Python for Physics

By

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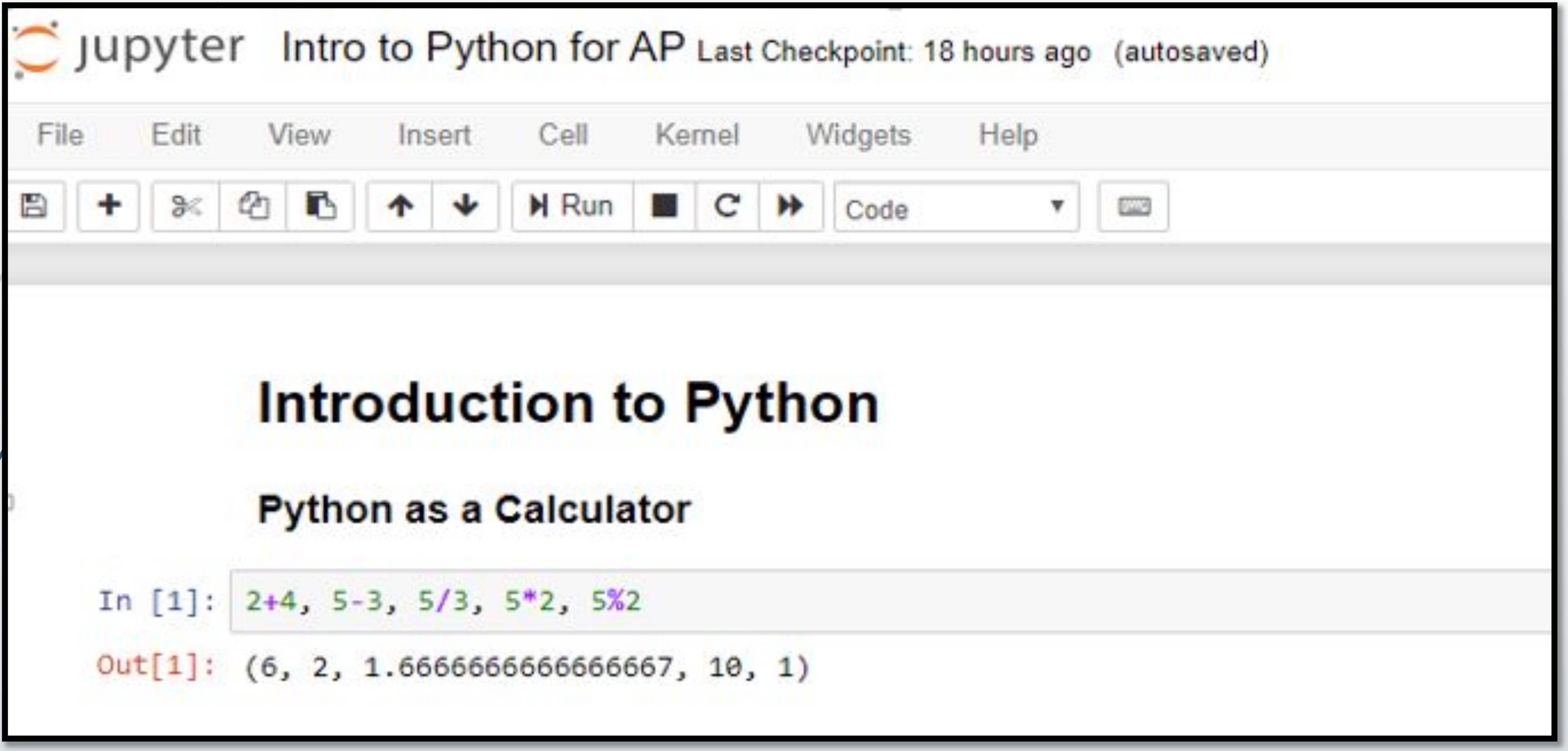
Key topics Covered

