Pink Programming

Python Camp

Code Handouts

PINK PROGRAMMING

How to read

The handouts are meant to match the slides. They are also meant as a practical reminder. **You would need to run the code to see the output.**

run in **commandline**

run in **interpreter**

concepts - not pure code

write in a python file then execute file

output

input

This handout belongs to:

_____

Install and “Hello, World!”

Checking If you have python and pip installed

```
python3 -V
pip3 -V
```

Example output

```
$ python3 -V
Python 3.6.1
$ pip3 -V
pip …
```

If it does not work, download and install python here: www.python.org/downloads/

Python Interpreter - an interactive commandline tool to try out python code

```
python3
```

You will now be in the interpreter.

```
print("Hello, world!")
exit() # or quit()
```

Command Line - Mac/Unix

Basic commands

```
cd path  #Changing a folder
ls -la #Listing folder contents
pwd #Listing your current location
mkdir folder_name #Making a folder
touch filename.txt #Creating a file
cat filename.py #print file content
```

Special folders

```
/  the root of your system
~  your user's home
.  current directory
..  parent directory
```

Tips:
Use **Tab** for autocomplete
Windows users can use this with:

- https://cygwin.com/

Command Line - Windows

Note!!! In windows, the **interpreter** is opened with:

```
python
```

Basic commands

```
cd path  #Changing a folder
dir #Listing folder contents
cd #Listing your current location
mkdir folder_name #Making a folder
echo "" > filename.txt #Create file
type filename.py #print file content
```

Special folders

```
c:\  the root of your system
.  current directory
..  parent directory
```

Tip:
Use **Tab** for autocomplete
Use **** instead of **/**

Data types

Python data types

`int` *(integer)* - numbers: `-3`, `0`, `23`
`float` - decimal numbers: `-34.5`, `-2.0`, `3.98`
`string` - words: `"game"`, `'Game'`, `"SAME"`
`bool` *(boolean)*: `True`, `False`
`None`

Strings

```
print("Game Over")
print('Game Over')
print("Game", "Over")
print("Here", end = " ")
print("it is...")
```

Escaping sequences with Strings

New line - **`\n`**
Tab - **`\t`**
Backslash - **`\\`**
Inserting a Quote - **`\'`** **`\"`**

```
print("a\nb")
print("c\td")
print("e\\f")
print("g\"h")
print("\a")
```

Concatenating Strings

```
print("snow" + "ball")
print("Pie" *10)
```

Variables

Simple create

```
name = "Nadia"
print(name)
print("Hi,", name)
```

Naming variables

Only **numbers, letters** or _
Can't start with a number
Descriptive names score not sc
Be consistent snow_ball not snowBall
Not too long (under 15 char)

Mathematical Operators

```
2 + 3  # Addition / Plus
4 - 6  # Subtraktion / Minus
2 * 5  # Multiplication
5 / 2  # Division
5 // 2 # Division
5 % 2  # Modulus
```

Augmented Assignment Operators

```
x = 10 ; print(x)
x *= 5 ; print(x) # x=x*5
x /= 5 ; print(x) # x=x/5
x %= 5 ; print(x) # x=x%5
x += 5 ; print(x) # x=x+5
x -= 5 ; print(x) # x=x-5
```

User input

```
name = input("Hi! What's your name?")
print("Your name is: " + name)
```

String methods

```
name = "NadIa"
name.upper()
name.lower()
name.title()
name.replace("d","tal")
```

Converting types

```
int("42")
float("3.42")
str(3)
age = int(input("How old are you?"))
print("Your age is: ", age)
```

Comparison operators

```
5 == 5  # equal-to
8 != 5  # not equal to
3 > 10  # greater than
5 >= 10 # greater than or = to
5 <  8  # less than
5 <= 5  # less than or = to
```

If statement

```
password = "secret"
if password == "secret":
    # note the indentation
    print("Access granted!")
```

if - elif - else

```
weekday = 1
if weekday == 1:
    print("It's Monday!")
elif weekday == 2:
    print("It's Tuesday!")
else:
    print("It's Weekend!!!")
```

While loop

Using condition

```
response = ""
while response != "Because":
    response = input("Why?")
```

Using counters

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

Break and continue

```
count = 0
while True:
    count += 1
    if count > 10:   #end if count > 10
        break        #to exit a loop
    if count == 5:   #skip 5
        continue     #to jump back
    print(count)
```

Multiple conditions

```
cookies = True
hungry = True
if cookies and hungry:
    print("Fika time!")
```

```
cookies = True
hungry = False
if cookies and not hungry:
    print("No fika yet!")
```

and, or and not

a	b	a **and** b	a **or** b	**not** a	**not** b
True	True	True	True	False	False
True	False	False	True	False	True
False	True	False	True	True	False
False	False	False	False	True	True

