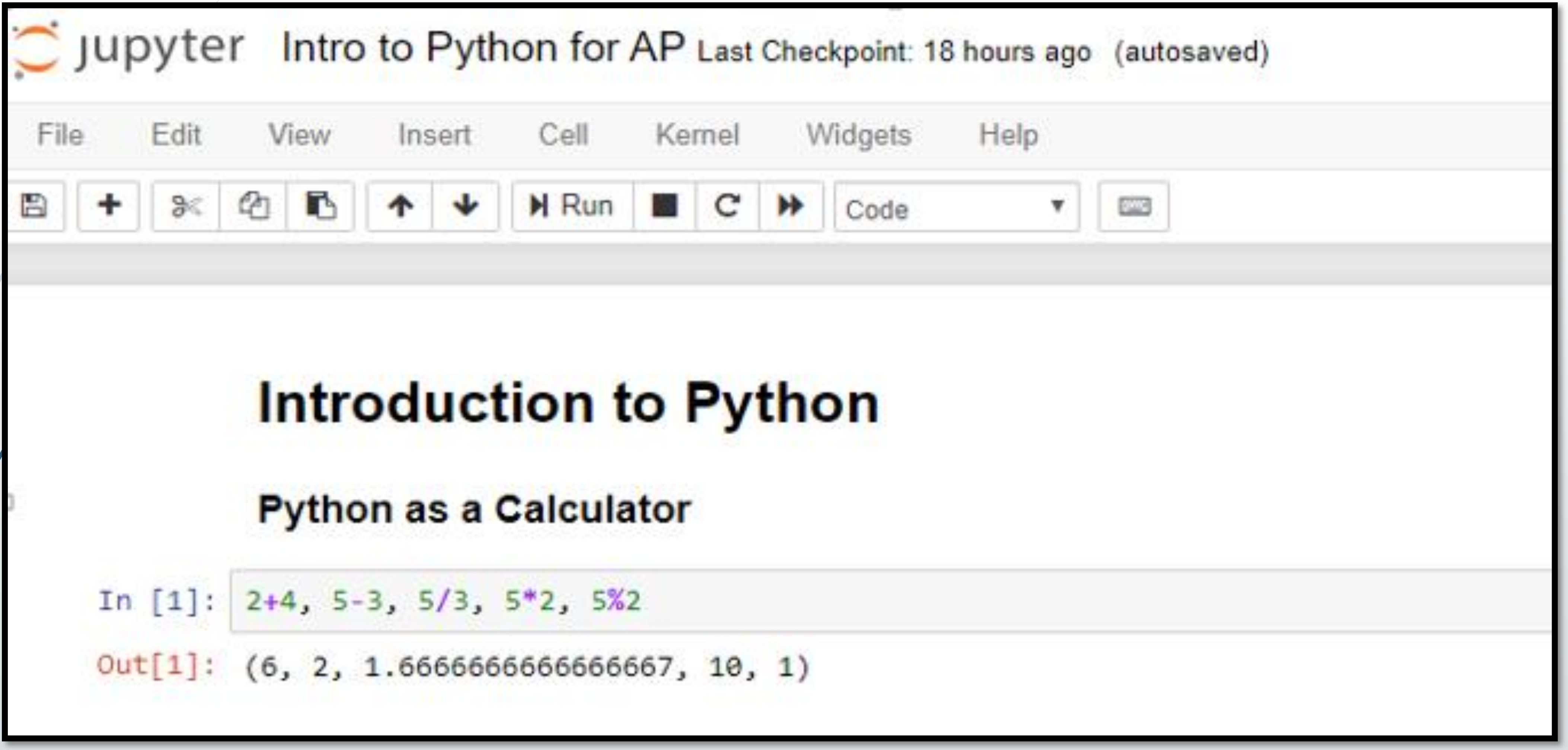
Python for Physics

Key topics Covered

- Introduction to Jupiter Notebook .
- Introduction to Basics of Python.
- Python libraries (Numpy and Matplotlib)
- Programming the main topics of Physics:
  - Vectors
  - Motion & Free Fall Motion
  - Projectile motion
  - Simple Harmonic Motion & Damped Oscillation
  - Circular Motion &SHM
  - Wave Motion
  - Electrostatics Force and Field
  - Gravitational Field

