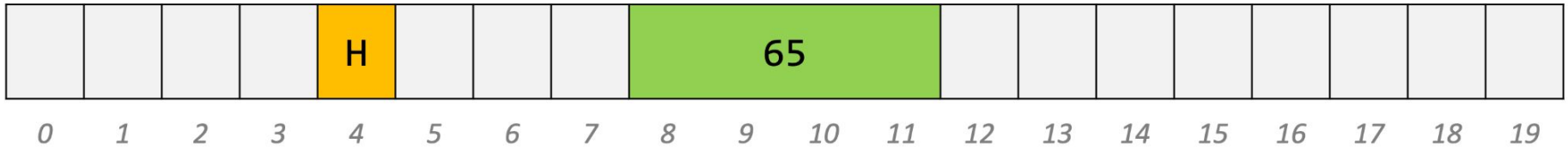
https://www.youtube.com/watch?v=i49_SNt4yfk

POINTERS give you the power to manage and directly manipulate **MEMORY**

MEMORY: for programs, RAM (random access memory)

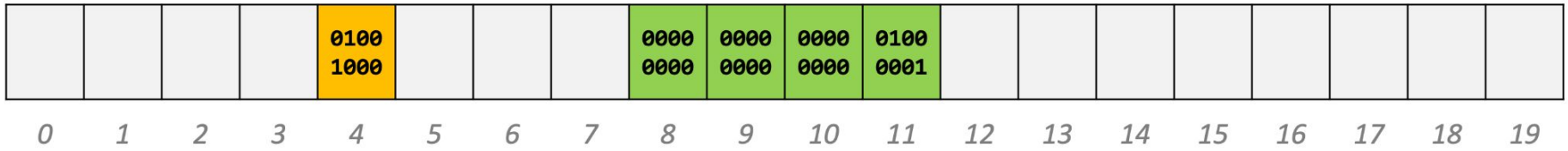


from Harvard CS50




```
char c = 'H';
int speedlimit = 65;
```

from Harvard CS50



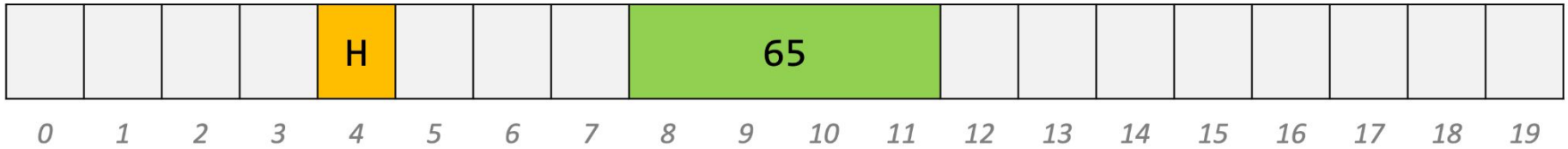

```
char c = 'H';
int speedlimit = 65;
```

from Harvard CS50

Memory Size

The size of a given data type is measured in bytes:

Data Type	Memory Size
bool	1 byte
char	1 byte
int	4 bytes
float	4 bytes
double	8 bytes
std::string	24 bytes




```
char c = 'H';
int speedlimit = 65;
```

