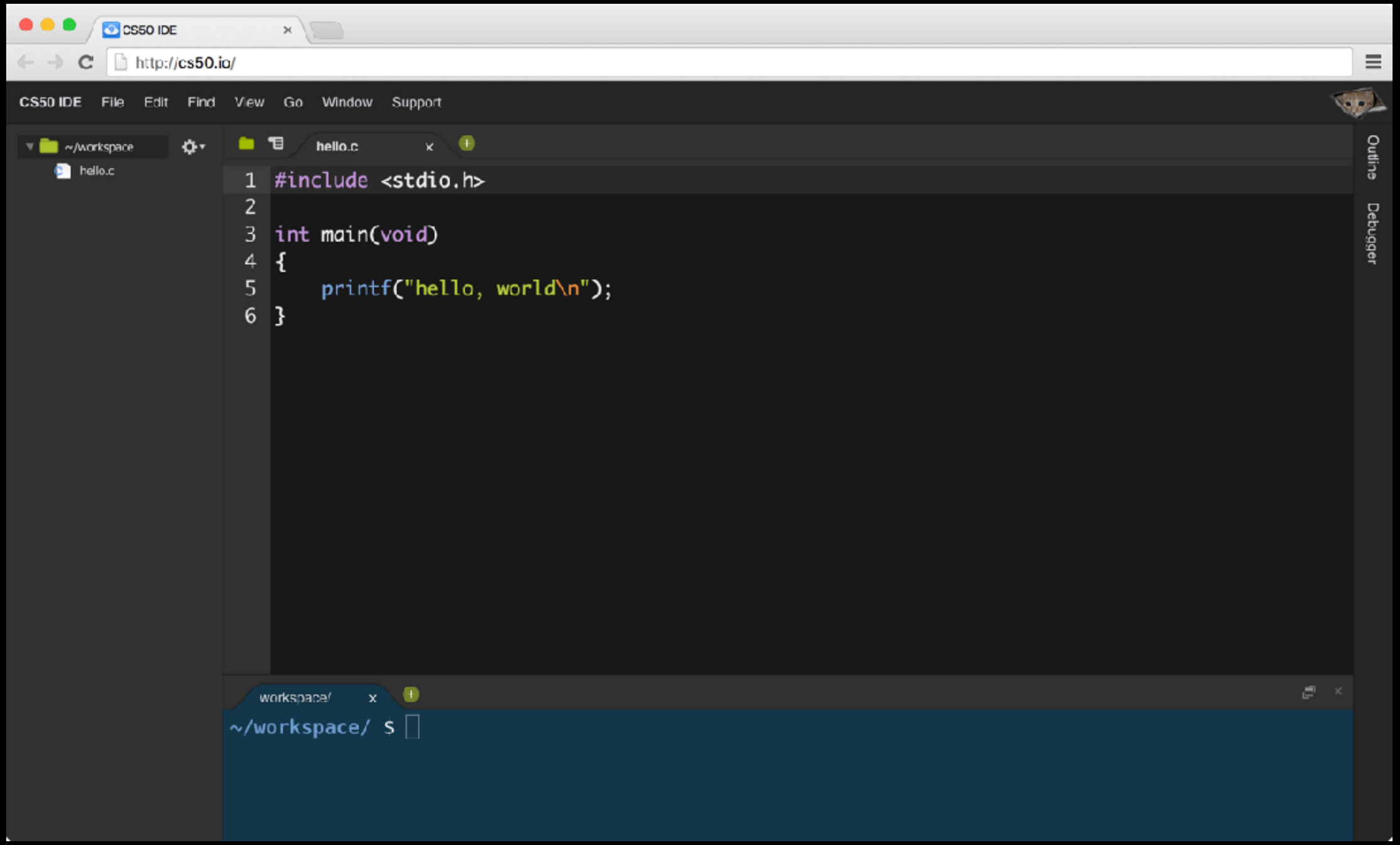
CS50

MARIO
000000
×00
WORLD
1-1
TIME
SUPER
MARIO BROS.
©1985 NINTENDO
1 PLAYER GAME
2 PLAYER GAME
TOP- 000000

CS50

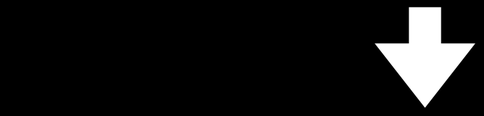

CS50 IDE
http://cs50.io/
CS50 IDE File Edit Find View Go Window Support
~/workspace
hello.c
hello.c
1 #include <stdio.h>
2
3 int main(void)
4 {
5 printf("hello, world\n");
6 }
Outline
Debugger
workspace/
~/workspace/ $

```c
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```

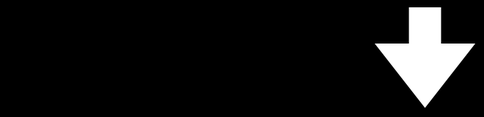
```
01111111 01000101 01001100 01000110 00000010 00000001 00000001 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000010 00000000 00111110 00000000 00000001 00000000 00000000 00000000
10110000 00000101 01000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
11010000 00010011 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 01000000 00000000 00111000 00000000
00001001 00000000 01000000 00000000 00100100 00000000 00100001 00000000
00000110 00000000 00000000 00000000 00000101 00000000 00000000 00000000
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 01000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 01000000 00000000 00000000 00000000 00000000 00000000
11111000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
11111000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
00001000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000011 00000000 00000000 00000000 00000100 00000000 00000000 00000000
00111000 00000010 00000000 00000000 00000000 00000000 00000000 00000000
00111000 00000010 01000000 00000000 00000000 00000000 00000000 00000000
00111000 00000010 01000000 00000000 00000000 00000000 00000000 00000000
00011100 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