Introduction to Python



jupyter
Intro to Python for AP Last Checkpoint: 18 hours ago (autosaved)
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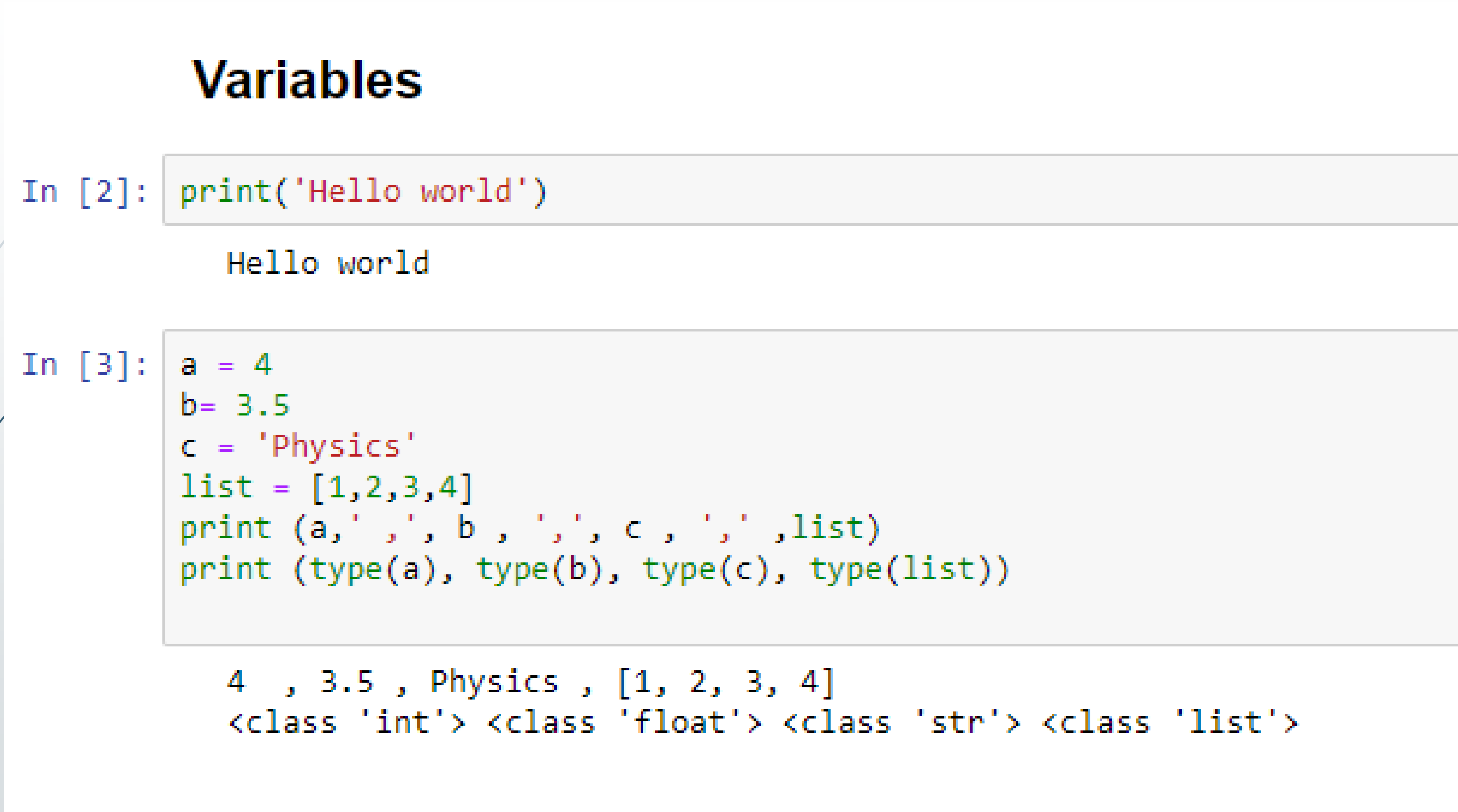
Introduction to Python

Python as a Calculator

```
In [1]: 2+4, 5-3, 5/3, 5*2, 5%2

Out[1]: (6, 2, 1.6666666666666667, 10, 1)
```



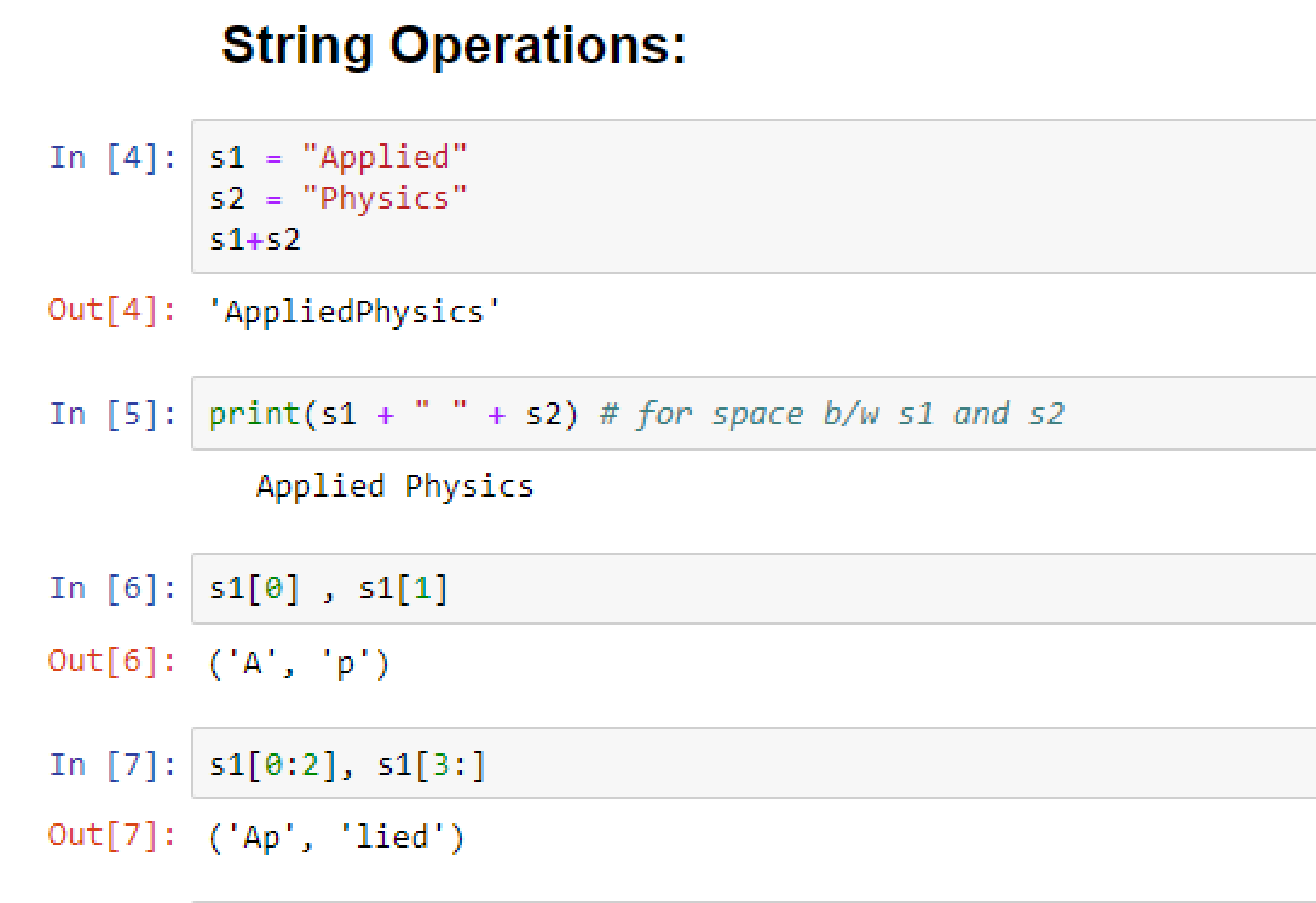
Variables

```
In [2]: print('Hello world')
```

```
Hello world
```