from Harvard CS50

1
2
3
4

1
2
3
4
203
204
301
302
303
304

POINTER = MEMORY ADDRESS

POINTER = MEMORY ADDRESS

POINTER = integer that stores a memory address

POINTER = MEMORY ADDRESS

POINTER = variable that holds an integer which is a memory address

POINTER = MEMORY ADDRESS

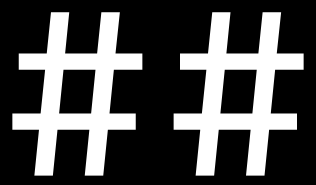
0x16d9d7470

hexadecimal

0 1 2 3 4 5 6 7 8 9 a b c d e f

from Harvard CS50

16 1



from Harvard CS50

16 1

02

from Harvard CS50

16 1

09

from Harvard CS50

16 1

from Harvard CS50

11111111

from Harvard CS50

FF

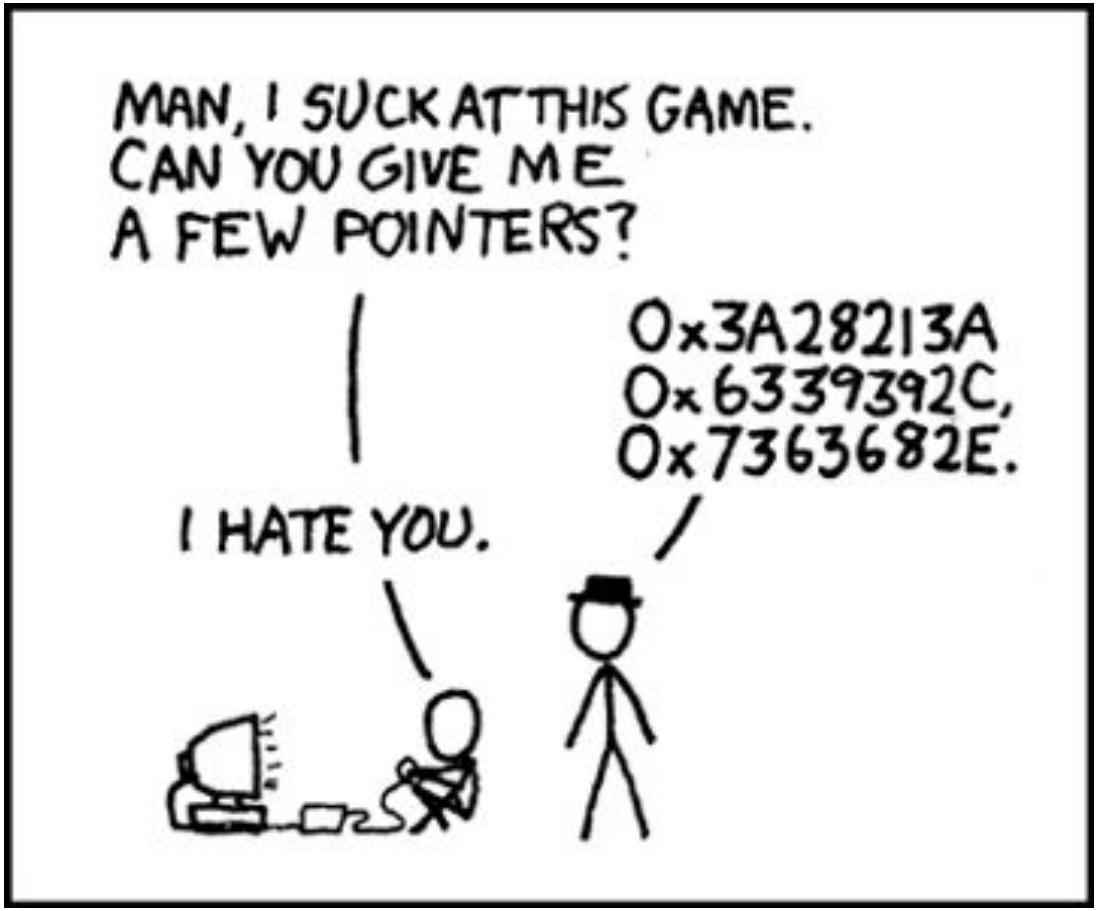
from Harvard CS50

POINTER = MEMORY ADDRESS

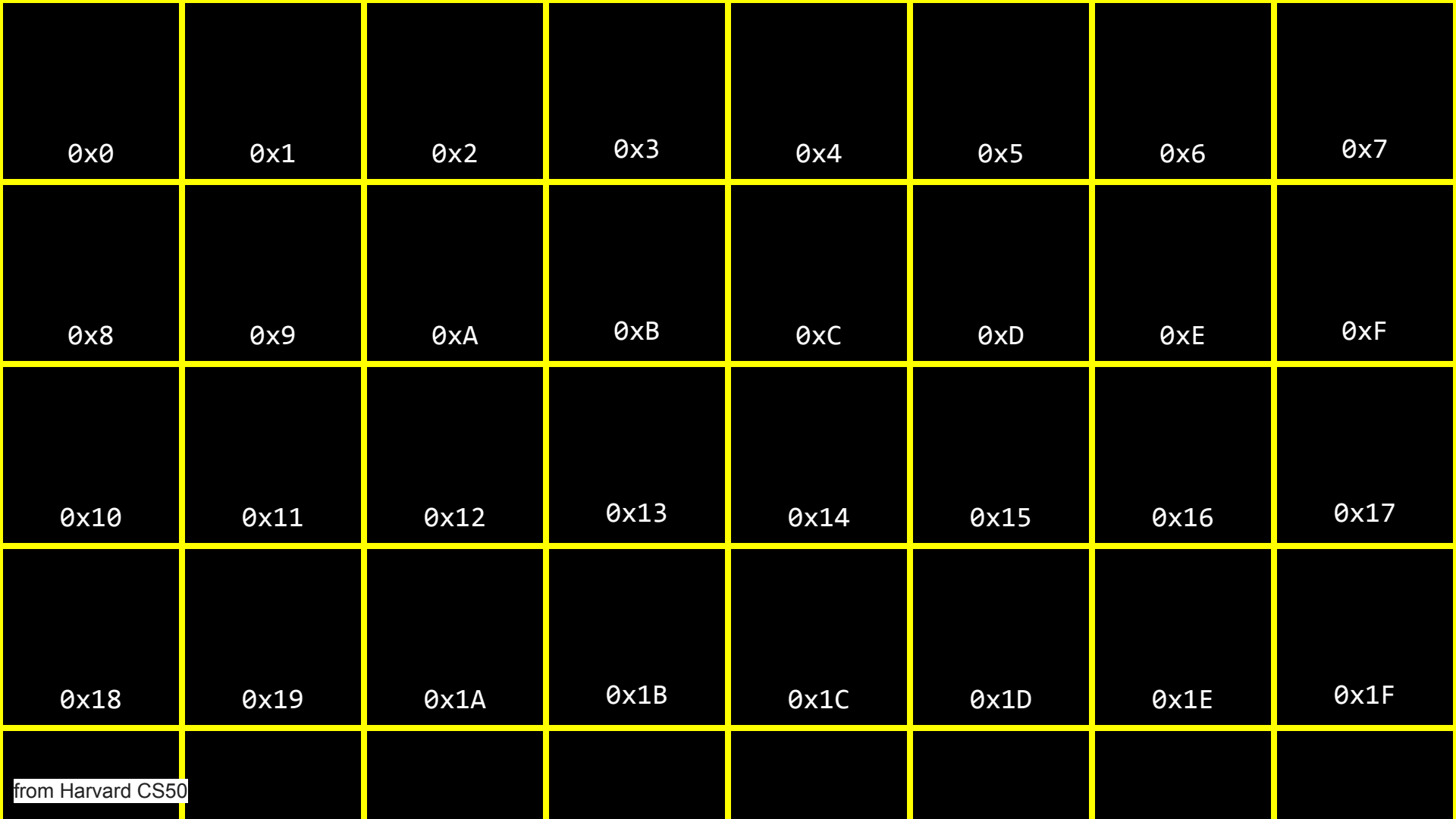
0x16d9d7470

6134002800

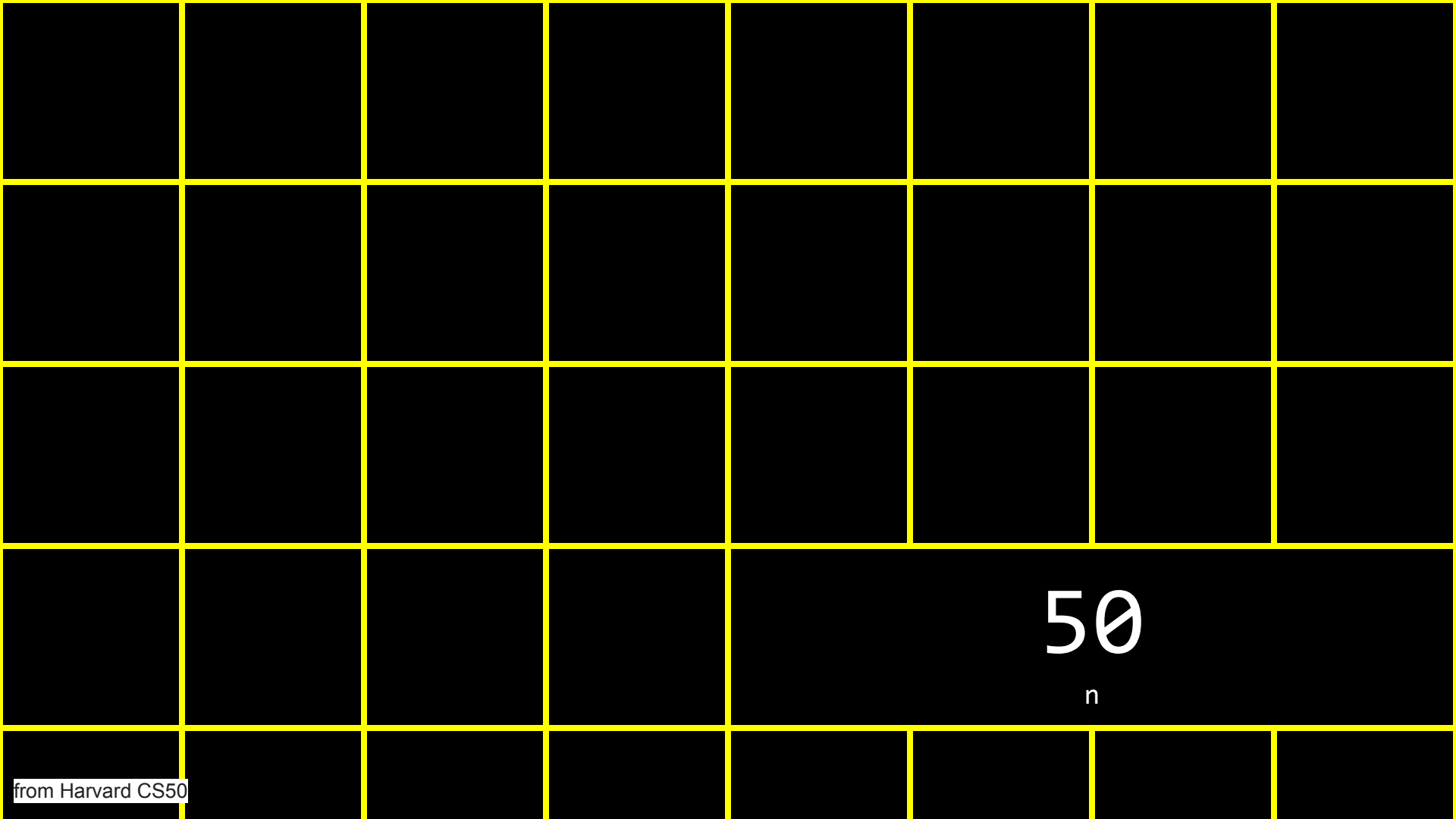
10110110110011101011010001110000



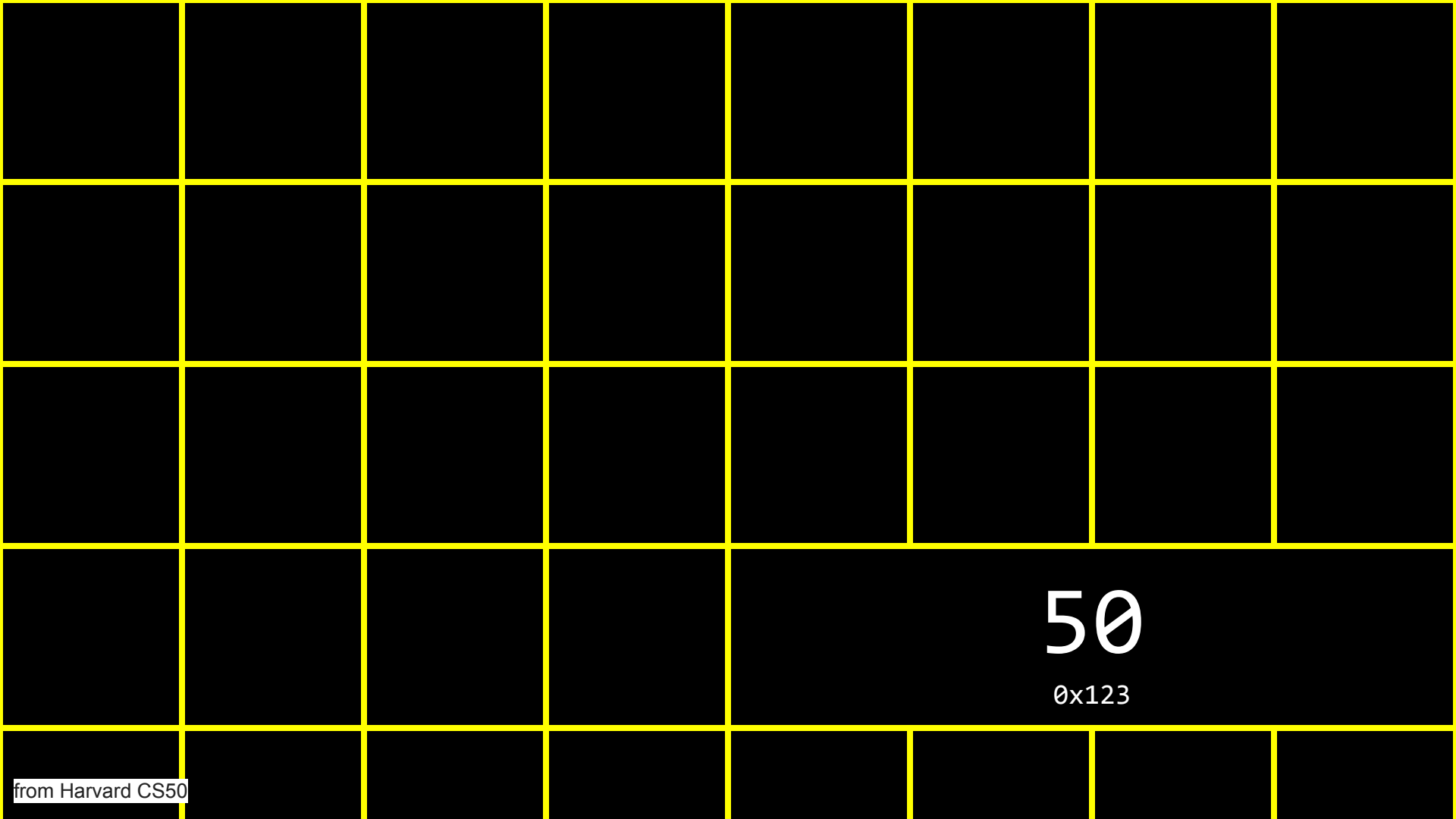
https://xkcd.com/138


0x0
0x1
0x2
0x3
0x4
0x5
0x6
0x7
0x8
0x9
0xA
0xB
0xC
0xD
0xE
0xF
0x10
0x11
0x12
0x13
0x14
0x15
0x16
0x17
0x18
0x19
0x1A
0x1B
0x1C
0x1D
0x1E
0x1F
from Harvard CS50

