

Math Challenge #4

The series of *self powers*, in which the exponent and base are the same, is as follows:

$$1^1, 2^2, 3^3, 4^4, \dots$$

If we sum the first ten terms of this series, we get:

$$1^1 + 2^2 + 3^3 + 4^4 + \dots + 10^{10} = 10405071317$$

Write a Python program to sum up the first 5,000 terms of this series, then print out only the last 10 digits of the sum. In other words,

$$1^1 + 2^2 + 3^3 + 4^4 + \dots + 5000^{5000} = ?$$

Notice that this will be a huge number. Rather than print out the entire number, just print out the last 10 digits.

Remember, start with small numbers first to make sure your program is correct. You can check your work by adding up the first 100 terms of the series and ensuring that your program displays the last 10 digits correctly, which are:

$$9027641920$$

As you work on this challenge, think very carefully about whether there are any numbers you can skip. For instance, $10^{10} = 10000000000$. Does adding this number to another number change any of its last 10 digits? How about 20^{20} ? Or 30^{30} ? And so on. The more numbers you are able to skip, the faster your program will run.