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<Welcome To>
python™

# 1.

## Overall Program Content

| Web development with Python | Hours |
|---|---|
| Work skills development | 50 |
| **Python Programming Introduction** | 150 |
| Web Programming Introduction (html/css) | 100 |
| Databases Concepts and Structures | 50 |
| Web Servers Programming | 150 |
| Web services development | 150 |
| Total | 650 |

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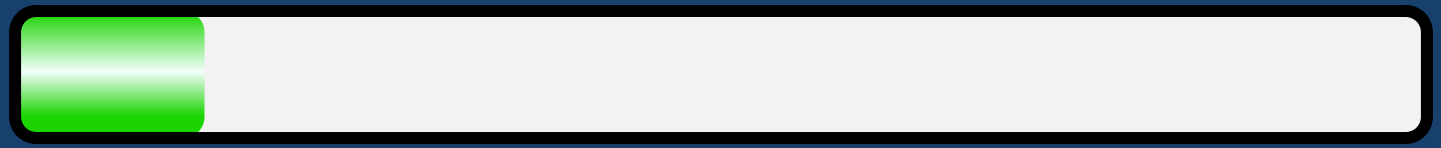
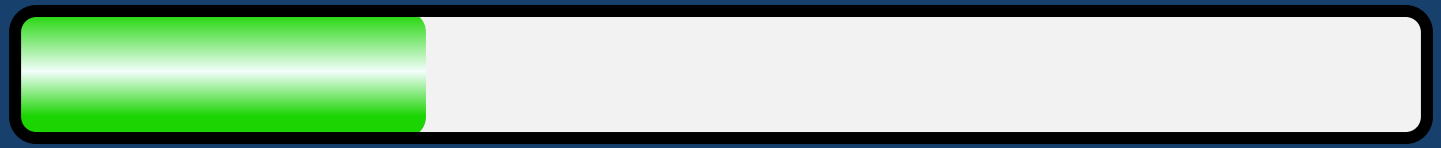
# Python programming Introduction Content

1. Course Introduction
- Why Python?
- Python Applications
- Installation Tools
- Building your code catalog
- Useful websites



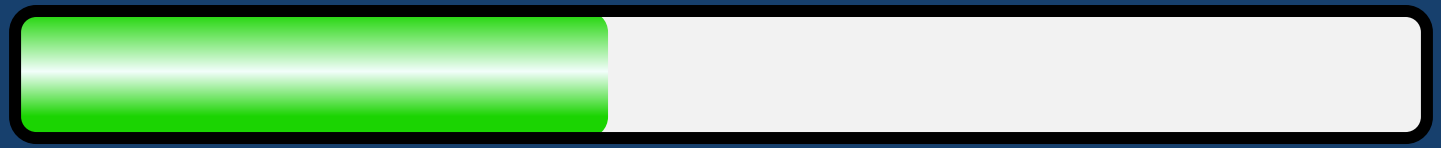
# Python programming Introduction Content

2. Data types/outputs/inputs
3. Operators
4. Functions and Modules



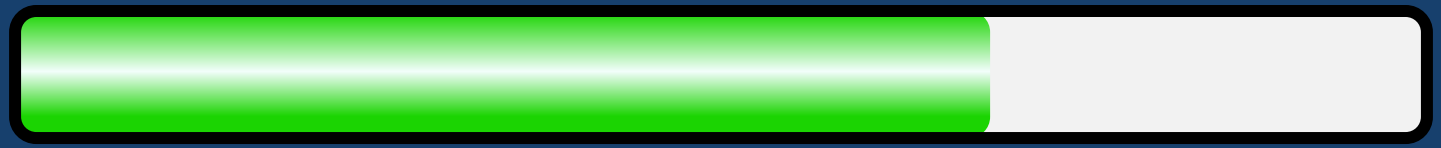
# Python programming Introduction Content

