Beginners Guide To Python

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Why Python

Upsides

- No semicolons
- No setting variable types

Downsides

- Not compiled language
- Whitespace matters

Topics

- Input data
- Output data
- Variables
- Variable operations
- String concatenation or string format
- If statements
- For loops
  - in range()
- While loops

https://docs.python.org/3/tutorial/index.html

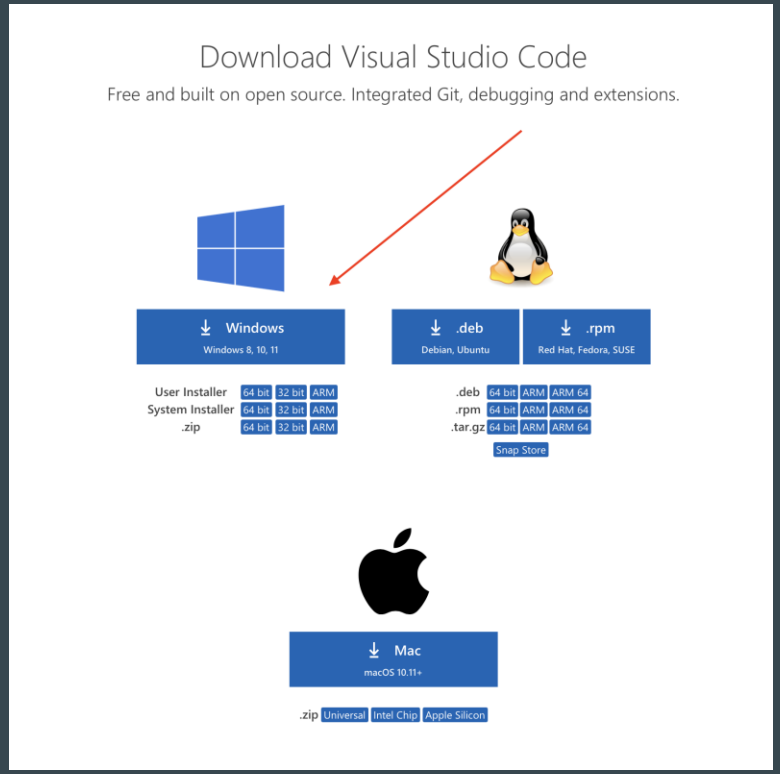
Integrated development environment (IDE)

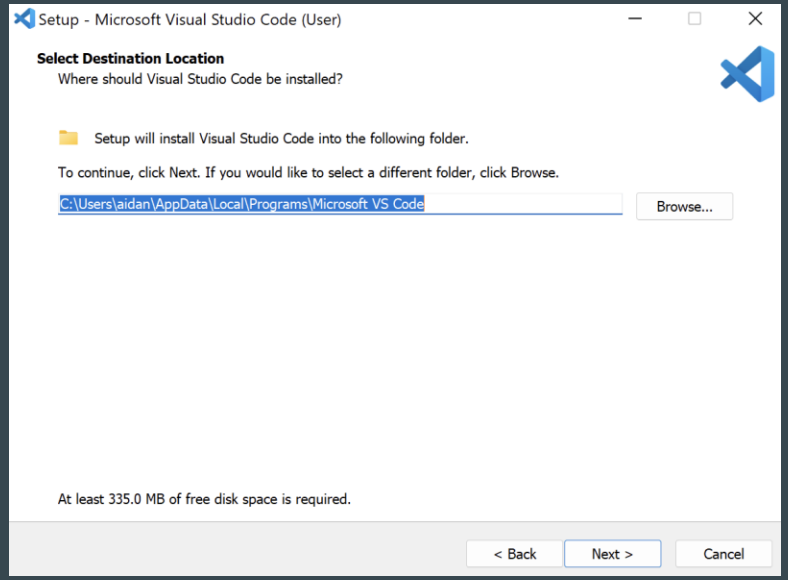
- Allows programmers to quickly program files
- Built in error checking
- Compiles and Runs the files for us

