Python 3 Reference (Beginner)

Interact with the user (input and output)

Print a message

```
print('Hello, world')
```

Print multiple values (of different types)

```
ndays = 365
print('There are', ndays, 'in a year')
```

Asking the user for a string

```
name = input('What is your name?')
```

Asking the user for a whole number (an integer)

```
num = int(input('Enter a number: '))
```

Decide between options (selection)

Decide to run a block (or not)

```
x = 3
if x == 3:
   print('x is 3')
```

Decide between two blocks

```
mark = 80
if mark >= 50:
   print('pass')
else:
   print('fail')
```

Decide between many blocks

```
mark = 80
if mark >= 65:
   print('credit')
elif mark >= 50:
   print('pass')
else:
   print('fail')
```

- elif can be used many times

The two values are equal

```
x == 3
```

two equals signs, not one

The two values are NOT equal

```
x != 3
```

Less than

```
x < 3
```

Greater than

```
x > 3
```

Less than or equal to

```
x <= 3
```

Greater than or equal to

```
x >= 3
```

The answer is a *Boolean*:

`True` OR `False`

String manipulation

Compare two strings

```
msg = 'hello'
if msg == 'hello':
   print('howdy')
```

Less than another string?

```
if msg < 'n':
   print('a-m')
else:
   print('m-z')
```

strings are compared one character at a time (lexicographic order)

Is a character in a string?

```
'e' in msg
```

Is a string in another string?

```
'ell' in msg
```

Convert to uppercase

```
msg.upper()
```

also `lower` and `title`

Count a charater in a string

```
msg.count('l')
```

Replace a character or string

```
msg.replace('l','x')
```

Delete a character or string

```
msg.replace('l','')
```

Is the string all lowercase?

```
msg.islower()
```

also `islower` and `istitle`

Text (strings)

Single quoted

```
'perfect'
```

Double quoted

```
"credit"
```

Multi-line

```
'''Hello,
World!'''
```

Add (*concatenate*) strings

```
'Hello' + 'World!'
```

Multiply string by integer

```
'Echo....'*4
```

Length of a string

```
len('Hello')
```

Convert string to integer

```
int('365')
```

Variables

Creating a variable

```
celsius = 25
```

one equals sign assigns the value

Using a variable

```
celsius * 9 / 5 + 32
```

Whole numbers (integers)

Addition and subtraction

```
365 + 1 - 2
```

Multiplication and division

```
25 * 10 / 5
```

Powers (8 to the power of 2)

```
8**2
```

Convert interger to string

```
str(365)
```

Repeat a block (a fixed number of times)

Repeat a block 10 times

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

Sum the numbers 0 to 9

```
total = 0
for i in range(10):
   total = total + 1
print(total)
```

Repeat a block over a string

```
for c in 'Hello':
   print(c)
```

Keep printing on one line

```
for c in 'Hello':
   print(c, end=' ')
print('!')
```

Count from 0 to 9

```
range(10)
```

range starts from 0 and goes up to, but not including, 10. E.g. 0-9

Count from 1 to 10

```
range(1, 11)
```

Count from 10 down to 1

```
range(10, 0, -1)
```

Count 2 at a time to 10

```
range(0, 11, 2)
```

Count down 2 at a time

```
range(10, 0, -2)
```

Repeat a block over list (or string) indices

```
msg = 'I love Python!'
for i in range(len(msg)):
   print(i, msg[i])
```

Putting it together; Celsius to Fahrenheit converter

Ask the user for a termerature in degree Celsius

```
celsius = int(imput('Temp. in Celsius: '))
```

Calculate the conversion

```
fahrenheit = celsius * 9 / 5 + 32
```

Output the result

```
print(fahrenheit, 'Fahrenheit')
```

Python 3 Reference (Intermediate)

Repeat a block while a condition is met

Repeat a block 5 times

```
x = 0
while x < 5:
   print('going around…')
   x = x + 1
```

Repeat a block while a condition is met

```
driverResponce = ""

driverResponce = input("Are we there yet? ")
while driverResponce != "yes":
   driverResponce = input("Are we there yet? ")

print("Hooray! Finally!")
```

Lists (variables that hold multiple items)

Creating a list

```
#Create a shopping list
shoppingList = ["bread","milk","cheese","ham"]
```

Printing a list

```
#Print the whole list
print(shoppingList)
#Print the second element of the list
print(shoppingList[1])
#Print a slice of the list
print(shoppingList[2:4])
```