5. Conditional statements and expression
6. Loops
7. Work with standard Library and Modules



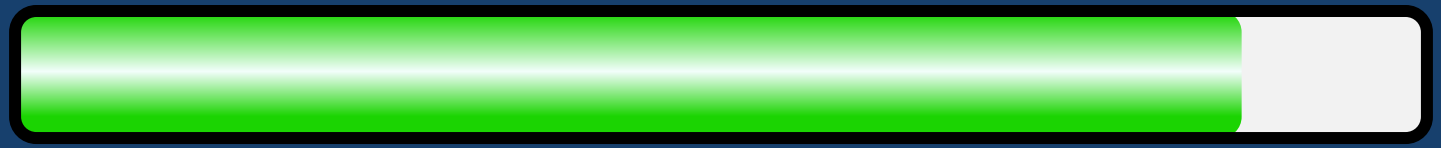
# Python programming Introduction Content

8. Data structure in python
9. List,
10. Tuple,
11. Dictionaries,
12. Set



# Python programming Introduction Content

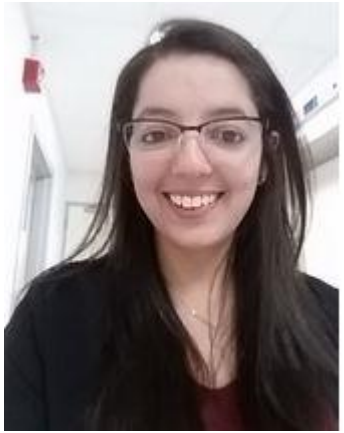
13. Files
14. Functions and Modules
15. Classes
16. Introduction to Numpy
17. Introduction to Pandas



# Python programming Introduction Content

18. Introduction to matplotlib for data visualization
19. Data Preprocessing

## Our Teachers:



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# Schedule

| Days/modules | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 12-Oct | Joseanne | | | | | | | | | | | | | | | | | | |
| 2 | 13-Oct | | | | | | | | | | | | | | | | | | | |
| 3 | 14-Oct | | | | | | | | | | | | | | | | | | | |
| 4 | 15-Oct | | | | | | | | | | | | | | | | | | | |
| 5 | 16-Oct | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 6 | 19-Oct | | | | | | Hamed | | | | | | | | | | | | | |
| 7 | 20-Oct | | | | | | | | | | | | | | | | | | | |
| 8 | 21-Oct | | | | | | | | | | | | | | | | | | | |
| 9 | 22-Oct | | | | | | | | | | | | | | | | | | | |
| 10 | 23-Oct | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 11 | 26-Oct | | | | | | | | | | | | | | | | | | | |
| 12 | 27-Oct | | | | | | | | | | | | Stefan | | | | | | | |
| 13 | 28-Oct | | | | | | | | | | | | | | | | | | | |
| 14 | 29-Oct | | | | | | | | | | | | | | | | | | | |
| 15 | 30-Oct | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 16 | 2-Nov | | | | | | | | | | | | | | | Joseanne | | | | |
| 17 | 3-Nov | | | | | | | | | | | | | | | | | | | |
| 18 | 4-Nov | | | | | | | | | | | | | | | | | | | |
| 19 | 5-Nov | | | | | | | | | | | | | | | | | | | |
| 20 | 6-Nov | | | | | | | | | | | | | | | | | Hamed | | |
| | | | | | | | | | | | | | | | | | | | | |
| 21 | 9-Nov | | | | | | | | | | | | | | | | | | | |


<Let’s get started >

# Contents

# Dictionary

# Define Dictionary

use [ ] to define a List
use ( , ) to define a Tuple
use { : } to define a Dictionary,
Dictionary {key : value}

```
d = {
      'brand' : 'cherry' ,
      'model' : 'arizo5' ,
      'color' : 'white'
      }

print(type(d))      # <class dict>

print(len(d))       # 3
```

## Question

# Dictionaries are Ordered or Not?

Add new
<key : value>

Or

Change value

## add new <key : value> to the 'd' dictionary

```
d = {
      'brand' : 'cherry' ,
      'model' : 'arizo5' ,
      'color' : 'white'
      }

d['year'] = '2010'
```