- We will be using Visual Studio Code

Installing VSCode

Go to https://code.visualstudio.com/download

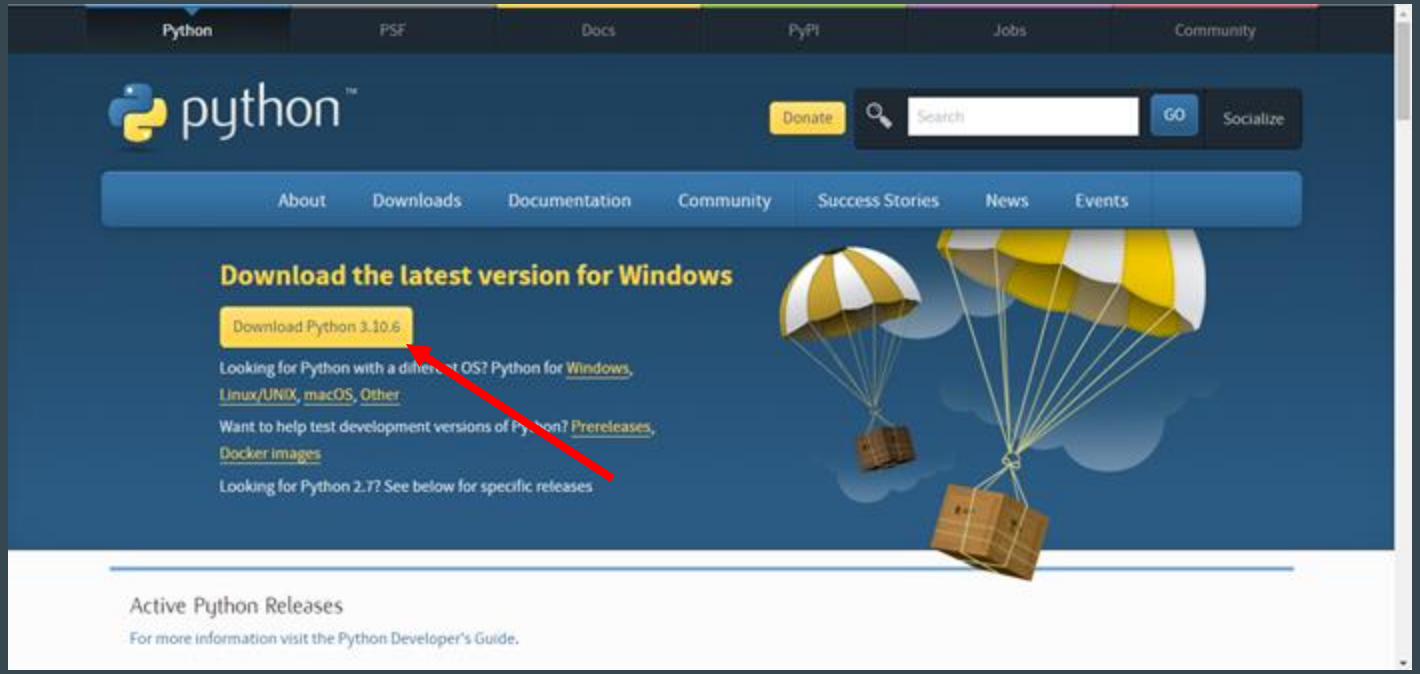




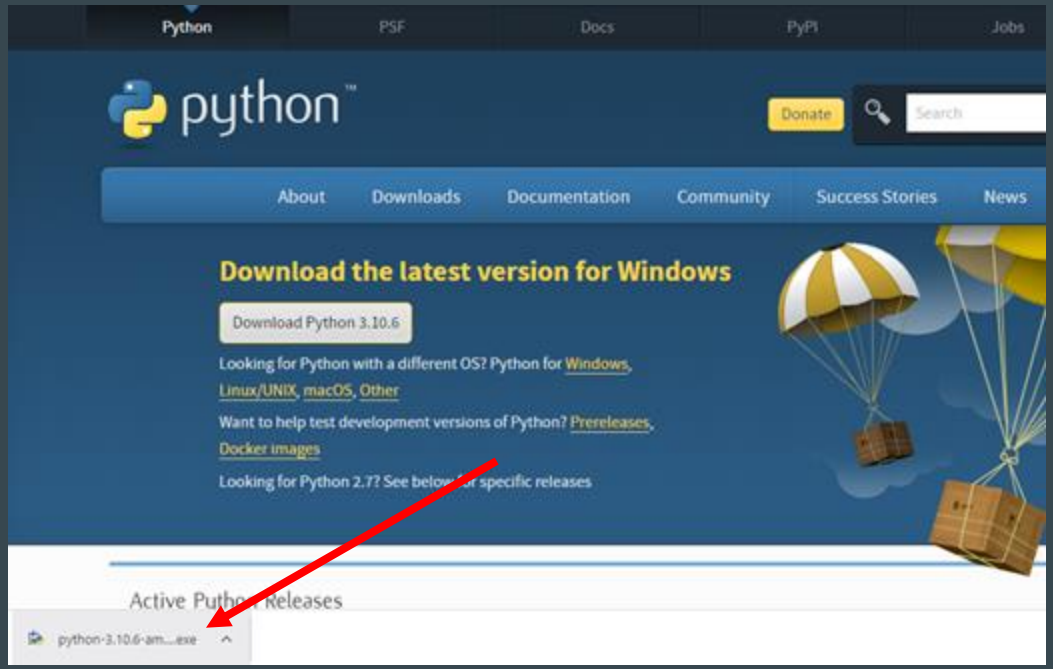