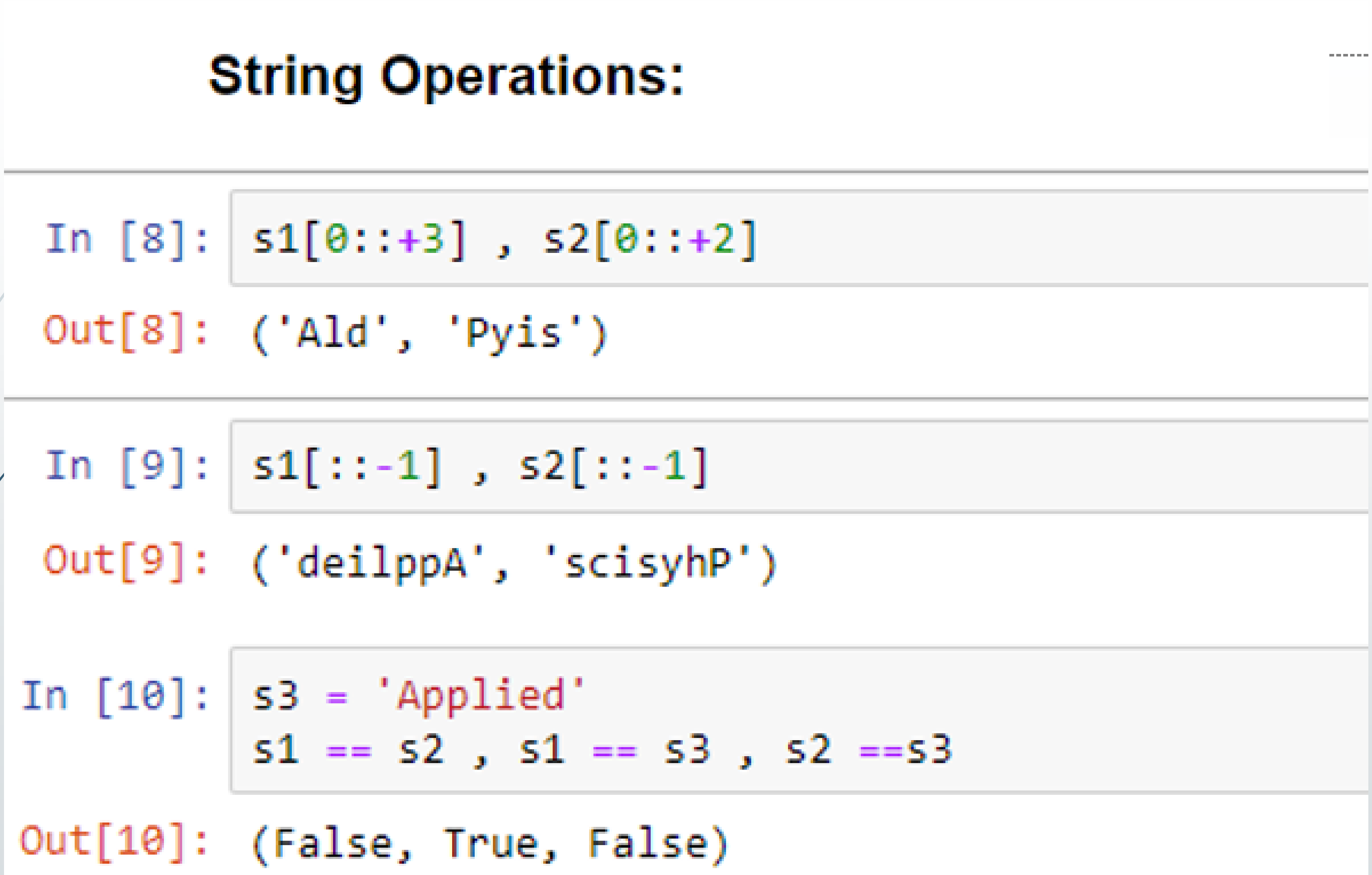
```
In [3]: a = 4
        b= 3.5
        c = 'Physics'
        list = [1,2,3,4]
        print (a,' ,', b , ',', c , ',' ,list)
        print (type(a), type(b), type(c), type(list))
```

```
4  , 3.5 , Physics , [1, 2, 3, 4]
<class 'int'> <class 'float'> <class 'str'> <class 'list'>
```