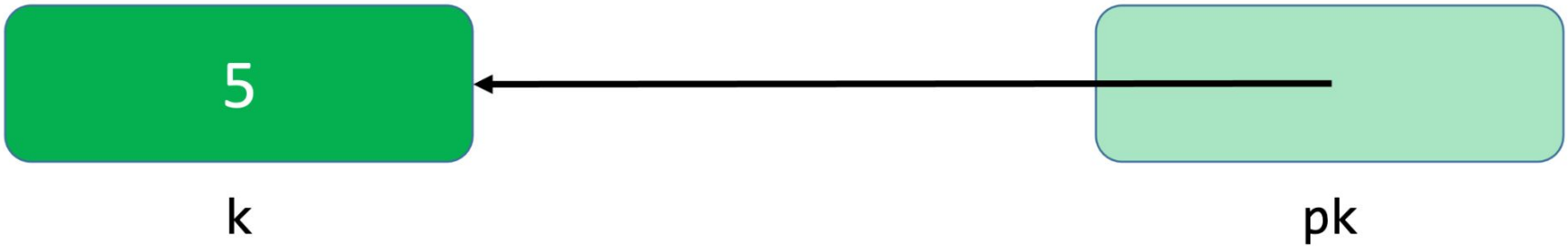
```
int n = 50;
```



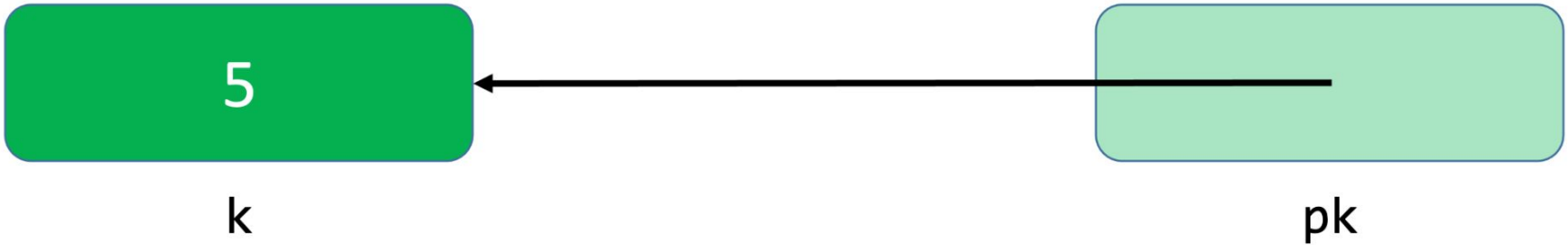
from Harvard CS50



from Harvard CS50

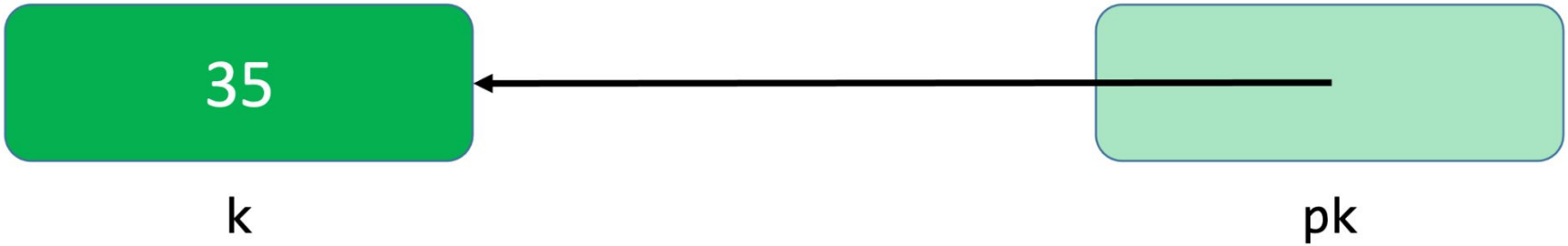


from Harvard CS50



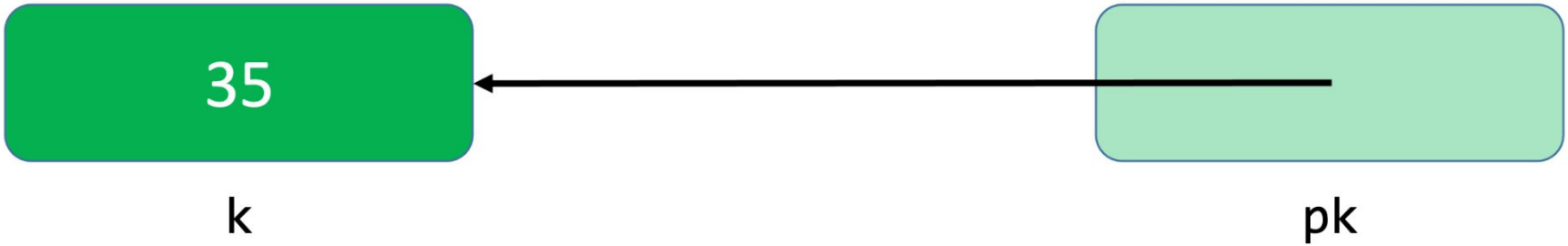

```
*pk = 35;
```

from Harvard CS50



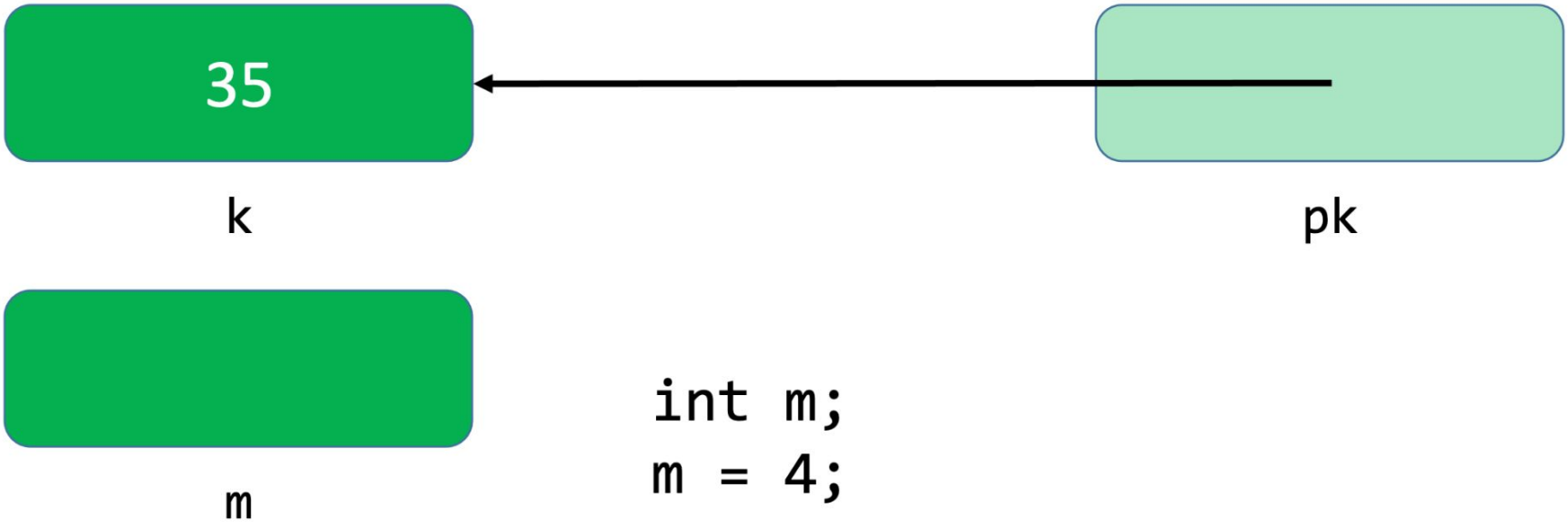

```
*pk = 35;
```

from Harvard CS50

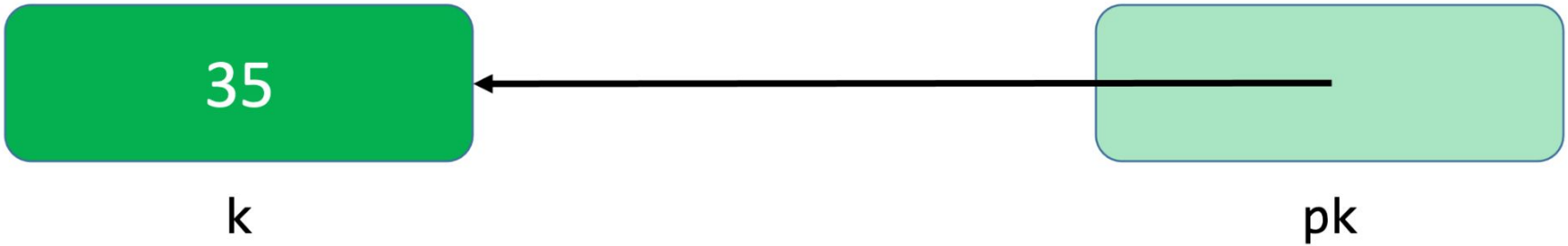



```
int m;
```

from Harvard CS50

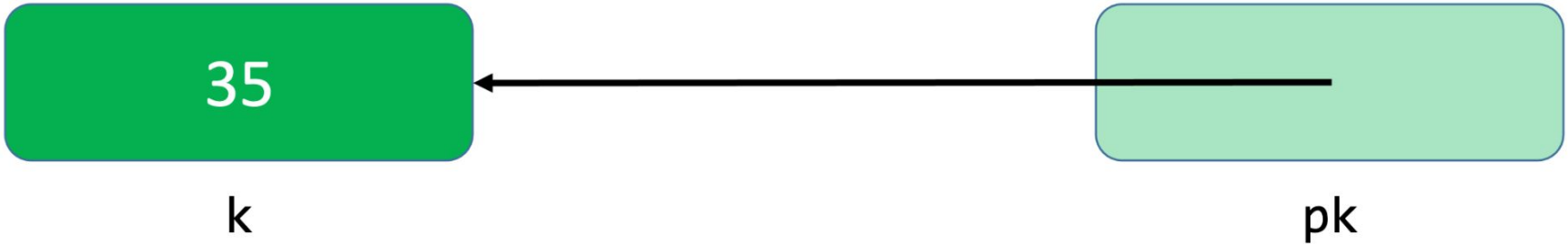


from Harvard CS50



