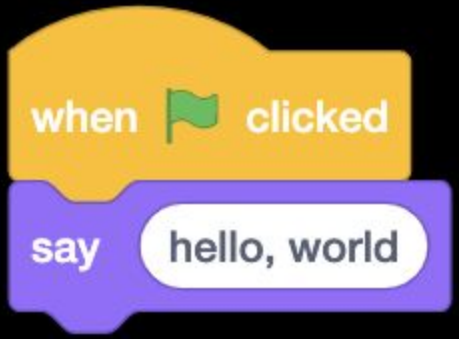
This is CS50


when clicked
say
hello, world

```c
#include <stdio.h>

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

- functions
  - arguments, return values
- conditionals
- Boolean expressions
- loops
- variables
- ...

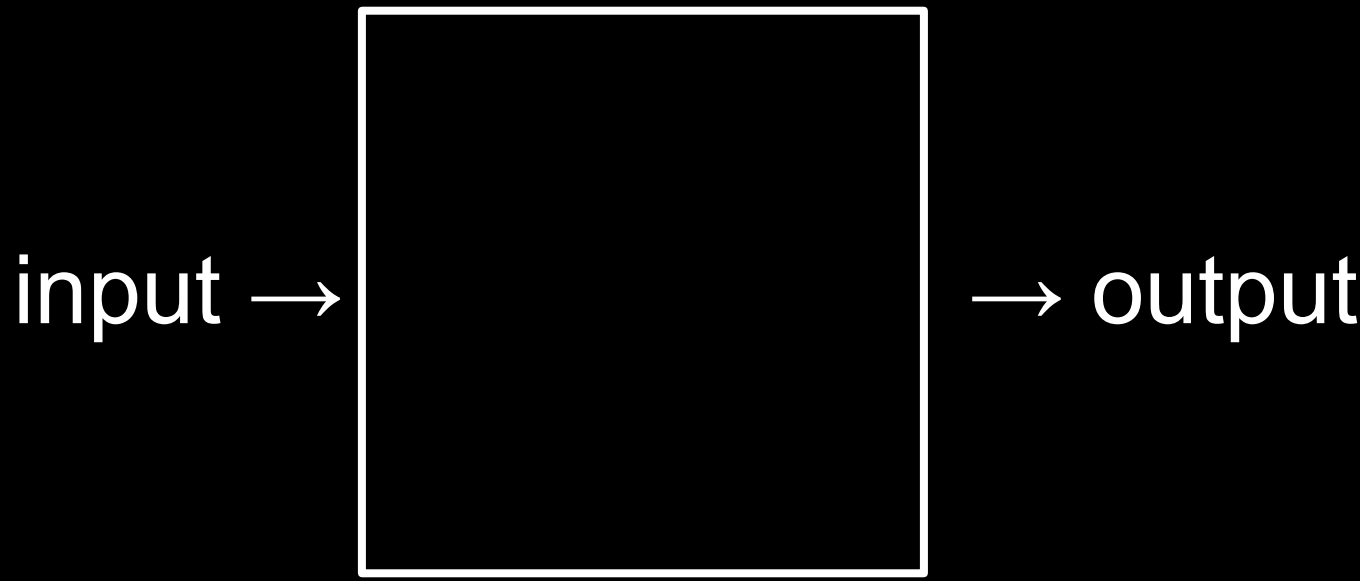
correctness

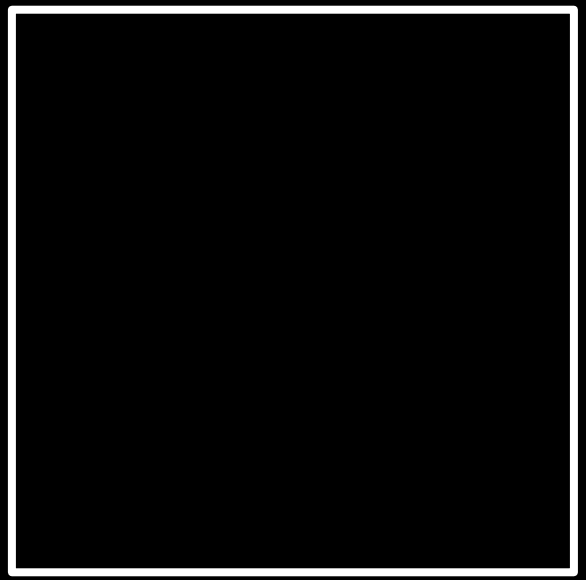
design

style

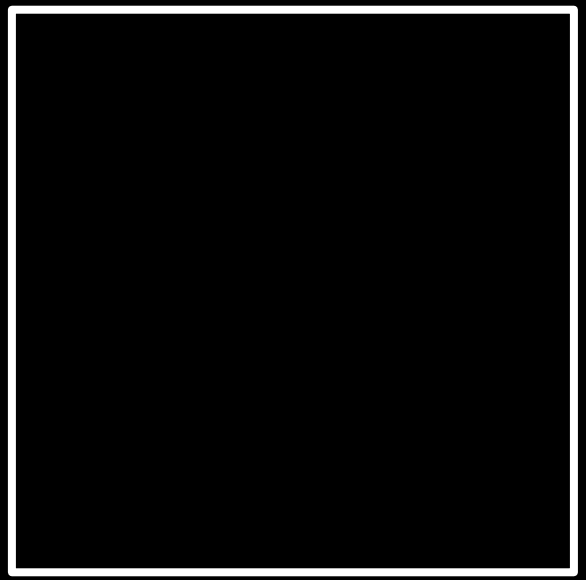
```c
#include <stdio.h>

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

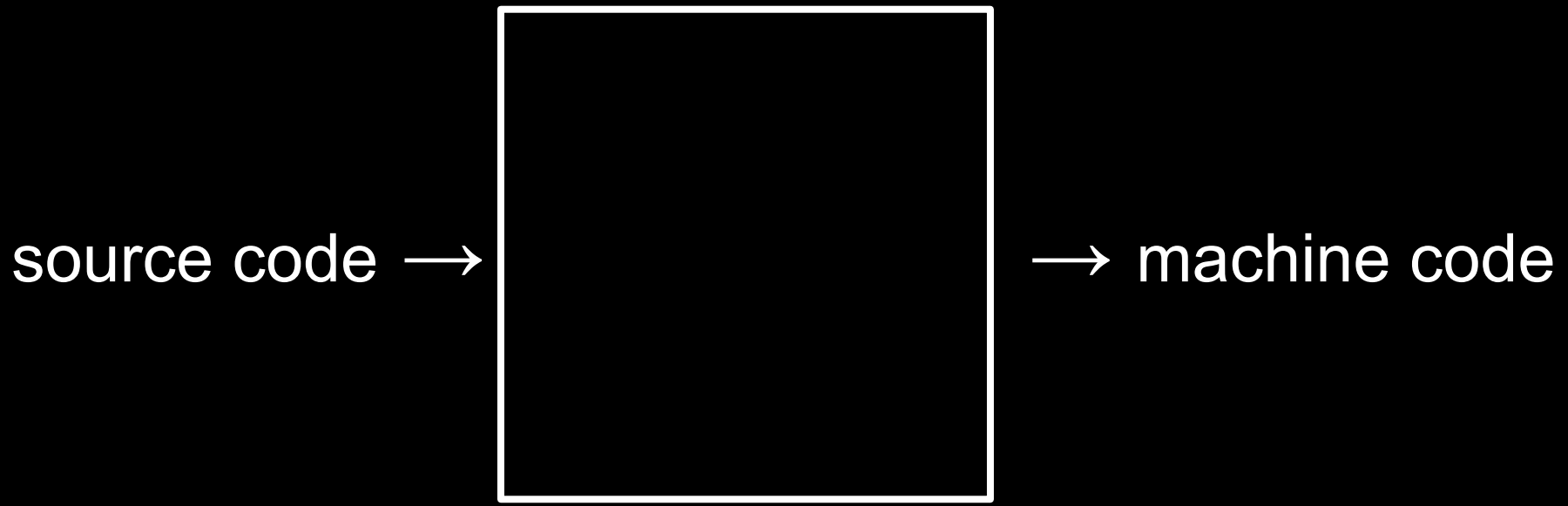
```
01111111 01000101 01001100 01000110 00000010 00000001 00000001 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000010 00000000 00111110 00000000 00000001 00000000 00000000 00000000
10110000 00000101 01000000 00000000 00000000 00000000 00000000 00000000
01000000 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
...
```