- 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

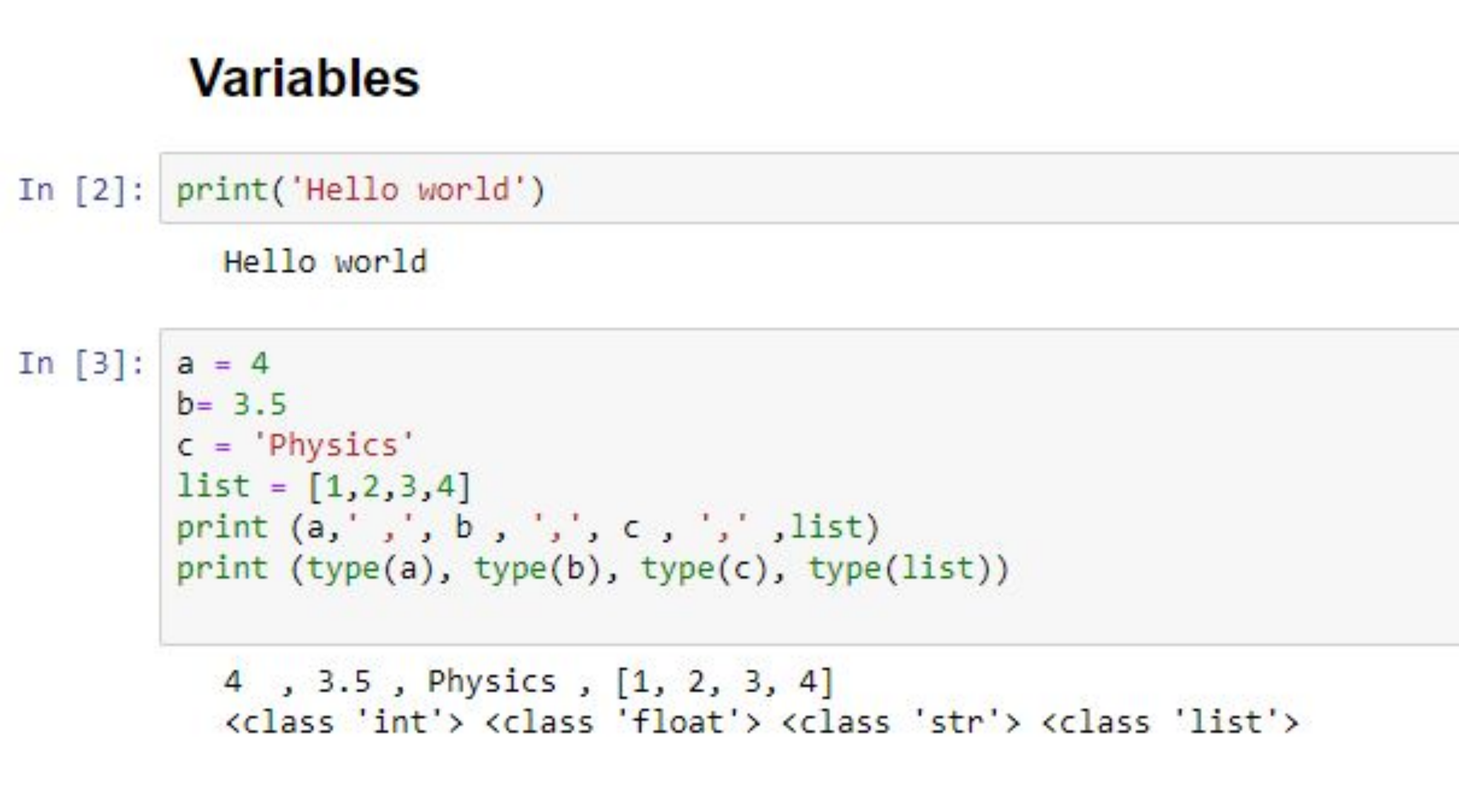


Intro to Python for AP Last Checkpoint: 18 hours ago (autosaved)