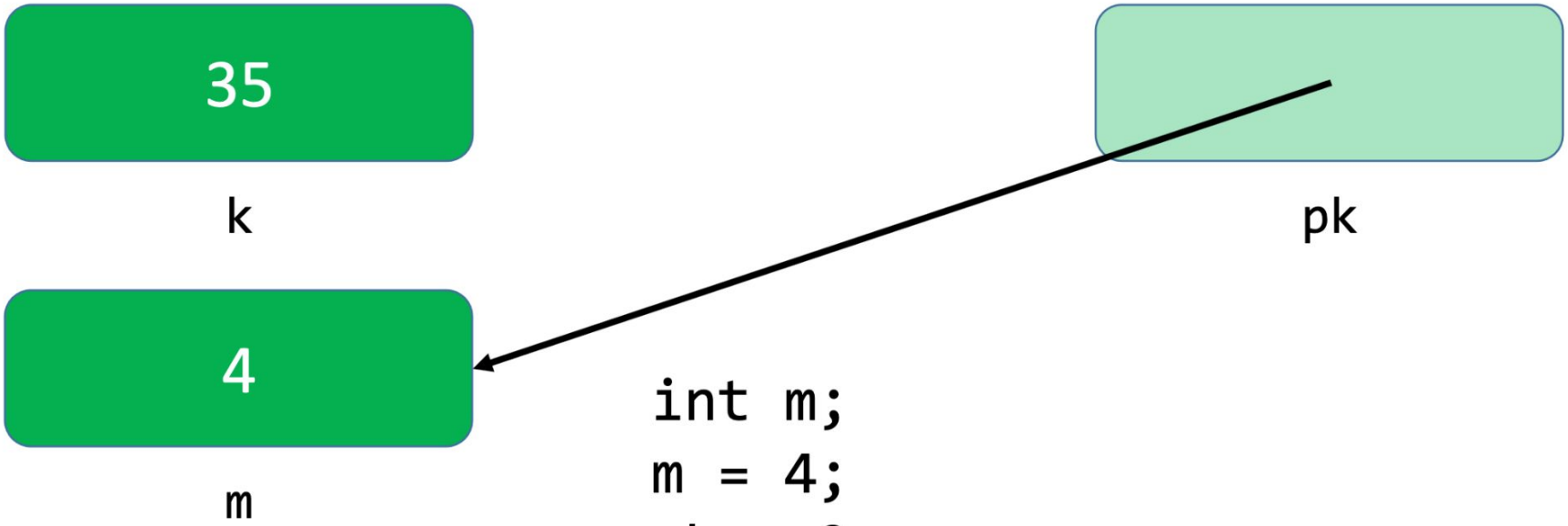
```
int m;
m = 4;
```

from Harvard CS50

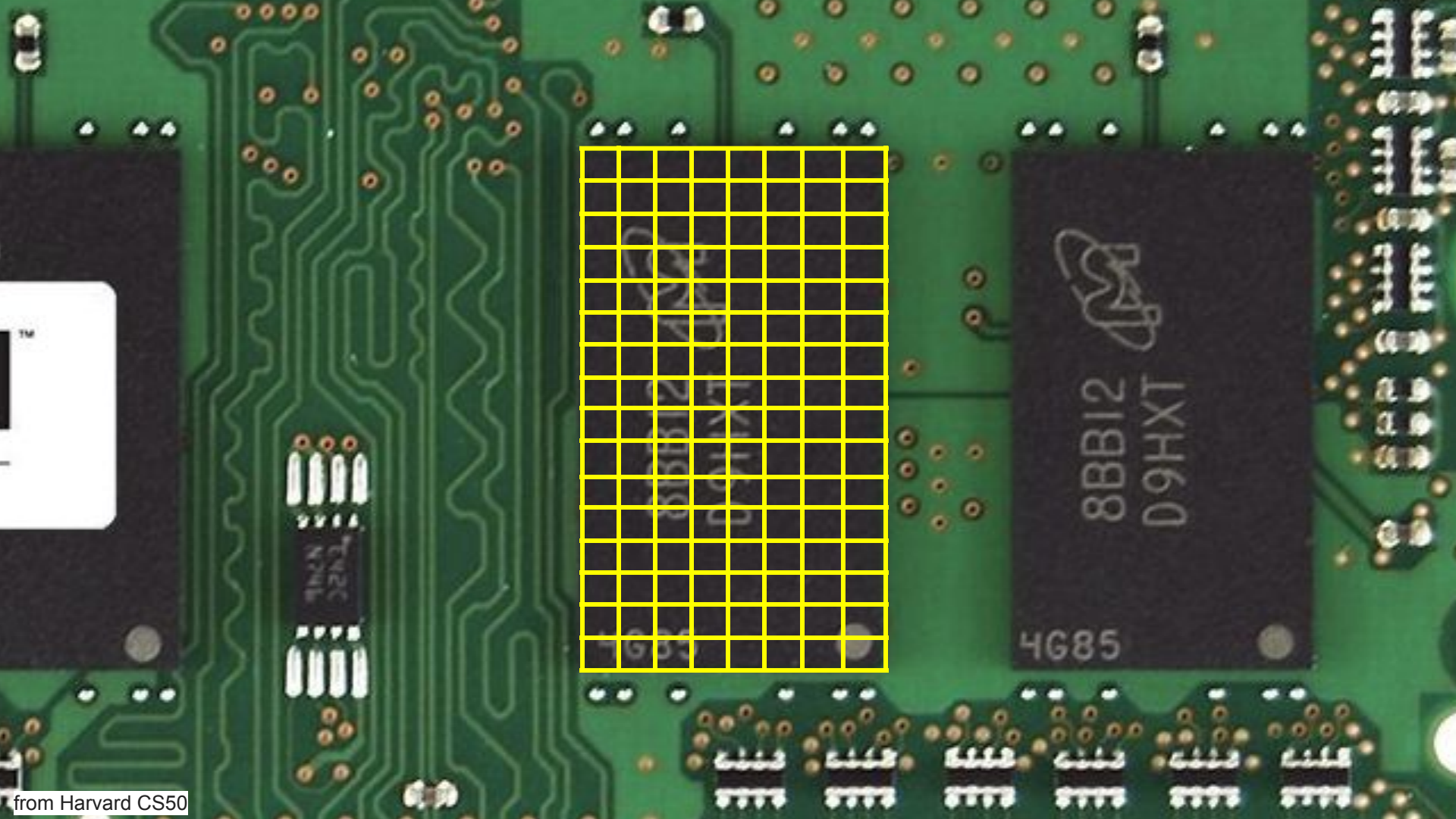



```
int m;
m = 4;
pk = &m;
```

from Harvard CS50



from Harvard CS50



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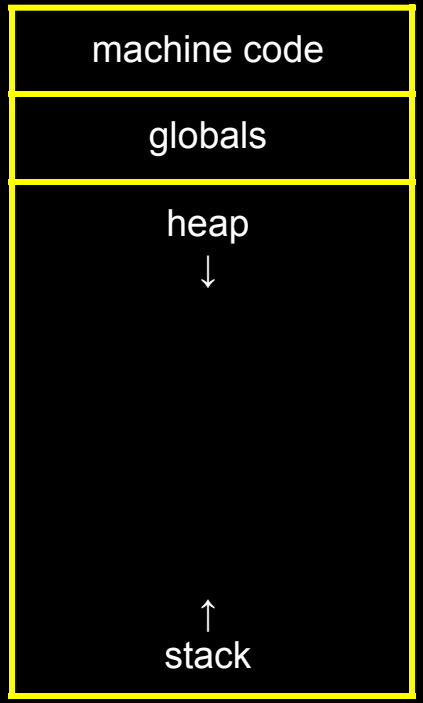

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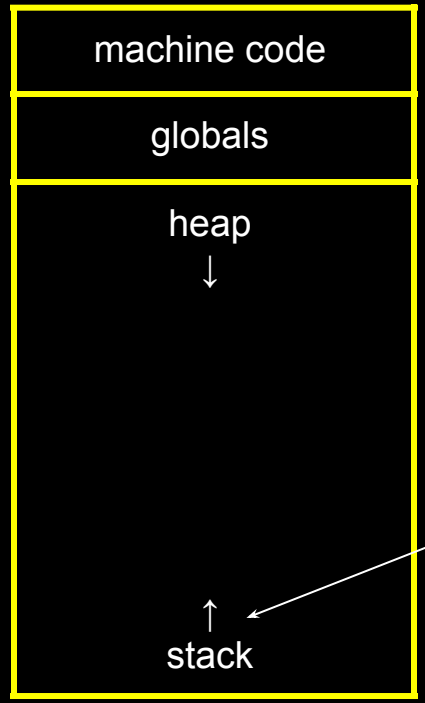


new keyword

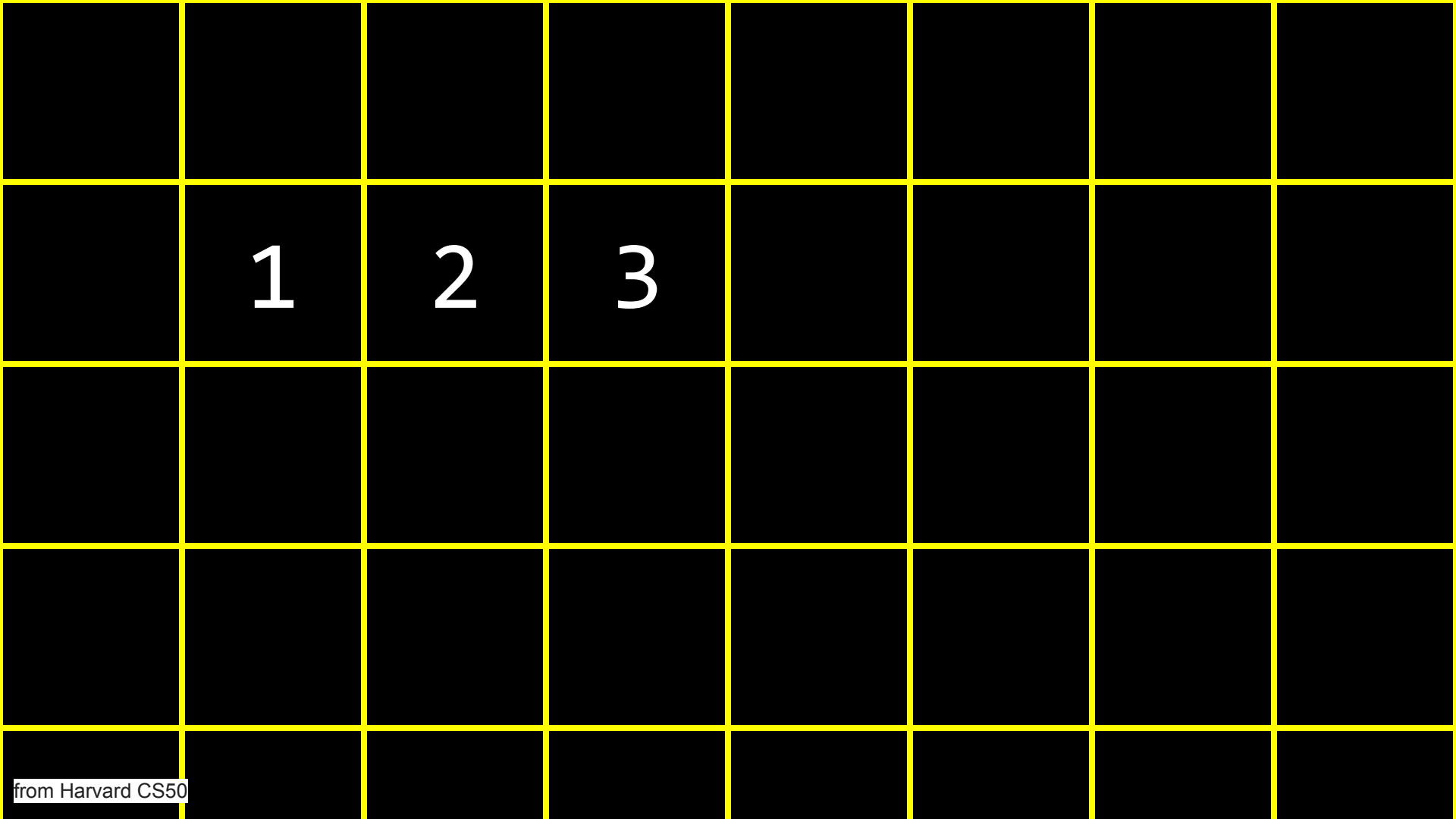
control: we get to allocate (and must free with **delete**)