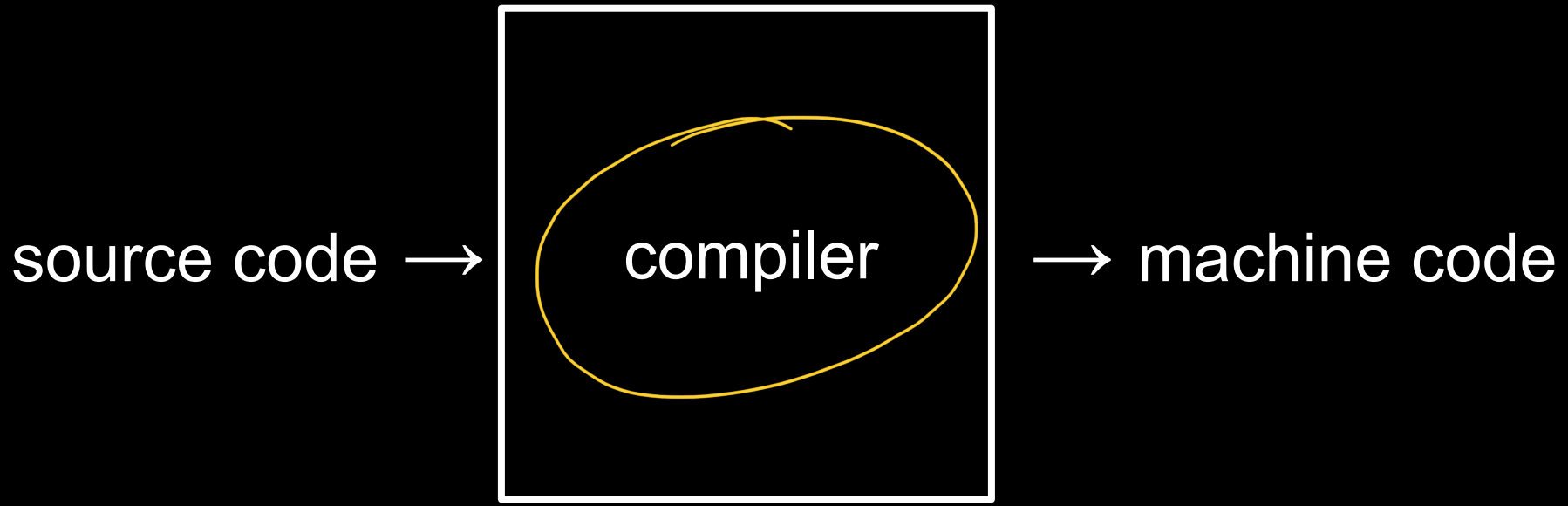

input →
→ output



source code ⟶

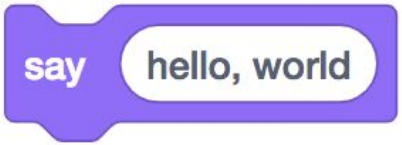


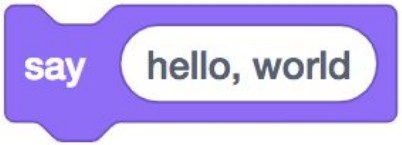

source code ⟶
⟶ machine code


source code
compiler
machine code

```
make hello

./hello
```

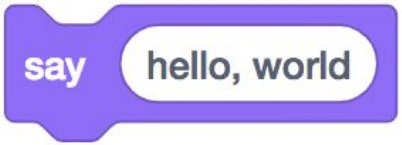
functions, arguments


say
hello, world




```
print (                )
```

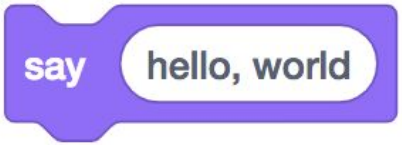
function



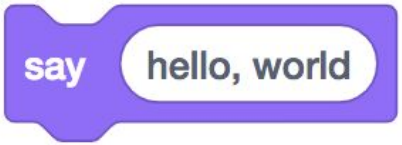

```
printf(                )
```

C

formatted



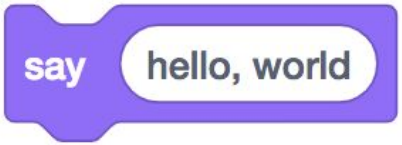

```
printf( hello, world )
```




```
printf("hello, world")
```

double quote

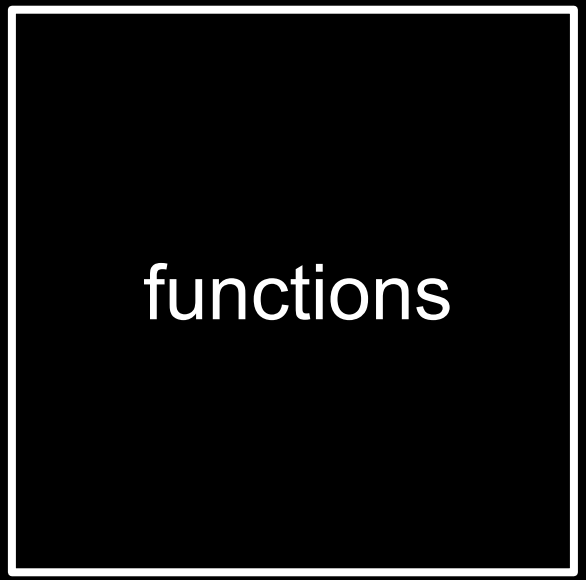
for string.