...

source code



compiler



machine code

```
clang hello.c

./a.out
```

```
clang -o hello hello.c

./hello
```

```
clang -o hello hello.c -lcs50

./hello
```

```
make hello

./hello
```

compiling

preprocessing

compiling

assembling

linking

```c
#include <stdio.h>


int main(void)
{
    printf("hello, world\n");
}
```

```c
#include <stdio.h>


int main(void)
{
    printf("hello, world\n");
}
```

```
...
int printf(const char *format, ...)
...

int main(void)
{
    printf("hello, world\n");
}
```

```
...
int printf(const char *format, ...)
...

int main(void)
{
    printf("hello, world\n");
}
```

```
main:                                   # @main
  .cfi_startproc
# BB#0:
  pushq   %rbp
.Ltmp0:
  .cfi_def_cfa_offset 16
.Ltmp1:
  .cfi_offset %rbp, -16
  movq %rsp, %rbp
.Ltmp2:
  .cfi_def_cfa_register %rbp
  subq $16, %rsp
  movabsq$.L.str, %rdi
  movb $0, %al
  callq  printf
  ...
```

```
00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
00000001 00000000 00111110 00000000
00000001 00000000 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
00110000 00000010 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
01000000 00000000 00000000 00000000
00000000 00000000 01000000 00000000
00001010 00000000 00000001 00000000
01010101 01001000 10001001 11100101
01001000 10000011 11101100 ...
```

01111111 01000101 01001100 01000110 00000010 00000001 00000001 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000010 00000000 00111110 00000000 00000001 00000000 00000000 00000000
10110000 00000101 01000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
11010000 00010011 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 01000000 00000000 00111000 00000000
00001001 00000000 01000000 00000000 00100100 00000000 00100001 00000000
00000110 00000000 00000000 00000000 00000101 00000000 00000000 00000000
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 01000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 01000000 00000000 00000000 00000000 00000000 00000000
11111000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
11111000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
00001000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000011 00000000 00000000 00000000 00000100 00000000 00000000 ...