## d[<key>] ==> <value>

```
print( d['model'])  # arizo5

d['color'] = 'Black' # change values
```

# Get( )

*access the members in tuple/list we use [<index> ]*

```
print(d)       # {'brand': 'cherry', 'model': 'arizo5',
                   'color': 'Black' , 'year' : '2010' }

x = d.get('model')          # dic_name.get(<key>) ==> <value>
print(x)                    # arizo5

x = d.get('cylinder')
print(x)                    # None, 'cylinder' key not found

x = d.get('cylinder',-1)    # if <key> not found, return -1
print(x)                    # -1
```

# Keys( )
# Values( )
# Items( )

## Access keys, values, Or both of them

```
print(d)      # {'brand': 'cherry', 'model': 'arizo5',
                'color': 'Black' , 'year' : '2010' }

print(list(d.keys()))    # ['brand', 'model', 'color', 'year']

print(list(d.values()))  # ['cherry', 'arizo5', 'Black', '2010']

print(list(d.items()))   # [ ( <key1> , <value1> ) , ... ]
#[('brand', 'cherry'), ('model', 'arizo5'), ('color', 'Black'), ('year', '2010')]


for k,v in d.items():
    print(k,':',v)
```

unpacking

# pop(<key>)

*d.pop()  # Error*

*Error: Pop() for dict expected at least 1 argument*

```
d = {
      'brand' : 'cherry' ,
      'model' : 'arizo5' ,
      'color' : 'white'
      }

d.pop('model')     # dict_name.pop(<key>)

print(d)      # {'brand': 'cherry', 'color': 'white'}
```

# popitem( )

*remove the last item in dictionary*
*return removed item in output*

```
d = {
     'brand' : 'cherry' ,
     'color' : 'white'
     }

f = d.popitem()
print(d)          # {'brand': 'cherry'}
print(f)          # ('color', 'white')
print(type(f))    # <class 'tuple'>
```

## clear( )
## del

```
d.clear()

print(d)      # {}

del d
```

# Example

make a dict of {<key : value>}
value of each key is the number of key occurrences
Input ['x', 'y', 'x', 'z', 'y', 'x']
Output {'x': 3, 'y': 2, 'z': 1}

# Example Solution 1

make a dict of {<key : value>}
value of each key is the number of key occurrences
Input ['x', 'y', 'x', 'z', 'y', 'x']
Output {'x': 3, 'y': 2, 'z': 1}

```
a = ['x', 'y', 'x', 'z', 'y', 'x']
d = {}

for i in a :
    if i not in d:
        d[i] = 1
    else:
        d[i] += 1          # d[i] = d[i] + 1
print(d)                   # {'x': 3, 'y': 2, 'z': 1}
```

# Example Solution 2 get( )

*make a dict of {<key : value>}*
*value of each key is the number of key occurrences*
*Input* ['x', 'y', 'x', 'z', 'y', 'x']
*Output* {'x': 3, 'y': 2, 'z': 1}

```
a = ['x', 'y', 'x', 'z', 'y', 'x']
d = {}

for i in a:
    d[i] = d.get(i,0) +1

print(d)
```

# Example Solution 3 Setdefault( , )

*make a dict of {<key : value>}*
*value of each key is the number of key occurrences*
*Input* ['x', 'y', 'x', 'z', 'y', 'x']
*Output* {'x': 3, 'y': 2, 'z': 1}

```
a = ['x', 'y', 'x', 'z', 'y', 'x']
d = {}


for i in a:
    d[i] = d.setdefault(i, 0) + 1

print(d)
```

# Setdefault( , )

*Good for initialize dictionary inside a loop*

```
"""
 d3 = { 1 : '1' ,
        2 : '2' ,
        3 : '3' ,
        ...     ,
        100 : '100' }
"""
d3 = {}
for i in range(1, 101):
    d3.setdefault(i,str(i) )
```

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# Copy( )

*make a copy with copy()*

```
a = {}          # 'a' is an empty dict

b = a           # 'a' and 'b' are dependent

c = a.copy()    # 'a' and 'c' are independent
```