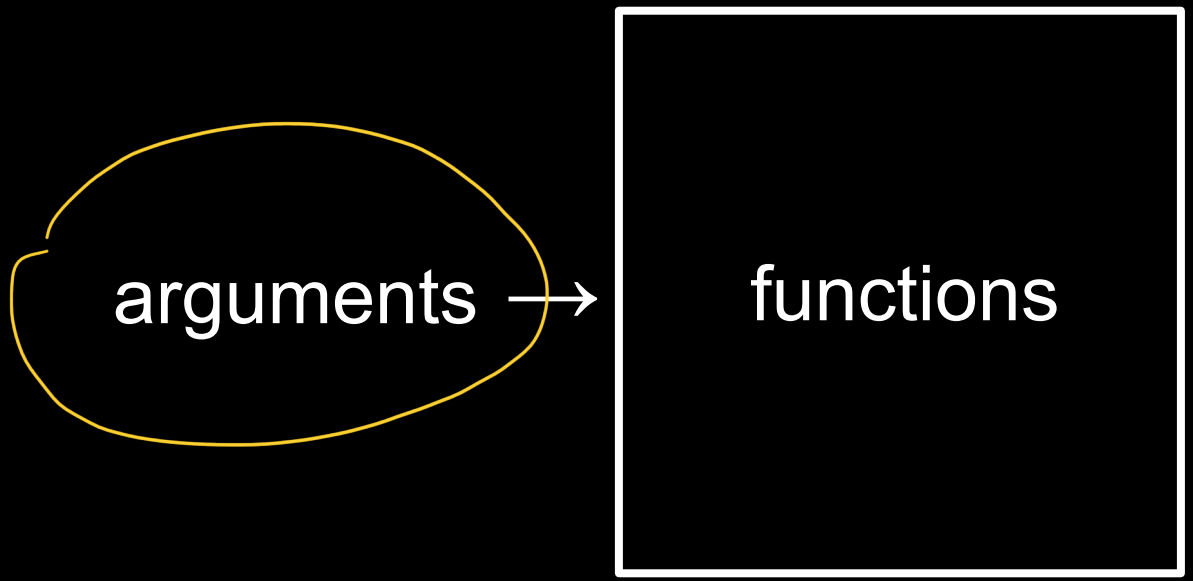


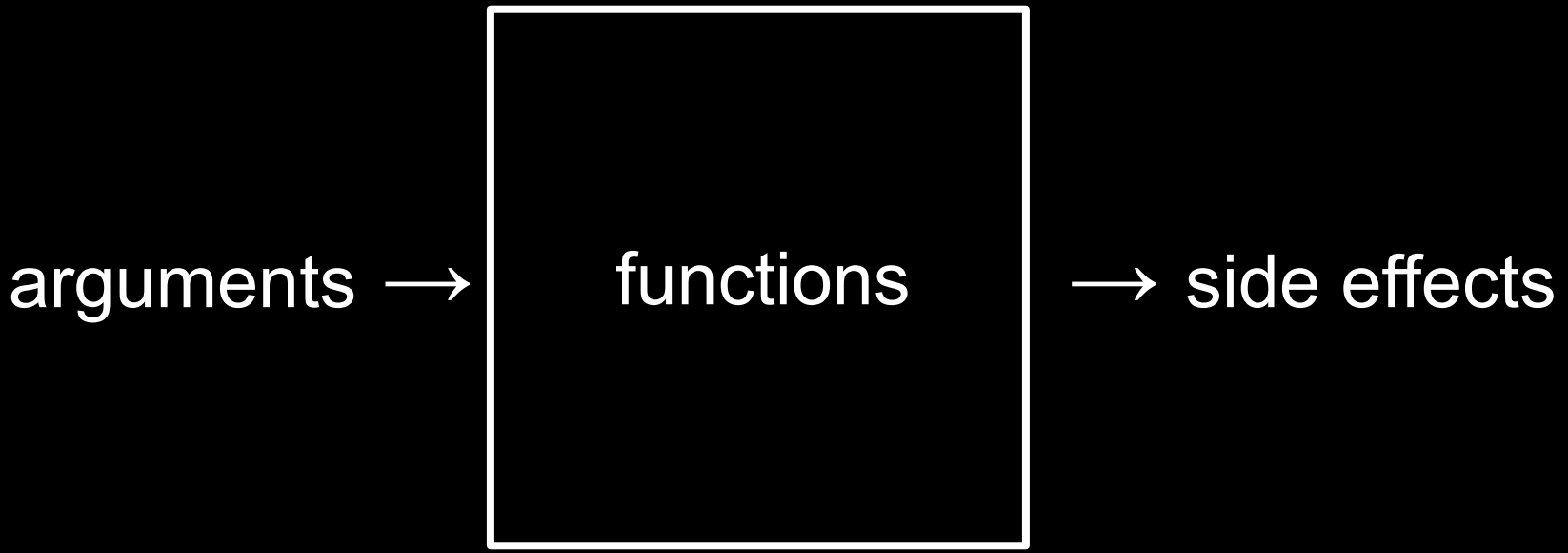

```
printf("hello, world");
```

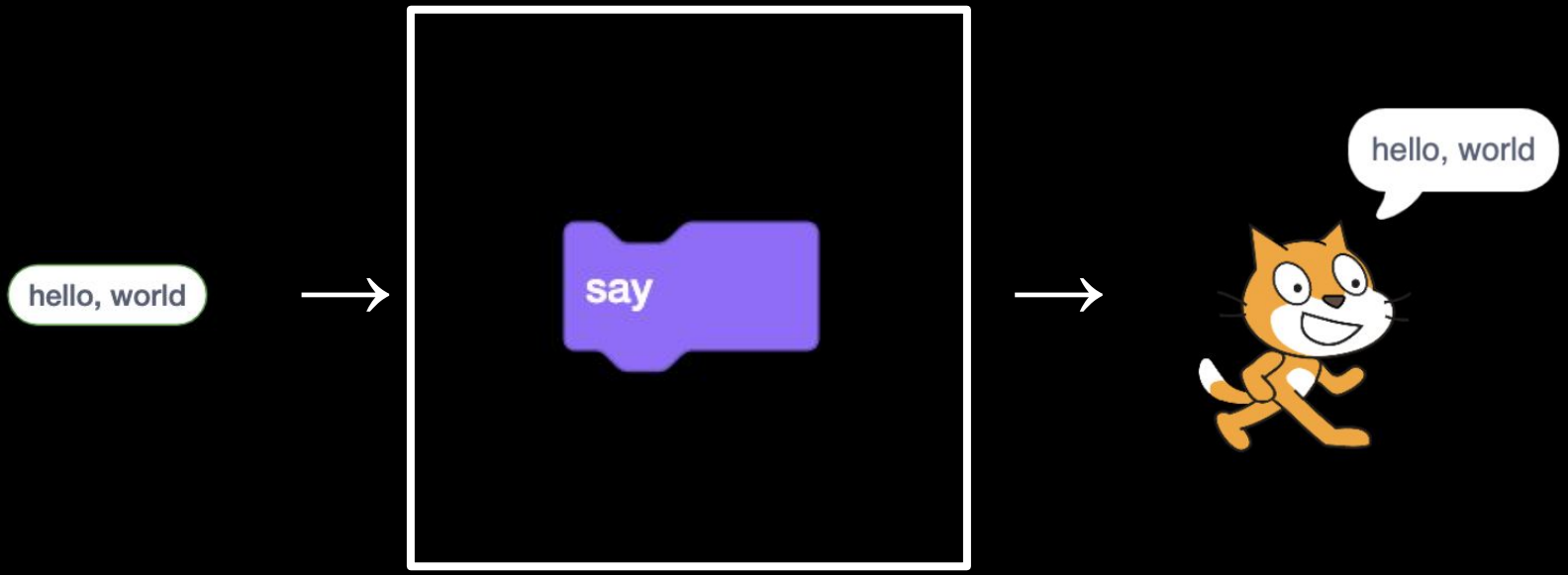
semi-colon

finish


functions


arguments
functions


arguments
functions
side effects


hello, world
say
hello, world

return values, variables


ask
What's your name?
and wait
answer

function

```
get_string(                    )
```

arguments

```
get_string("What's your name? ")
```

variable.

```
answer = get_string("What's your name? ")
```

assignment operator.

type of value

```
string answer = get_string("What's your name? ")
```


```
string answer = get_string("What's your name? ");
```