preprocessing

compiling

assembling

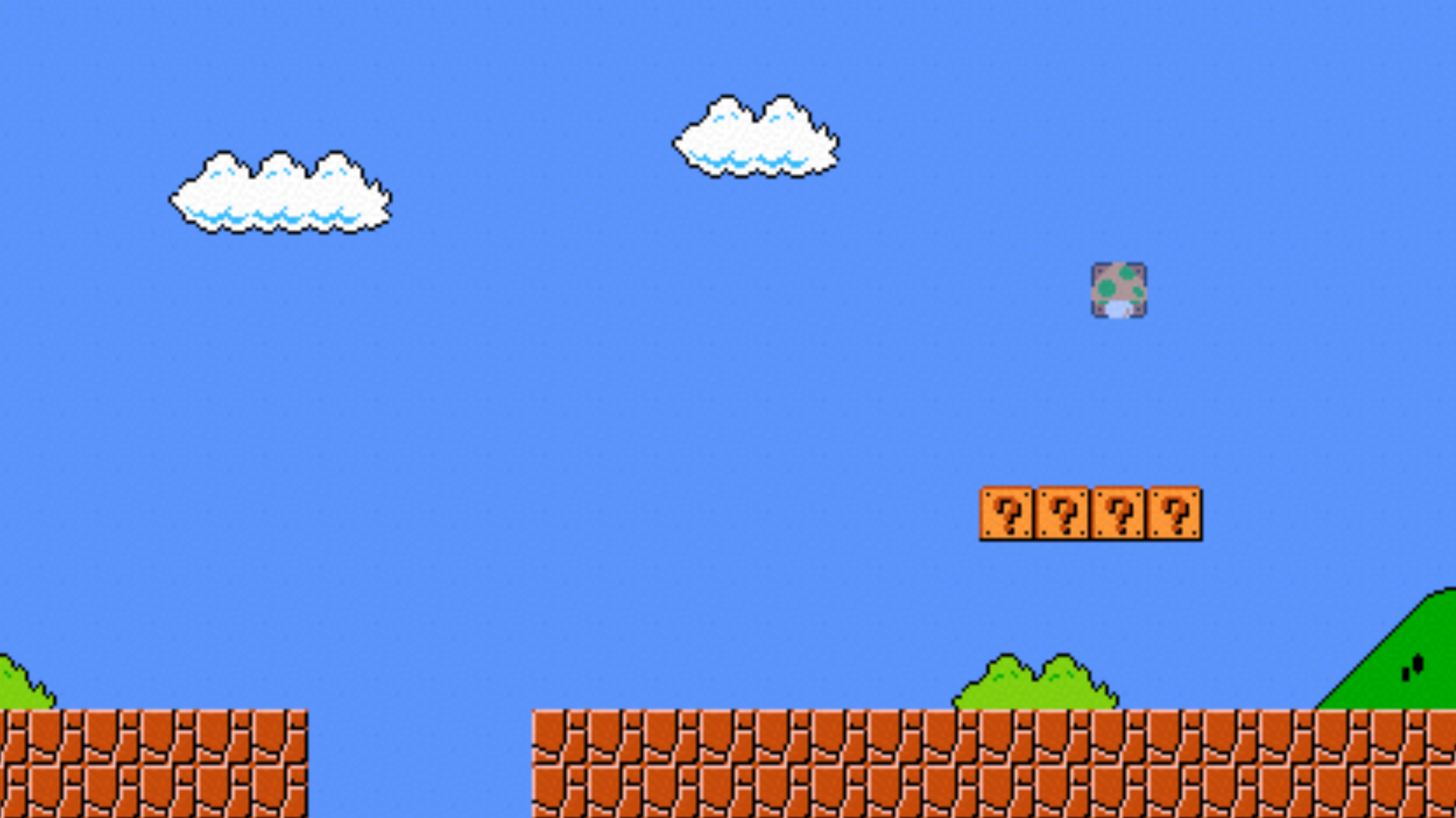
linking

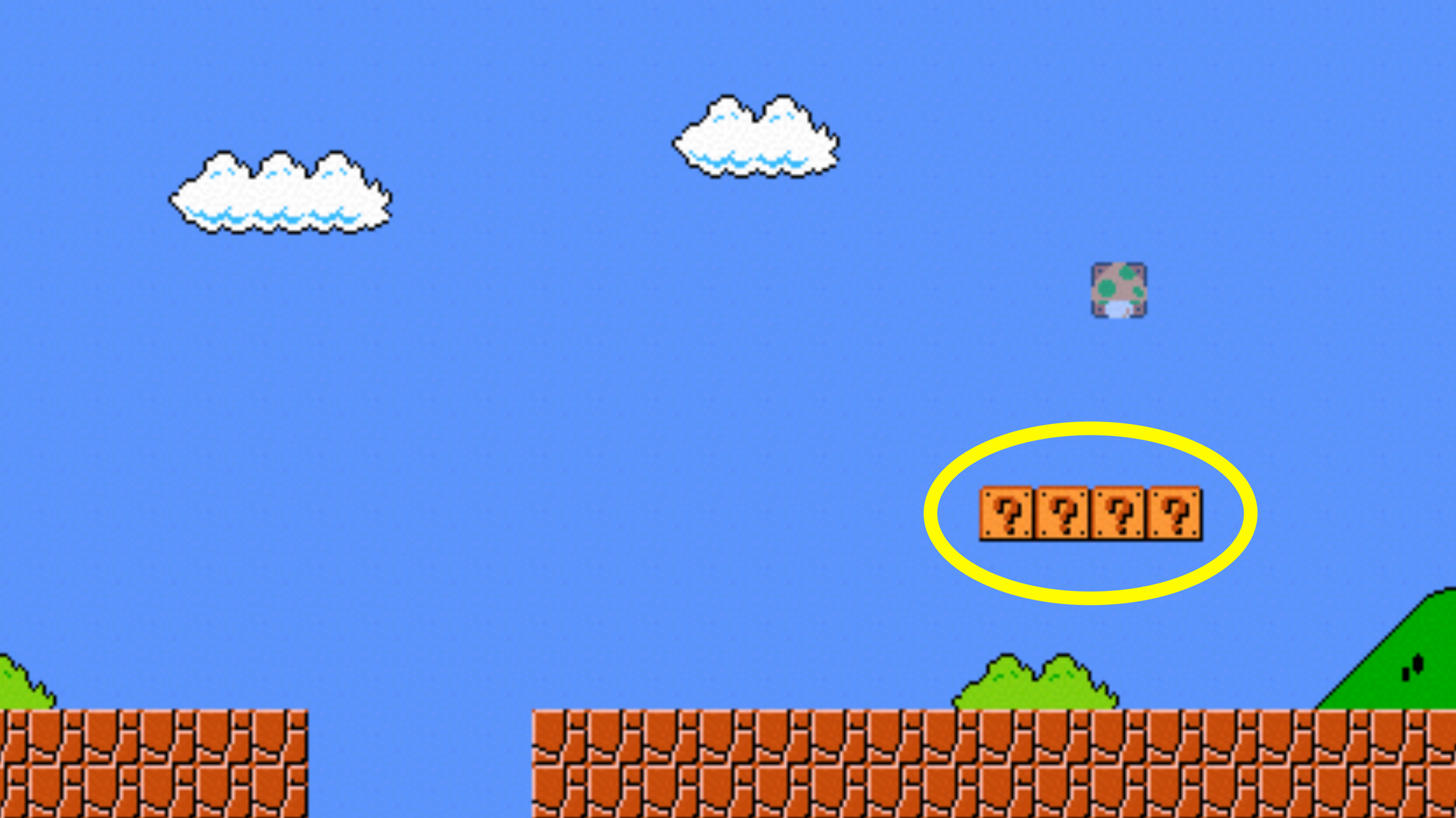
compiling

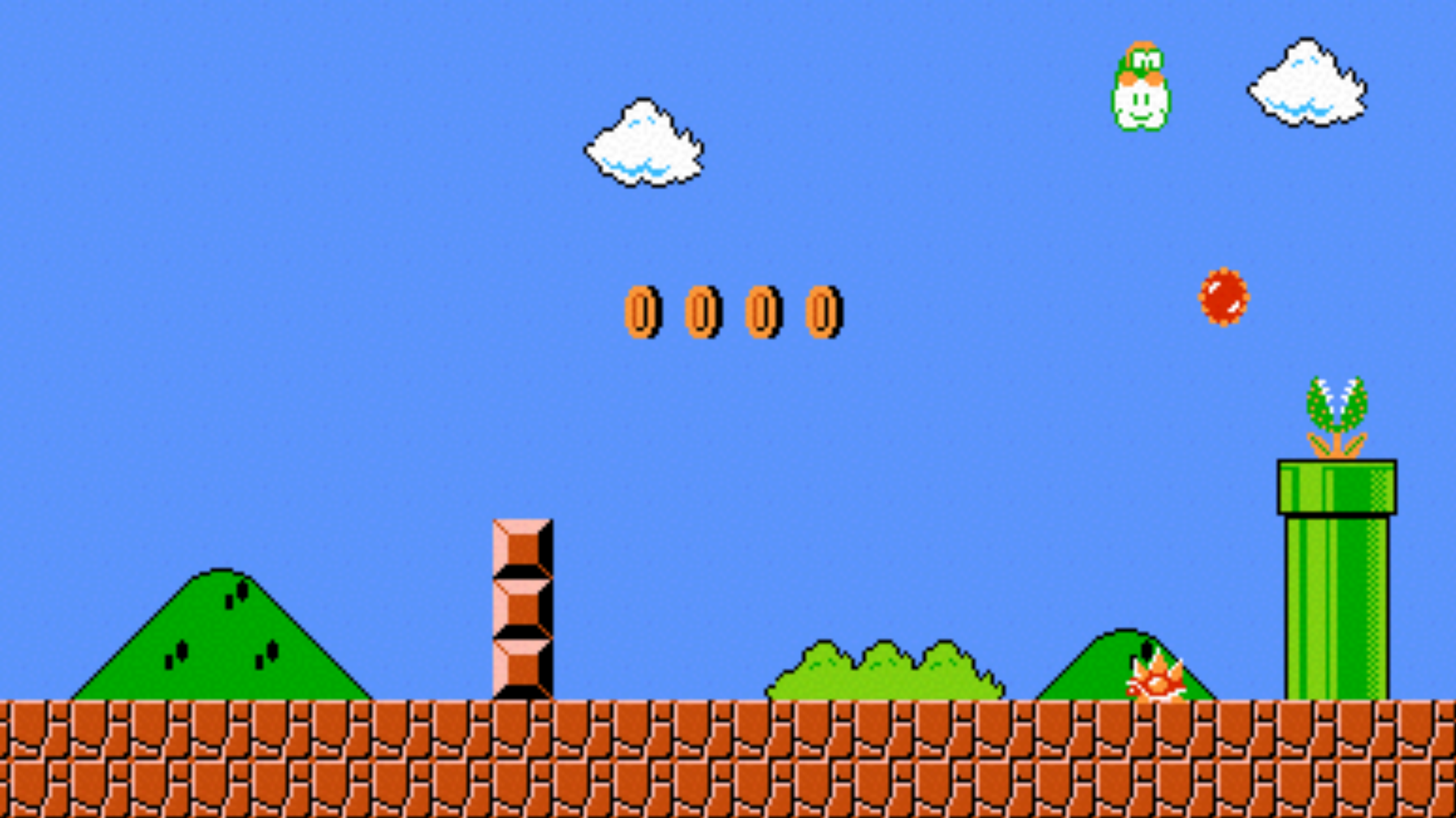
```
help50

check50