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
```

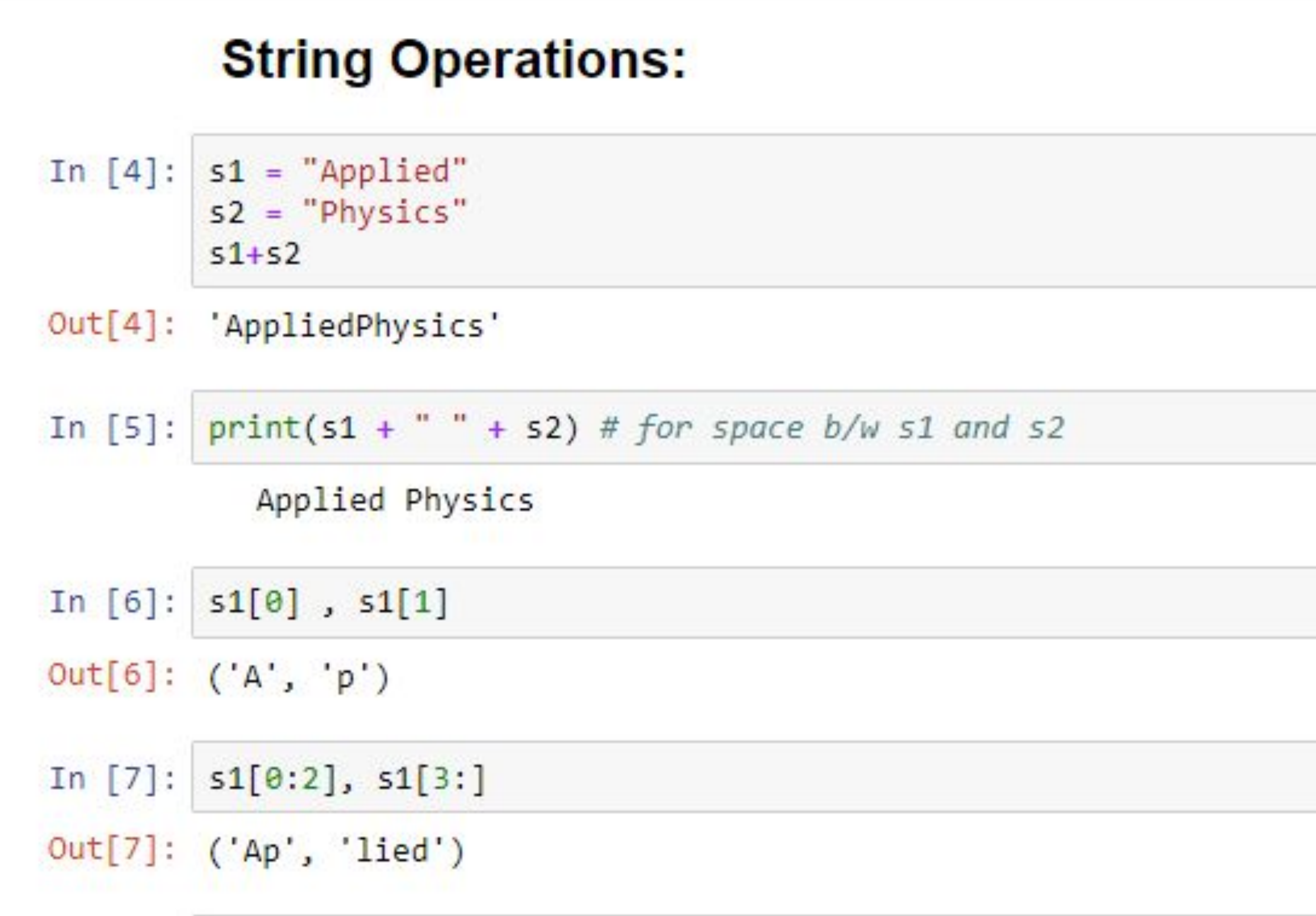
```
In [3]: a = 4
        b= 3.5
        c = 'Physics'
        list = [1,2,3,4]
        print (a,' ,', b , ',', c , ',' ,list)