String Operations:

```
In [4]: s1 = "Applied"
        s2 = "Physics"
        s1+s2

Out[4]: 'AppliedPhysics'

In [5]: print(s1 + " " + s2) # for space b/w s1 and s2

          Applied Physics

In [6]: s1[0] , s1[1]

Out[6]: ('A', 'p')

In [7]: s1[0:2], s1[3:]

Out[7]: ('Ap', 'lied')
```

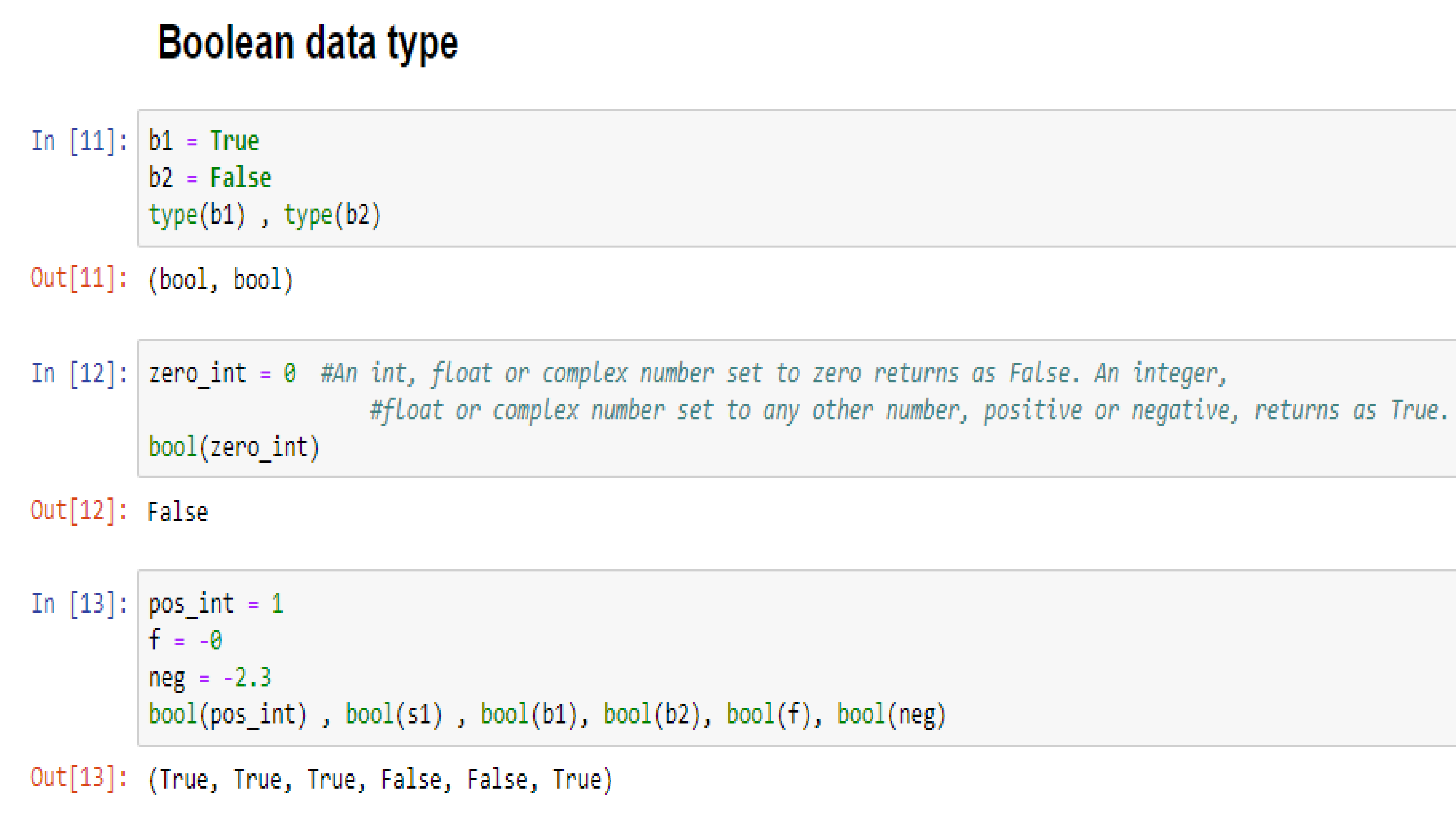


String Operations:

```
In [8]:  s1[0::+3] , s2[0::+2]

Out[8]:  ('Ald', 'Pyis')
```

```
In [9]:  s1[::-1] , s2[::-1]

Out[9]:  ('deilppA', 'scisyhP')
```

```
In [10]: s3 = 'Applied'
         s1 == s2 , s1 == s3 , s2 ==s3

Out[10]: (False, True, False)
```

