Simple programming exercises

Here are some very introductory examples with some elementary algorithms. When examples are provided with the expected outcome, it is very important that you make sure that your code matches the examples exactly. Details matter!!

Important: Always test your code, either in the console or in source file. Make sure it gives the correct results for simple cases where you can predict the output.

Important: Remember to be both curious and precise. If you don't understand something, investigate it. If you observe something peculiar, investigate it. Don't be afraid to experiment.

1. Swap the values of two variables

Let's say that, at some point in your code, you have two variables, `a` and `b`. You want to swap their values.

For example, if `a == 1` and `b == 3` you want to end up with `a == 3` and `b == 1`.

Note that doing this doesn't work (you should make sure that you understand why):

```
a = b
b = a
```

2. Simple loop.

Assume that at the beginning of your code, variable `n` contains an integer value. Write a code that prints "Hello world", n^2 times.

3. Sum of odd squares.

Assume that at the beginning of your code, variable `n` contains an integer value. Write a code that prints a sum of squares of all odd numbers between 1 and n. That is, if n is odd, $n = 2k + 1$ you want to print

$$\sum_{i=1}^{k} (2i + 1)^2,$$

if n is even, $n = 2k$ you want to print

$$\sum_{i=1}^{k-1} (2i + 1)^2.$$

4. Fibonacci numbers

Fibonacci numbers are defined by a recursive relation
$F_0 = 1, F_1 = 1$, and $F_{n+2} = F_{n+1} + F_n$. For example, the first 8 Fibonacci numbers are

$$
\begin{aligned}
F_0 &= 1, \\
F_1 &= 1, \\
F_2 &= F_0 + F_1 = 2 \\
F_3 &= F_2 + F_1 = 3 \\
F_4 &= F_2 + F_3 = 5 \\
F_5 &= F_4 + F_3 = 8 \\
F_6 &= F_5 + F_4 = 13 \\
F_7 &= F_5 + F_6 = 21.
\end{aligned}
$$

Assume that at the beginning of your code, variable `n` contains an integer value. Write a code that prints all Fibonacci numbers up to F_n.