Changing the data in a list

```
#Adds an item to the end of the list
shoppingList.append("eggs")
#Removes only the first instance of an item
shoppingList.remove("cheese")
#Inserts an item into a list at a given index
shoppingList.insert(1, "saussages")
#Overwrite a list element
shoppingList = ["bread","saussages","milk","ham"
,"eggs"]
shoppinglist[1] = "rolls"
```

Cycling through a list

```
#Prints each item on the list
shoppingList =["bread","milk","ham","eggs"]
for item in shoppingList:
   print (item)
```

Searching in a list

```
#List of items in stock at shop
shoppingList =["bread","milk","ham","eggs"]
for item in shoppingList:
   if item == "bread":
      print("Found bread")
```

Searching in a list

```
#in operator checks for a value in a list #Returns a
Boolean
print("rolls" in stock)
#index function returns the index position of a
#value is in a list
print(stock.index("rolls"))
#max function returns the highest value in a #list
print(max(stock))
#max function returns the lowest value in a #list
print(min(stock))
```

Use a built in module

Generate a random number

```
#Must import module you want to use
import random

#Generate a random number between 1 and 100
number = random.randint(1,100)

#Generate a random even number using a step #value
evenNumber = random.randrange(1, 100, 2)
```

Suspend provessing for a specified time

```
# import Time module
import time

#Suspend processing for 10 seconds
time.sleep(10)
```

String manipulation (advanced)

Using parts of a string

```
text = "sandwich"
print(text[2])
#Print part of a string
print(text[0:4])
#Print every other letter in a string
print(text[::2])
#Print every other letter in a string starting #at
the end and working to start
print(text[::-2])
#Convert a string of text into upper case
text.upper()
#Convert a string of text into lower case
text.lower()
```

Looping though a string

```
sentence = "The cat sat on the mat."
for letter in sentence:
   print(letter)
```

Writing to a reading from text files

Write to a file (add \n at end of text to start a new line)

```
newFile = open('example.txt', 'wt')
newFile.write('I have written to a file.')
newFile.close()
```

Read the whole of a file

```
newFile = open('example.txt', 'r')
contents = newFile.read()
   print(line)
newFile.close()
```

Using a For loop to read all lines in a file.

```
myFile = open('example.txt', 'r')
for line in myFile
   print(line)
myFile.close()
```

The text file needs to be in the same folder as your program for this to work.

Python 3 Reference (Advanced)

Define and Call a Procedure

Define a procedure that can be called upon later

```
def bbcLogo():
    print()
    print("====================================")
    print("  BBBBBB      BBBBBB      CCCCCCCC  ")
    print("  BB    BB    BB    BB    CCCCCCCC  ")
    print("  BB    BB    BB    BB    CC        ")
    print("  BBBBBB      BBBBBB      CC  C     ")
    print("  BB    BB    BB    BB    CC        ")
    print("  BB    BB    BB    BB    CCCCCCCC  ")
    print("  BBBBBB      BBBBBB      CCCCCCCC  ")
    print("====================================")
    print()
```

Call this procedure in the code.

```
bbcLogo()
```

Resulting output

```
====================================
  BBBBBB      BBBBBB      CCCCCCCC
  BB    BB    BB    BB    CCCCCCCC
  BB    BB    BB    BB    CC
  BBBBBB      BBBBBB      CC  C
  BB    BB    BB    BB    CC
  BB    BB    BB    BB    CCCCCCCC
  BBBBBB      BBBBBB      CCCCCCCC
====================================
```

Using procedures to create a loop.

Define a procedure that calls itself inside it, in order to run it again.

```
def inputChoice():
   choice = input("Yes or No?: ")
   if choice == "Yes":
      print("You chose Yes.")
   elif choice == "No":
      print("You chose No.")
   else:
      print("Incorrect entry, please try again")
      #Unsatisfied with the user input, the block
      calls the same procedure to give the user
      another go.
      inputChoice()
```

Define and Call a Procedure with a Parameter

Define a procedure that can be called upon later

```
def printDouble(amount):
   print("Double",amount, "is",amount*2)
```

Call this procedure later on passing in different parameters

```
printDouble(10)
printDouble(50)
printDouble(1862)
```

Resulting output

```
Double 10 is 20
Double 50 is 100
Double 1862 is 3724
```

Find a word in a string of text

If statement condition checks for multiple words in string

```
answer = input("Describe the fault with your phone: ")
if "water" or "wet" or "splash" in answer:
    print("Put it in a bag of rice for 36 hours.")
```

