

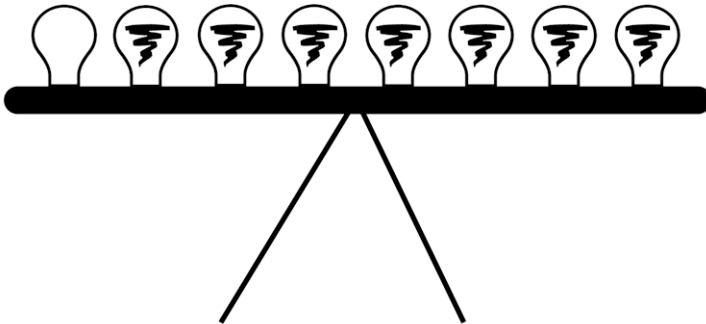
Quiz 0

Answer Key

Answers other than the below may be possible.

Binary Bulbs.

0.



Bit-Sized Questions.

1. Because 0 is non-negative, we need to set aside one pattern of bits (000) for it, which leaves us with only seven other patterns, with which we can thus represent 1 (001) through 7 (111).
2. 2^n

This is CS80.

3. 1010000
4. 80

Looping back to Scratch.

```
5. #include <cs50.h>
#include <stdio.h>

int main(void)
{
    for (int i = 0; i < 4; i++)
    {
        printf("Peanut butter jelly!\n");
    }
}
```

```
6. #include <cs50.h>
#include <stdio.h>

int main(void)
{
    int i = 0;
    while (true)
    {
        printf("%i\n", i);
        i++;
    }
}
```

Itsa Mario again.

```
7. #include <stdio.h>

void PrintGrid(int width, int height);

int main(void)
{
    PrintGrid(5, 3);
}

void PrintGrid(int width, int height)
{
    for (int i = 0; i < height; i++)
    {
        for (int j = 0; j < width; j++)
        {
            printf("#");
        }
        printf("\n");
    }
}
```

8. A return value is data that's passed from one function back to another, whereas a side effect is some modification of state by a function that persists beyond the function's call (e.g., displaying text on a screen via `printf`, as is the case with `PrintGrid`).

Curses, recursive!

18. Factorial of n (i.e., $n!$).

```
19. int f(int n)
    {
        int product = 1;
        for (int i = 2; i <= n; i++)
        {
            product *= i;
        }
        return product;
    }
```

$O(MG)$.

20.

	Ω	O
linear search	1	n
merge sort	$n \log n$	$n \log n$
bubble sort	n	n^2
selection sort	n^2	n^2
stupid sort	n	∞

Overflowing with Questions.

- Integer overflow is said to occur when a program attempts to store a value in a variable (e.g., an `int`) that's too large to fit in that variable (because its representation would require more bits than are used for that variable's type). For instance, if `i` were an `int` with a value of $2^{31} - 1$ (i.e., 2147483647), adding 1 (or more) to that value would overflow `i`.
- A buffer overflow is said to occur when a program attempts to write data beyond the boundary of some buffer (e.g., an array). For instance, if `a` were an array of size `n`, writing to `a` beyond `a[n-1]` would overflow `a`.

Forgetful.

```
23. int strlen(char* s)
    {
        int n = 0;
        while (s[n] != '\0')
        {
            n++;
        }
        return n;
    }
```

Having said that...

- 24. Having said that, merge sort requires twice as much space (to store values while merging).
- 25. Having said that, a linked list does not allow for binary search, even if sorted, since it doesn't support direct access to nodes by index.
- 26. Having said that, binary search requires that its input be sorted, which might not be the case (and sorting it would require additional time).

Swapping Stories.

27.

	x	y	a	b	tmp
1 →	1				
2 →	1	2			
3 →	1	2	0x10	0x14	
4 →	1	2	0x10	0x14	1
5 →	2	2	0x10	0x14	1
6 →	2	1	0x10	0x14	1
7 →	2	1			

Role Reversal.

28. Be sure to pass `-lcs50` as a command-line argument to `clang` (as via `make`).

29. Be sure to have

```
#include <string.h>
```

atop the program.

30. Be sure to pass $n + 1$ arguments in total to `printf`, where n is the number of format codes (that begin with `%`) in the first argument to (i.e., format string for) `printf`.

31. Be sure to free (as with `free`) any memory allocated by `malloc`.

32. Be sure not to touch memory beyond the boundary of any array.