local scope

control: clears by itself, after every function

from Harvard CS50

```
x = new int;
```



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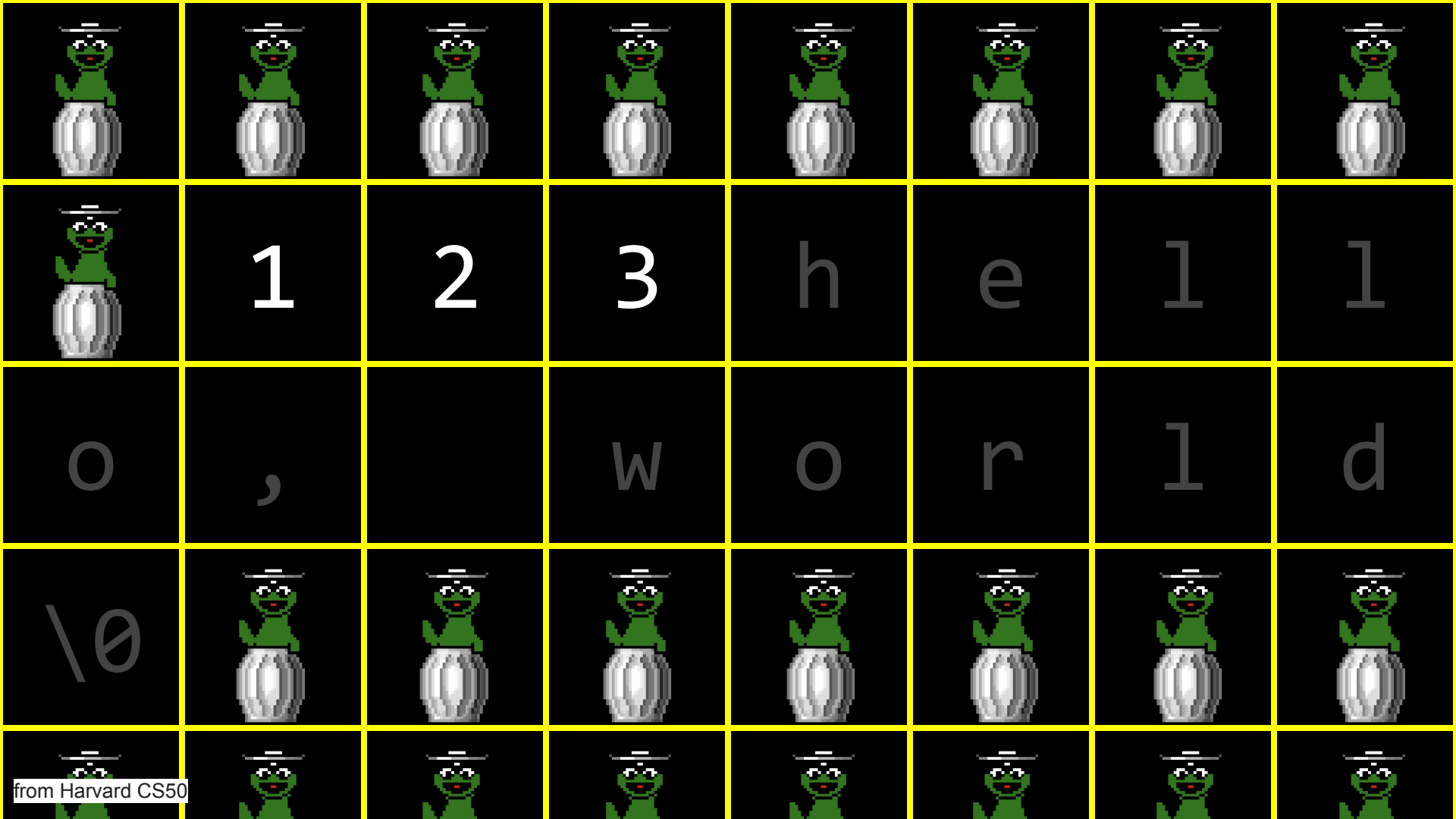


from Harvard CS50

1	2	3

from Harvard CS50

1	2	3

1			

from Harvard CS50

1	2	3

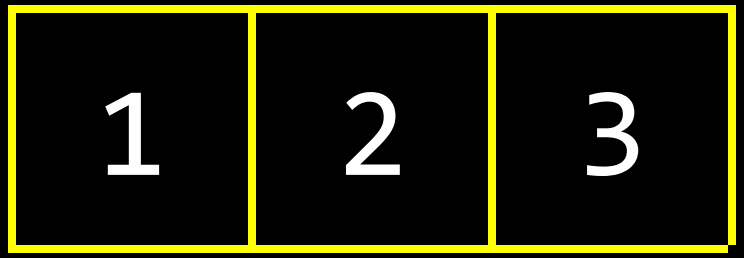
1	2		

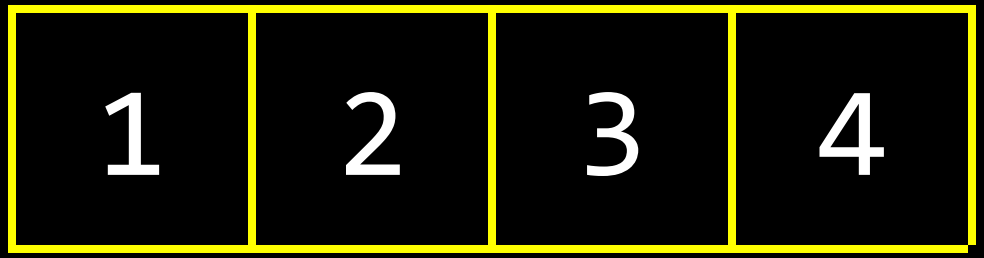
from Harvard CS50

1	2	3

1	2	3	

from Harvard CS50





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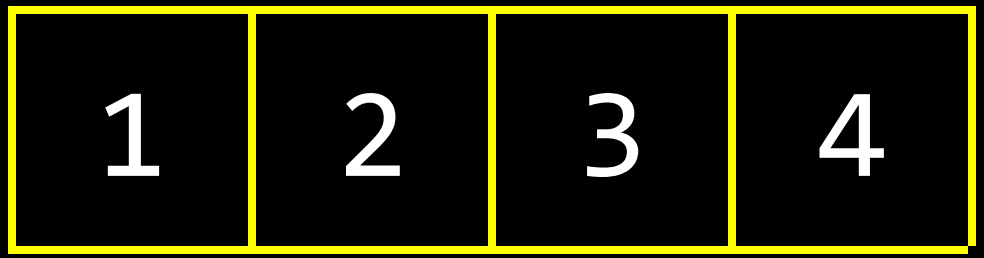
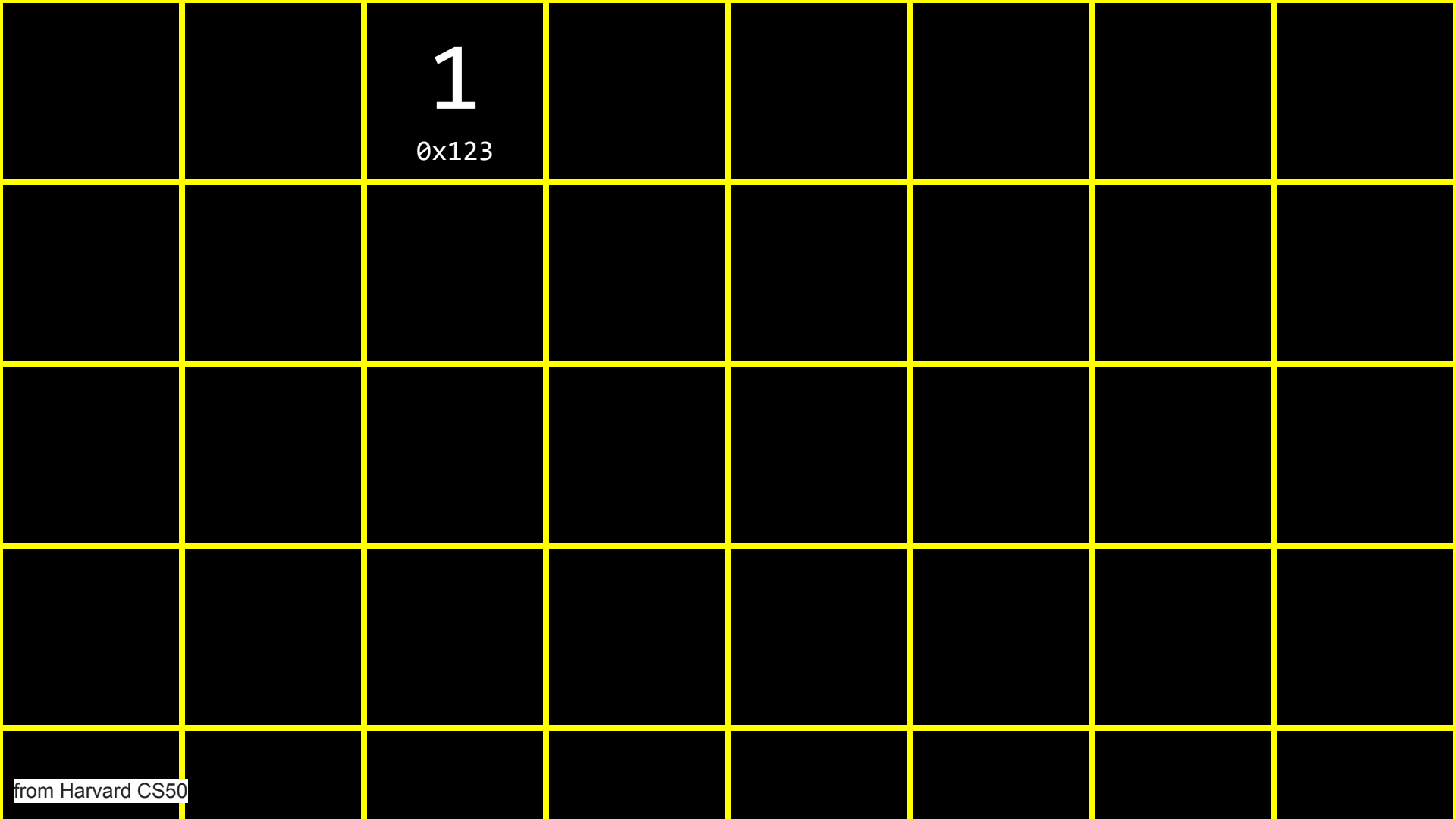


