CSIT110

Fundamental Programming with Python

Loop Statements (2)

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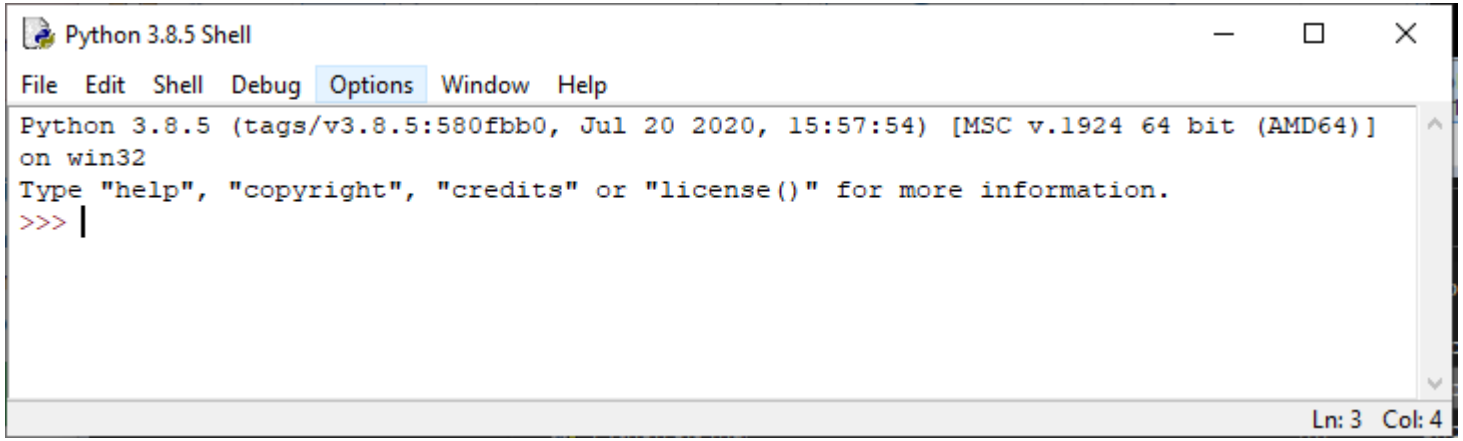
In this lecture