Installing Python

Downloading Python

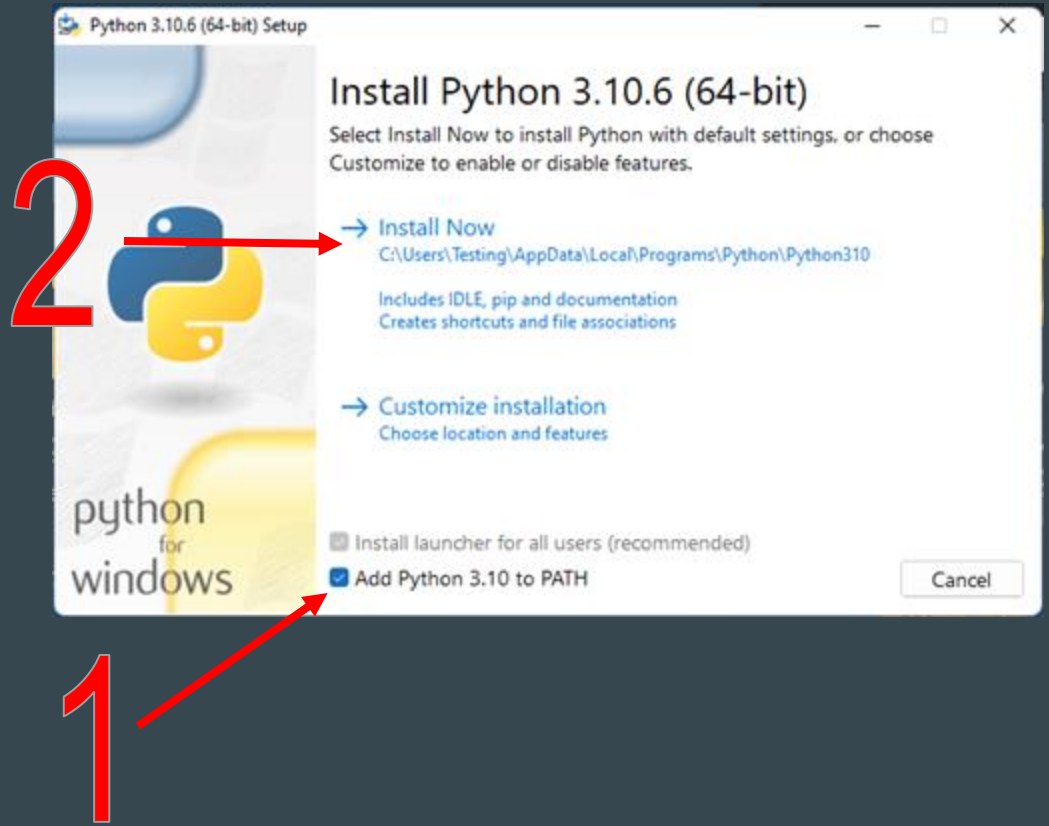
python.org/downloads/



Downloading Python

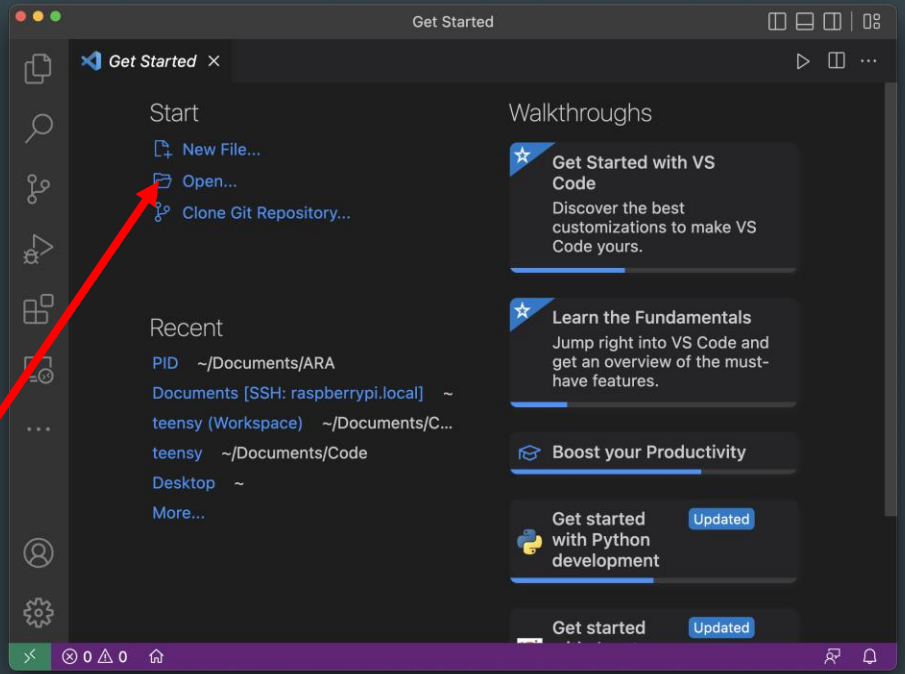


Downloading Python