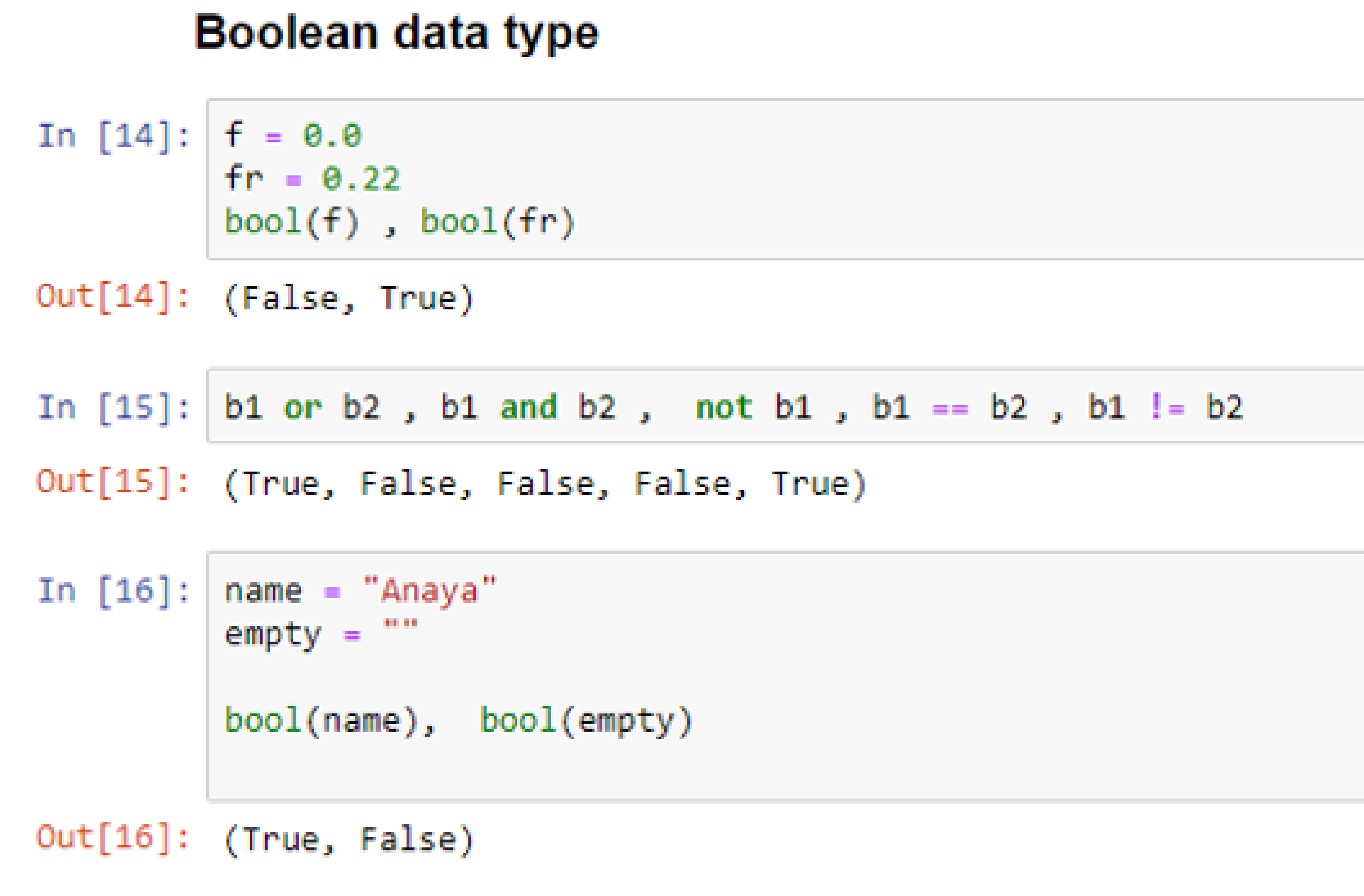


Boolean data type

```
In [11]: b1 = True
         b2 = False
         type(b1) , type(b2)

Out[11]: (bool, bool)
```

```
In [12]: zero_int = 0  #An int, float or complex number set to zero returns as False. An integer,
                           #float or complex number set to any other number, positive or negative, returns as True.
         bool(zero_int)

Out[12]: False
```

```
In [13]: pos_int = 1
         f = -0
         neg = -2.3
         bool(pos_int) , bool(s1) , bool(b1), bool(b2), bool(f), bool(neg)

Out[13]: (True, True, True, False, False, True)
```