- Recap
- While loop
- Reading documentation

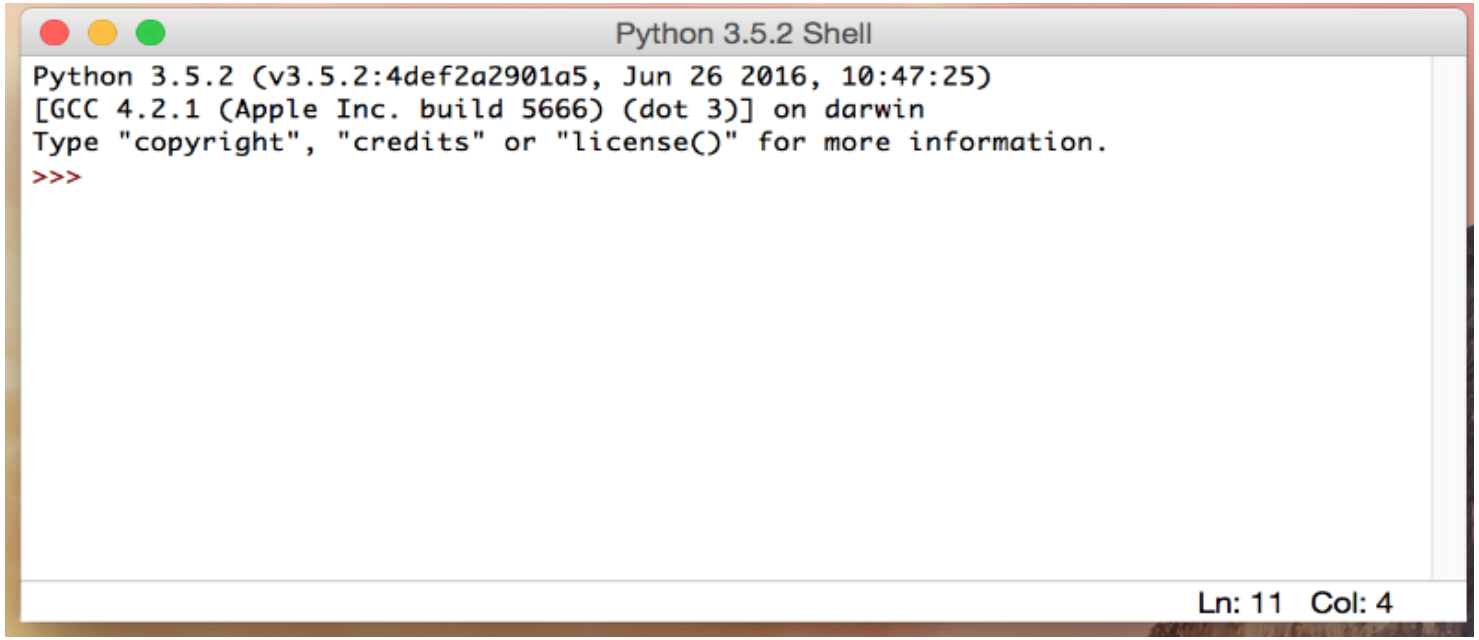
Recap – IDLE

use the python interpreter + run a python script

Window



Mac/
Unix



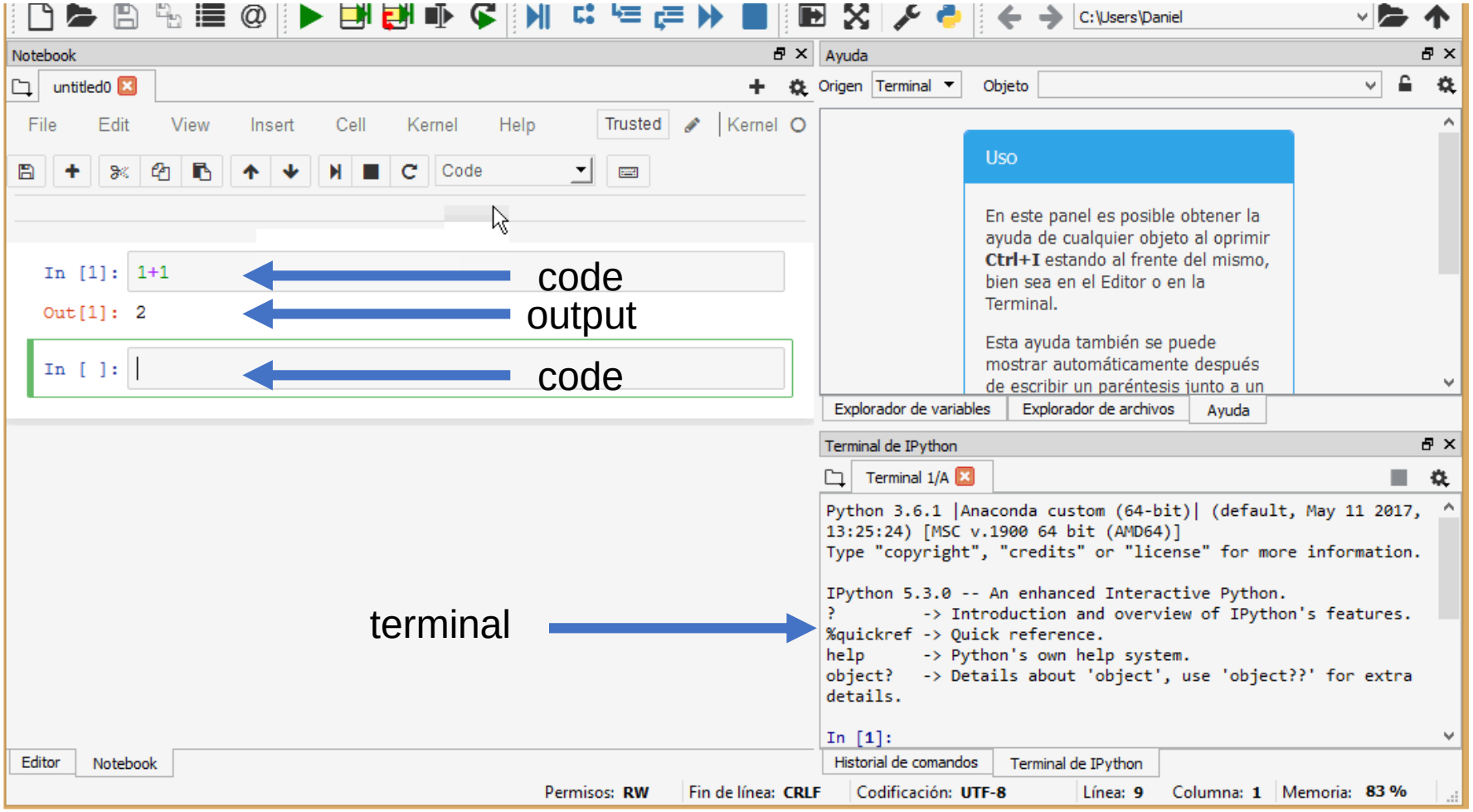
Using Python Interpreter VS Running a python script

- Hit ‘Enter’ key to execute a line
- Interprets one line at a time
- A line with only variable name will print out the variable object
- If the line of code returns a value, it will also be printed out.
  - E.g. >>>type(1232) gives <class ‘int’>

- Runs all the command in the script
- Usually triggered by a run button
- Or by typing `python script.py ` in the console
- A line with only variable name will not print out anything
- Nothing will be printed out if the line of code returns a value unless the print() function is used

