Python Fundamentals

What is an iteration? while loop

Objectives:

- What is an iteration?
- while loop

What is an iteration?

▶ Iteration is a process where a set of instructions are repeated in a sequence a specified number of times or until a condition is met. Multiple iterations form a loop.

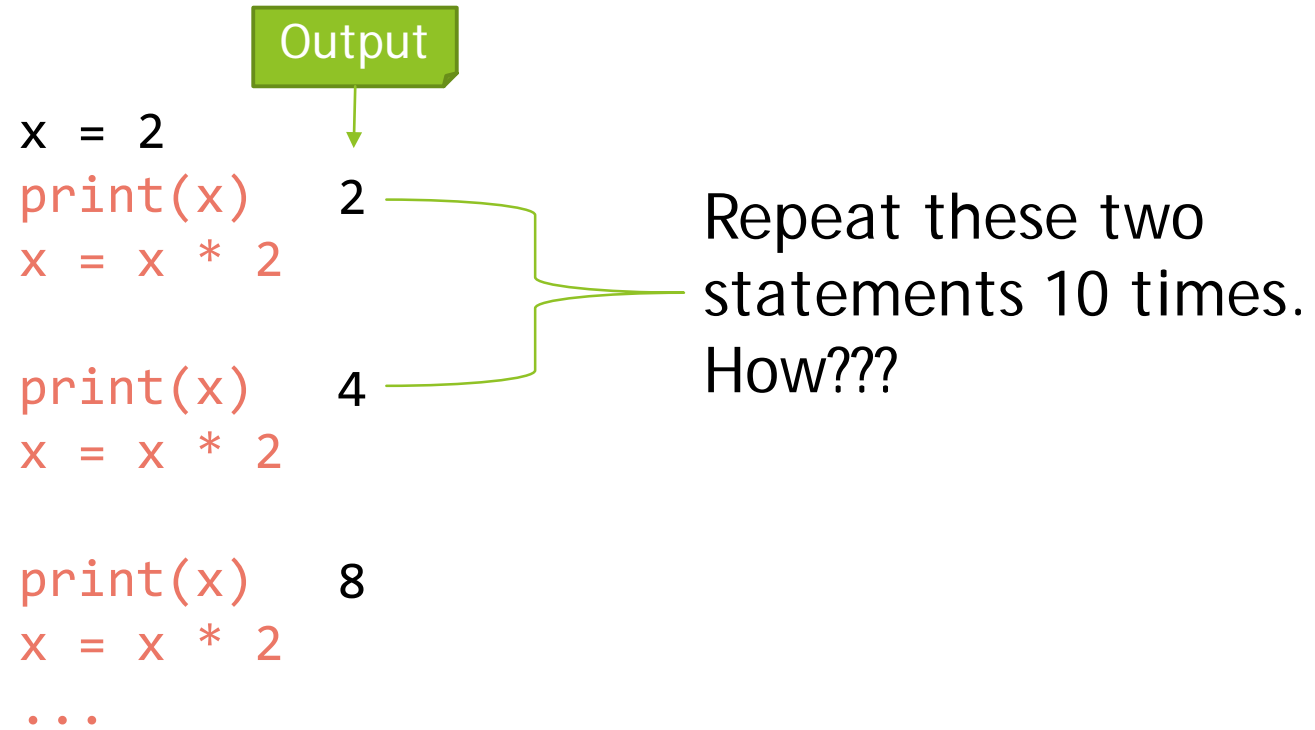For example we want to create a program in order to print the first 10 powers of 2

2
4
8
16
32
64
128
256
512
1024

What is an iteration?

```
print(2)
print(4)
print(8)
print(16)
print(32)
print(64)
print(128)
print(256)
print(512)
print(1024)
```

The program will display the required numbers but will not calculate them!!
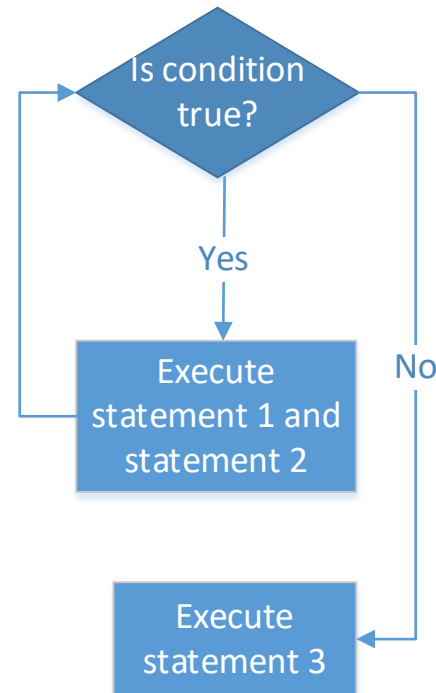
What is an iteration?

```
Output
```

```
x = 2
print(x)    2
x = x * 2

print(x)    4
x = x * 2

print(x)    8
x = x * 2
...
```

Repeat these two statements 10 times. How???

while loop

- Looping in Python is achieved with the `while` statement. It takes a Boolean expression.

- The loop will continue while the condition is **true**.

```
while condition:
    statement1
    statement2
statement3
```

while statement

```
x = 2
# repeat the following
# statement 10 times
print(x)
x = x * 2
```

Loop control variable

```
count = 1
x = 2
while count < 11:
    print(x)
    x = x * 2
    count += 1
```

Must increment count so condition will eventually be false and the loop will end.

while statement sample

Write a program which generates and displays 10 random integer numbers between 0 and 100 and then displays the highest of these numbers.

while statement sample

Below is the sample; we're trying to find out the highest number. Note the line `count, num = 1, 0`. This is an example of assigning to multiple variables.

```python
# It's good practice to declare all imports first
import random

count, num = 1, 0
while count < 11:
    num = random.randint(0, 100)
    print(num)
    count += 1
print()
print("The highest is")
```

while statement sample

We define a new variable to store the highest value. However, there's an error with this code.

```python
# It's good practice to declare all imports first
import random

highest
count, num = 1, 0
while count < 11:
    num = random.randint(0, 100)
    print(num)
    if num > highest:
        highest = num
    count += 1
print()
print("The highest is", highest)
```

Runtime error: variable **highest** has no initial value.

given a value (initialized) here

while statement sample

A variable **MUST** have an initial value before it's used.

```python
# It's good practice to declare all imports first
import random

highest = 0
count, num = 1, 0
while count < 11:
    num = random.randint(0, 100)
    print(num)
    if num > highest:
        highest = num
    count += 1
print()
print("The highest is", highest)
```

References

Python tutorial using a while statement

https://docs.python.org/tutorial/introduction.html#first-steps-towards-programming

Demonstration:

- What is an iteration?
- while loop