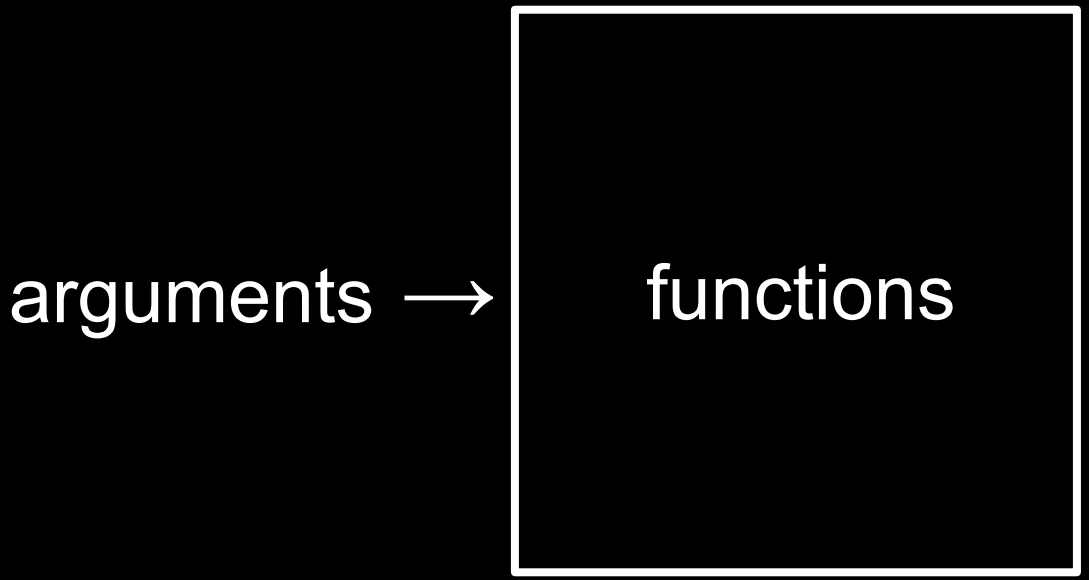
functions

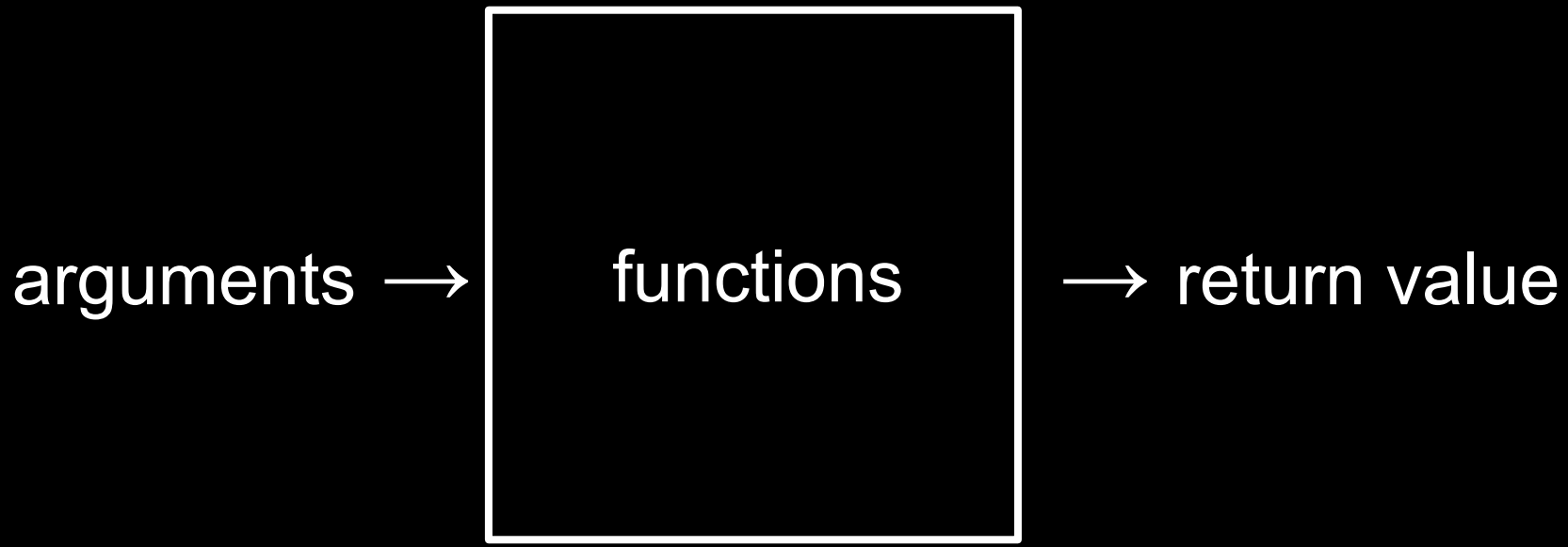
Standard I/O

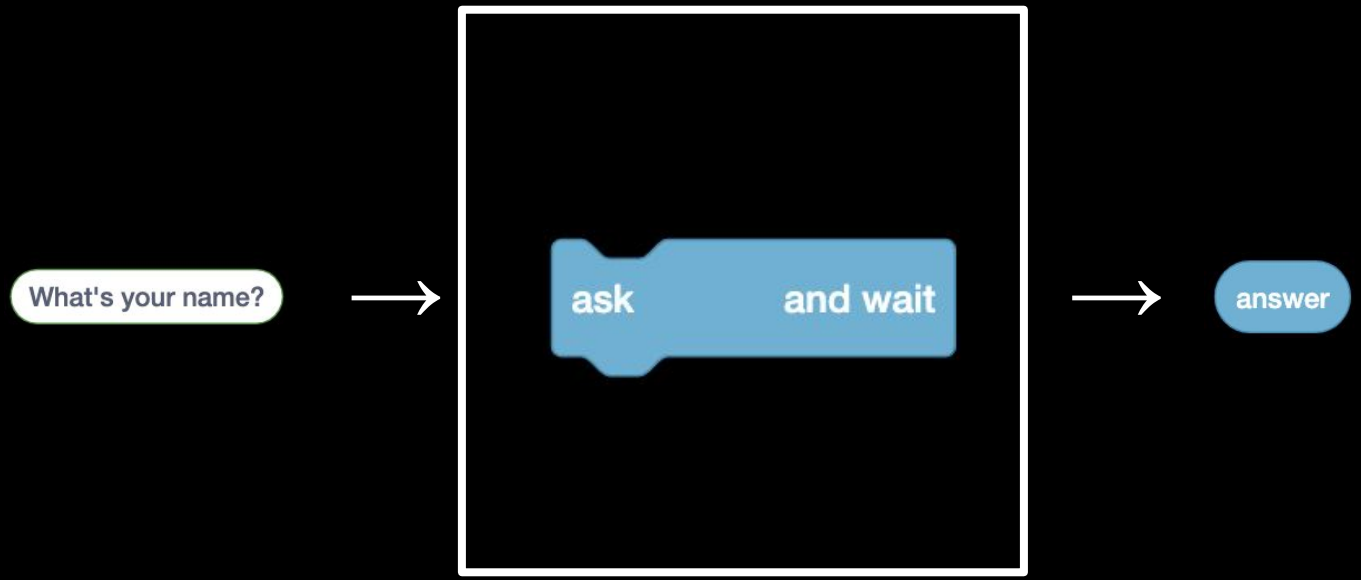
<stdio.h>
↑
library

<cs50.h>
↑
string

%s
↑ string


arguments ⟶
functions


arguments
functions
return value


What's your name?
ask
and wait
answer


say
join
hello,
answer


```
printf(                    );
```


```
printf("hello, %s"        );
```

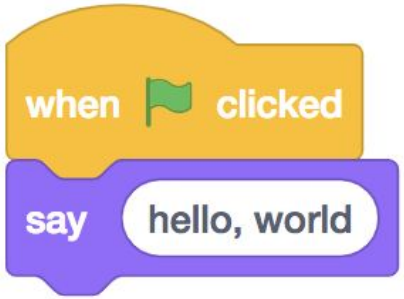

```
printf("hello, %s", answer);
```

main

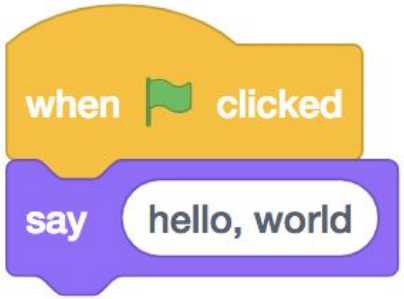

when clicked


```
int main(void)
{

}
```

header files




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




```c
#include <stdio.h>

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

cd

cp

ls

mkdir

mv

rm

rmdir

...

types

```
bool

char

double

float

int

long

string

...
```

```
get_char

get_double

get_float

get_int

get_long

get_string

...
```

format codes

%c

%f

%i

%li

%s

float

int

long int

string

```
%c  char

%f  float, double

%i  int

%li long

%s  string
```

operators

+

-

*

/

%


remainder

```
+  addition
-  subtraction
*  multiplication
/  division
%  remainder
```

variables, syntactic sugar

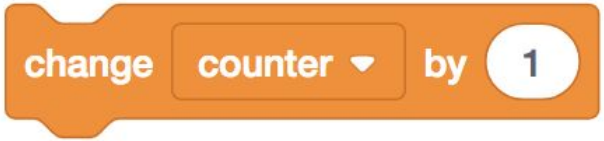

set
counter
to
0

```
counter = 0
```

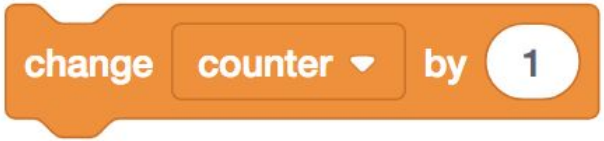

```
int counter = 0
```

data type

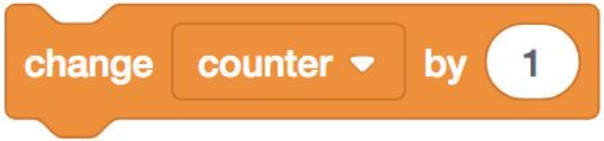

```
int counter = 0;
```



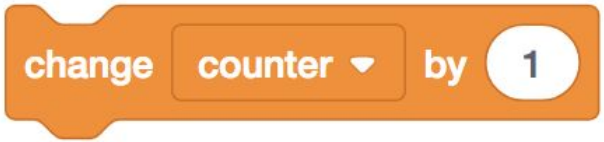
increment




```
counter = counter + 1
```



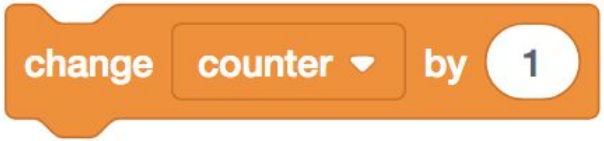

```
counter = counter + 1;
```



sugar

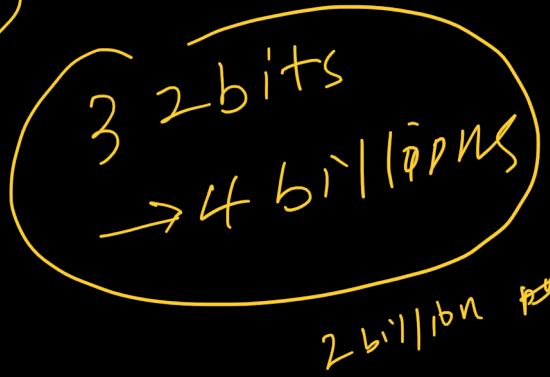
+1

```
counter += 1;
```



+1

```
counter++;
```



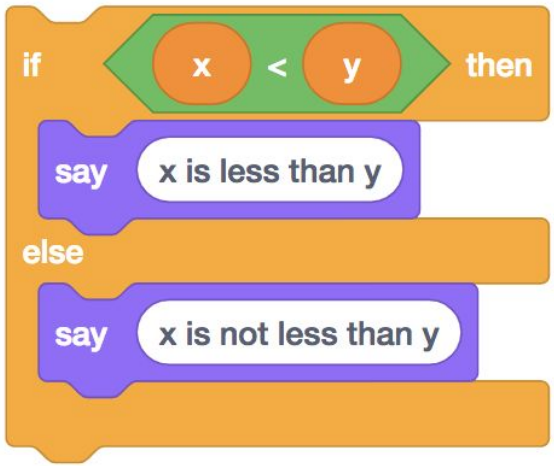
conditions

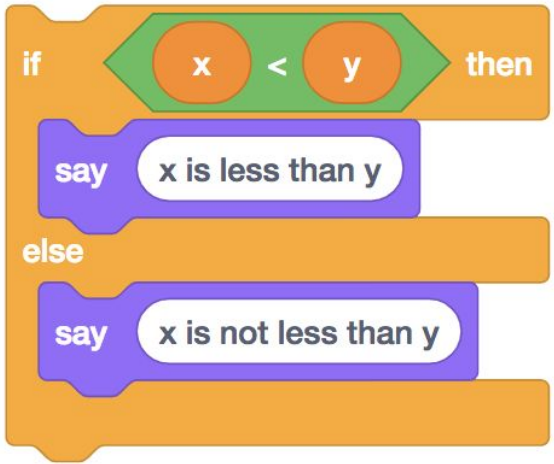

if
x
<
y
then
say
x is less than y