IDE example

Spyder

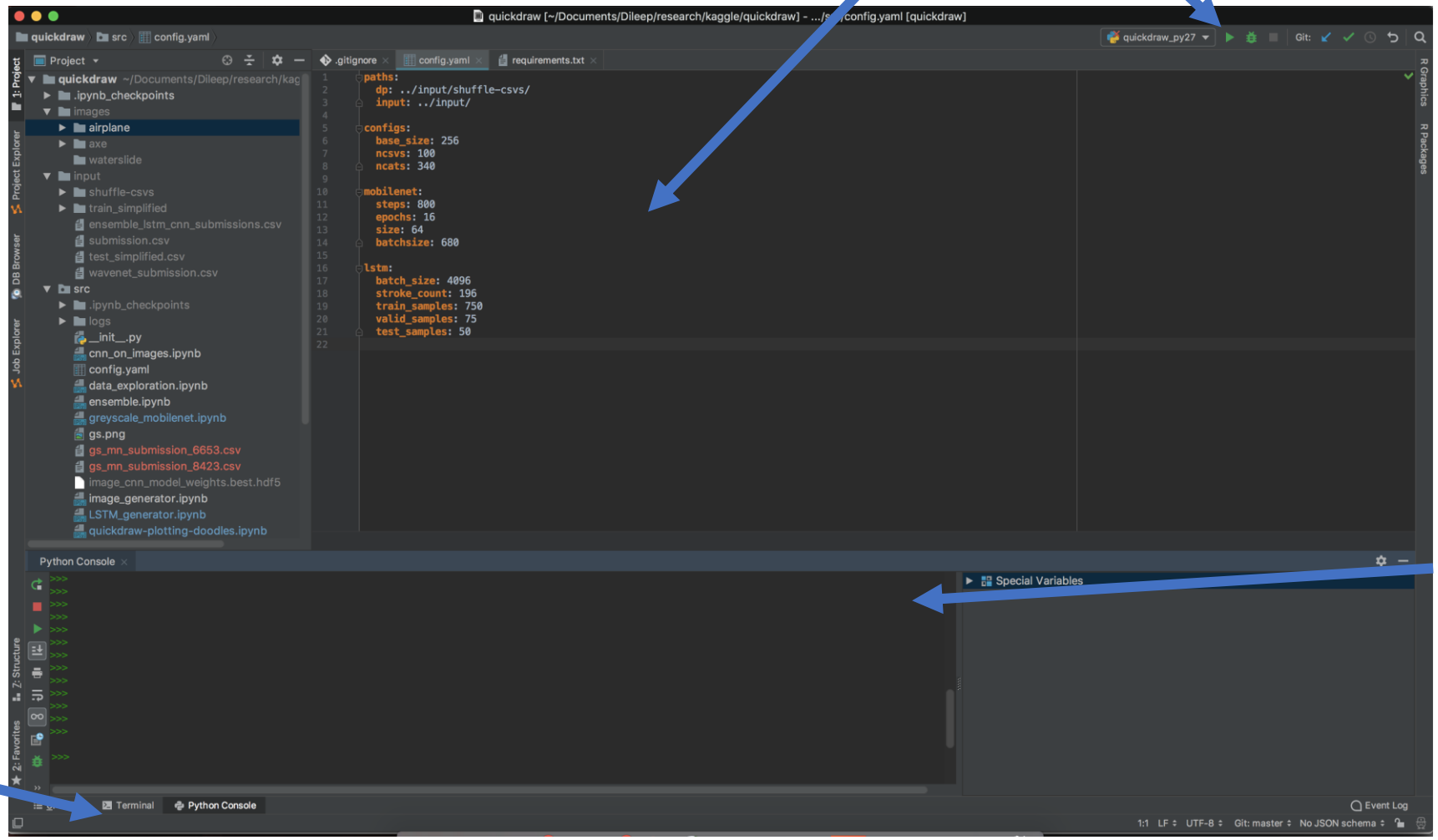


IDE example

Pycharm

run button

script

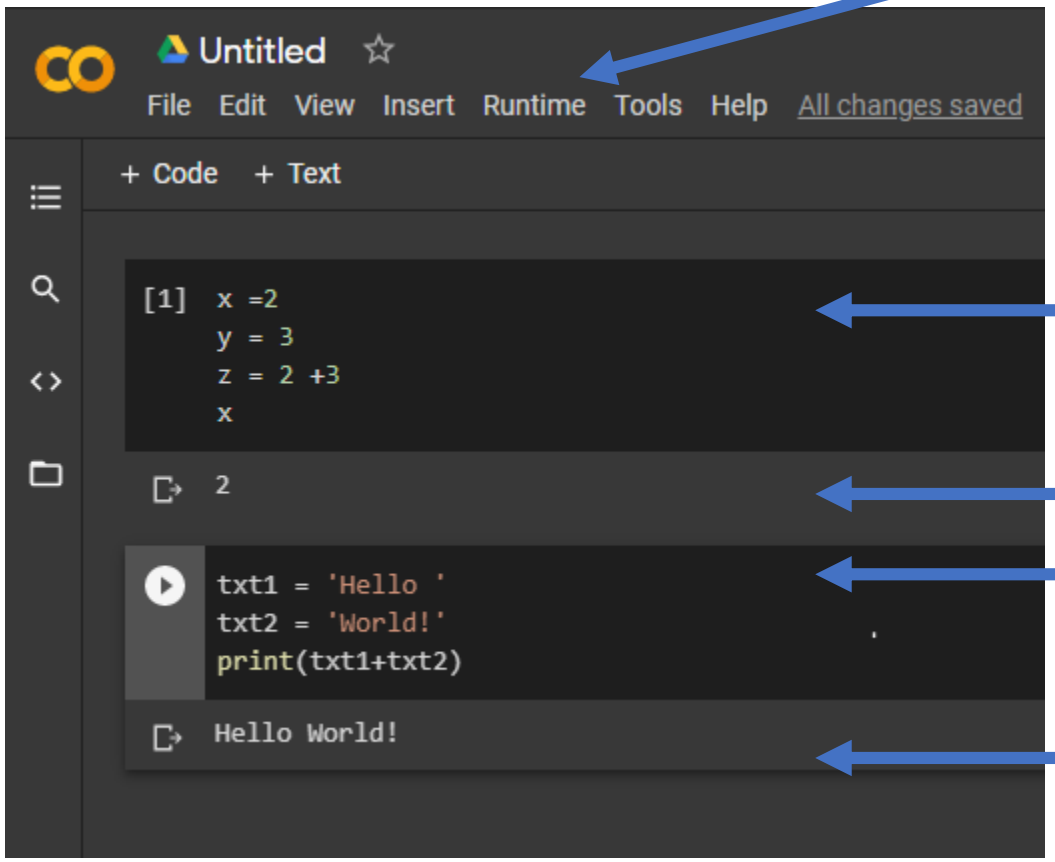


Console output

Interpreter Terminal

Recap – Online IDE

Google Colab



