



Welcome to the UMD STEM Workshop 2023!

Week One: Introduction to Python

a. What is Python?

Python is an object-oriented programming language that can be used for nearly everything! Did you know that NASA uses Python to program their equipment and space machinery? Other big companies such as Google, and Instagram also use Python.

It can be used to process all sorts of data, display text or images, or solve scientific equations. Don't worry about what object oriented means just yet, but you can look it up if you are curious!

b. Print Statements

To output text:

```
print("Hello World")
```

Output: Hello World

To output numbers:

```
print(10)
```

Output: 10

c. Variables

Variables can take on the values of integers (whole numbers) (4, 2, 391) , floating point numbers (numbers with decimal points) (3.2, -4.153, 3.1415926), strings of letters ("Hello there"), etc. Names can be assigned to variables:

```
val = 10  
word = "hello"  
val2 = 4.3
```

d. Changing the Value of Variables

The value of a variable can be reassigned:

```
val = 10  
print(val)  
val = 15
```



```
print(val)
```

Output: 15

```
num = 2
```

```
print(num + 4)
```

Output: 6

A variable can be defined by the value of another variable:

```
num = 5
```

```
val = num*5
```

```
print(val)
```

Output: 25

e. Concatenation

Strings cannot be added to numbers or other strings, but they can be concatenated (look up that word!):

```
word = "hello"
```

```
word2 = " world"
```

```
print(word + word2)
```

Output: hello world

Strings can also be multiplied:

```
word = "hi"
```

```
print(word*3)
```

Output: hihhi

f. Converting Variable Types

When converting floating point numbers to integers, positive numbers will always be rounded down, and negative numbers will always be rounded up. For example, 5.8 will be rounded to 5, and -4.2 will be rounded to -4.

To convert:

```
num = 12.56
```

```
newInt= int(num)
```

```
print(newInt)
```

Output: 12



To convert a string to an integer:

```
string = "5"  
newInt = int(string) * 4  
Output: 20
```

To convert an integer to a string:

```
int = 5  
newString = str(int)*4  
print(newString)  
Output: 5555
```

When a string cannot be converted to an integer, an error will occur. For example, you cannot convert the word "hello" into an integer.

```
string = int("hello")
```

g. Accept User Input

Accepting user input allows the program to interact with users and accept data from them. Inputted values will be strings by default:

```
x = input("Enter text here")  
print(x)
```

The program will prompt the user to enter data, using the statement in Quotes.

To accept integer inputs, we need to convert the data type from string to Int.

```
x = int(input("Enter number here"))  
print(x)
```

h. Writing Comments

When programming, it is a good practice to write comments that indicate what the code is doing. This will help other people understand your code when they read it. Lines that are commented out will not be run.



Comments can be added by entering the pound symbol (#) before the line:

```
#print user input  
x = input("Enter input here")  
print(x)
```

Multiline comments can be added by enclosing the lines with ''' and '''

```
''' print user input  
x = input("Enter input here")  
print(x)'''
```

i. Practice Problems

Write a program that inputs and prints out a value. Write a comment that describes your code. Run the program again. Does anything change?

Comment out the print statement. Run the program again. Does anything change?

Write a program that inputs a name, and prints out the Happy Birthday song along with the name as follows.

```
"Happy Birthday to you!"  
"Happy Birthday to you!"  
"Happy Birthday dear ___!"  
"Happy Birthday to you!"
```

Write a program that tells the user to input a temperature value in degrees Fahrenheit and convert it to degrees Celsius. Note: $F = 9/5 * C + 32$. Can you write a program that converts from degrees Celsius to degrees Fahrenheit? $C = (F - 32) * (5/9)$



Challenge Problem

The number S is called the mean (average) of two numbers X and Y where S is equal to $(X + Y) \div 2$. Bob's birthday present for Jeff was two integers X and Y . Jeff promptly calculated their mean which also happened to be an integer but then lost Y ! Help Jeff restore Y .

Input

The first and only line of input contains two integers X and S .

Output

Output Y on a single line.

Sample Input	Sample Output
11 15	19
4 3	2