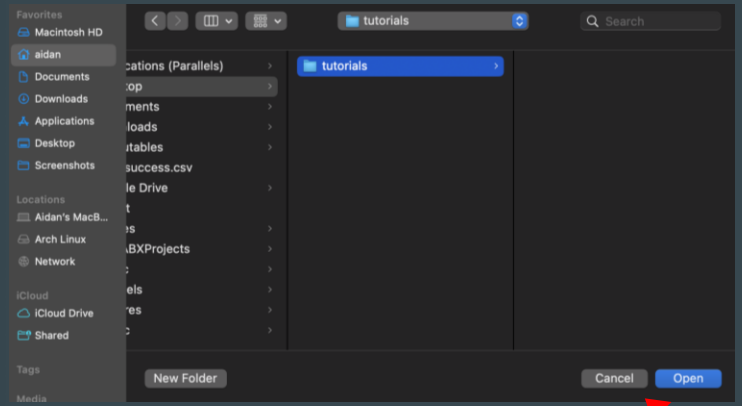


Setting up “Hello World”

Create a new project



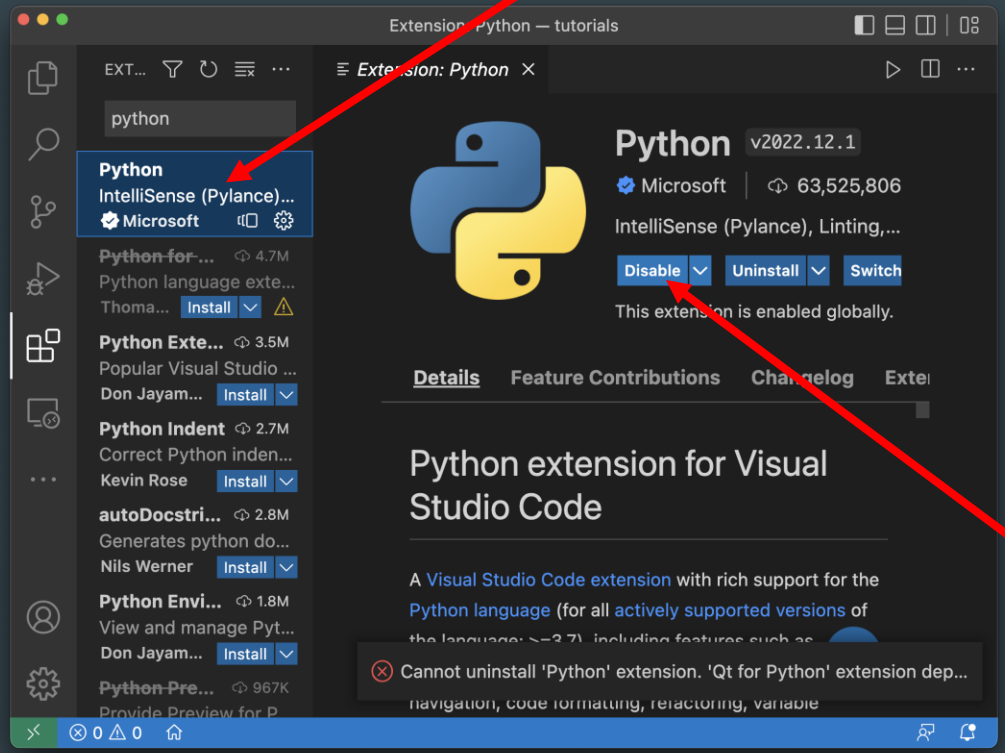
Open a folder on your computer where you wish to store all your programs