*Dependencies are like as Lists*


<Exercise 1>

# Exercise

make a dict of {<key : value>}

value of each key is the number of key occurrences

Input 'abfabdcaa' ← string

Output {'a': 4, 'b': 2, 'f': 1, 'd': 1, 'c': 1}

# Exercise Solution

*make a dict of {<key : value>}*

*value of each key is the number of key occurrences*

*Input* *'abfabdcaa'* ← *string*

*Output* *{'a': 4, 'b': 2, 'f': 1, 'd': 1, 'c': 1}*

```
s = 'abfabdcaa'

d = {}

for i in s:
    d[i] = d.get(i,0) + 1

print(d)   #{'a': 4, 'b': 2, 'f': 1, 'd': 1, 'c': 1}
```


<Exercise 2>

## Exercise

make a dict of {<key : value>}

value of each key is the number of key occurrences

Input

line ='a dictionary is a datastructure·'

Output

{'a': 2, 'dictionary': 1, 'is': 1, 'datastructure·': 1}

find repeats in a text line

# Exercise Solution

Input line ='a dictionary is a datastructure.'

Output

{'a': 2, 'dictionary': 1, 'is': 1, 'datastructure.': 1}

```
line ='a dictionary is a datastructure.'
d = {}
s = line.split() # split string by spaces
print(s)  # ['a', 'dictionary', 'is', 'a', 'datastructure.']

for i in s:
    d[i] = d.get(i,0) + 1

print(d)
# {'a': 2, 'dictionary': 1, 'is': 1, 'datastructure.': 1}
```


<Exercise 3>

## Exercise development

make a dict of {<key : value>}

value of each key is the number of key occurrences

Input

```
lines ='a dictionary is a datastructure \n
        a set is also a datastructure.'
```

Output

```
{'a': 4, 'dictionary': 1, 'is': 2, 'datastructure': 2,
  'set' : 1, 'also' : 1}
```

find repeats in a text lines

# Exercise Solution

```
"""
input
lines ='a dictionary is a datastructure
        a set is also a datastructure.'
Output
{'a': 4, 'dictionary': 1, 'is': 2, 'datastructure': 2,
  'set' : 1, 'also' : 1}
**************************************************

line1 = lines.split("\n")[0]
line1 = line1.split(".")[0]

line1 = lines.split("\n")[0].split(".")[0]

**************************************************

line2 = lines.split("\n")[1]
line2 = line2.split(".")[0]

line2 = lines.split("\n")[1].split(".")[0]

****** replace [...] with 'i'  ******
i = 0, 1
line = lines.split("\n")[i].split(".")[0]
"""
```

# Exercise Solution

*We developed the codes of previous exercise!*

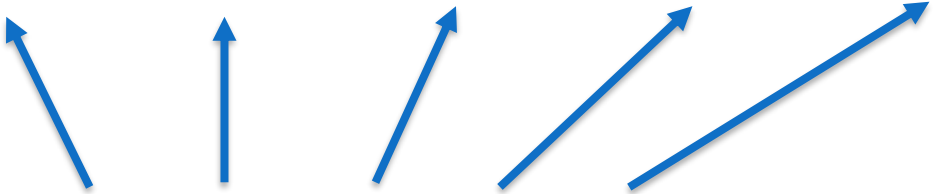
```
lines = 'a dictionary is a datastructure\na set is also a datastructure.'

d = {}
number_of_lines = len(lines.split("\n"))

for i in range(number_of_lines):
    line = lines.split("\n")[i].split(".")[0]

    s = line.split()
    # print(s)

    for i in s:
        d[i] = d.get(i, 0) + 1

print(d)
```


<Exercise 4>

# Exercise

*calculate sum of values in dict*

```
d = {'a': 4, 'b': 2, 'f': 1, 'd': 1, 'c': 1}
```



*Output* *4 + 2 + 1 + 1 + 1 = 9*

## Exercise Answer

# calculate sum of values in dict

```
d = {'a': 4, 'b': 2, 'f': 1, 'd': 1, 'c': 1}

s = 0
for i in d:
    s += d[i]
print(s)        # 9
```