from Harvard CS50

linked lists

from Harvard CS50

from Harvard CS50



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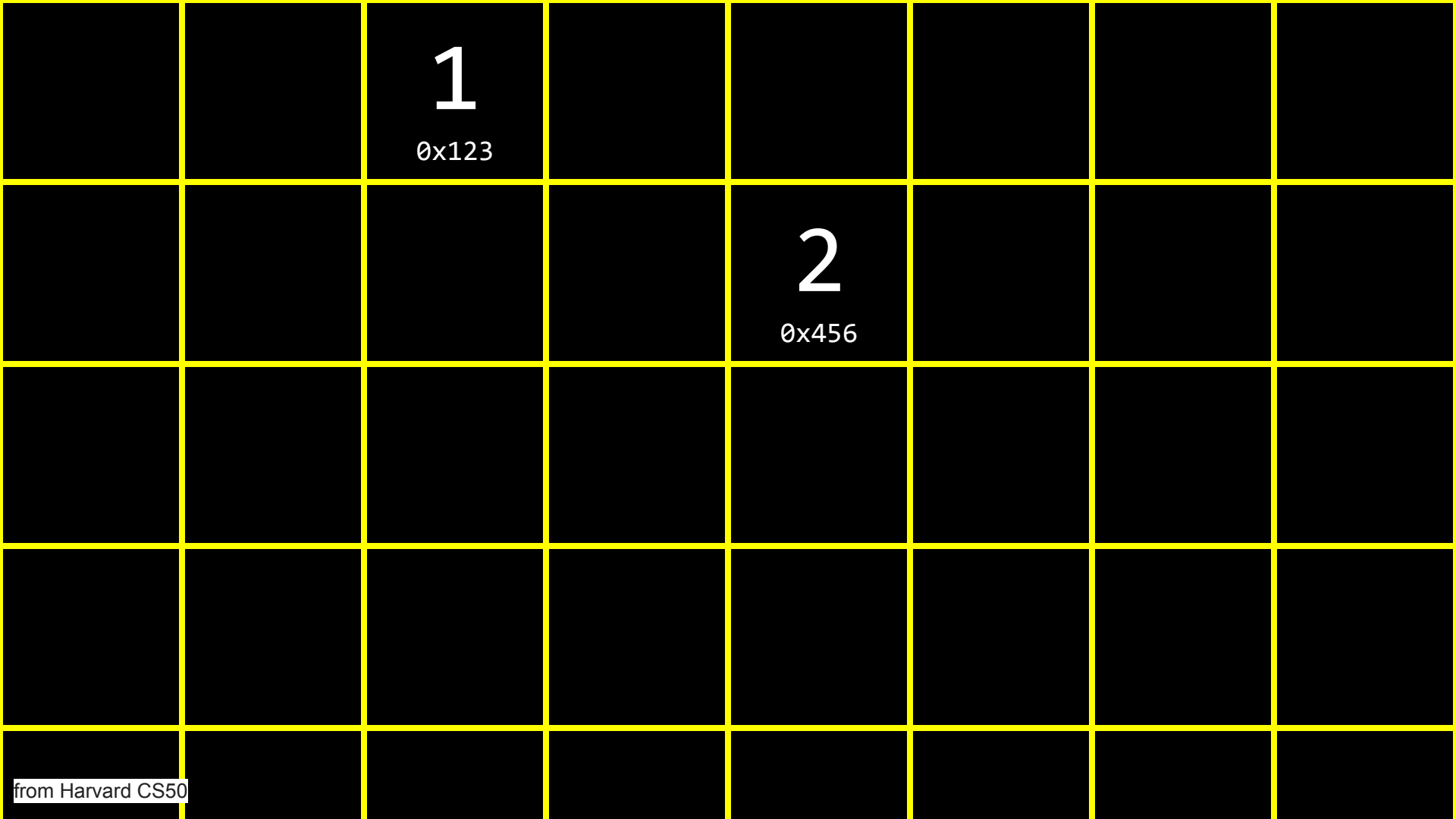

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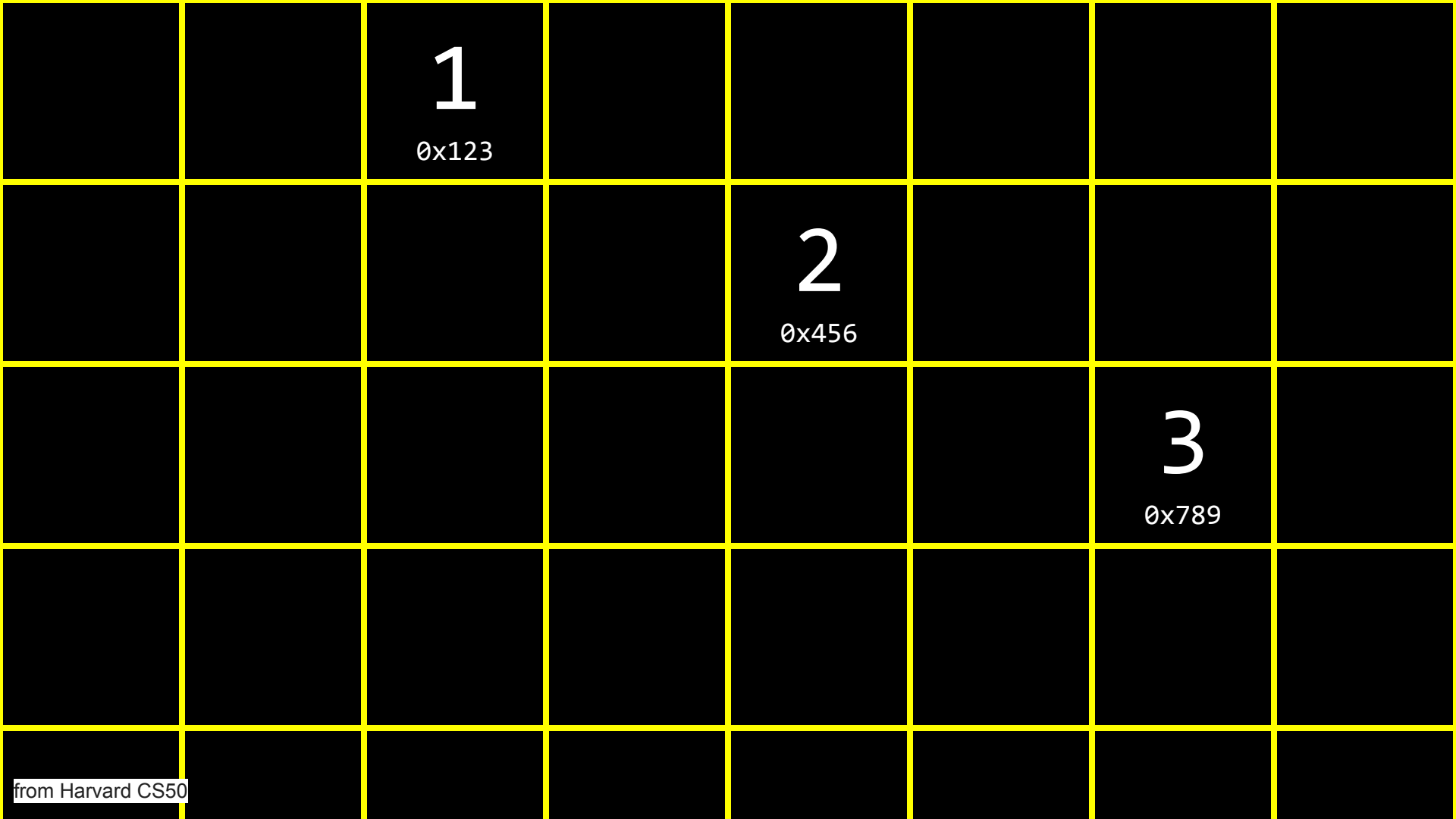

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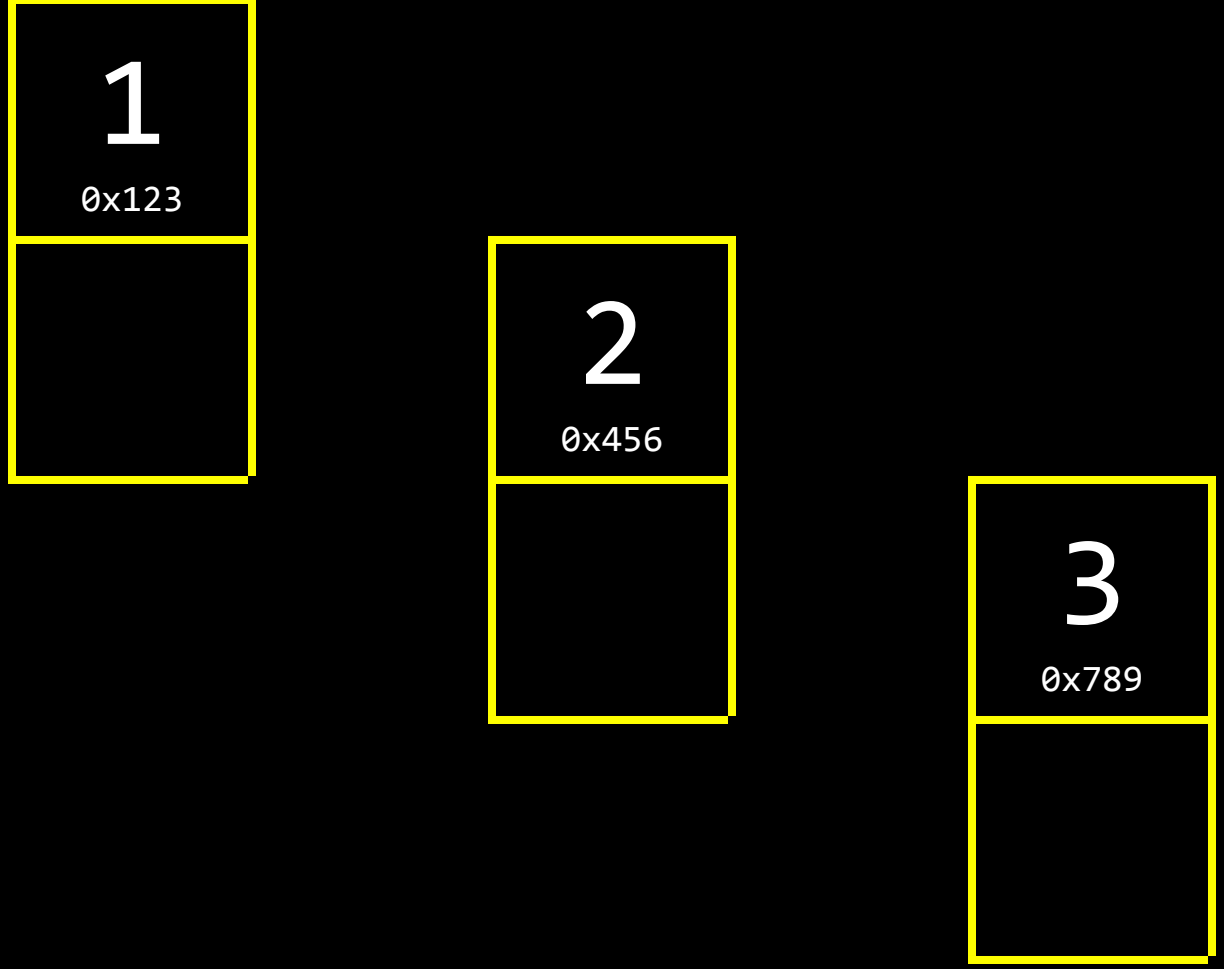