style50
```

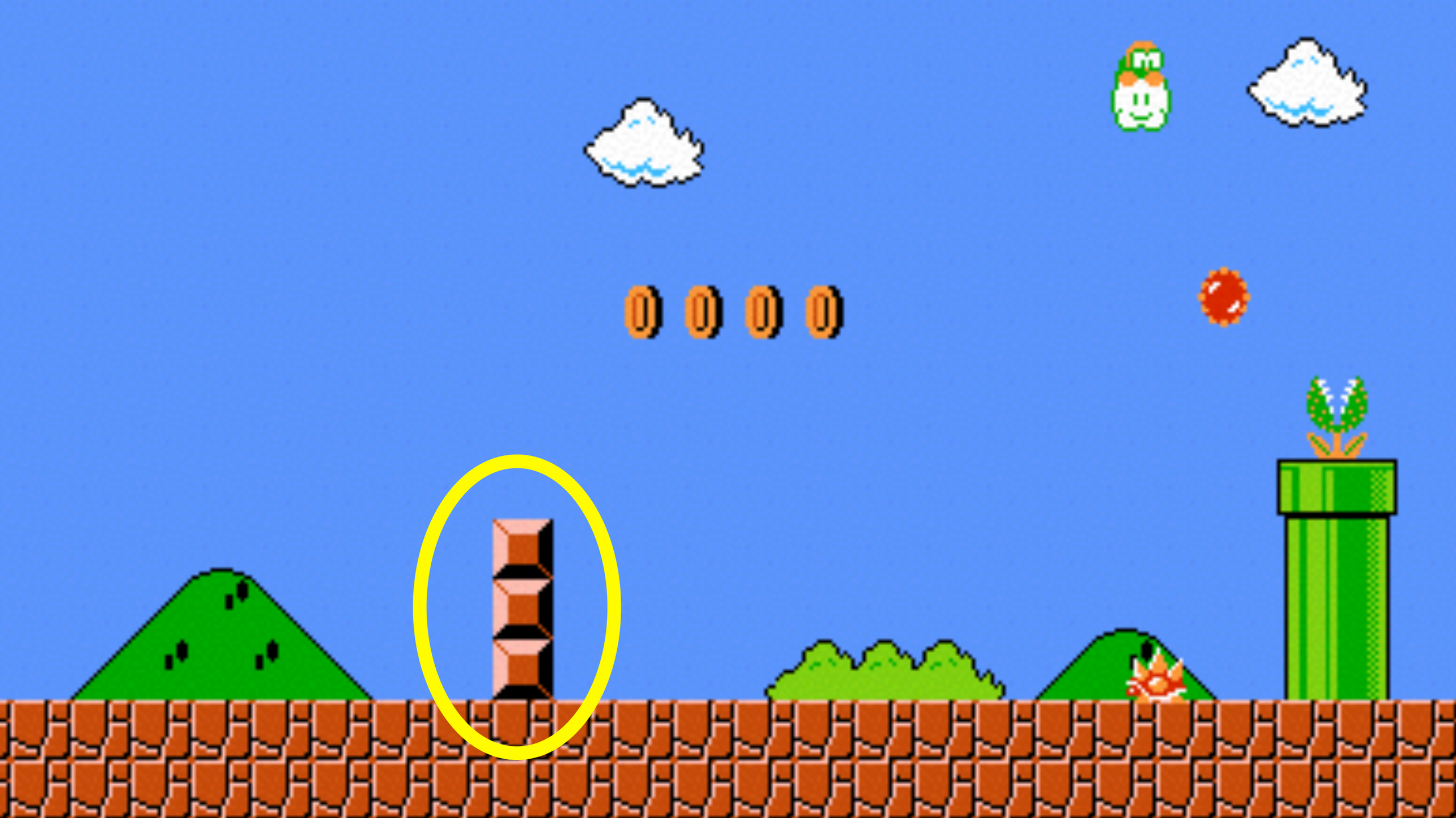
eprintf

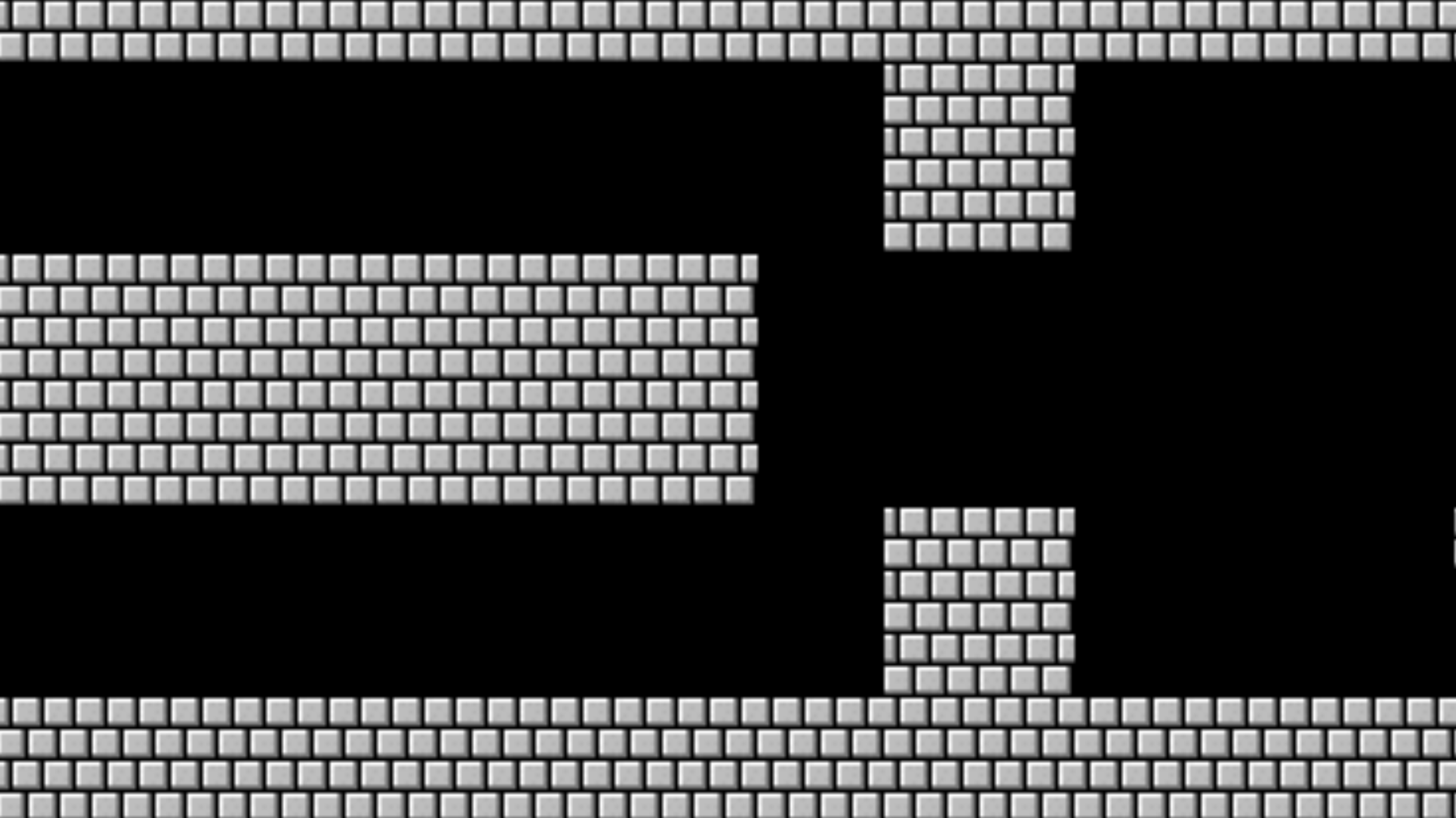
debug50

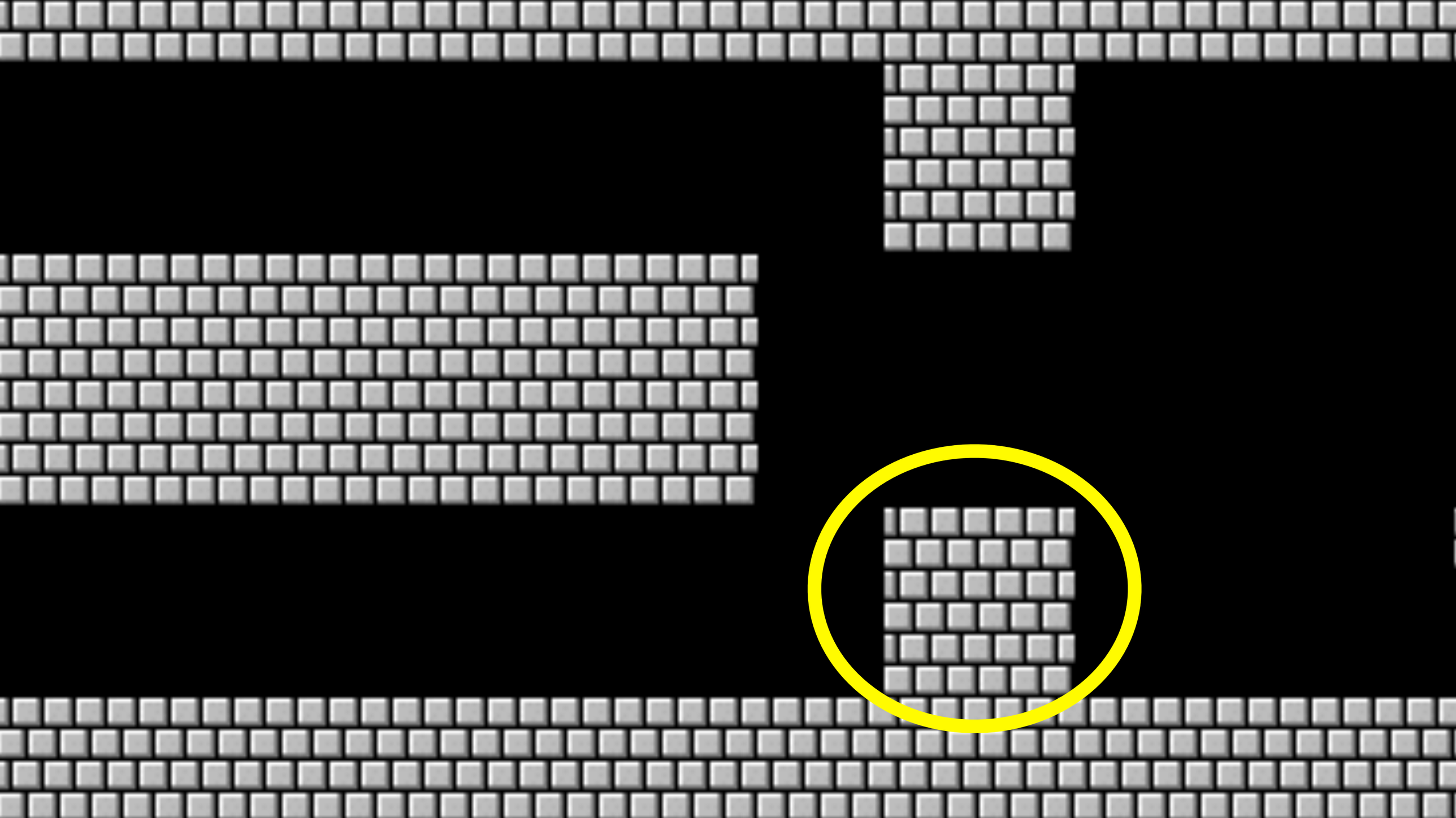












printf

```
get_char

get_double

get_float

get_int

get_long_long

get_string
```

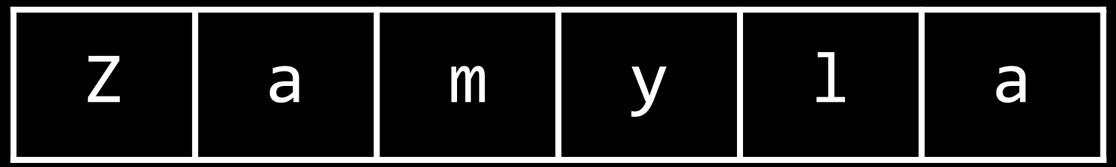
```
bool

char

double

float

int

long long

string

...
```

```
%c

%f

%i

%lld

%s

...
```

string

Z a m y l a

string



typecasting

ASCII

A	B	C	D	E	F	G	H	I	...
65	66	67	68	69	70	71	72	73	...

ASCII

A	B	C	D	E	F	G	H	I	...
65	66	67	68	69	70	71	72	73	...

a	b	c	d	e	f	g	h	i	...
97	98	99	100	101	102	103	104	105	...