Or you can use dict_name.values() and sum()

```
print(sum(d.values()))  # 9
```

# Sort
# Operator module
# Itemgetter( )

*sort in dict*
*by keys / by values*

```
d = {'a': 4, 'b': 2, 'f': 1, 'd': 1, 'c': 1}

import operator
k= operator.itemgetter(1)      # sort by values
print(sorted(d.items(),key = k))
# [('f', 1), ('d', 1), ('c', 1), ('b', 2), ('a', 4)]

k= operator.itemgetter(0)      # sort by keys
print(sorted(d.items(),key = k))
# [('a', 4), ('b', 2), ('c', 1), ('d', 1), ('f', 1)]
```

# Sorted( )

## Sort values

```
num ={
      'ali' : [12,13,8],
      'sara': [15,7,14],
      'taha': [5,18,13]
      }

d = {k : sorted(v)  for k,v in num.items()}

print(d)

# {'ali': [8, 12, 13], 'sara': [7, 14, 15], 'taha': [5, 13, 18]}
```

# update( )

*merge 2 dictionaries*

```
d1 = {'x' : 3 , 'y': 2 , 'z':1}

d2 = {'w' : 8 , 't': 7 , 'z':5}


d1.update(d2)

print(d1)
# {'x': 3, 'y': 2, 'z': 5, 'w': 8, 't': 7}
```

*new value of 'z' is replaced*

**update( )**
**{**d1 , **d2}**

## merge 2 dictionaries with for

```
d1 = {'x' : 3 , 'y': 2 , 'z':1}

d2 = {'w' : 8 , 't': 7 , 'z':5}

d = {}
for i in (d1,d2):
    d.update(i)
print(d)
```

```
# d = d1.copy()
# d.update(d2)
```

## merge 2 dictionaries with {**d1 , **d2}

```
d = {**d1 , **d2}
print(d)
```

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<Exercise 5>

# Exercise

merge 2 dictionaries together
For same keys, sum values

Input:
d1 = { 'x' : 3 , 'y': 2 , 'z':1 }
d2 = { 'w' : 8 , 't': 7 , 'z':5 }

Output:
{ 'x': 3, 'y': 2, 'z': 6, 'w': 8, 't': 7 }

# Exercise Solution

*Input:*
*d1 = { 'x' : 3 , 'y': 2 , 'z':1 }*
*d2 = { 'w' : 8 , 't': 7 , 'z':5 }*

*Output:*
*{ 'x': 3, 'y': 2, 'z': 6, 'w': 8, 't': 7 }*

```
d1 = {'x' : 3 , 'y': 2 , 'z':1}
d2 = {'w' : 8 , 't': 7 , 'z':5}

for i,j in d2.items():
    if i in d1:
        d1[i] += d2[i]   # d1[i] = d1[i] + d2[i]
    else:
        d1.update({i : j})

print(d1)
```

# zip

## Map two lists into a dict

```
k = ['red' , 'green']

v = ['#FF0000' , '#008000']

z = zip(k,v)

d = dict(z)

print(d)    # {'red': '#FF0000', 'green': '#008000'}
```


<Exercise 6>

# Exercise

Find number of X occurrences in S

Input:

```
s = 'Python Course'
x = ['o', 'r']
```

Output:

```
{'o': 2, 'r': 1}
```

# Exercise Solution 1

*Input:*
*s = 'Python Course'*
*x = ['o', 'r']*

*Output:*
*{'o': 2, 'r': 1}*

```
s = 'Python Course'
x = ['o', 'r']
d = {}

for i in s:
    if i in x:
        d.setdefault(i,0)
        d[i] +=1

print(d)            # {'o': 2, 'r': 1}
```

# Exercise Solution 2

```
'''
# from Exercise 1 we have:
s = "string Occurences"
d = {}

for i in s:
    d[i] = d.get(i, 0) + 1

print(d)
# {'s': 2, 't': 1, 'r': 2, 'i': 1, 'n': 2,
#  'g': 1, ' ': 1, 'O': 1, 'c': 3, 'u': 1,
#    'e': 2}

 '''
# we developed this solution for exercise 6:
s = "Python Course"
d = {}
x = ['o', 'r']
for i in s:
    if i in x:
        d[i] = d.get(i, 0) + 1

print(d)   # {'o': 2, 'r': 1}
```