```
if (x < y)
{

}
```

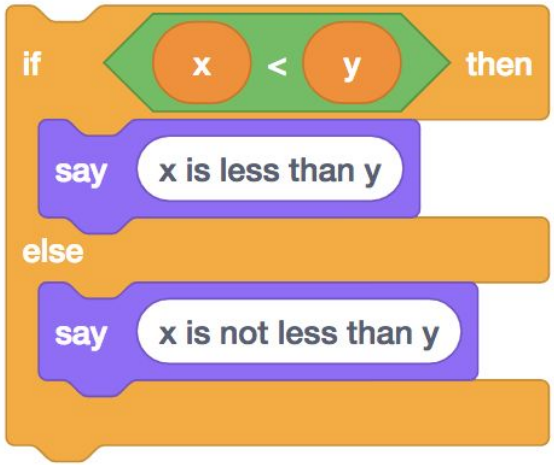

```
if (x < y)
{
    printf("x is less than y\n");
}
```

construct

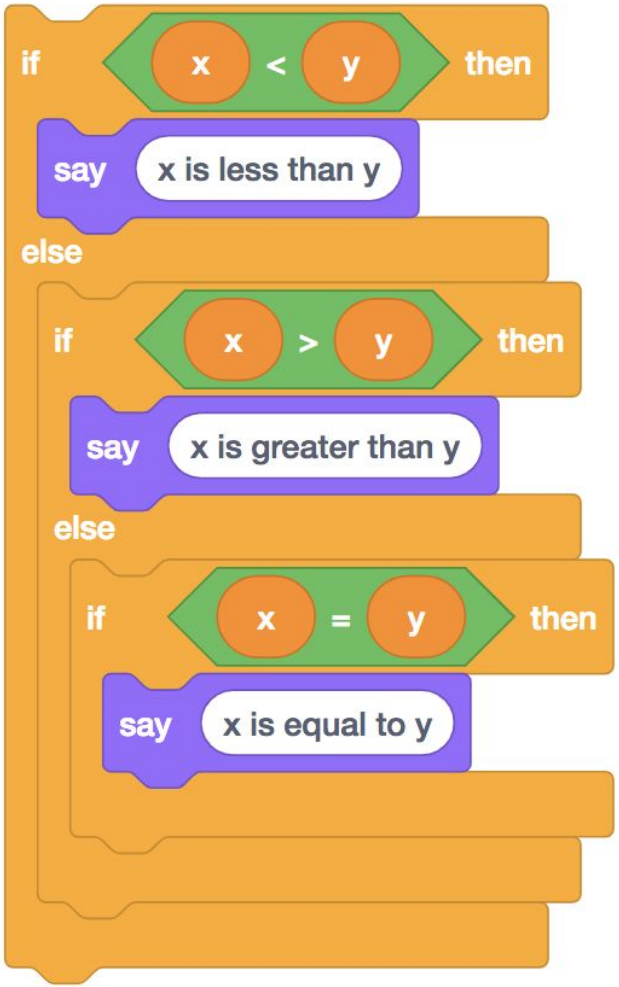

if
x
<
y
then
say
x is less than y
else
say
x is not less than y

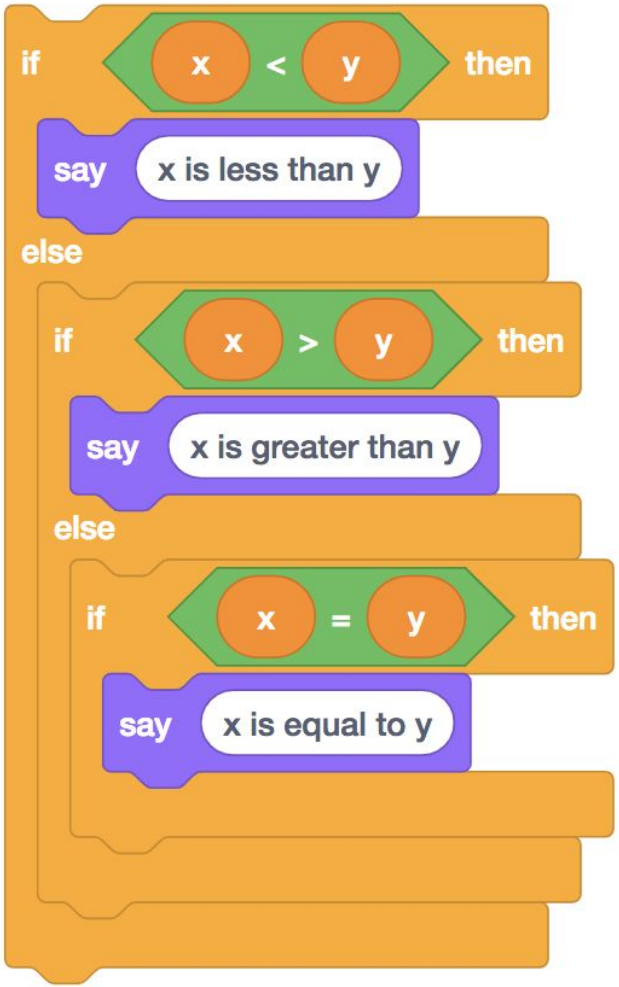



```
if (x < y)
{

}
else
{

}
```

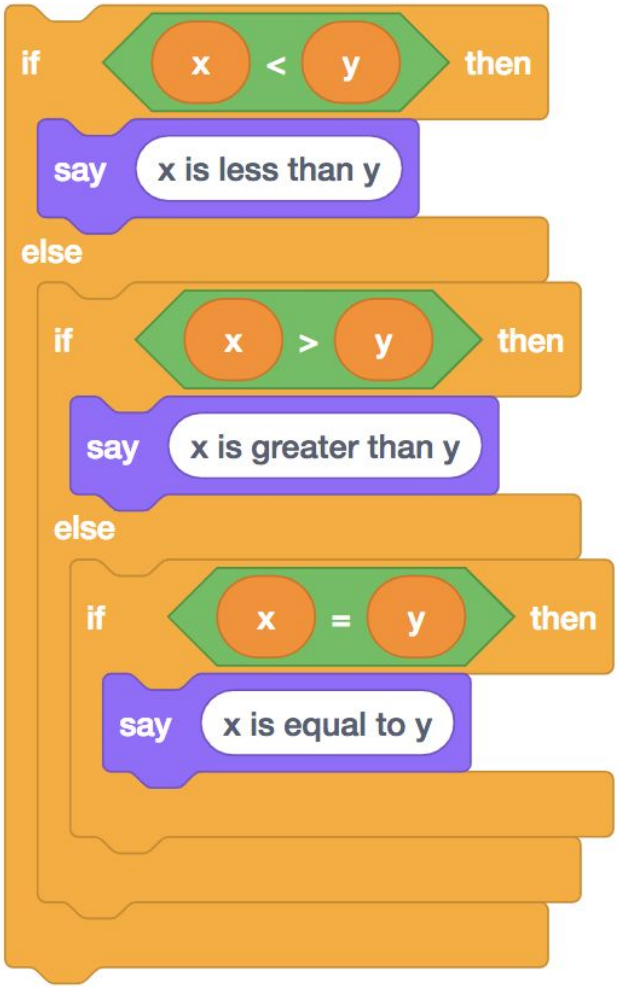



```
if (x < y)
{
    printf("x is less than y\n");
}
else
{
    printf("x is not less than y\n");
}
```

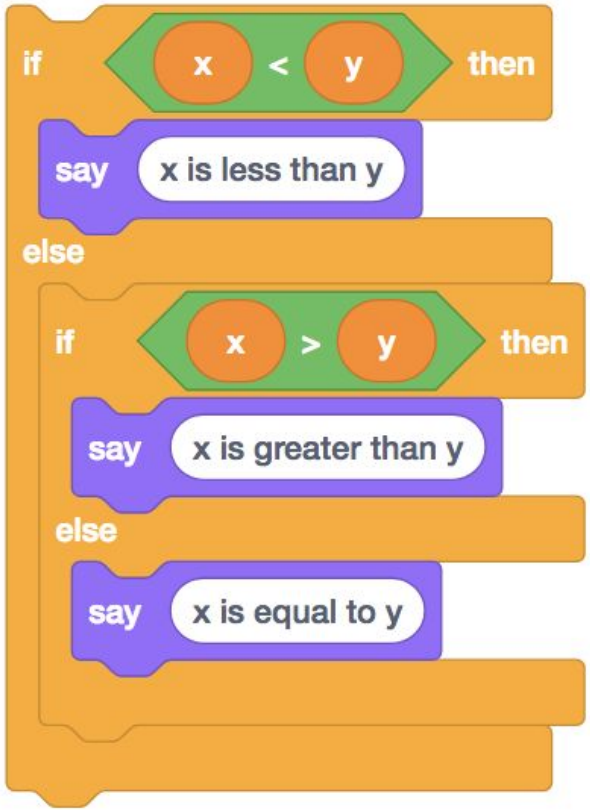

if x < y then
say x is less than y
else
if x > y then
say x is greater than y
else
if x = y then
say x is equal to y