libraries

```
stdio

cs50

string

ctype

...
```

header files

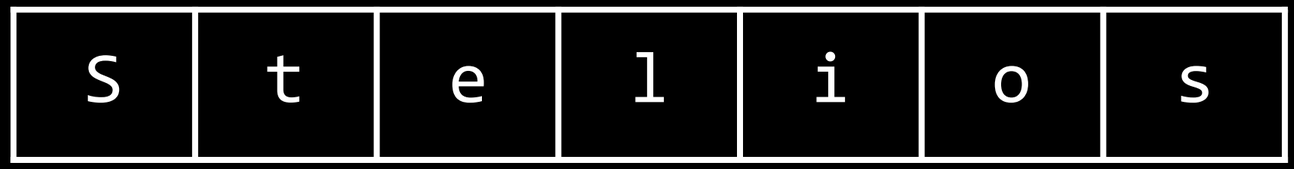
```
stdio.h

cs50.h

string.h

ctype.h

...
```

man

string

S t e l i o s

string



crucial
by Micron
47J6
4G85
8BB12
D6HXT
4G85
8BB12
D9HXT
4G85

amazon.com

string

S	t	e	l	i	o	s	

string

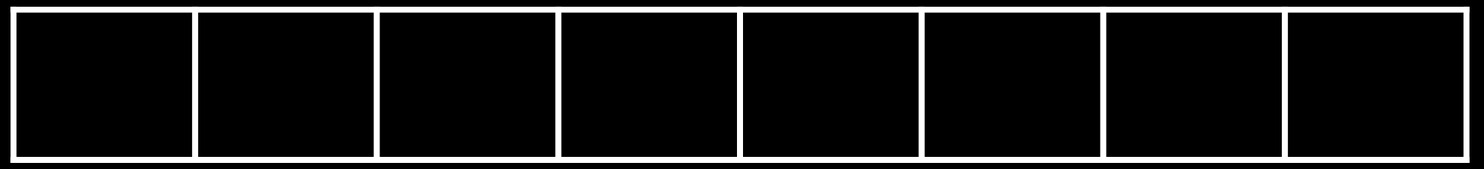
S	t	e	l	i	o	s	\0

string

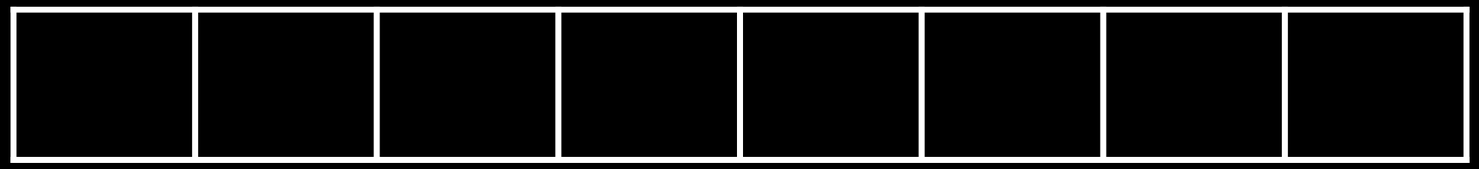
S	t	e	l	i	o	s	\0