        print (type(a), type(b), type(c), type(list))
```

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

Reserved Words

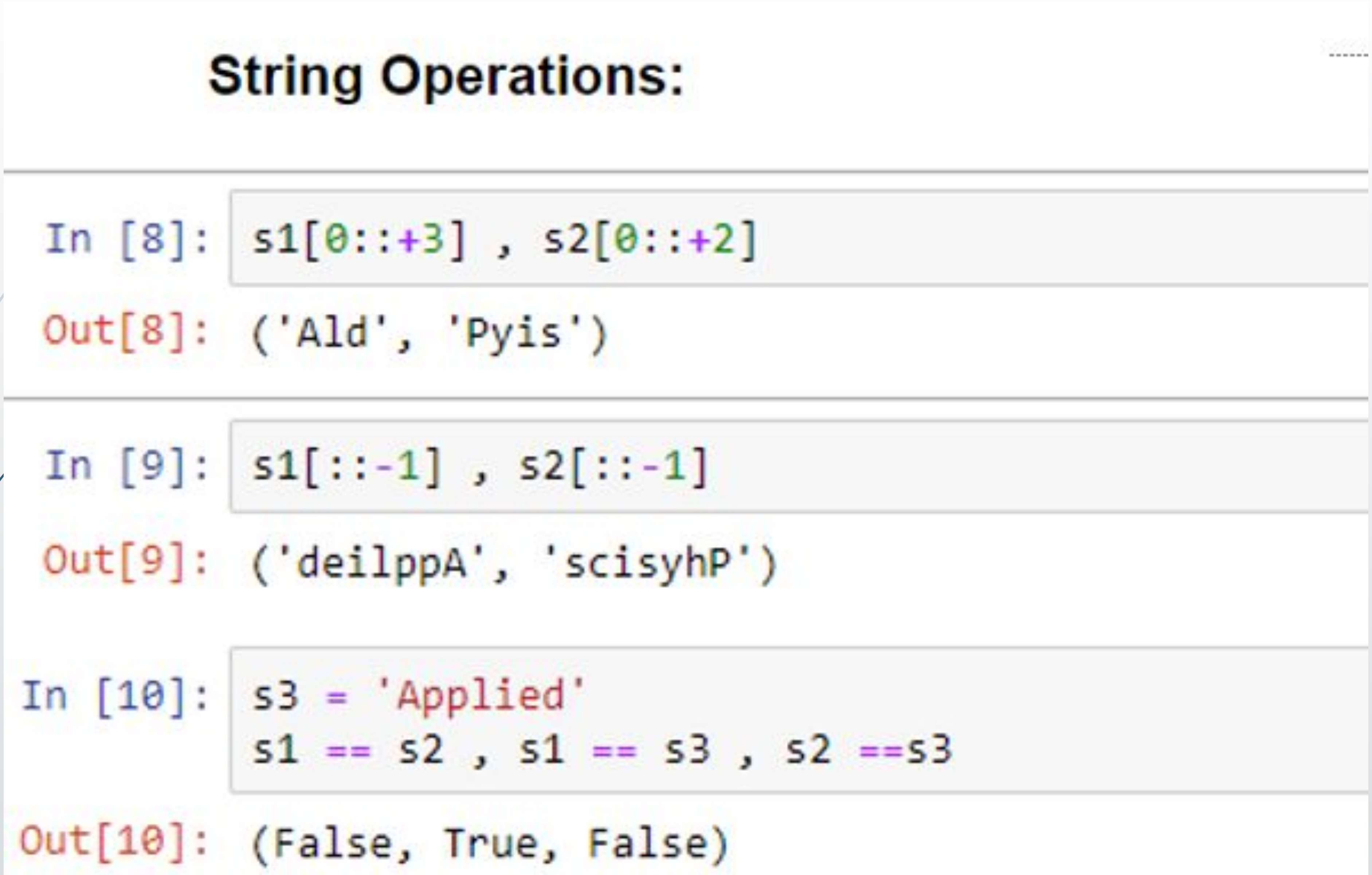
You cannot use reserved words as variable names / identifiers