```
if (x < y)
{

}
else if (x > y)
{

}
else if (x == y)
{

}
```




```
if (x < y)
{
    printf("x is less than y\n");
}
else if (x > y)
{
    printf("x is greater than y\n");
}
else if (x == y)
{
    printf("x is equal to y\n");
}
```




```
if (x < y)
{
    printf("x is less than y\n");
}
else if (x > y)
{
    printf("x is greater than y\n");
}
else
{
    printf("x is equal to y\n");
}
```

better design.

loops


forever
say
meow


```
while (true)
{

}
```


```
while (true)
{
    printf("meow\n");
}
```


repeat
3
say
meow


```
int counter = 0;
while (counter < 3)
{


}
```


```
int counter = 0;
while (counter < 3)
{
    printf("meow\n");

}
```


```
int counter = 0;
while (counter < 3)
{
    printf("meow\n");
    counter = counter + 1;
}
```


```c
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i = i + 1;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i += 1;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```

sugar


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```

loop

```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```


```
int i = 0;
while (i < 3)
{
    printf("meow\n");
    i++;
}
```


```
int i = 1;
while (i <= 3)
{
    printf("meow\n");
    i++;
}
```

Count down

```
int i = 3;
while (i > 0)
{
    printf("meow\n");
    i--;
}
```

decrement


repeat
3
say
meow


```
for (int i = 0; i < 3; i++)
{

}
```


```
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```


```c
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```


```c
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```

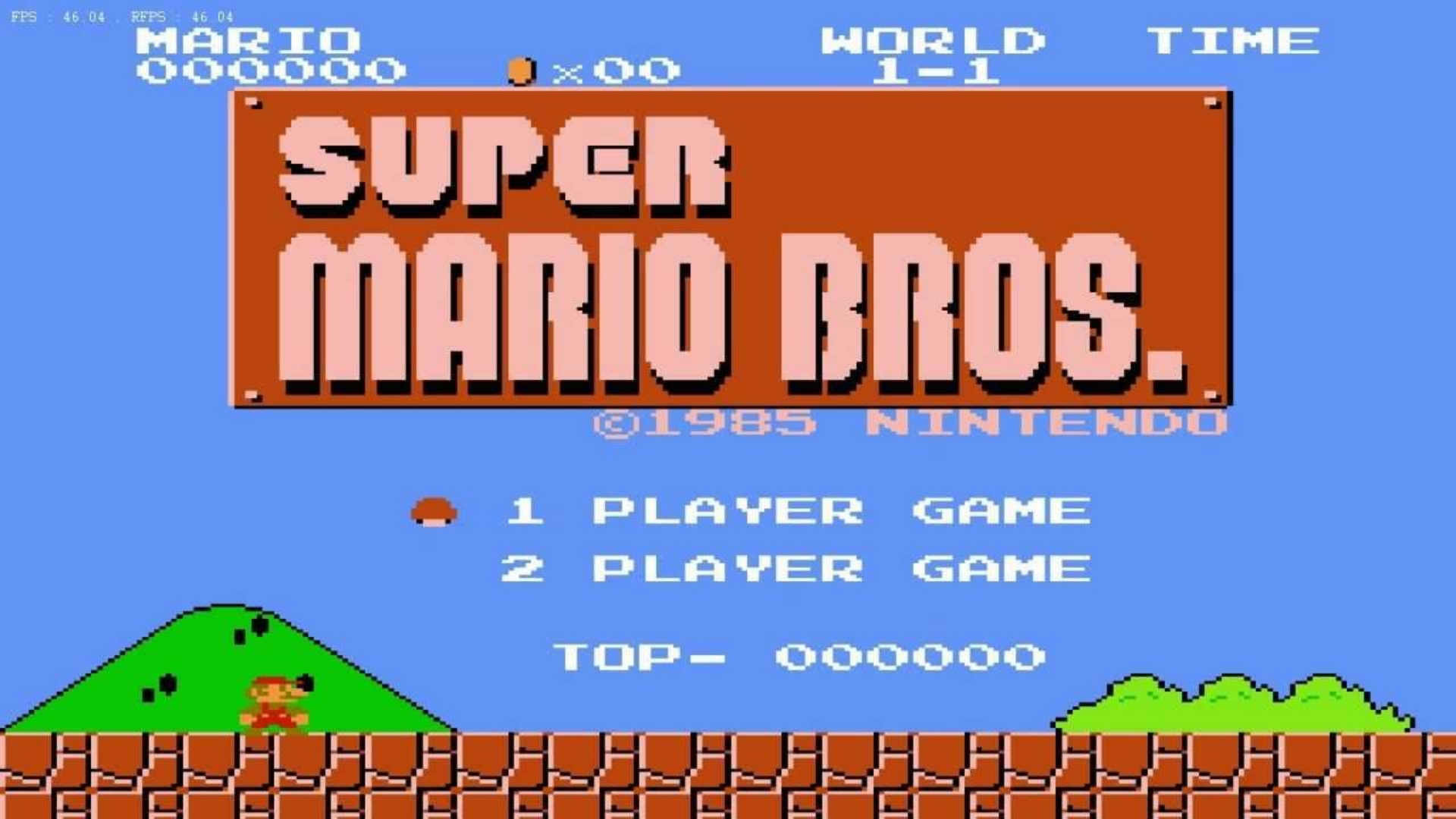

```
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```

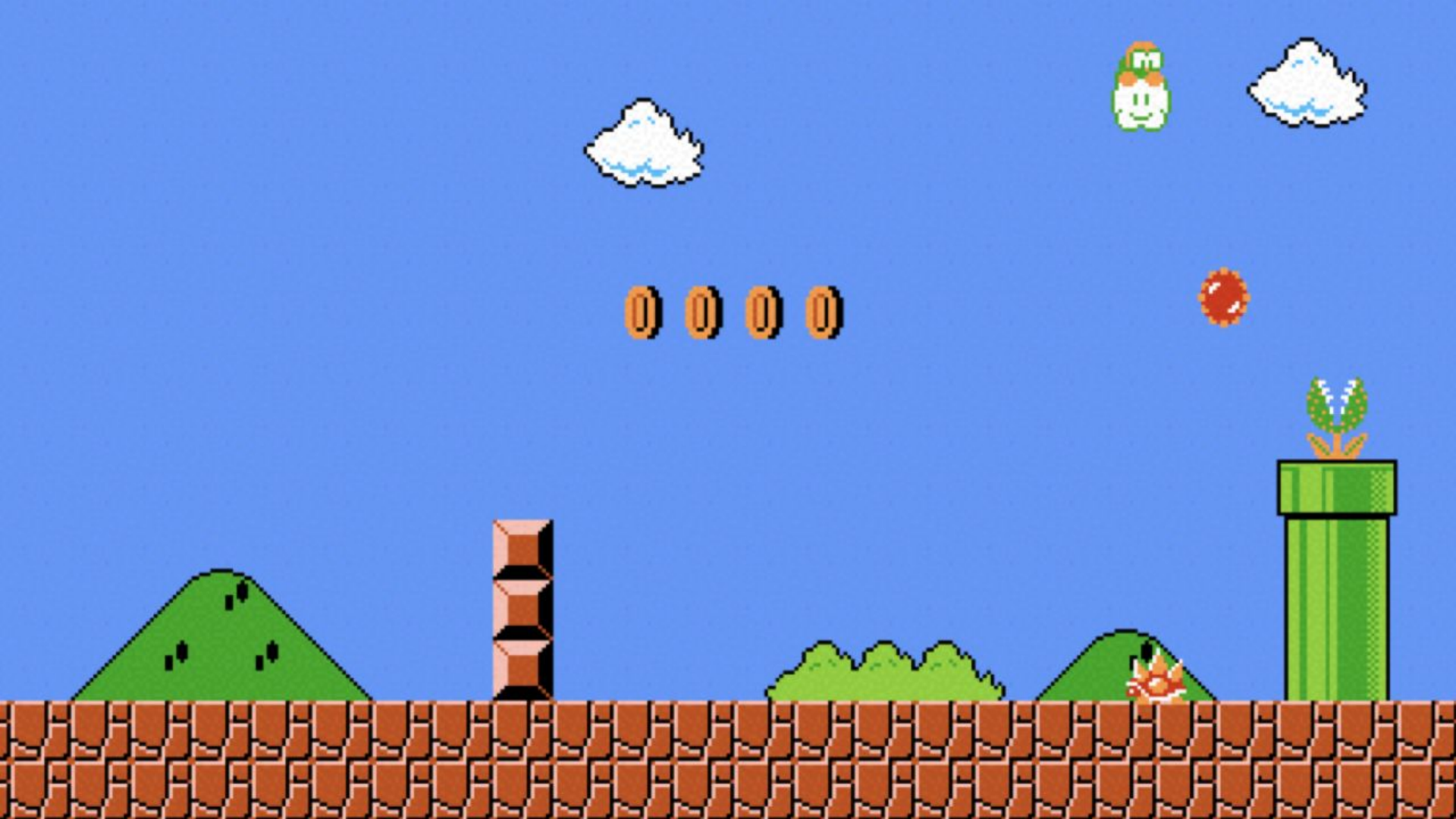