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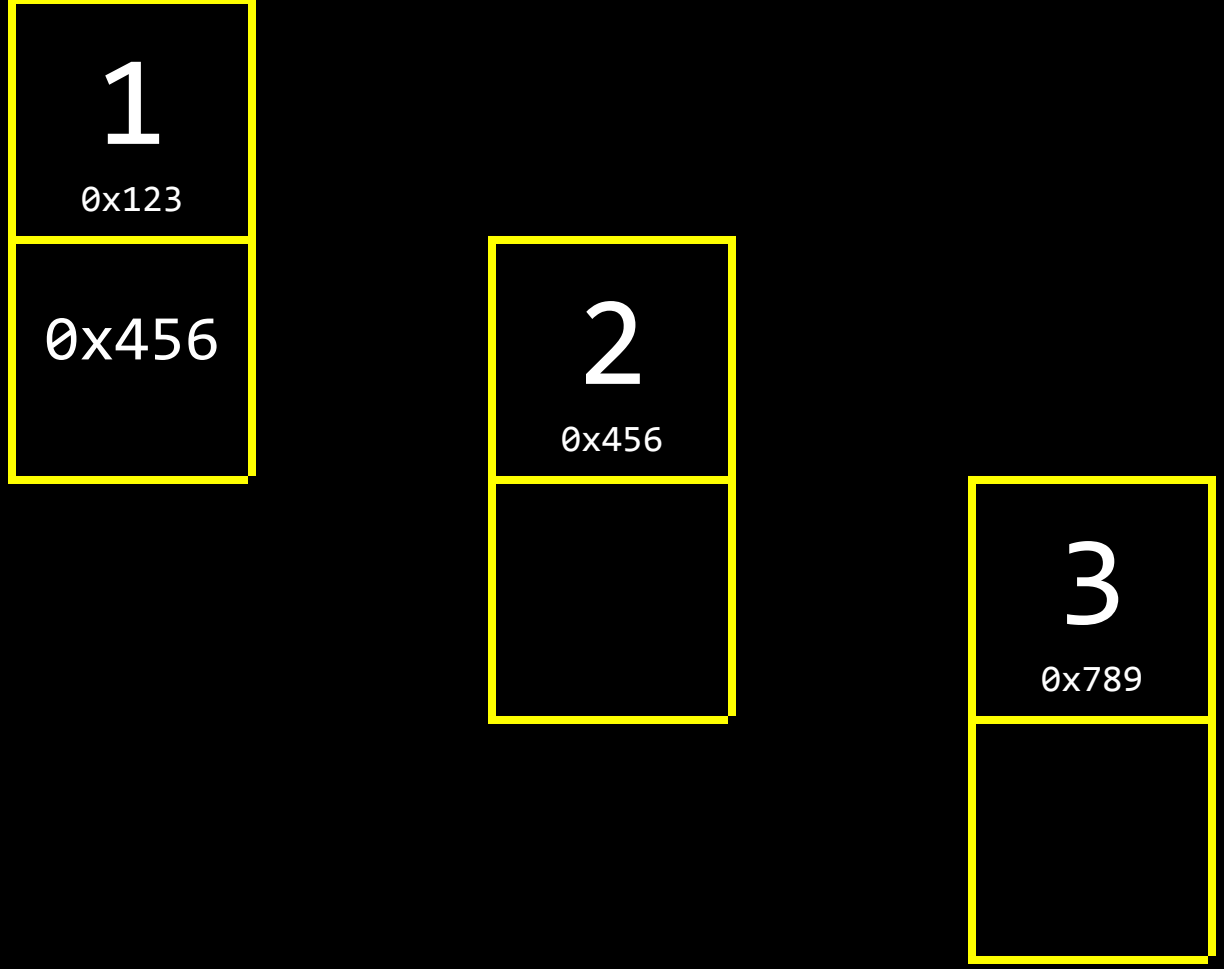

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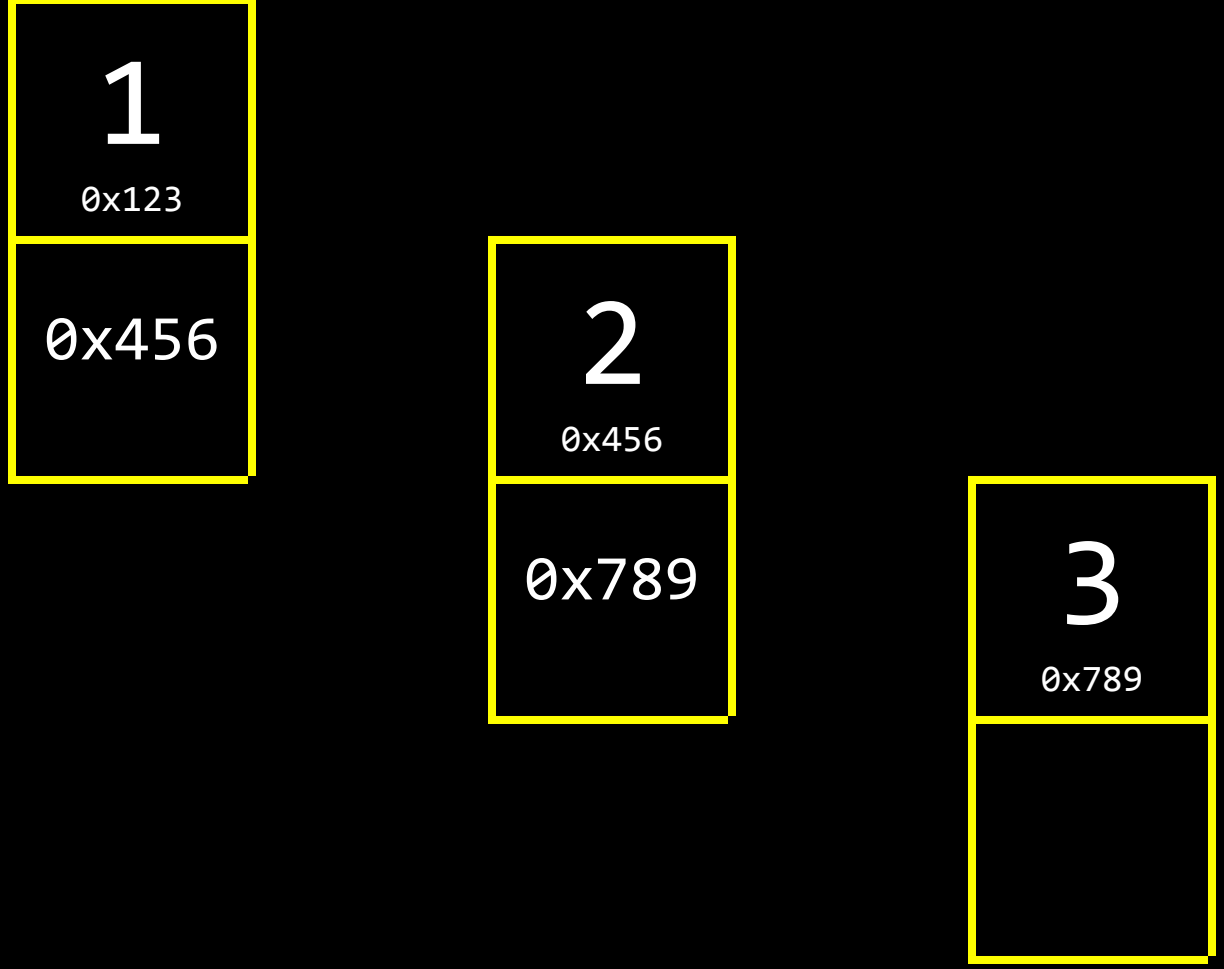

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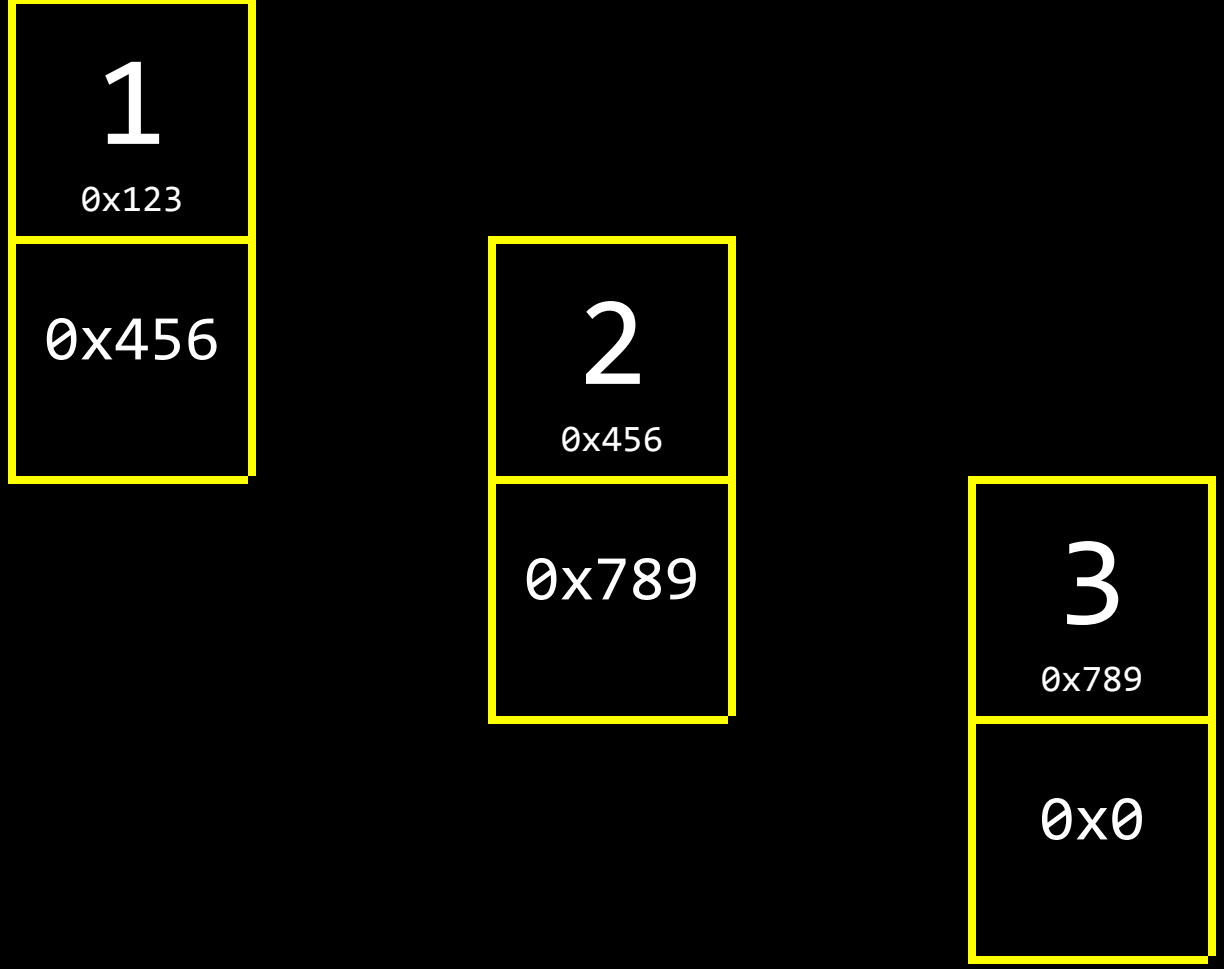