<Exercise 7>

# Exercise
# Bad understanding

*Remove duplications*
*find the bug of this example?*

```
d = {'x': 3, 'y': 2, 'z': 1, 'y' :4 , 'z' : 2 }

r = {}

for k,v in d.items():
    if k not in r.keys():
        r[k] = v

print(r)          # {'x': 3, 'y': 4, 'z': 2}
```

# Exercise Solution

*Remove duplications*
*find the bug of this example?*

```
d = {'x': 3, 'y': 2, 'z': 1, 'y' :4 , 'z' : 2 }

print(d) # {'x': 3, 'y': 4, 'z': 2}
```

*dictionaries do not accept duplicate keys!*
*so there is no duplicate keys in dictionaries!!!*


<Exercise 8>

# Exercise

list of dictionaries

```
students = [
              {'id':123 , 'name' : 'Sophia'   , 's': True},
              {'id':378 , 'name' : 'William' , 's': False},
              {'id':934 , 'name' : 'Sara'     , 's': True}
            ]
```

Count the number of 's == True' in students list
Output is 2

# Exercise Solution 1

```
student = [
        {'id' : 123, 'name':'Sophia'   , 's':True },
        {'id' : 378, 'name':'William'  , 's':False},
        {'id' : 934, 'name':'Sara'     , 's':True }
        ]
# 's' == True
'''
print(True + True)      # 2
print(True + False)     # 1
print(True + 1)         # 2
print(True + 3.14)      # 4.14
'''
sum_of_True = 0
for i in student:
    sum_of_True += int(i['s'])

print(sum_of_True)
```


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# Exercise Solution 2

*Count the number of 's == True' in students list*
*Output is 2*

```
students = [
            {'id':123 , 'name' : 'Sophia'   , 's': True},
            {'id':378 , 'name' : 'William' , 's': False},
            {'id':934 , 'name' : 'Sara'     , 's': True}
           ]


print(sum(d['s']  for d in students))    #2

print(students[1])  # {'id': 378, 'name': 'William', 's': False}
```

# Nested dict

## *dict in dict*

```
family = {
        'child1':{'name':'James'  , 'age' : 8}  ,
        'child2':{'name':'Emma' , 'age' : 20}
        }

print(family)
```

```
d1 = {'name':'James'  , 'age' : 8}
d2 = {'name':'Emma' , 'age' : 20}

family = {
        'child1':d1 ,
        'child2':d2
        }
```

## Example

*randomly choose between dictionary keys*

```
d = {
      'F' : 0 ,
      'B' : 0
      }

import random

for _ in range(17): # do it 17 times
    d[random.choice(list(d.keys()))] +=1

print(d)
```

# Dictionary Merge & Update Operators

## Python 3.9 changes
## Be updated!

Merge (`|`) and update (`|=`) operators have been added to the built-in `dict` class. Those complement the existing `dict.update` and `{**d1, **d2}` methods of merging dictionaries.

Example:

```
>>> x = {"key1": "value1 from x", "key2": "value2 from x"}
>>> y = {"key2": "value2 from y", "key3": "value3 from y"}
>>> x | y
{'key1': 'value1 from x', 'key2': 'value2 from y', 'key3': 'value3 from y'}
>>> y | x
{'key2': 'value2 from x', 'key3': 'value3 from y', 'key1': 'value1 from x'}
```

https://docs.python.org/3/whatsnew/3.9.html
https://www.python.org/dev/peps/pep-0584/