Run button – Runtime-> run all

code

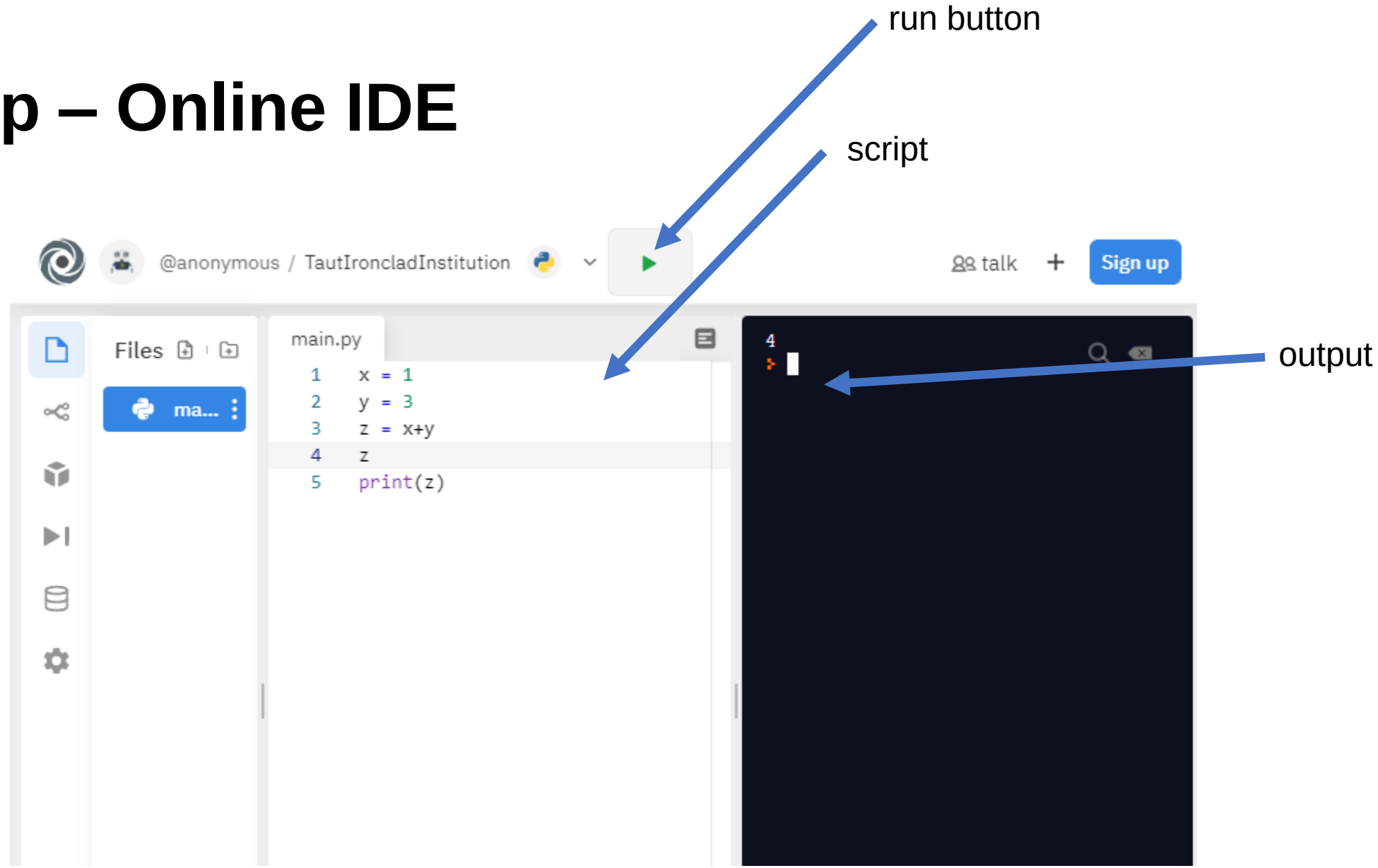
output

code

output

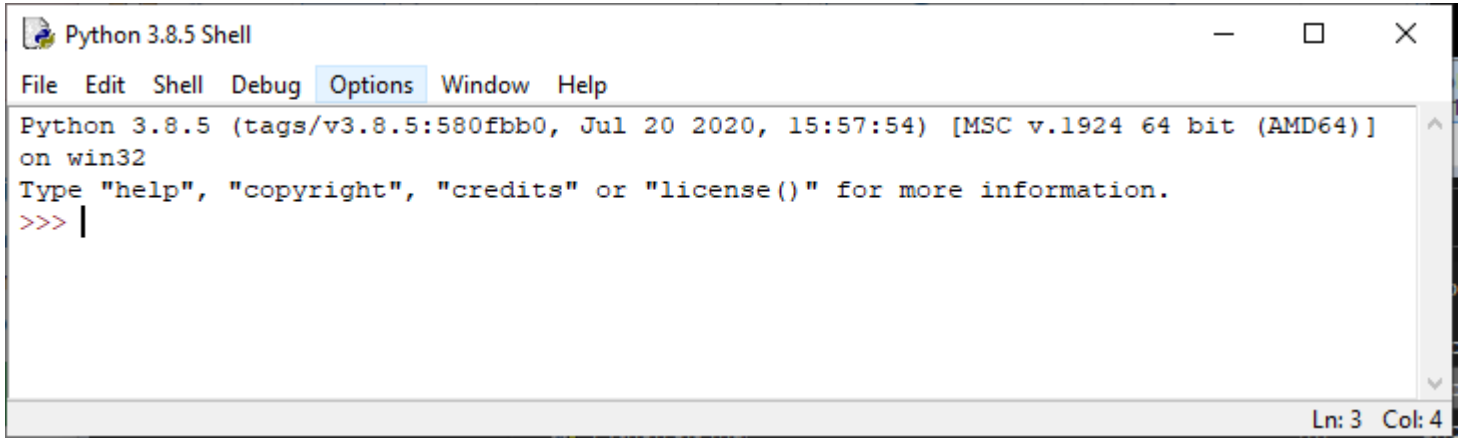
Recap – Online IDE

repl.it

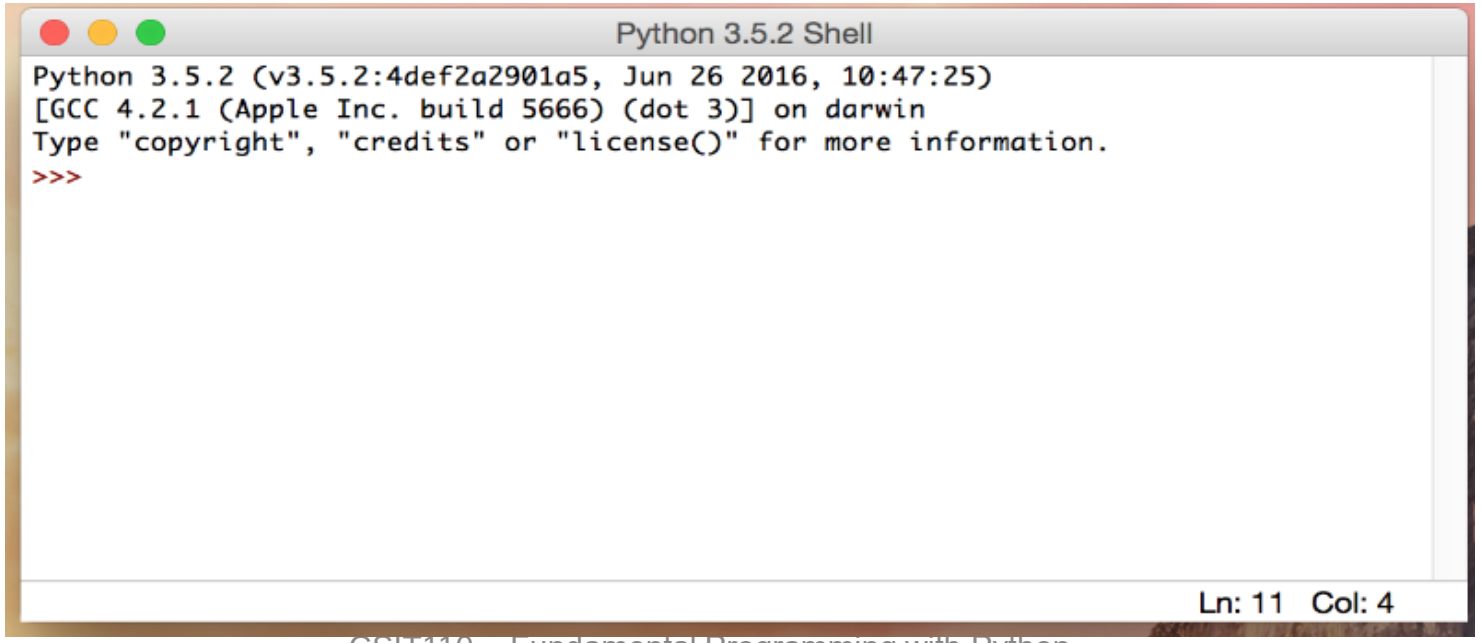


Recap – IDLE: interpreter in a PythonShell