```c
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```

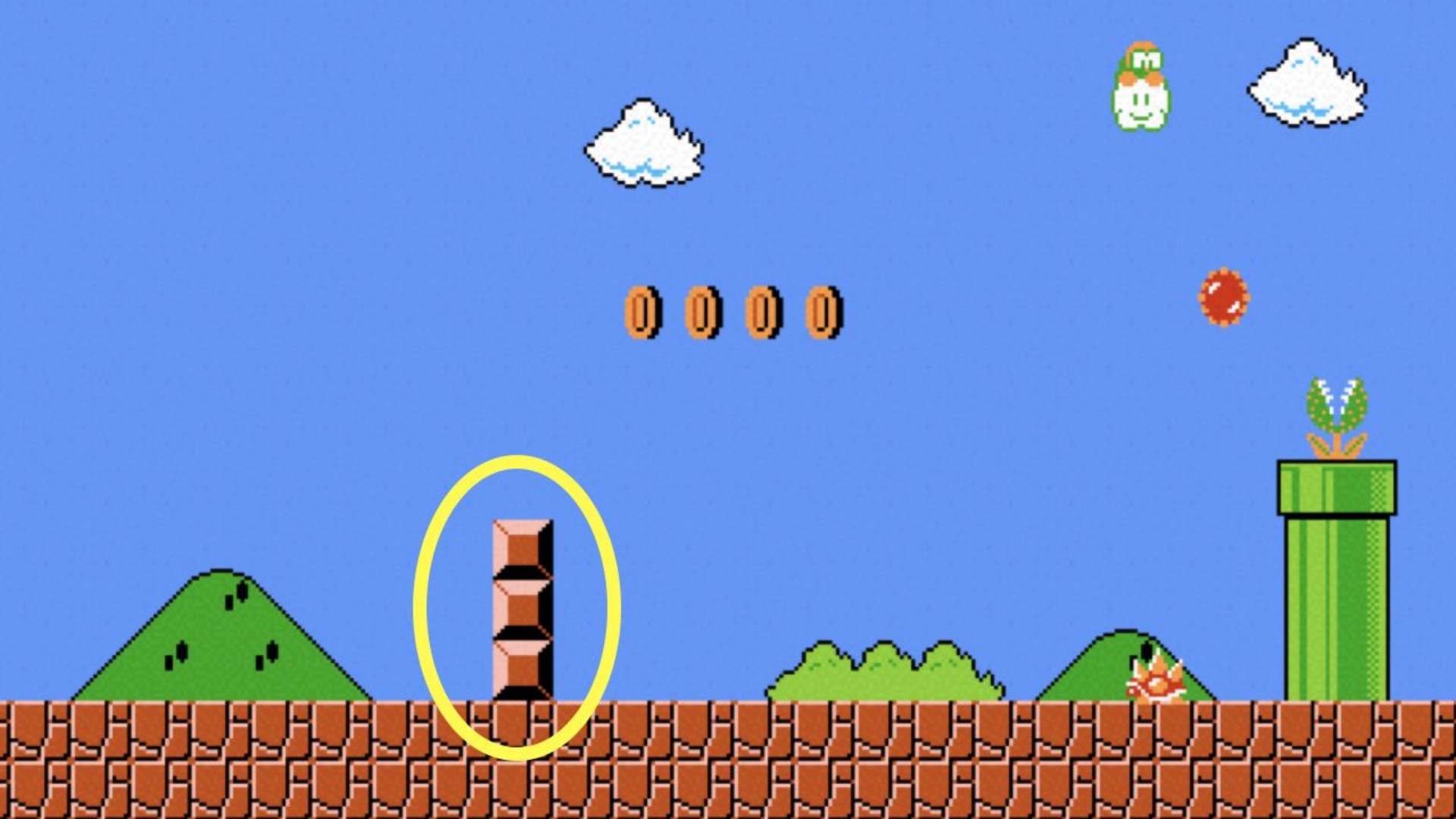

```c
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```

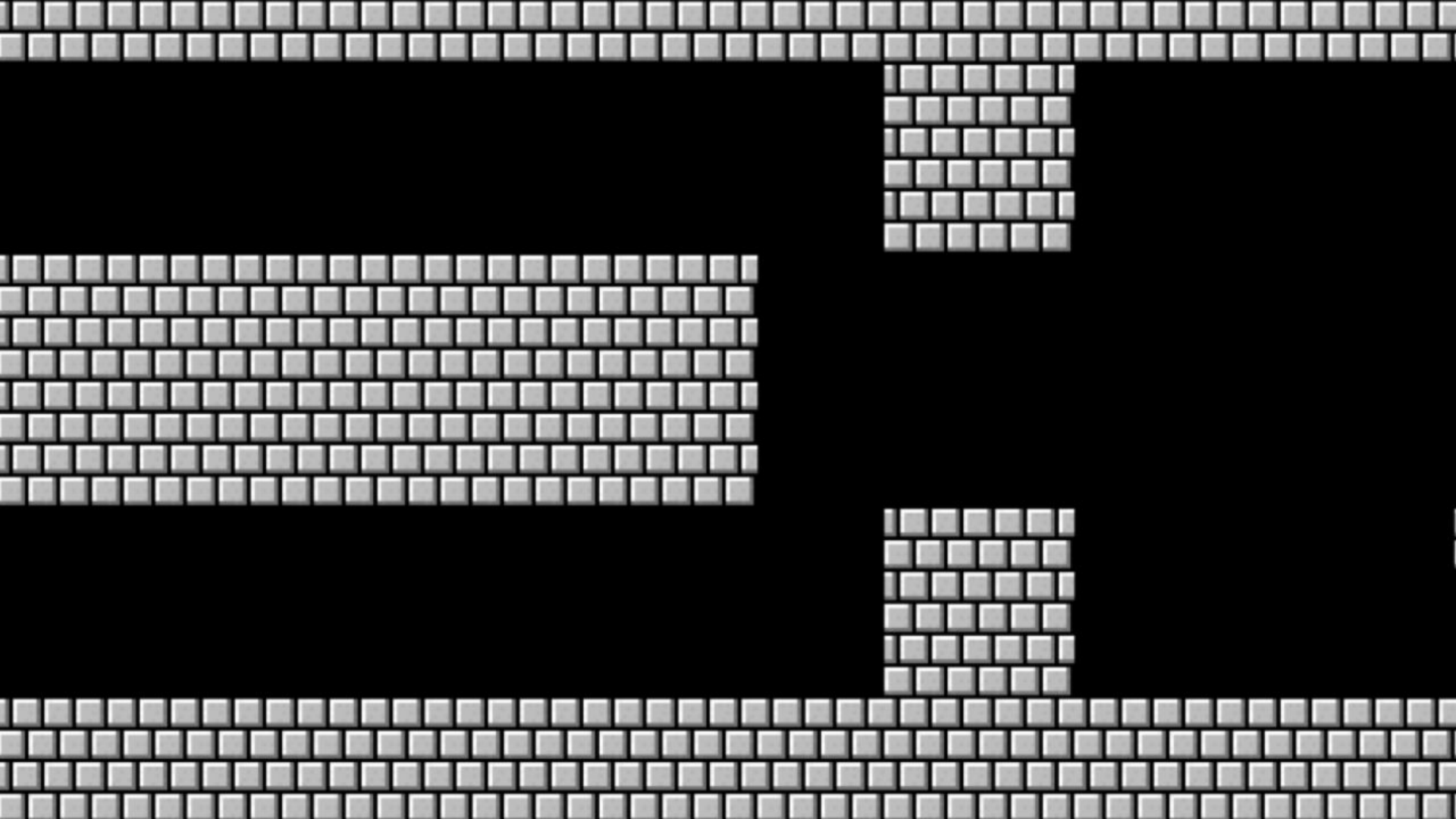
for / while loop
can do the same thing

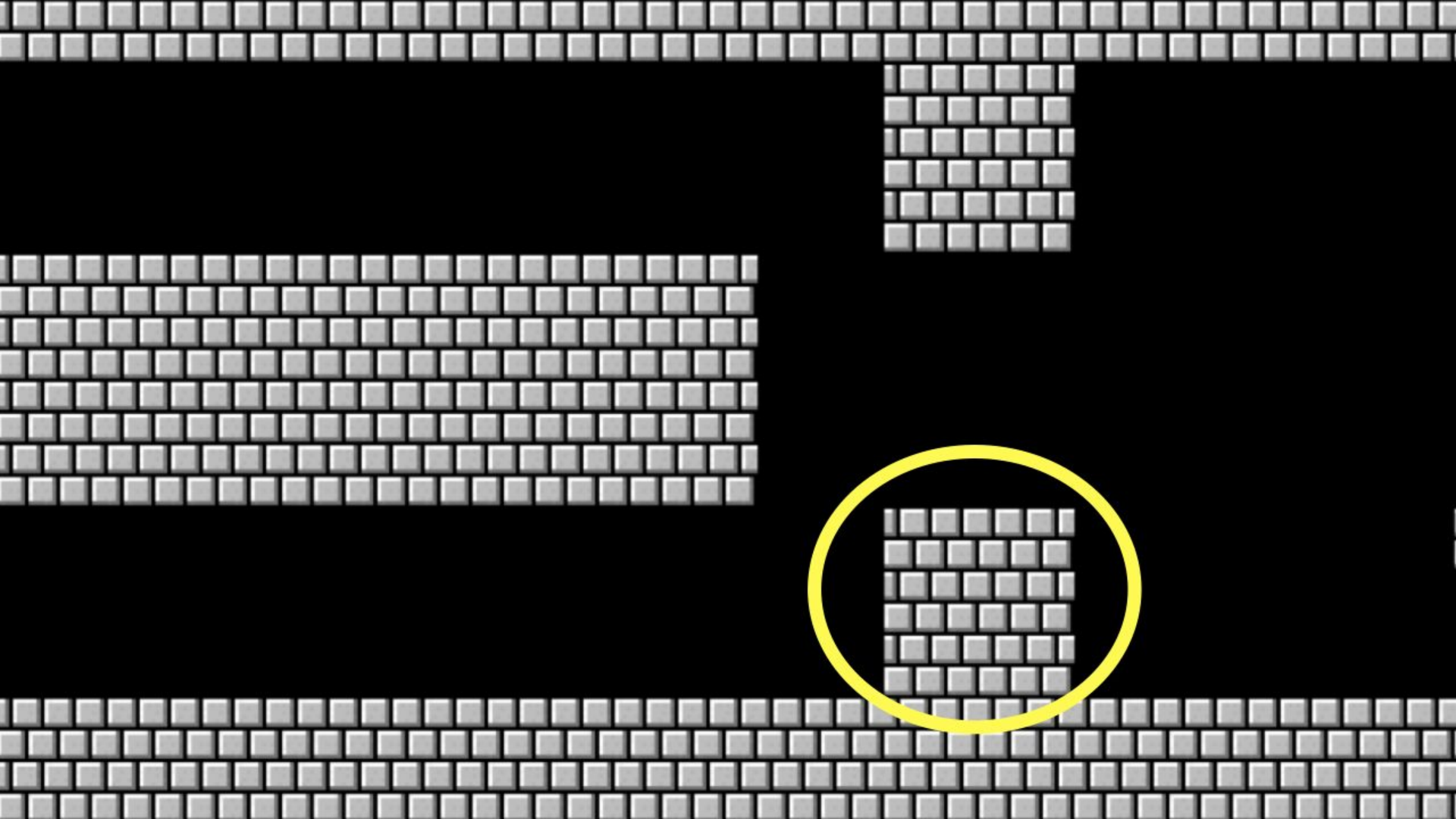