Importing a module

```python
import random
#produces a random integer between 10-40
print(random.randint(10, 40))
#random integer between 0 and 10
print(random.randrange(10))
```

For loops

```python
for i in range(0, 3):
    print("i1 = ", i)
for i in range(0, 50, 5):
    print("i2 = ", i)
for i in range(50, 0, -5):
    print("i3 = ", i)
```

Index

0	1	2	3	4
i	n	d	e	x

String as a sequence

```python
word = "programming"
print(word[0])
print(word[5])
```

```python
for i in "index":
   print(i)
```

Lists

Sequence - like string, but can contain anything you want

index	0	1	2	3	4	5
	"cat"	"dog"	"fish"	"cow"	"pig"	"fox"

```
animals = ["cat", "dog", "fish", "cow", "pig", "fox"]
```

Accessing elements

```
animals = ["cat", "dog", "fish", "cow",
"pig", "fox"]
print(animals[2])
print(animals[1:4])
print(animals[:3])
print(animals[4:])
print(len(animals))
```

Concatenating lists

```
farm_animals = ["sheep", "cow", "pig"]
wild_animals = ["fox", "wolf", "eagle"]
all_animals = farm_animals + wild_animals
print(all_animals)
```

Negative index

0	1	2	3	4
i	n	d	e	x
-5	-4	-3	-2	-1

```python
word = "programming"
print(word[-1])
print(word[-3:])
print(word[:-2])
print(word[-4:-2])
```

Lists

Deleting

```python
all_animals = ["sheep", "cow", "pig",
"fox", "wolf", "eagle"]
del all_animals[5]
print(all_animals)
del all_animals[-1]
print(all_animals)
```

Appending

```python
all_animals = ["sheep", "cow", "pig",
"fox", "wolf"]
all_animals.append("horses")
print(all_animals)
```

Change a value

```python
all_animals = ["sheep", "cow", "pig",
"fox", "wolf", "horses"]
all_animals[-1] = "horse"
print(all_animals)
```

Loop

```python
all_animals = ["sheep", "cow", "pig",
"fox", "wolf", "horse"]
for animal in all_animals:
    print(animal)
```

Lists in lists

```
farm_animals = ["sheep", "cow", "pig",
"horse"]
wild_animals = ["fox", "wolf", "eagle"]
all_animals = [farm_animals, wild_animals]
print(all_animals)
```

Dictionaries

List of key-value pairs

```
animal_info = {"sheep": "stubborn", "cow": "gives milk"}
```

key value key value

Try it

```
animal_info = {"sheep": "stubborn",
               "cow": "gives milk"}
print(animal_info["sheep"])
```

Adding an item

```
animal_info = {"sheep": "stubborn",
               "cow": "gives milk"}
animal_info["wolf"] = "wants to eat cow"
print(animal_info)
```

Deleting an item

```
animal_info = {"sheep": "stubborn",
               "cow": "gives milk",
               "wolf": "wants to eat cow"}
del animal_info["wolf"]
print(animal_info)
```

Dictionary loop

```
animal_info = {"sheep": "stubborn",
               "cow": "gives milk"}
for key in animal_info:
    print(key)
    print(animal_info[key])
```

```
animal_info = {"sheep": "stubborn",
               "cow": "gives milk"}
for key, value in animal_info.items():
     print(key + " has info: " + value)
```

Functions

You've actually already used them!

- print(<string>)
- len(<list>)
- range(<from>, <to>, <step>)
- ...

Writing a function

name parameter

```
def circle_circumference(radius):
""" Return circle circumference """
```

docstring

```
    circumference = 2 * 3.14 * radius
    return circumference
```

return value

Try it

```
def circle_circumference(radius):
    """ Return circle circumference """
    circumference = 2 * 3.14 * radius
    return circumference
my_circumference = circle_circumference(5)
print(my_circumference)
```

Note!!! Functions - can be reused. That is why we return the value, to be used by the code calling it.

Functions import

from <filename> **import** circle_circumference

Try it

```
from math import pi
def circle_circumference(radius):
    """ Return circle circumference """
    circumference = 2 * pi * radius
    return circumference
my_circumference = circle_circumference(5)
print(my_circumference)
```

Parameters

```
def birthday_wishes1(name, age):
    print("Happy birthday, " + name +
    "! You're " + str(age) + ".\n")
birthday_wishes1("Ana", 10)
```

```
# Positional parameters
def birthday_wishes2(name = "Ana",
                     age = 12):
    print("Happy birthday, " + name +
        "! You're " + str(age) + ".\n")
birthday_wishes2(age= 10)
```

Global variables are accessible from everywhere
Local variables are only accessible in their block
Scope is the area of the code in which the variable is defined

Scope and functions

```
def func1():
    variable1 = 1
```
local variable scope func1

```
def func2():
    variable2 = 2
```
local variable scope func2

```
variable0 = 0
```
global variable global scope

Files

Reading - do not use, good to know

```
#Open and Read File
my_file = open("read_it.txt", "r")
#Close File after using it
my_file.close()
```

Access modes

`"r"/"r+"` Read from / Read from and write to.
Error if the file doesn't exist

`"w"/"w+"` Write to / Write to and read from.
Overwrites if file exists, creates a new file otherwise

`"a"/"a+"` Append / Append and read from
Appends or creates a new file.