Window

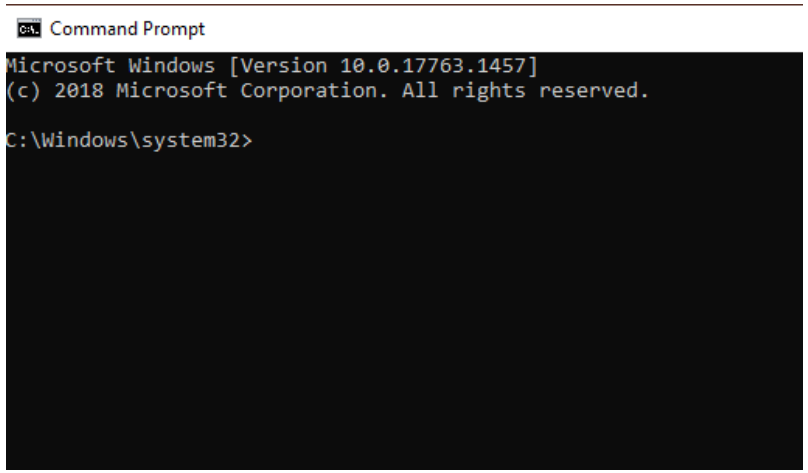


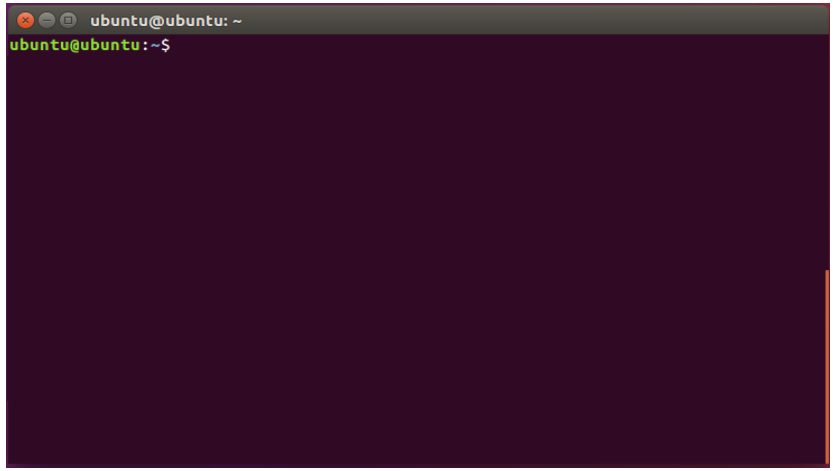
Mac/
Unix

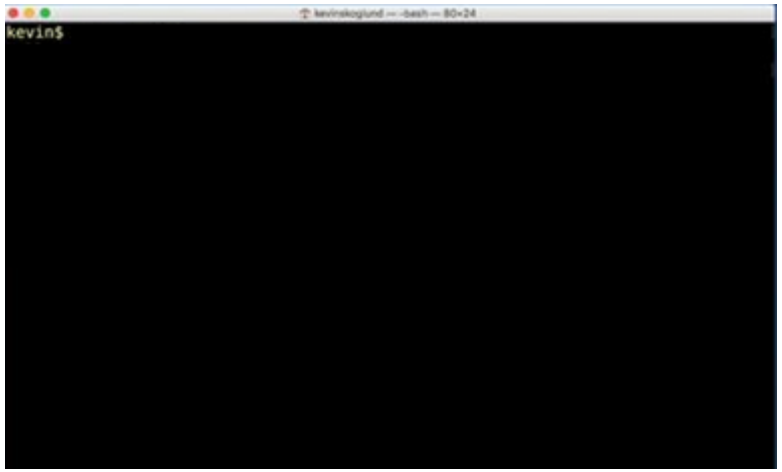


Consoles

- command prompt (Windows), command line, terminal (mac, unix)