```
False   class  return  is     finally
None    if   for  lambda continue
True    def  from   while   nonlocal
and  del  global  not  with
as   elif    try    or      yield
assert  else   import  pass
break   except in      raise
```



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')
```

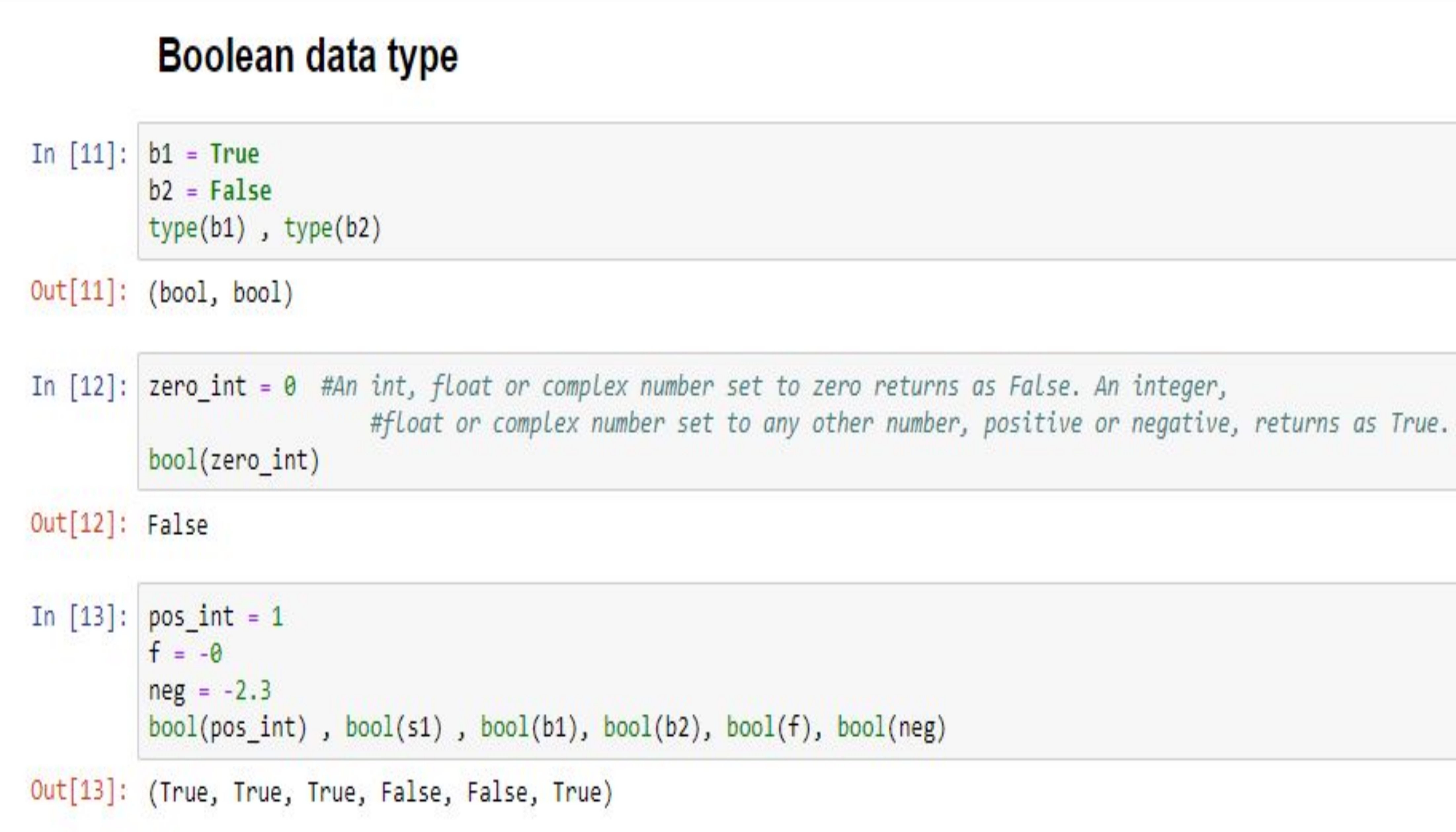


String Operations:

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

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

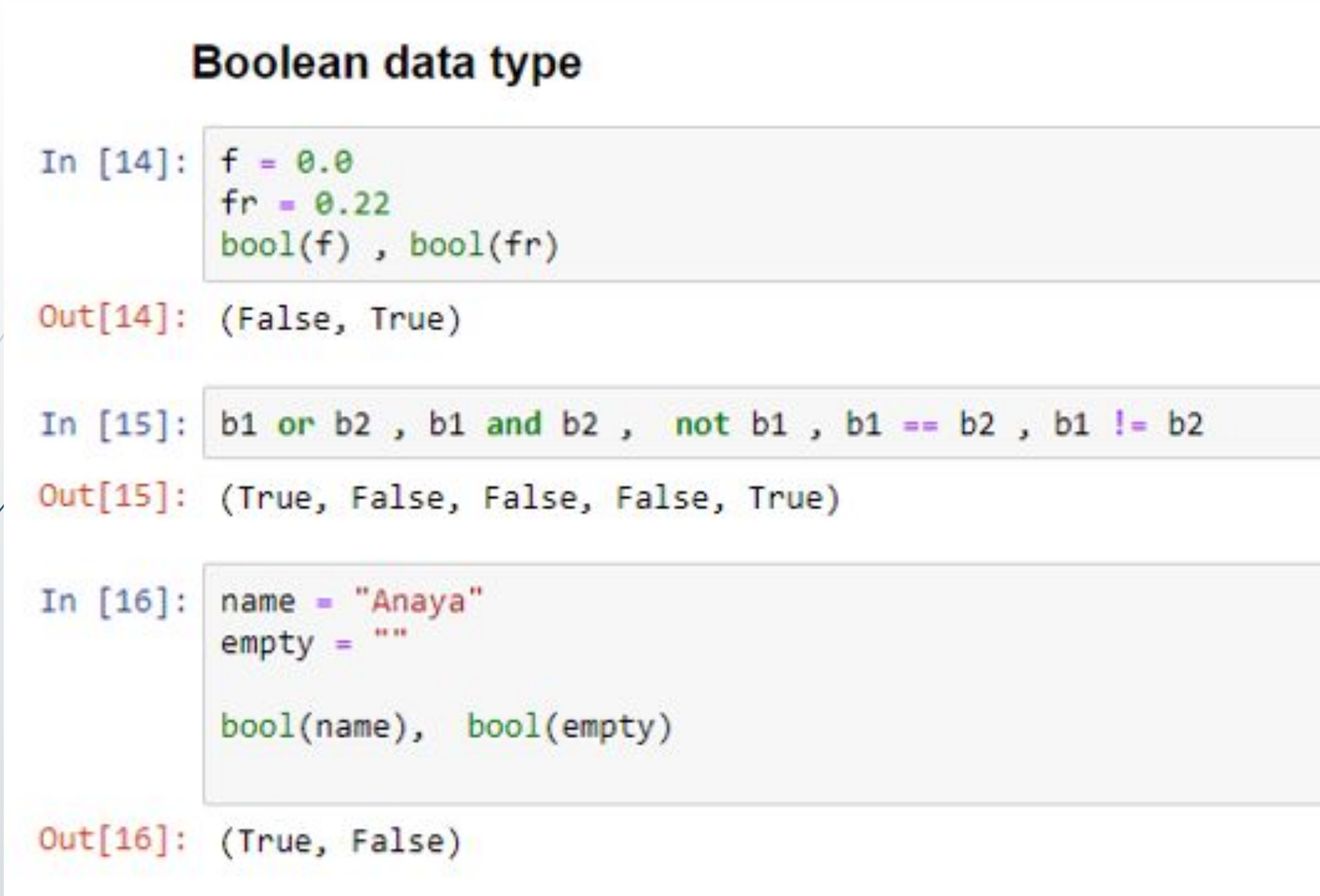
```
In [9]: s1[::-1] , s2[::-1]

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)
```