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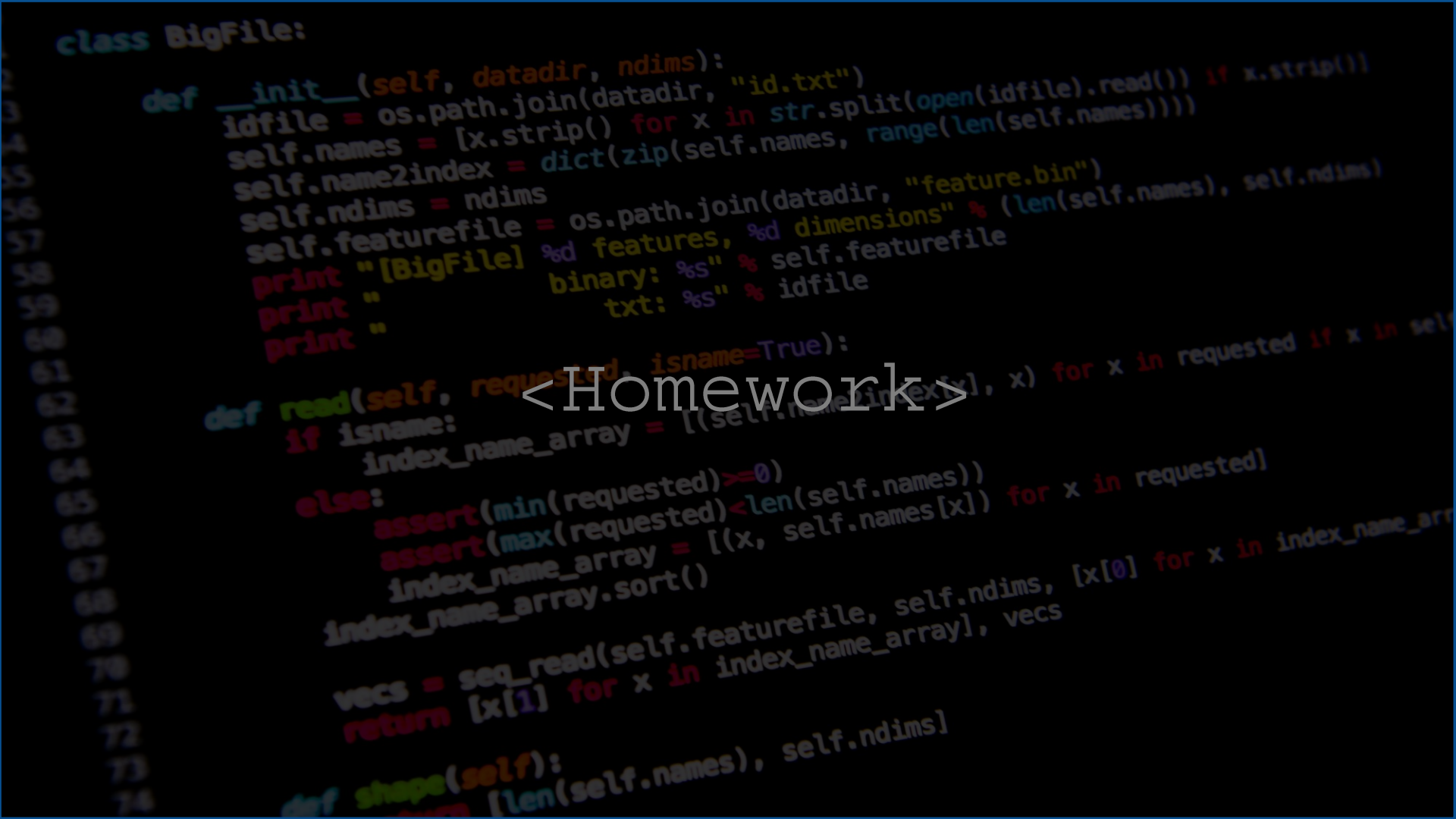
<Homework>

# Homework

*Create a 'person' Dictionary with this details:*

```
print(len(person))  # 4

print(person['phone']['home'])    # 01-4455

print(person['phone']['mobile'])  #918-123456

print(person['children'])     # ['Olivia', 'Sophia']
print(person['children'][0])  # Olivia

print(person.pop('age'))      # 48
```

“

- *Make it work*
- *Make it Right*
- *Make it Fast*


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