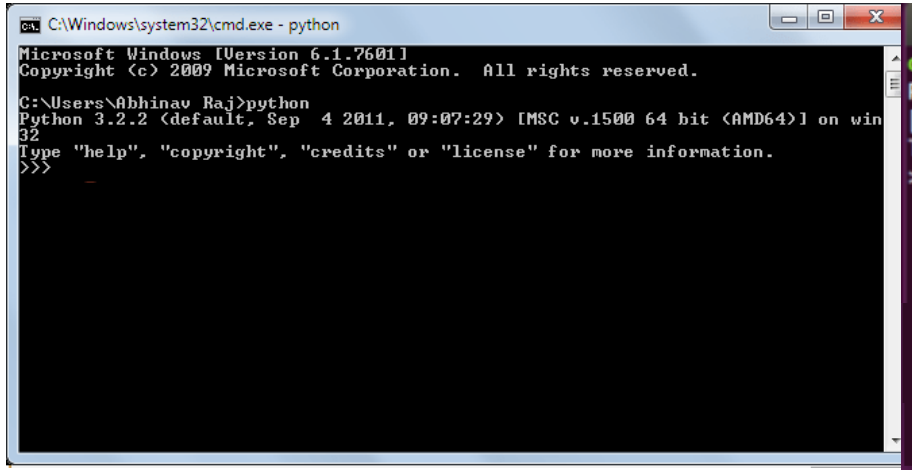


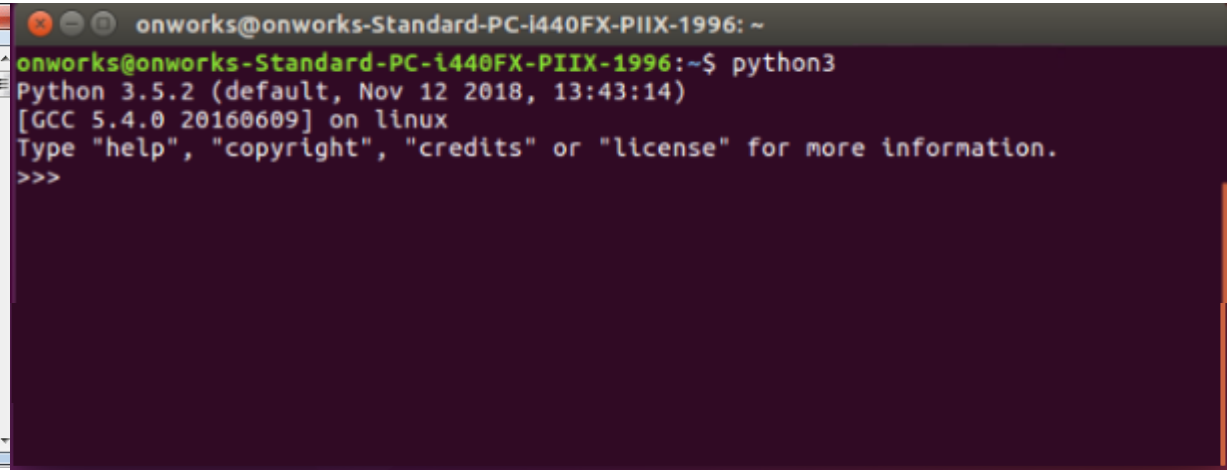


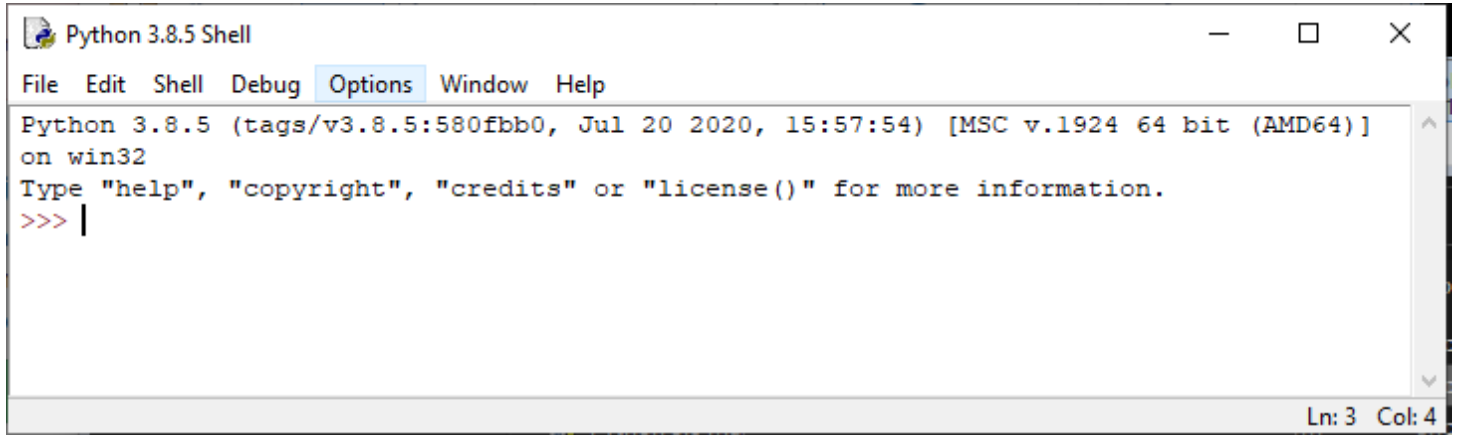


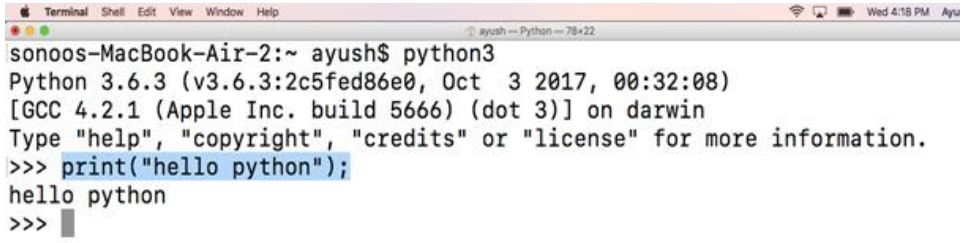
Consoles

Run python interpreter within the console









Recap – Variables and DataTypes

variable_name1 = ‘text value’	<class ‘str’>
variable_name2 = 123	<class ‘int’>
variable_name3 = 321.0	<class ‘float’>
variable_name4 = 4 + 5j	<class ‘complex’>
variable_name5 = True	<class ‘bool’>