Python Extension

1. Select the “Extensions” tab
2. Search for the “Python” extension

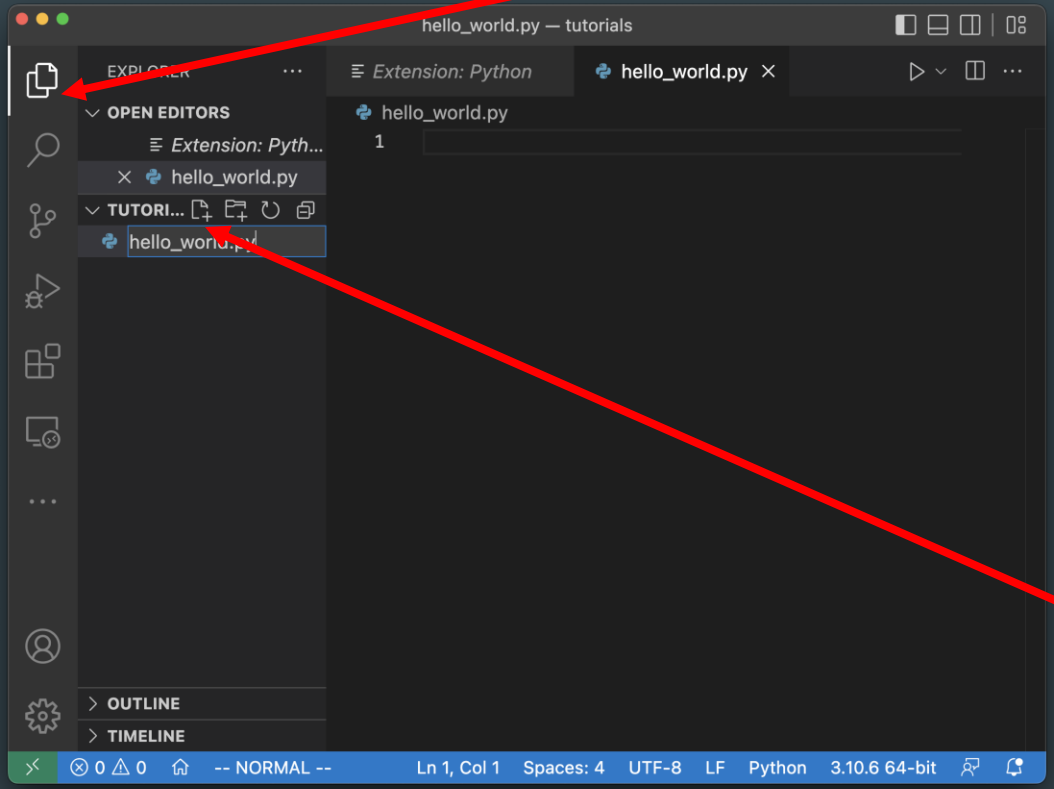
Python Extension



3. Select the first result

4. Click the “Install” button

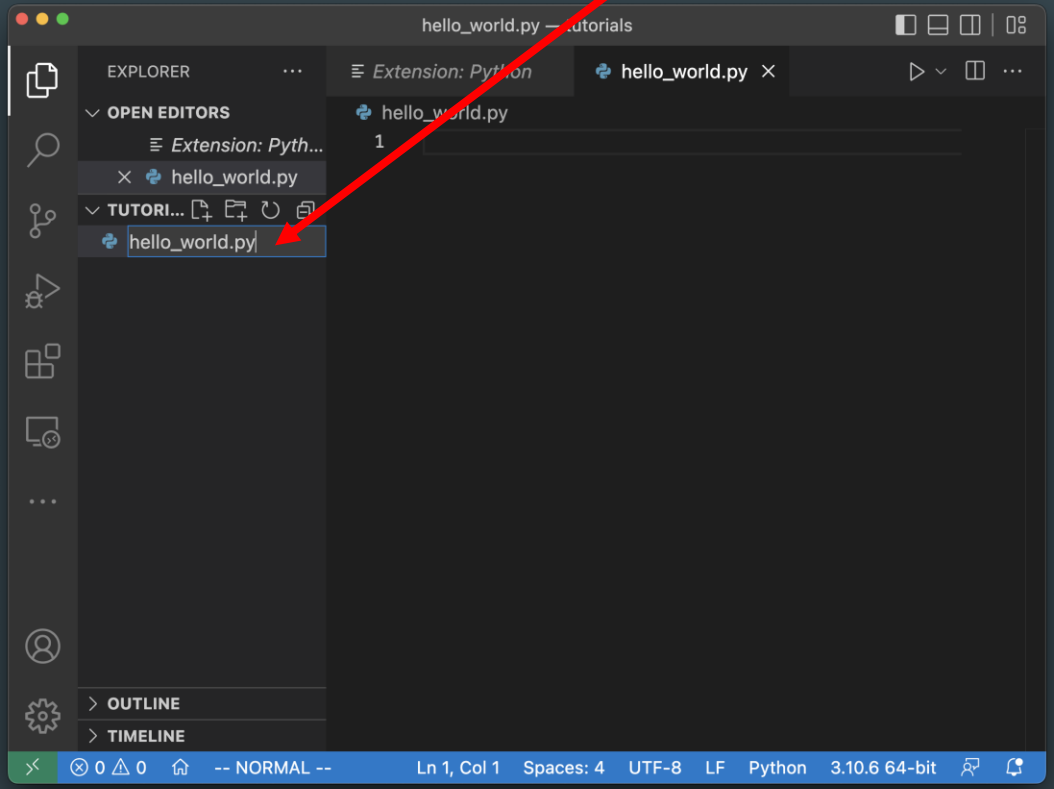
Create a New File



5. Go back to the “Files” tab

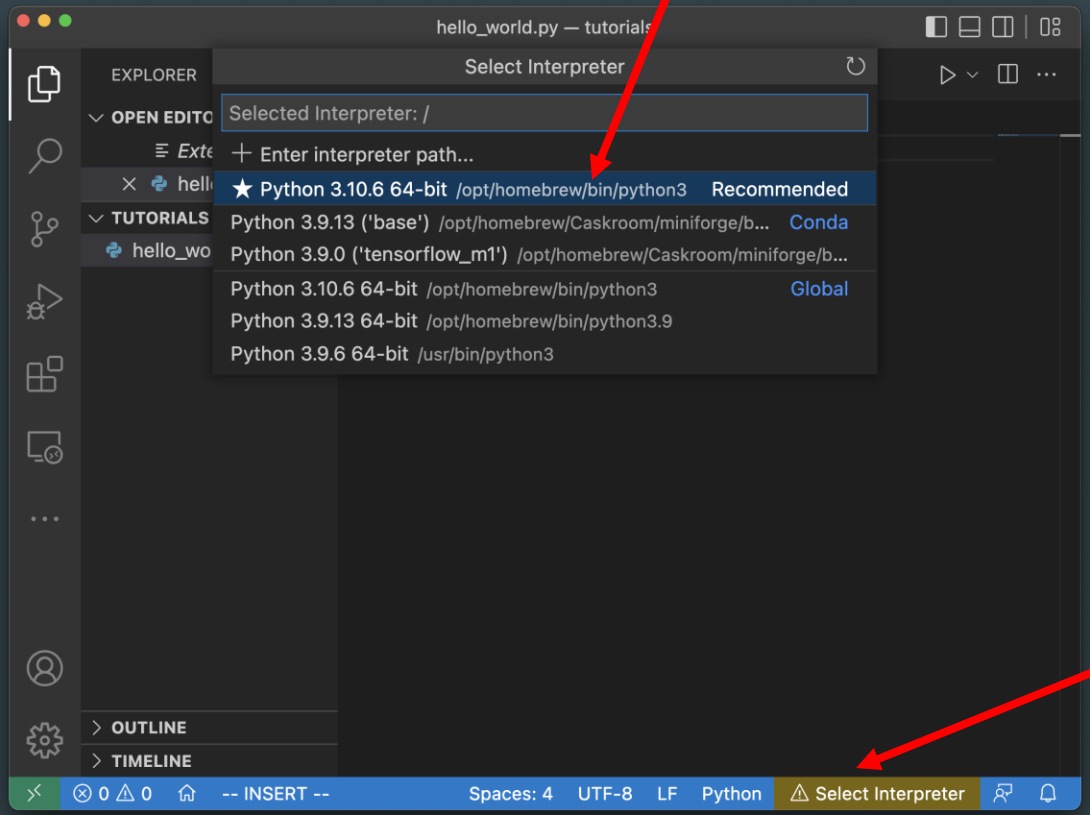
6. Add a new file to your project

Create a New File



7. Name your file with a “.py” extension

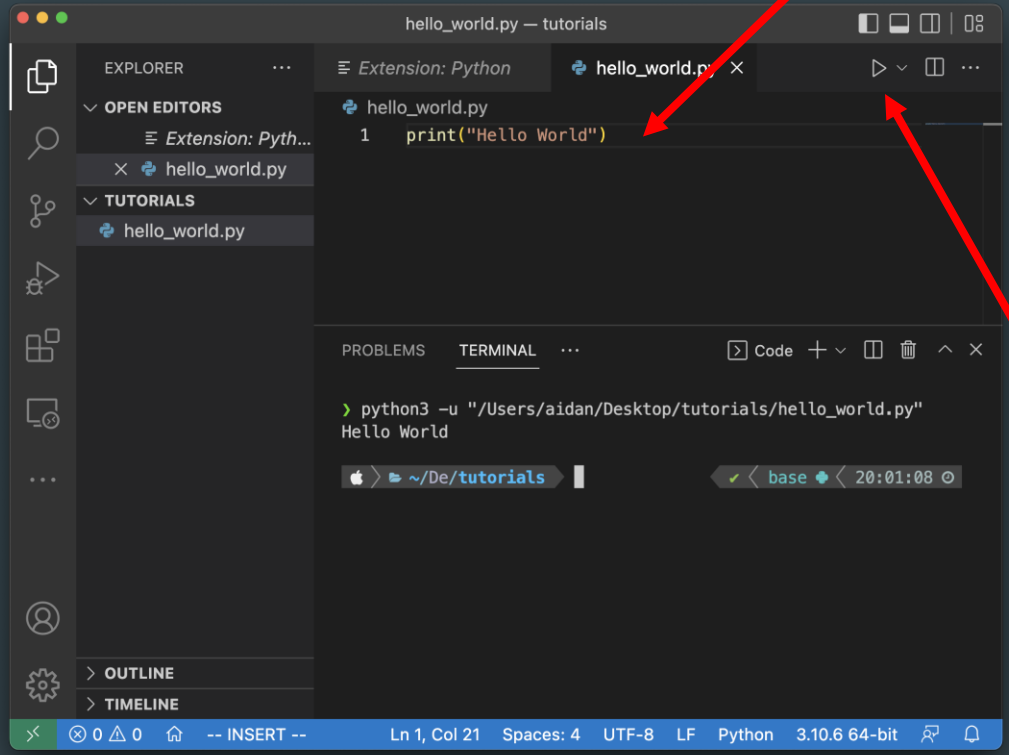
Select an Interpreter



8. Click the “Select Interpreter” button

9. Select the interpreter you installed earlier

Run “Hello World!”



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10. Type this statement:

```
print(“Hello World!”)
```

11. Click the ”run” button

NOW LET'S GET TO PROGRAMMING

Variables

Let's look at 4 common variable types

- Strings
- Integers
- Floats
- Booleans

See Python Built-in Types:
https://docs.python.org/3/library/stdtypes.html

Declaring Variables

Strings are denoted by " or '

name = "Avery"

Integers are denoted by a number without a decimal

age = 19

Floats/Doubles are denoted by a number with a decimal

bankAccount = 125.43

Booleans are denoted by True or False

single = True

Testing Variable Types

```