Better read - closes file automatically

```
# Make sure you create a workfile.txt
# with random text
with open(read_it.txt', "r") as f:
    read_data = f.read()
print(f.closed) # to show it is closed
print(read_data)
```

Reading characters

```
with open("read_it.txt", "r") as my_file:
    print(my_file.read(1))
    print(my_file.read(5))
```

Reading one line at a time

```
with open("read_it.txt", "r") as my_file:
    print(my_file.readline())
    print(my_file.readline())
    print(my_file.readline())
```

Reading all lines into a list

```
with open("read_it.txt", "r") as my_file:
    lines = my_file.readlines()
    print(lines)
    print(len(lines))
    for line in lines:
        print(line)
```

Looping through the file

```
with open("read_it.txt", "r") as my_file:
    for line in my_file:
        print(line)
```

Creating a file

```
with open("read_it.txt", "w") as my_file:
    my_file.write("Line 1\n")
    my_file.write("Line 2\n")
    my_file.write("Line 3\n")
```

Creating a file from string list

```
with open("read_it.txt", "w") as my_file:
    lines = [ "Line 4\n",
              "Line 5\n",
              "Line 6\n"]
    my_file.writelines(lines)
```

Recap - file functions

```
read() # reads entire file
read(size) # reads that many characters
readlines() # reads lines in a list
readline() # reads chars to end of line
write(output) # writes output to file
writelines(output) # writes strings in
# the list output to a file
```

Exceptions

Examples
(ValueError, ZeroDivisionError, NameError, TypeError)

```
float("Hi!")
10 * (1/0)
4 + spam*3
'2' + 2
```

Handling exceptions

```python
try:
    x = int(input("Type a letter: "))
except(ValueError):
    print("Oops!")
```

Skipping exceptions

```python
try:
    x = int(input("Type a letter: "))
except(ValueError, RuntimeError):
    pass
```

For more exception Types:
docs.python.org/3/library/exceptions.html

Json files (JavaScript Object Notation)

Example json file (**data.json**)

```
{ "name":"Jill",
  "age":31,
  "city":"New York",
  "cats" : [ "jixy",
             "mixy"]}
```

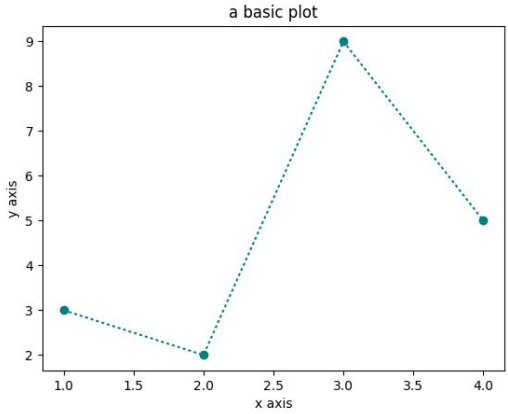
```python
import json
from pprint import pprint
with open('data.json') as data_file:
   data = json.load(data_file)
pprint(data)
print(data["age"])
print(data["name"])
print(data["cats"][0])
```

If it cannot find **pprint** or **json** run

```
pip install pprint json
```

Basic plots

```
import matplotlib.pyplot as plt
x = [1, 2, 3, 4]
y = [3, 2, 9, 5]
plt.plot(x, y, 'o:', color='teal')
plt.xlabel('x axis')
plt.ylabel('y axis')
plt.title('a basic plot')
plt.show()
```



If it cannot find **matplotlib**, **urllib** or **pprint** run

```
pip install matplotlib urllib pprint
```

APIs

```
import urllib.request, json
from pprint import pprint
l = "http://weathers.co/api.php?city=Stockholm"
with urllib.request.urlopen(l) as url:
    data = json.loads(url.read().decode())
    pprint(data)
```

Content credits

Mariana Bocoi - mariana.bocoi@gmail.com
Liza Sigova - elizavetasigova@gmail.com
Nadia Mohedano Troyano - nadiamt@gmail.com
Sara Ekman - sara@pinkprogramming.se

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