ALWAYS use variables with **meaningful names**

`lower_case_with_underscores` for normal variables

`UPPER_CASE_WITH_UNDERSCORES` for constants

Recap - Terminologies

return_values_or_output = function_always_comes_with_brackets()

output = function_name(input, also_known_as_arguments)

Recap – Input Output

<class ‘str’> = **input**(<class ‘str’>)

<class ‘str’> = **print**(<class ‘str’>, end=‘\n’)

Default of end=‘\n’ (a newline)
To print the next output in the same line do this in the previous print statement

```
print(<class 'str'>, end='')
```

Recap – string format

1. f'…..{variable_name}…{variable_name}'
2. 'The three variables are {0}, {1}, {2}'.format(variable0,variable1, variable2)
3. 'I can align the text like this {0:<15}, {1:^10}, {2:>12}'.format(txt0,txt1,txt2)

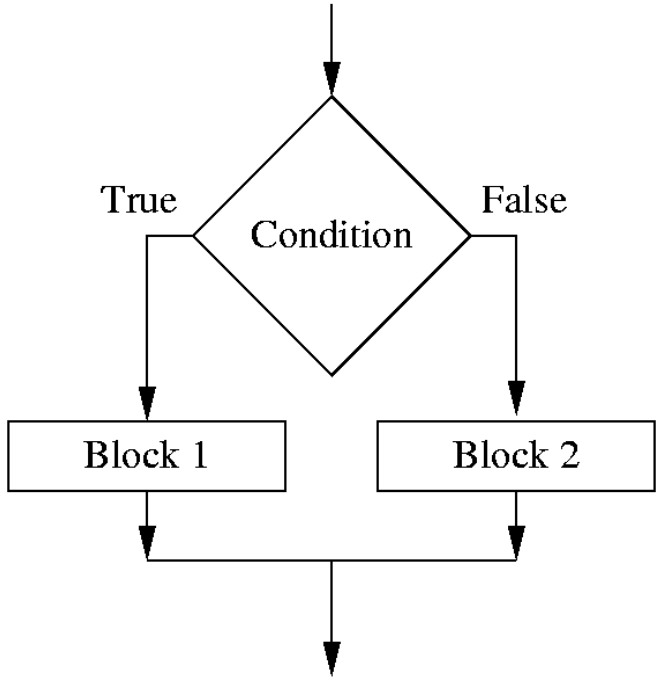
<	left
>	right
^	centre

4. 'To set decimal places I can do {0:<15.1f}, {1:^10.2f}, {2:>12.0f}'.format(price0,price1,price2)

Recap – If-Else statement

```
if (some condition):
    # block statements if condition
    # is True

else:
    # block statements if condition
    # is False
```



Recap – if - elif - elif - … - else

```
if (condition1):
    # condition1 is true
    statement
    statement
    ...
elif (condition2):
    # condition1 is false and condition2 is true
    statement
    statement
    ...
elif (condition3):
    # condition1 is false, condition2 is false, and condition3 is true
    statement
    statement
    ...
else:
    # all the conditions are false
    statement
    statement
    ...
```

Recap – Common Mistakes

Don't forget the colon **:**

```
    for (x == 2)
                ^
SyntaxError: invalid syntax
```

```
if (some condition):
  this is
  a block
  of codes
  that is indented
  by the same amount
  of spaces
else:
  usually
  we use 2, 3 or 4 spaces for
  indentation
```

What happens when there is no indent:

```
    ^
IndentationError: expected an indented block
>
```

Wrong indentation,
mix-up between spaces and tabs
miix-up number of spaces

Make your choice of indentation and use it consistently!

How does it look like?

```
while (<condition that returns True | False>):
    # block statements when condition is True
```

The first while-loop example

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

```
i = 0, print(i)
i = 1, print(i)
i = 2, print(i)
i = 3, print(i)
i = 4, print(i)
i = 5, print(i)
i = 6, print(i)
i = 7, print(i)
i = 8, print(i)
i = 9, print(i)
```

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

initialization statement

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

conditional statement

post-loop statement

Going backwards

initialization statement

```
i = 9
while (i >= 0):
  print(i)
  i = i - 1
```

conditional statement

post-loop statement

```
i = 9, print(i)
i = 8, print(i)
i = 7, print(i)
i = 6, print(i)
i = 5, print(i)
i = 4, print(i)
i = 3, print(i)
i = 2, print(i)
i = 1, print(i)
i = 0, print(i)
```

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

Times table example

```
for i in range(1,10):
  print("{0} x {1} = {2}".format(i, 5, 5*i))
```

```
i = 1, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 2, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 3, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 4, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 5, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 6, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 7, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 8, print("{0} x {1} = {2}".format(i, 5, 5*i))
i = 9, print("{0} x {1} = {2}".format(i, 5, 5*i))
```

```
1 x 5 = 5
2 x 5 = 10
3 x 5 = 15
4 x 5 = 20
5 x 5 = 25
6 x 5 = 30
7 x 5 = 35
8 x 5 = 40
9 x 5 = 45
```

```
i = 0
while (i < 10):
  print("{0} x {1} = {2}".format(i, 5, 5*i))
  i = i + 1
```

Friend of 10 table

```
for i in range(0,11):
  print("{0:>2} + {1:>2} = {2:>2}".format(i, 10 - i, 10))
```

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

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

```
i = 0
while (i <= 10):
  print("{0:>2} + {1:>2} = {2:>2}".format(i, 10 - i, 10))
  i = i + 1
```

Questions

What is the output of the following codes?