print(type(variable_name))
```

print(type(name))

Output: <class 'str'>

Variable Names

In the world of programming, there are two common ways of naming variables:

Camel Case

- myVariable

Snake Case

- my_variable

Math Operations

Now let's focus on mathematical operations:

It is the basics of programming

- Add **+**
- Subtract **-**
- Multiply *****
- Divide **/**
- Integer Division **//**
- Remainders **%**
- Exponents ******

https://docs.python.org/3/library/operator.html#module-operator

Math with Variables

```
a = 8
b = 6
print(a + b) # add
print(a - b) # subtract
print(a * b) # multiply
print(a / b) # divide
print(a // b) # floor division, rounds down
print(a % b) # modulo, returns remainder
print(a ** b) # power, exponents
```

Outputs

```
14
2
48
1.3333333
1
2
262144
```

Exercise 1 – Evaluating a Function:

- Use a python program to evaluate the following equation for $f(4)$:

$$f(x) = \frac{12x^4 - 4x^2 + 9}{x^5 - 31}$$

Possible Answer

```
x = 4
equation = (12 * x ** 4 - 4 * x ** 2 + 9)/(x ** 5 - 31)
print(equation)
```

3.0382678751258814

Increment Math Operations

Say we want to adjust the value of a variable using itself

```
a = 6
a = a + 5
print(a)
```

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Increment Math Operations

