Subtracting Binary Numbers

12 min

Subtracting binary numbers is very similar to adding them, except now instead of carrying we are going to need to borrow.

Let's subtract down from 8 and until we reach 4.

Decimal	Binary
8 - 1 = 7	1000 - 1 = 111
7 - 1 = 6	111 - 1 = 110
6 - 1 = 5	110 - 1 = 101
5 - 1 = 4	101 - 1 = 100

Here are some rules for subtraction:

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

The key to any math problem is to take your time and check your work often. Subtraction is typically slightly more difficult simply because of borrowing and keeping track of the borrowed digits.

While not as important in addition, it is paramount in subtraction to place the larger number on top of the subtraction. If not, the result will be a negative number.

Here is an example of subtraction, pay close attention to how the borrowing in binary works out and try it out on simple problems first!

Ex. Subtracting 11_2 from 11010_2:

```
Binary | Decimal
       |
 11010 |   26
-   11 |  - 3
------ |  ---
 10111 |   23
```

to Clipboard

In decimal subtraction, you would borrow from the next digit. If the next value was a 7, you would cross it out, make it a 6, and bring the 1 over to your current subtraction.

In binary subtraction you do the same thing except you can only ever borrow from a 1 and it will always go to 0. Just like in decimal, if the next digit is a 0, you have to go to the next 1 and carry all the way down the numbers.

Instructions

1. Checkpoint 1 Passed

1.

Create the variable, answer1, and set it equal to the result of 101_2 - 1_2.

**Note:* Using a sheet of scratch paper can help significantly with keeping your math in order.

Hint

Look back through the exercise to the “rules” of subtraction. They should help here.

2. Checkpoint 2 Passed

2.

Create another variable, answer2, and set it equal to the result of 10010_2 - 1011_2.

Hint

There are a few ‘borrowing’ occasions here, go slow and follow the borrows.

3. Checkpoint 3 Passed

3.

Create the final variable, answer3, and set it equal to the result of 1110111011_2 - 11010111_2.

Hint

This question requires borrowing multiple times from the larger number. The combination of the simple rules from the exercise and the multiple borrowing occasions will help solve this problem. Use a piece of scrap paper for the extra working room if you need to.

script.py

```
# Part 1:

answer1 = 100

# Part 2:

answer2 = 111

# Part 3:

answer3 = 1011100100
```