A

```
i = 0
while (i < 10):
  print(i)
  i = i + 2
```

B

```
i = 0
while (i < 10):
  i = i + 2
  print(i)
```

Questions

What is the output of the following codes?

C

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

D

```
i = 5
while (i < 10):
  print(i)
  i = i + 1
```

E

```
i = 5
while (i < 10):
  i = i + 1
  print(i)
```

Questions

What is the output of the following codes?

F

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

G

```
i = 0
while (i < 10):
  print(i)
```

H

```
while (cat < 10):
  print(cat)
  cat = cat + 1
```

Even numbers

```
i = 0
while (i <= 10):
  trailing = "cat"

  # display the number
  print(i, end="")

  # display the trailing
  print(trailing, end="")

  # update the even number
  i = i + 2
```

```
0, 2, 4, 6, 8, 10.
```

i = 0 i = 2 i = 10

```
0cat2cat4cat6cat8cat10cat
```

Even numbers

```
i = 0
while (i <= 10):
  # determine the trailing
  if (i < 10):
    trailing = ", "
  else:
    trailing = "."

  print(i, end="")
  print(trailing, end="")

  i = i + 2
```

```
0, 2, 4, 6, 8, 10.
```

i = 0 i = 2 i = 10

```
0cat2cat4cat6cat8cat10cat
```

Display equations

```
Enter start number: 4
Enter end number: 7

Equations:
4 + 4 = 8
5 + 5 = 10
6 + 6 = 12
7 + 7 = 14
```

```
# ask user for start number

# ask user for end number

# display equations between the two input numbers
```

Display equations

```
# ask user for start number and end number
user_input = input("Enter start number: ")
number_start = int(user_input)

user_input = input("Enter end number: ")
number_end = int(user_input)

# display equations between the two input numbers
print("Equations:")

# initialise number to the start number
number = number_start

# repeat as long as number is <= number_end
while(number <= number_end):
  print("{0} + {1} = {2}".format(number, number, number*2))
  # increase the number by 1
  number = number + 1
```

```
4 + 4 = 8
5 + 5 = 10
6 + 6 = 12
7 + 7 = 14
```

Example 1: While loops that runs forever!

```
while True:
  user_input = input("Enter something: ")
  print("You have entered: " + user_input)
```

This program will run forever!

```
Enter something: Clocks on fox tick
You have entered: Clocks on fox tick
Enter something: Clocks on Knox tock
You have entered: Clocks on Knox tock
Enter something: Six sick bricks tick
You have entered: Six sick bricks tick
Enter something: Six sick chicks tock
You have entered: Six sick chicks tock
……
```

Example 2: This while loop will stop if user enters q

```
while True:
  user_input = input("Enter something (or q to quit): ")
  if (user_input == "q"):
    print("Goodbye!")
    break
 print("You have entered: " + user_input) print()
```

use **`break`** *to stop the loop*

```
Enter something (or q to quit): Clocks on fox tick
You have entered: Clocks on fox tick

Enter something (or q to quit): Clocks on Knox tock
You have entered: Clocks on Knox tock

Enter something (or q to quit): Six sick bricks tick
You have entered: Six sick bricks tick

Enter something (or q to quit): q
Goodbye!
```

Example 3: Keep asking until user enters a positive number

```
Enter a positive integer: -2

Enter a positive integer: 0

Enter a positive integer: -5

Enter a positive integer: 20
You have entered: 20
```

```
Enter a positive integer: 6
You have entered: 6
```

Example 3: Keep asking until user enters a positive number

```
while True:
  user_input = input("Enter a positive integer: ")
  number = int(user_input)
  if (number > 0):
    break
print()
print("You have entered: {0}".format(number))
```

User has entered a positive number. Hurray!!!

```
Enter a positive integer: -2
Enter a positive integer: 0
Enter a positive integer: -5
Enter a positive integer: 20

You have entered: 20
```

Example 4: Counting even and odd numbers

```
Enter an integer (or q to quit): 5
Enter an integer (or q to quit): 7
Enter an integer (or q to quit): 0
Enter an integer (or q to quit): 13
Enter an integer (or q to quit): 8
Enter an integer (or q to quit): 15
Enter an integer (or q to quit): q
You have entered 2 even numbers
You have entered 4 odd numbers
```

Example 4: Counting even and odd numbers

```
even_count = 0
 odd_count = 0
 while True:
  user_input = input("Enter an integer (or q to quit): ")

  if (user_input == "q"):
    break

  number = int(user_input)

  if (number%2 == 0):
    even_count += 1
  else:
    odd_count += 1

print("You have entered {0} even numbers".format(even_count))
print("You have entered {0} odd numbers".format(odd_count))
```

Example 5: Green egg and ham?

```
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Oh well, you don't know what you're
missing!
```

```
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): Y
That's a smart choice!
```

Example 5: Green egg and ham?

```
# how many time we ask the question
ask_count = 0

# keep asking green egg question
while True:
  answer = input("Would you like green eggs and ham? (Y/N): ")
  ask_count = ask_count + 1

  if (answer == "Y"):
    print("That's a smart choice!")
    break
  if (ask_count == 10):
    # after 10 times, user still says NO, ok enough!
    print("Oh well, you don't know what you're missing!")
    break
```

*use **break** to stop the loop*

*use **break** to stop the loop*

Extra:

A little more about print()

You can have multiple arguments

To define separators between the input, use sep=‘<class ‘str’>’

Default of sep=‘ ’ (a space)

```
# Useful for formatting a date
>>>print('09','12','2016', sep='-’)
```

09-12-2016

Extra:

Learning to read Python docs

Any questions?