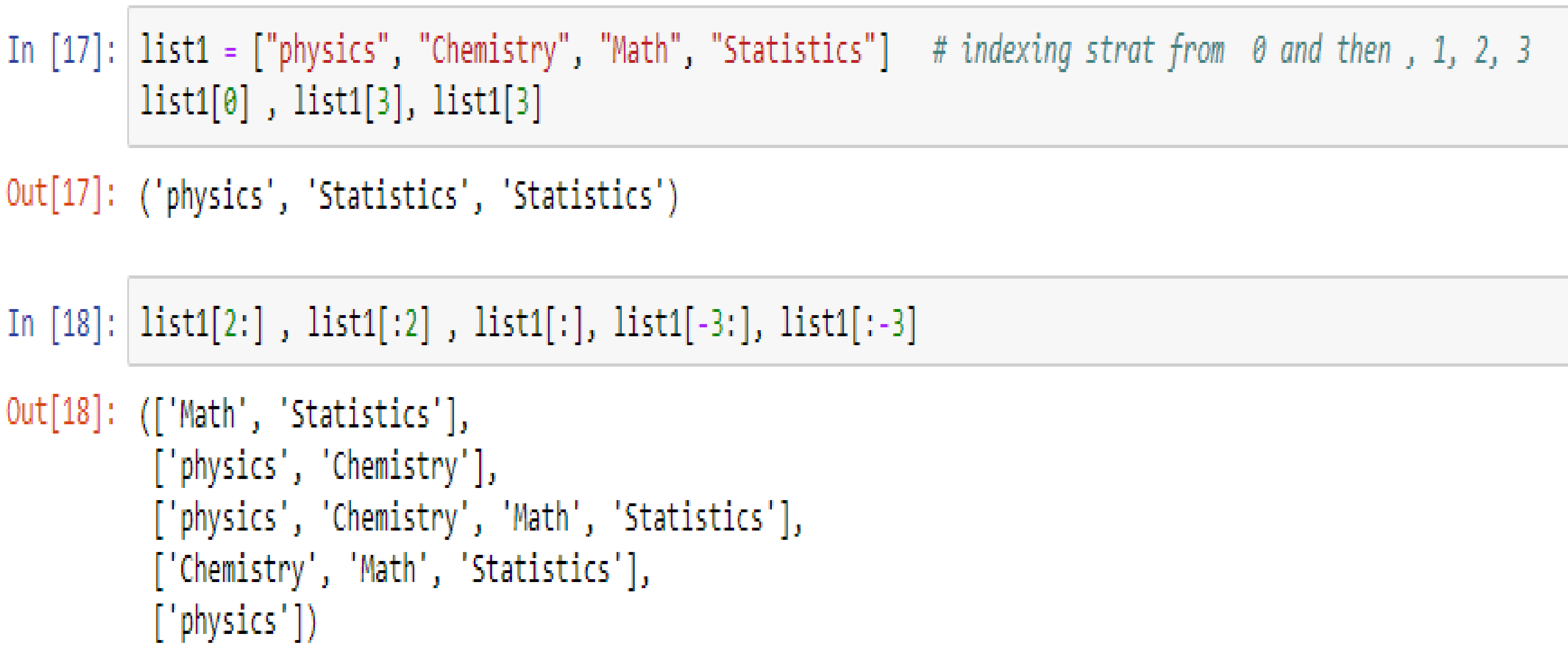
Boolean data type

```
In [14]: f = 0.0
         fr = 0.22
         bool(f) , bool(fr)

Out[14]: (False, True)
```

```
In [15]: b1 or b2 , b1 and b2 ,  not b1 , b1 == b2 , b1 != b2

Out[15]: (True, False, False, False, True)
```

```
In [16]: name = "Anaya"
         empty = ""

         bool(name),  bool(empty)

Out[16]: (True, False)
```