- Add **+=**
- Subtract **-=**
- Multiply ***=**
- Divide **/=**
- Integer Division **//=**
- Remainders **%=**
- Exponents ****=**

https://www.w3schools.com/python/gloss_python_assignment_operators.asp

Incrementation

```
n = 10
print(n)
```

10

```
print(n+1)
print(n)
```

11

10

```
n = n+1
print(n)
```

11

```
n += 1
print(n)
```

12

```
n /= 2
print(n)
```

6.0

String Operations

Now let's focus on strings:

Can concatenate or format.

https://docs.python.org/3/tutorial/inputoutput.html

Using only print statements

```
first = "Avery"
second = "Fernandez"
print("My name is ")
print(first)
print(second)
```

```
My name is
Avery
Fernandez
```

Each print statement is on its own line

Formatting

```
print("My name is", first, second)
```

My name is Avery Fernandez

```
print(f"My name is {first} {second}")
```

My name is Avery Fernandez

Concatenation

```
print("My name is " + first + " " + second)
```

My name is Avery Fernandez

```
age = 19
print("My age is " + age)
```

receive an error, can only concatenate str (not "int")

Casting Variables

```
print(type(age))
<class 'int'>
```

We can't concatenate since the variable is an integer

```
ageString = str(age)
print(type(ageString))
<class 'str'>
```