Resulting output

```
Describe the fault with your phone:
Dropped it in water.
Put it in a bag of rice for 36 hours.
```

Define and Call a Function with a Parameter

Define a function that passes and returns a parameter

```
def calcDouble(amount):
   amount = 2 * amount
   return amount

question = 120
answer = calcDouble(question)
print("Double",question,"is",answer)
```

Resulting output

```
Double 120 is 240
```

Create a recursive algorithm

Putting a function within a function creates recursion

```
def Factorial(n):
    print(n)
    if n == 0:
        return 1
    else:
        return n * Factorial(n-1)

n = int(input("Enter number: "))
result = Factorial(n)
print(result,"is the factorial of", n)
```

Resulting output

```
Enter number: 3
3
2
1
0
6 is the factorial of 3
```

Other list methods

Add a new value to the end of a list

```
append(value)
```

Resulting output

```
insert(index,value)
```

Removes a particular index value from a list

```
pop(index)
```

Removes a given value from a list

```
remove(value)
```

Create a list

```
word =["c","b","e","g","h","d"]
word[0] = "e"
word.pop(2)
word.remove ("g")
word.insert(0,"Z")
word.pop(3)
word.insert(4,"r")
word.pop(3)
word.append("a")
print(word)
```

Resulting output

```
['Z', 'e', 'b', 'r', 'a']
```

For loops

Creates a loop that performs an action for each item in a list

```
highscore = [125,63,35,12]
for counter in range(4):
    print(highscore[counter])
```

Example Programs

Password Program

```
# Password - Demonstrates the if statement
attempts = 3
print("Welcome to System Security Inc.")
print("- where security is our middle name\n")
while attempts > 0:
    password = input("Enter your password: ")
    if password == "secret":
        print("Access Granted")
        break
    else:
        attempts = attempts - 1
        print("Access Denied")
        print("Number of attempts remaining:", attempts)
if password != "secret":
    print("You have been locked out.")
input("\n\nPress the enter key to exit.")
```

Mood Computer

```
# Mood Computer
# Demonstrates the elif clause

import random
print("I sense your energy.  Your true emotions
are coming across my screen.")
print("You are…")
mood = random.randint(1, 3)
if mood == 1:
    # happy
    print( \
    """
       _____
       |         |
       | 0    0  |
       |   <     |
       |         |
       | .     . |
       |  `.....`  |
       _____
                  """)
elif mood == 2:
    # neutral
    print( \
    """
       _____
       |         |
       | 0    0  |
       |   <     |
       |         |
       | ------  |
       |         |
       _____
                  """)
elif mood == 3:
    # sad
    print( \
    """
       _____
       |         |
       | 0    0  |
       |   <     |
       |         |
       |  .'.    |
       | '   '   |
       _____
                  """)
else:
    print("Illegal mood value!  (You must be in a
really bad mood).")

print("…today.")

input("\n\nPress the enter key to exit.")
```

Guess My Number Game

```
# Guess My Number
# The computer picks a random number between 1 and
100
# The player tries to guess it and the computer lets
# the player know if the guess is too high, too low
# or right on the money

import random
print("\tWelcome to 'Guess My Number'!")
print("\nI'm thinking of a number between 1 and
100.")
print("Try to guess it in as few attempts as
possible.\n")

# set the initial values
the_number = random.randint(1, 100)
guess = int(input("Take a guess: "))
tries = 1

# guessing loop
while guess != the_number:
    if guess > the_number:
        print("Lower…")
    else:
        print("Higher…")

    guess = int(input("Take a guess: "))
    tries += 1

print("You guessed it!  The number was", the_number)
print("And it only took you", tries, "tries!\n")

input("\n\nPress the enter key to exit.")
```

Bubble Sort

```
# Program to perform a bubble sort
# Define the list of names
userName =
["Carl","Tamsin","Eric","Zoe","Alan","Mark"]
numItems = 6
while numItems>1:
    for count in range(5):
        if userName[count] > userName[count+1]:
            temp = userName[count]
            userName[count] = userName[count+1]
            userName[count+1] = temp
    numItems = numItems-1
#endwhile
print (userName)
```

Pocket Money

```
# Program to show the user how much pocket money they
will get if it doubles each week.

pocketMoney = 0.01

for week in range(1,30):
    pocketMoney = pocketMoney * 2
    print("In week",week,"you will get £",pocketMoney)
```