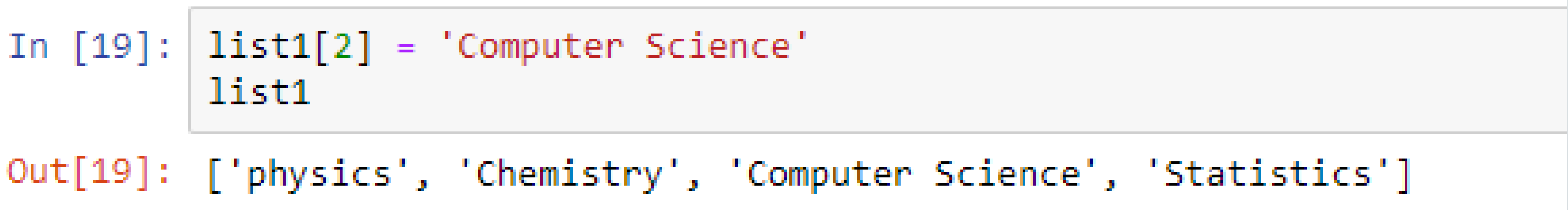
List



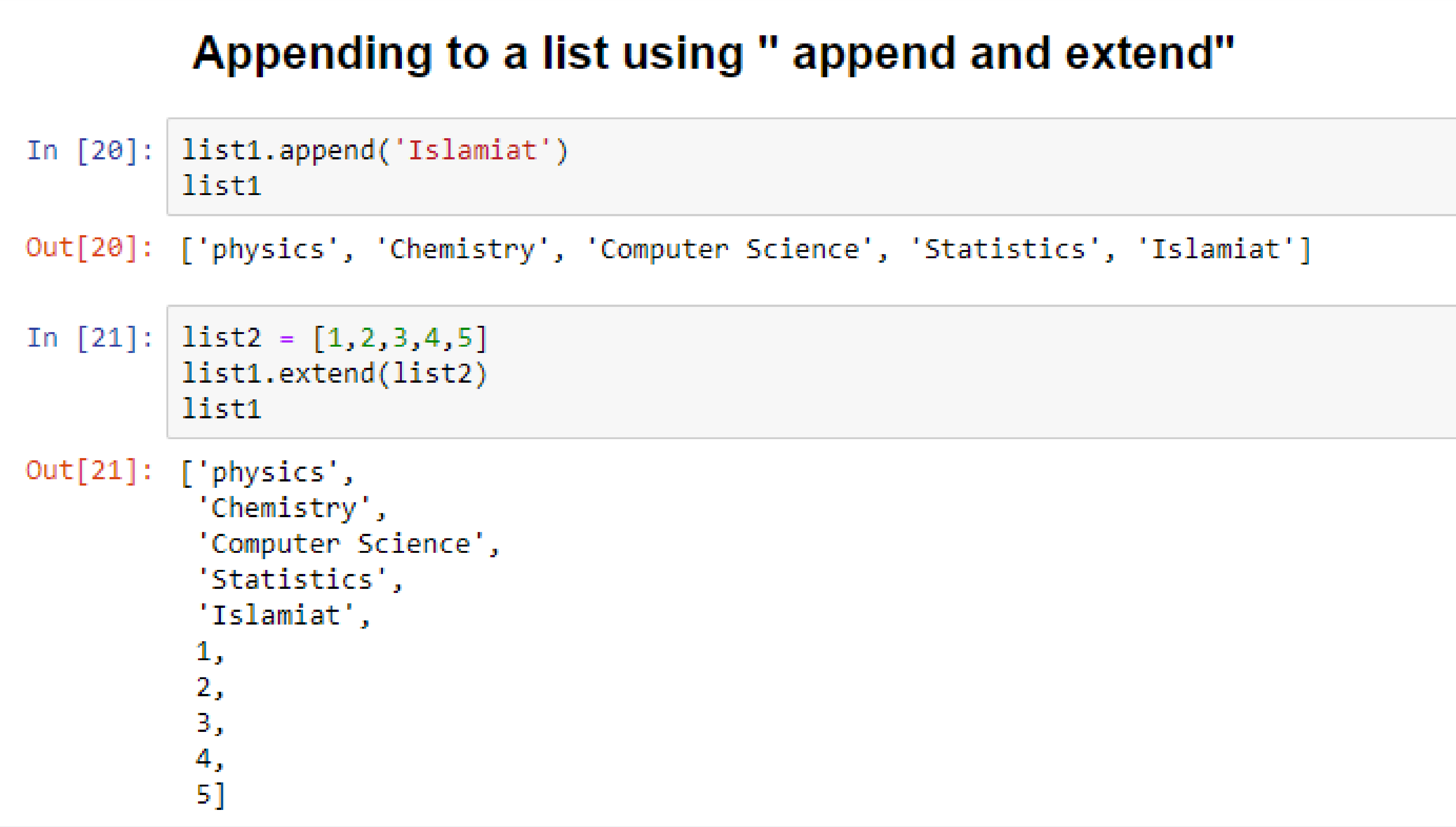
```
In [17]: list1 = ["physics", "Chemistry", "Math", "Statistics"]   # indexing strat from  0 and then , 1, 2, 3
         list1[0] , list1[3], list1[3]

Out[17]: ('physics', 'Statistics', 'Statistics')
```

```
In [18]: list1[2:] , list1[:2] , list1[:], list1[-3:], list1[:-3]

Out[18]: (['Math', 'Statistics'],
          ['physics', 'Chemistry'],
          ['physics', 'Chemistry', 'Math', 'Statistics'],
          ['Chemistry', 'Math', 'Statistics'],
          ['physics'])
```