```
for (int i = 0; i < 3; i++)
{
    printf("meow\n");
}
```












crucial
by Micron
8BBI2
D9HXT
8BBI2
D9HXT
4G85
4G85
4G85
47J6

floating-point imprecision

integer overflow

000

001

010

011

100

101

110

111


3 bits
1000

000

1 January 2000

1999

1999

1900

1 Jan 1970

second.

2 billion

19 January 2038

2147483647

01111111111111111111111111111

01111111111111111111111111111
1

1

01111111111111111111111111111110

1

01111111111111111111111111111100

1

01111111111111111111111111111000

01111111111111111111111110000

01111111111111111111111111100000

01111111111111111111111111000000

01111111111111111111111110000000

01111111111111111111111100000000

01111111111111111111111000000000

01111111111111111111110000000000

01111111111111111111000000000000

01111111111111111110000000000000

01111111111111111100000000000000

01111111111111111000000000000000

01111111111111110000000000000000

01111111111111110000000000000000

01111111111111100000000000000000

01111111111110000000000000000000

01111111111100000000000000000000

01111111111000000000000000000000

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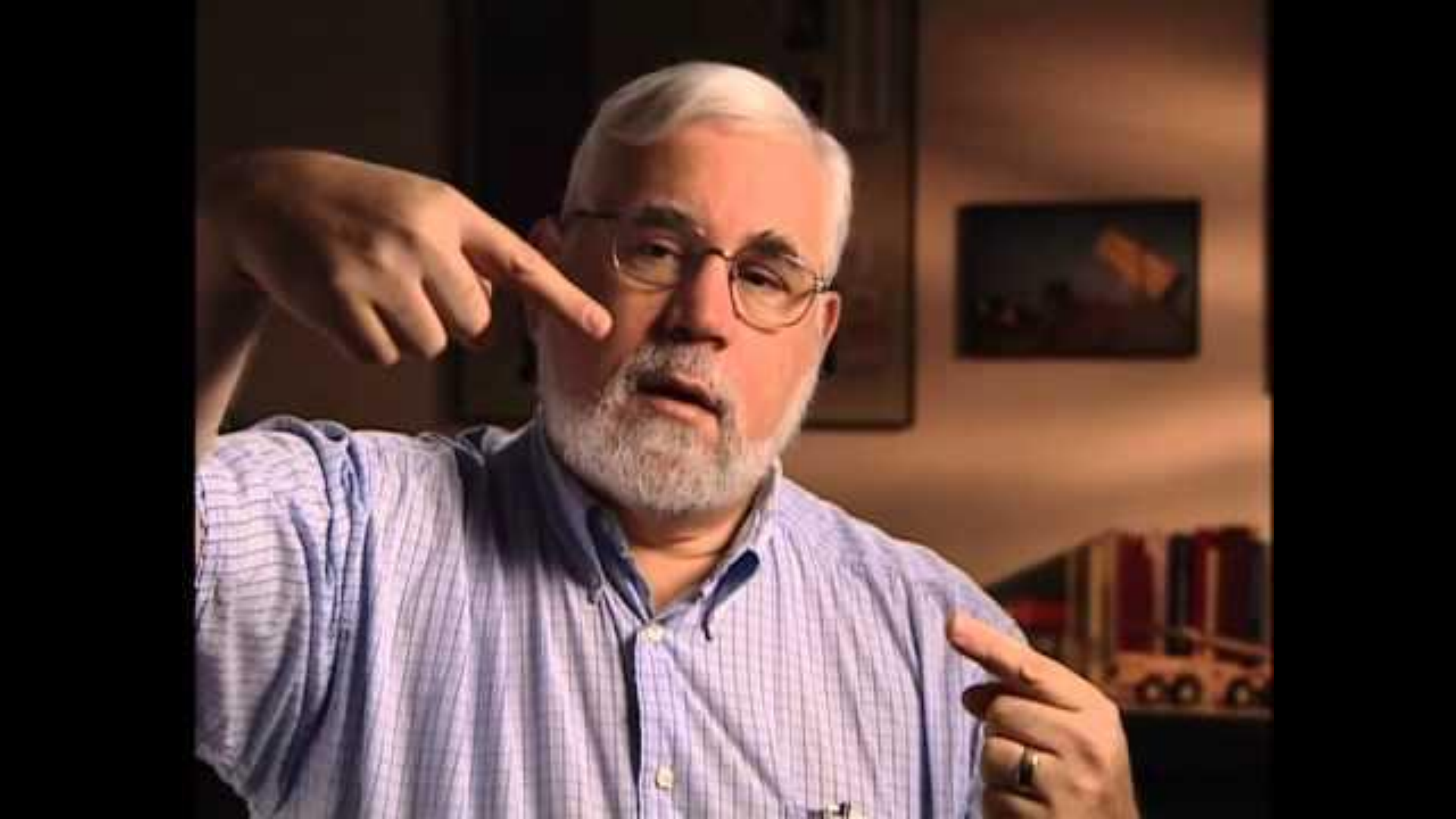
64bits → solve issues

10000000000000000000000000000000

-2147483648

13 December 1901



This is CS50