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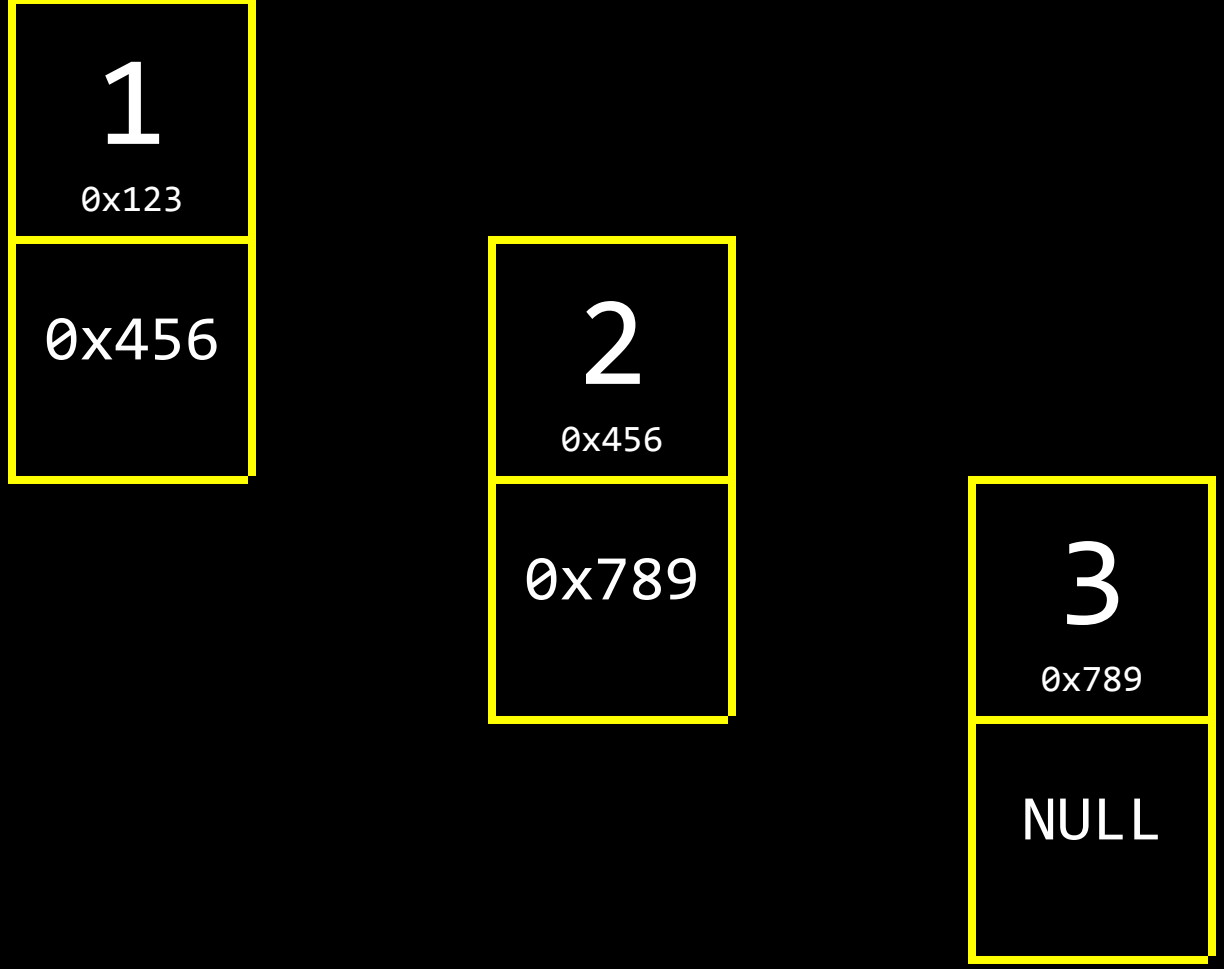

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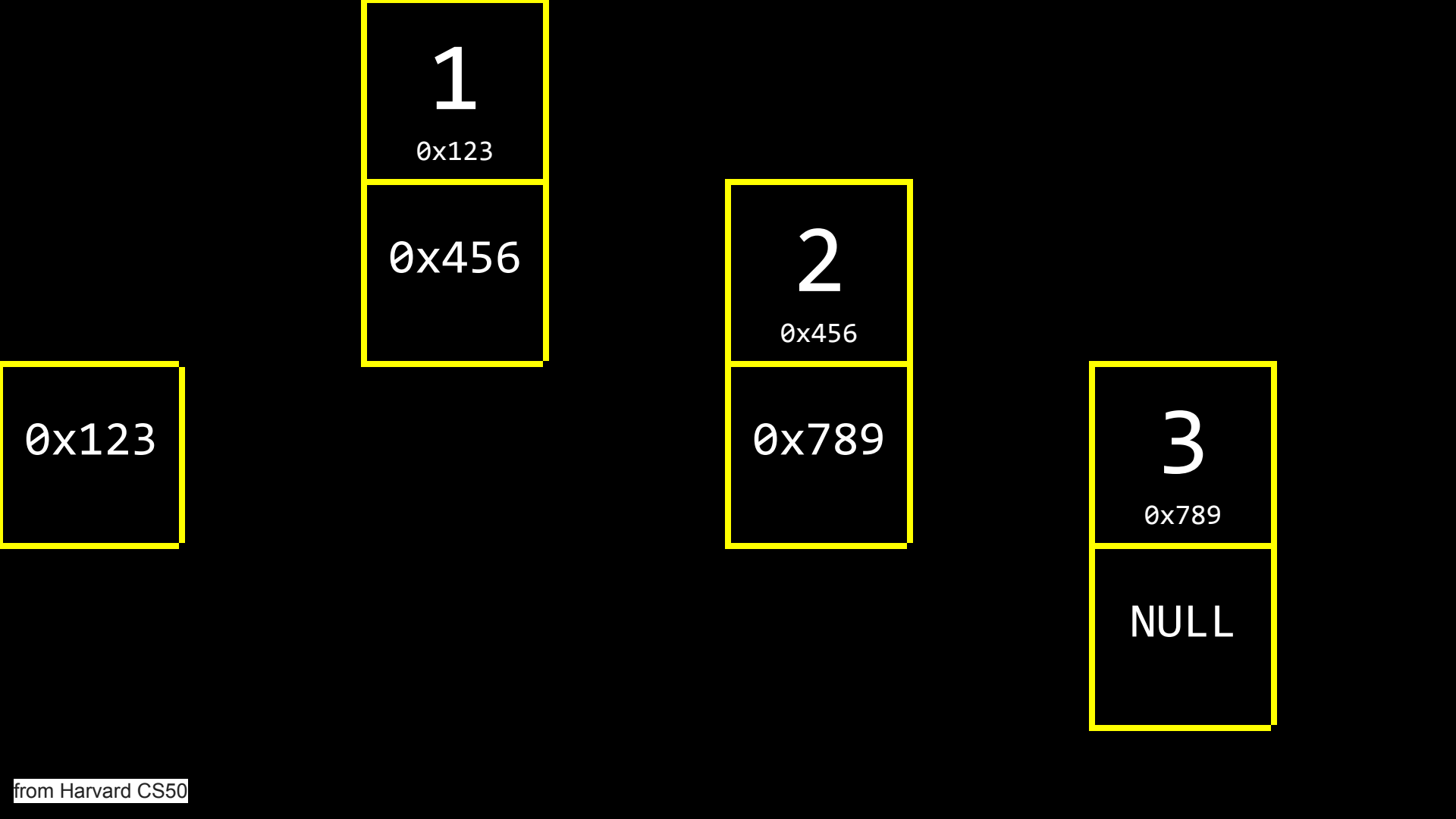

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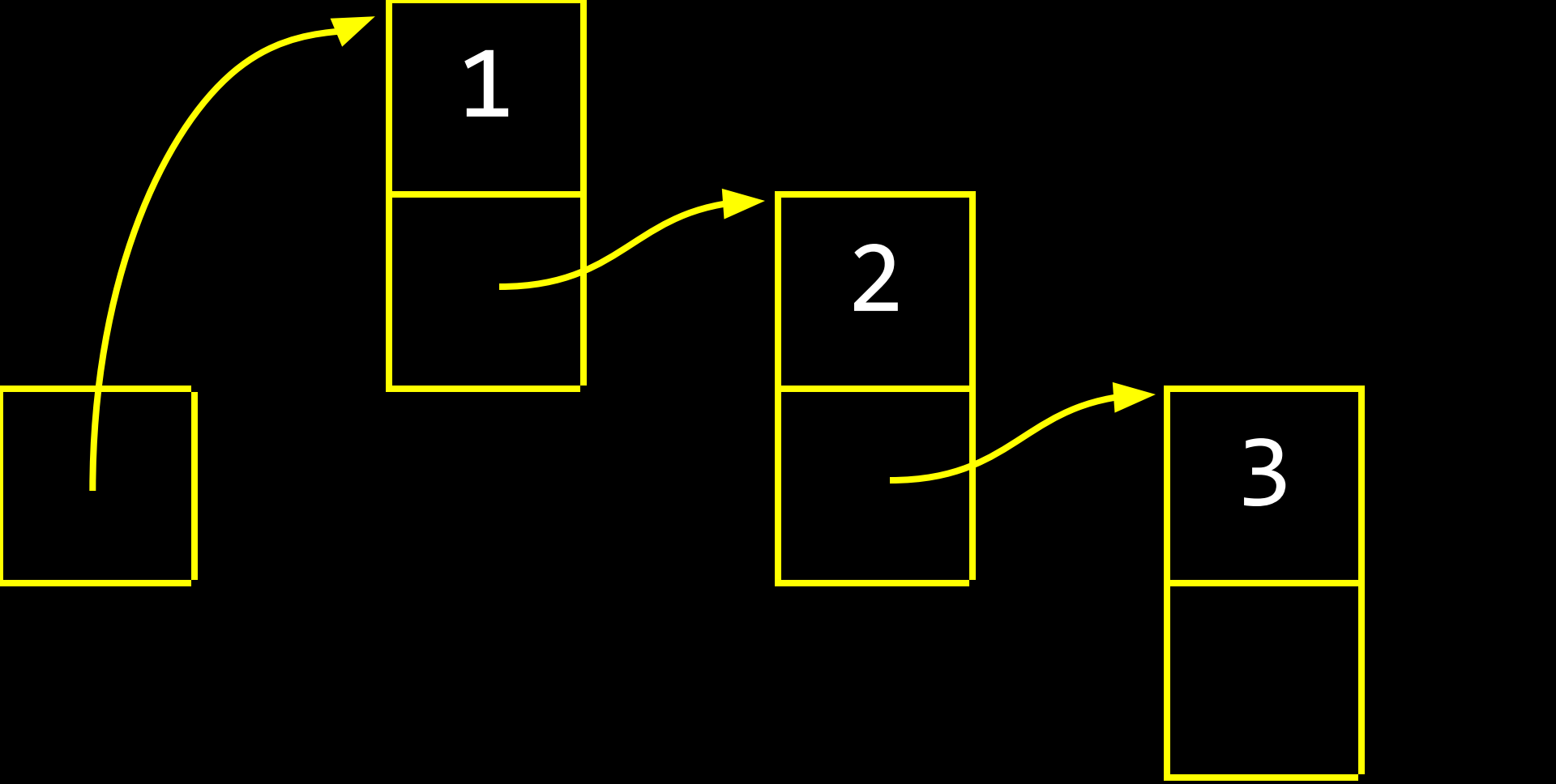

from Harvard CS50