Adding Binary Numbers

10 min

Adding binary numbers can be done in much the same way that we add base 10 numbers, with a couple of caveats.

Let's start at 0_{10} and add until we reach 4_{10}:

Decimal	**Binary**
0 + 1 = 1	0 + 1 = 1
1 + 1 = 2	1 + 1 = 10
2 + 1 = 3	10 + 1 = 11
3 + 1 = 4	11 + 1 = 100

We can see that when adding numbers we need to be very careful when carrying our numbers. This will happen much more frequently than we are used to with decimal numbers. Here are some important rules to remember when adding in binary:

- 1 + 0 = 1
- 1 + 1 = 10
- 1 + 1 + 1 = 11

For larger numbers they can be lined up, one on top of another, just like in the regular addition you are used to. Take a look at the examples below, you can see how often you need to carry in binary addition.

Ex. Adding 100_2 and 1_2:

```
Binary | Decimal
       |
 100   |    4
+  1   | + 1
----   | ---
 101   |    5
```

to Clipboard

Ex. Adding 101101_2 and 111_2:

```
Binary  | Decimal
  1111  |  1    <- carried digits
 101101 |  45
+   111 | + 7
------- | ---
 110100 |  52
```

to Clipboard

Instructions

1. Checkpoint 1 Passed

1.

Create a new variable, answer1, and set it equal to the sum of $10_2 + 10_2$

Hint

1 + 1 = 10. Line up the numbers and make sure to carry your extra digit to the next column to the left if you have one.

2. Checkpoint 2 Passed

2.

Create a new variable, answer2, and set it equal to the sum of $10010_2 + 101011_2$

3. Checkpoint 3 Passed

3.

The previous two questions had very limited carrying, this number question will put your binary addition skills to the test! Create the variable, answer3, and set it equal to the sum of $1110111011_2 + 11010111_2$

Hint

It can sometimes be helpful to keep track of your carried digits on paper. Binary math carries so often that it is easy to lose a bit somewhere along the way.

script.py

```
# Part 1:

answer1 =  100


# Part 2:

answer2 = 111101


# Part 3:

answer3 = 10010010010
```