M	a	r	i	a	\0		

string

S	t	e	l	i	o	s	\0
M	a	r	i	a	\0	Z	a
m	y	l	a	\0			



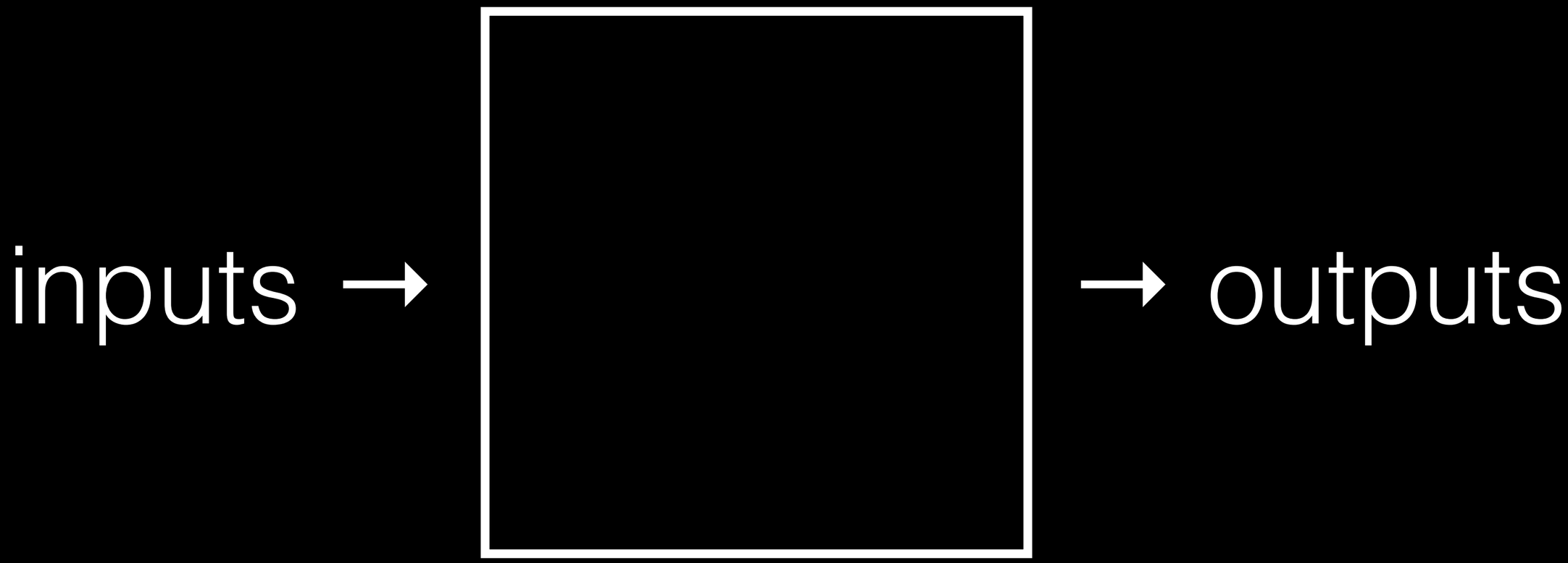
arrays

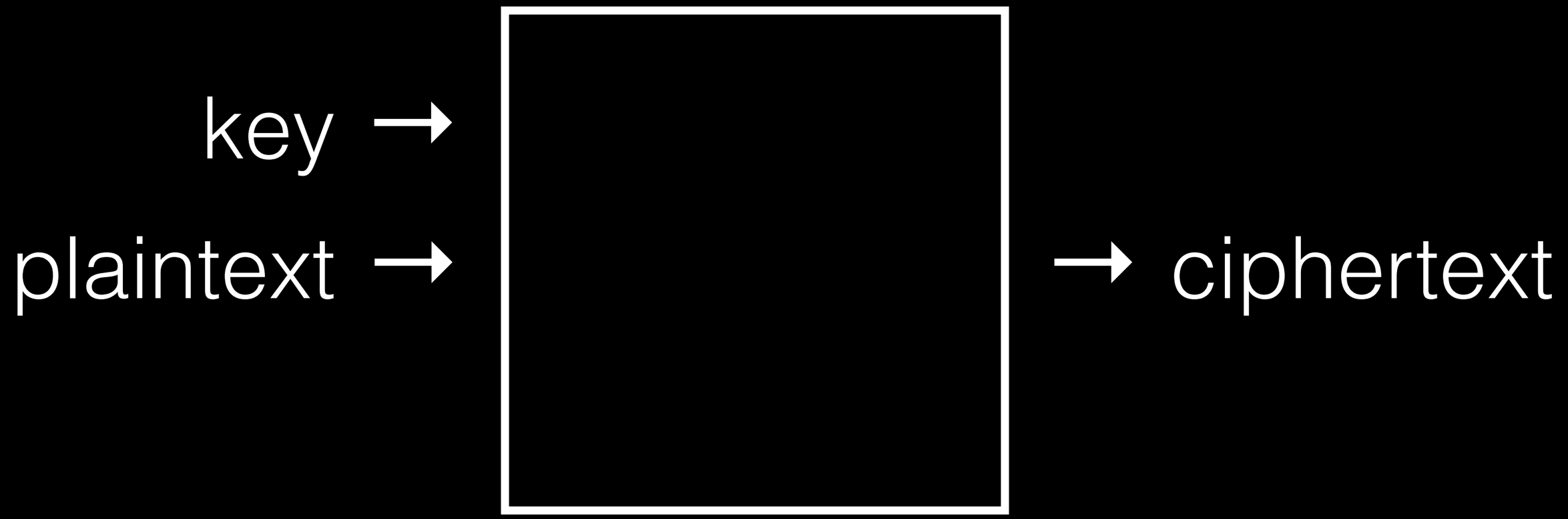


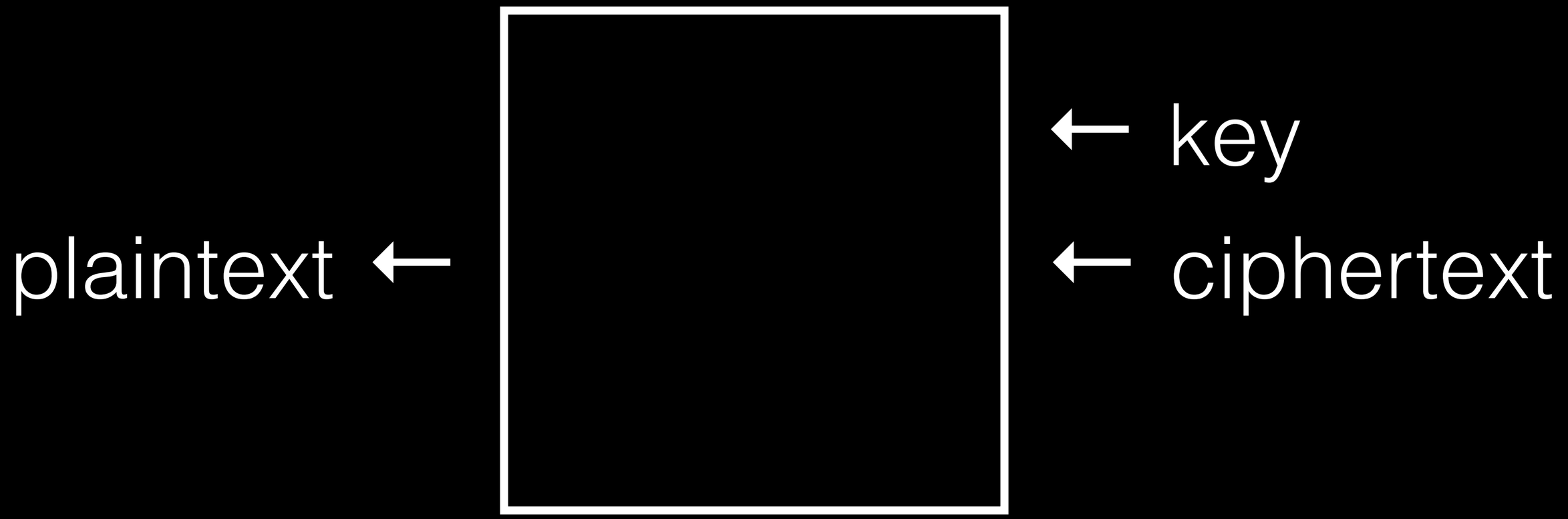
```
int main(void)
```

```
int main(int argc, string argv[])
```

cryptography


inputs
outputs


key
plaintext
ciphertext


plaintext
key
ciphertext

sloppress.com

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