Now we can concatenate

```
print("My age is " + ageString)
print("My age is " + str(age))
```

```
My age is 19
My age is 19
```

Works for all data types

```
print(f"Examples: {str(age)} {str(bankAccount)} {str(single)}")
```

```
Examples: 19 125.43 True
```

Taking User Inputs

How can we input our own data

https://docs.python.org/3/library/2to3.html?highlight=input#to3fixer-input

Inputs

```
name = input("What is our name")
print(name)

print(type(name))
<class 'str'>
```

```
number = input("Give me a number")
print(number)
print(type(number))

<class 'str'>

number = int(input("Give me a number"))
print(number)
print(type(number))
<class 'int'>
```

Booleans and Comparisons

Booleans can be used to evaluate statements that, for example, are either True or False

Statements like: (is 2 even)would be **True**

Booleans can either be displayed with **True** and **False**
or
1 and **0**

Now this moves us into if and else statements.

https://docs.python.org/3/library/stdtypes.html#bltin-boolean-values
http://swcarpentry.github.io/python-novice-gapminder/13-conditionals/index.html

Boolean Statements

```
apple = True
if apple:
    print("Hi")
else:
    print("Rawr")
```

Hi

```
apple = 1
if apple:
    print("Hi")
else:
    print("Rarw")
```

Hi

Some Boolean and Comparison Operators

- *==*
- *<*
- *>*
- *<=*
- *>=*
- *!=*

- *and*
- *or*
- *not*

It will output True or False based on the statement

https://docs.python.org/3/library/stdtypes.html#boolean-operations-and-or-not

Boolean Examples

```
print(1>0)
True
print(10!=5)
True
print(4<3)
False
print(4 > 3 and 3 > 4)
False
```

```
user = int(input("Enter a number"))
if user > 50:
    print("Number is greater than 50")
else:
    print("Number is less than 50")
```

Exercise 2 – Even/Odd numbers:

Make a program which lets a user input a number, and tells them if the number is even or odd

Hint: %

Possible Answers

```
user = int(input("Enter a number"))
if user % 2:
    print("Odd Number")
else:
    print("Even Number")
```

```
user = int(input("Enter a number"))
if user % 2 == 0:
    print("Even Number")
else:
    print("Odd Number")
```

For Loops

Do repeated operations

https://nbviewer.org/github/jakevdp/WhirlwindTourOfPython/blob/master/07-Control-Flow-Statements.ipynb

Basic For Loop: in range()

```
for i in range(10):
    print(i)
```

```
0
1
2
3
4
5
6
7
8
9
```

For Loops Syntax: in range()

for (variable) in range(starting number, end number, increment):

```
for i in range(1,10):
    print(i)
```

```
1
2
3
4
5
6
7
8
9
```

Full Syntax Example

```
for i in range(0, 10, 3):
    print(i)
```

```
0
3
6
9
```

Exercise 3 – Factorials:

Make a program which lets a user input a number n and evaluates:

$$n! = 1 * 2 * \cdots * (n-1) * n$$

Hint: Use a storage variable
0 * any number = 0

Possible Answers

```
n=1
user = int(input("Enter a number"))
for i in range(1, user+1):
    n*=i
print(n)
```

While Loops

Uses Boolean argument

While (true statement):

https://nbviewer.org/github/jakevdp/WhirlwindTourOfPython/blob/master/07-Control-Flow-Statements.ipynb

While Loop Example

```
i = 0
while True:
    print("Hi", i)
    i += 1
    if (i > 10):
        break
```

```
Hi 0
Hi 1
Hi 2
Hi 3
Hi 4
Hi 5
Hi 6
Hi 7
Hi 8
Hi 9
Hi 10
```

```
while (input("name?") != "Avery"):
    print("Not my owner")

i = 1
while (i < 10 and i > 0):
    print(i)
    i+=1
```

```
1
2
3
4
5
6
7
8
9
```

Exercise 4 – Least Common Multiples:

Find the first number which is divisible by 1, 2, 3, 4, 5, 6, and 7 – in other words, the least common multiple of those numbers

Possible Solutions

```
i = 1
while (True):
    if i % 1 == 0 and i %2 == 0 and i % 3 == 0 and i % 4 == 0 and i % 5 == 0 and i % 6 == 0 and i % 7 == 0:
        break;
    i+=1
print(i)
```

```
i = 1
while not (i % 1 == 0 and i % 2 == 0 and i % 3 == 0 and i % 4 == 0 and i % 5 == 0 and i % 6 == 0 and i % 7 == 0):
    i+=1
print(i)
```

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THANKS SO MUCH

Jupyter Notebook