Lists are mutable

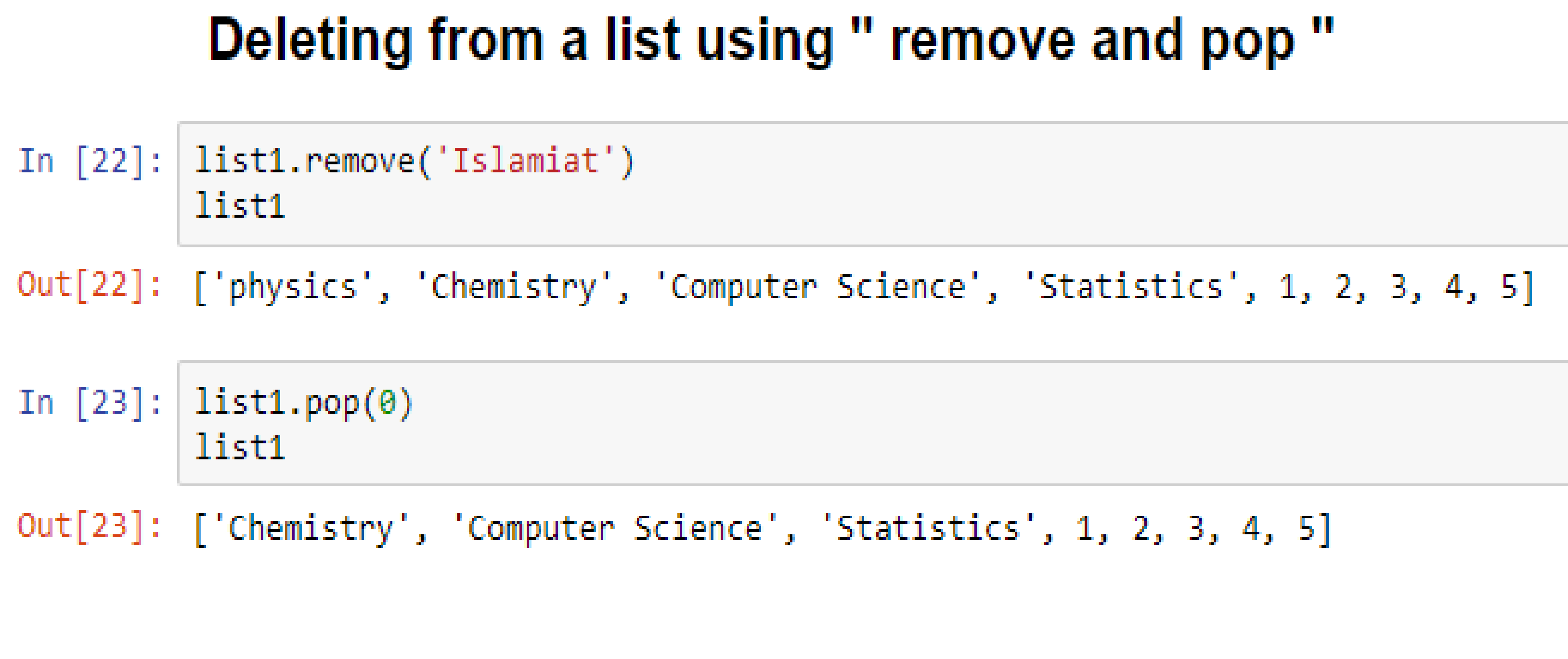


```
In [19]: list1[2] = 'Computer Science'
         list1

Out[19]: ['physics', 'Chemistry', 'Computer Science', 'Statistics']
```



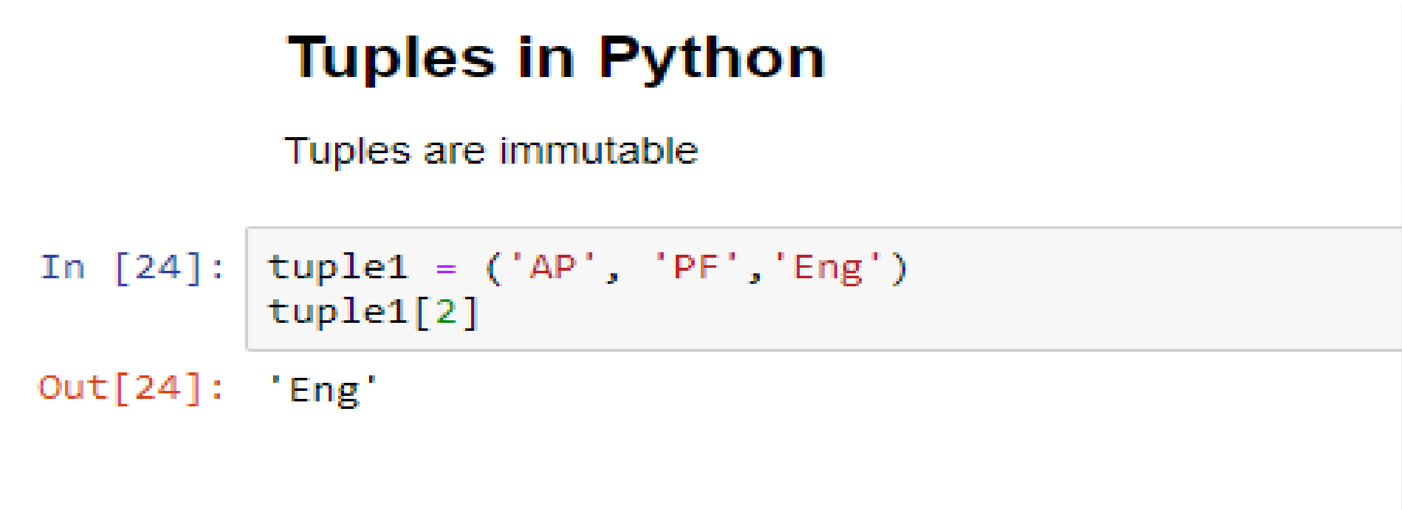
Appending to a list using " append and extend"

```
In [20]: list1.append('Islamiat')
         list1

Out[20]: ['physics', 'Chemistry', 'Computer Science', 'Statistics', 'Islamiat']

In [21]: list2 = [1,2,3,4,5]
         list1.extend(list2)
         list1

Out[21]: ['physics',
          'Chemistry',
          'Computer Science',
          'Statistics',
          'Islamiat',
          1,
          2,
          3,
          4,
          5]
```



Deleting from a list using " remove and pop "

```
In [22]: list1.remove('Islamiat')
         list1

Out[22]: ['physics', 'Chemistry', 'Computer Science', 'Statistics', 1, 2, 3, 4, 5]

In [23]: list1.pop(0)
         list1

Out[23]: ['Chemistry', 'Computer Science', 'Statistics', 1, 2, 3, 4, 5]
```



Tuples in Python

Tuples are immutable

```
In [24]: tuple1 = ('AP', 'PF','Eng')
         tuple1[2]

Out[24]: 'Eng'
```