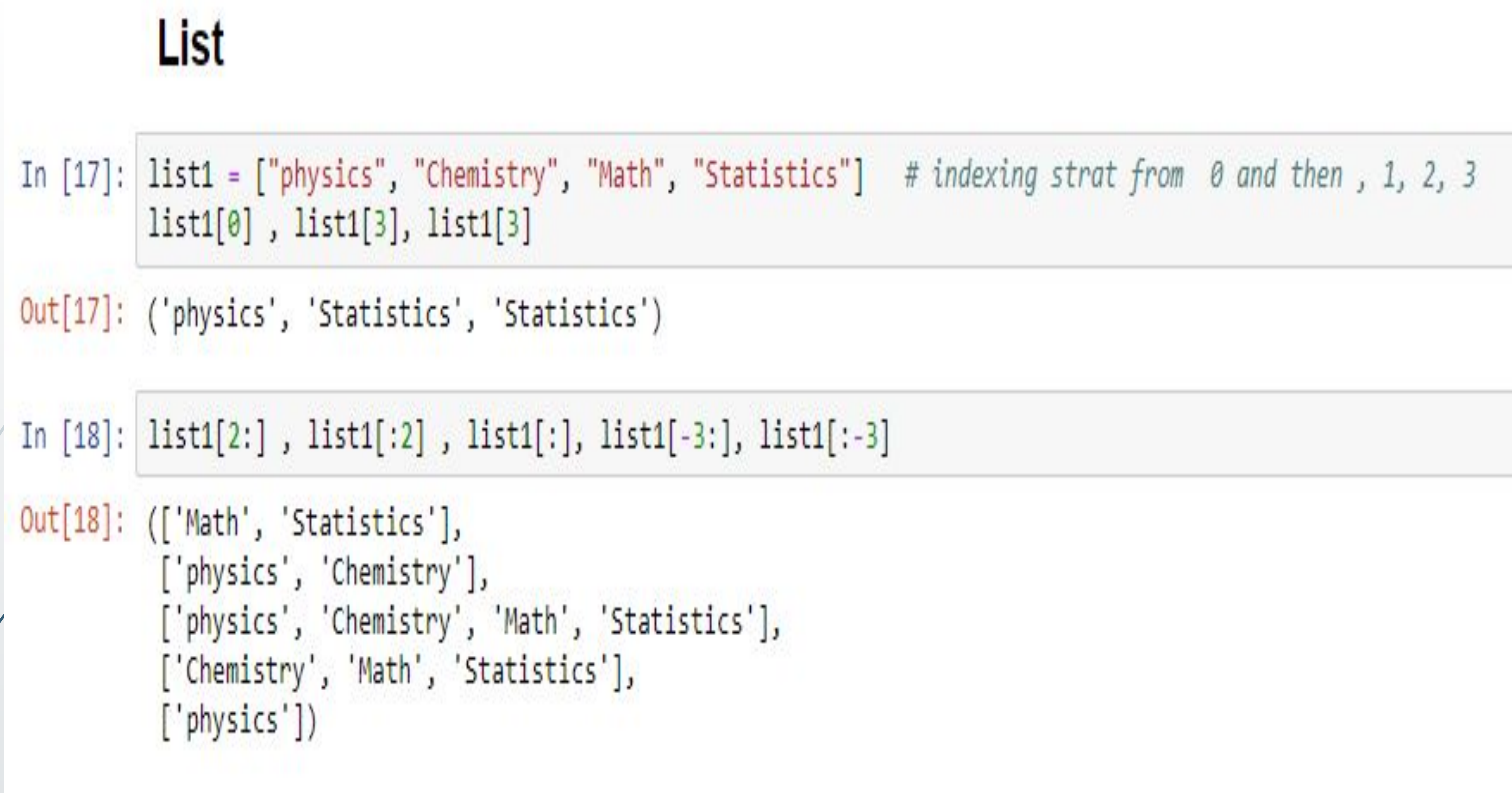


Boolean data type

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

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

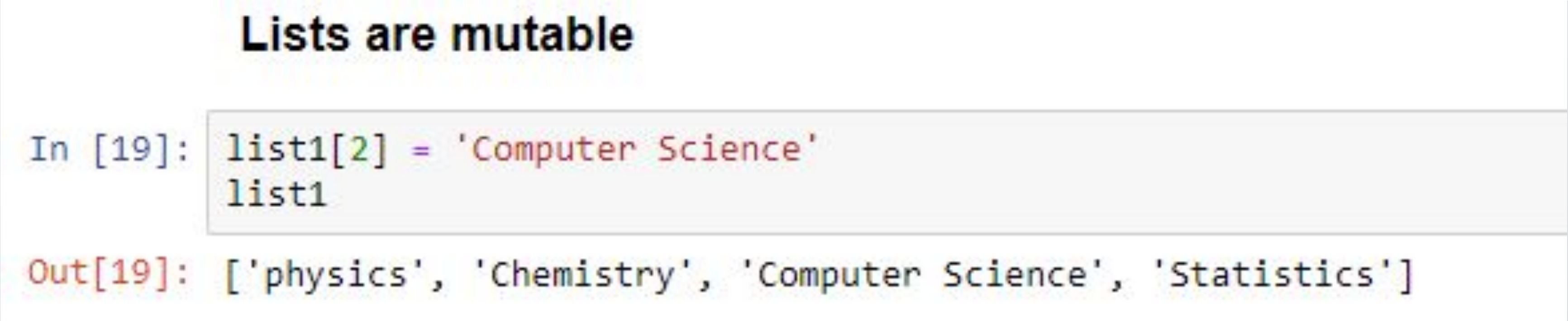
```
In [15]: b1 or b2 , b1 and b2 ,  not b1 , b1 == b2 , b1 != b2

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

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

         bool(name),  bool(empty)

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



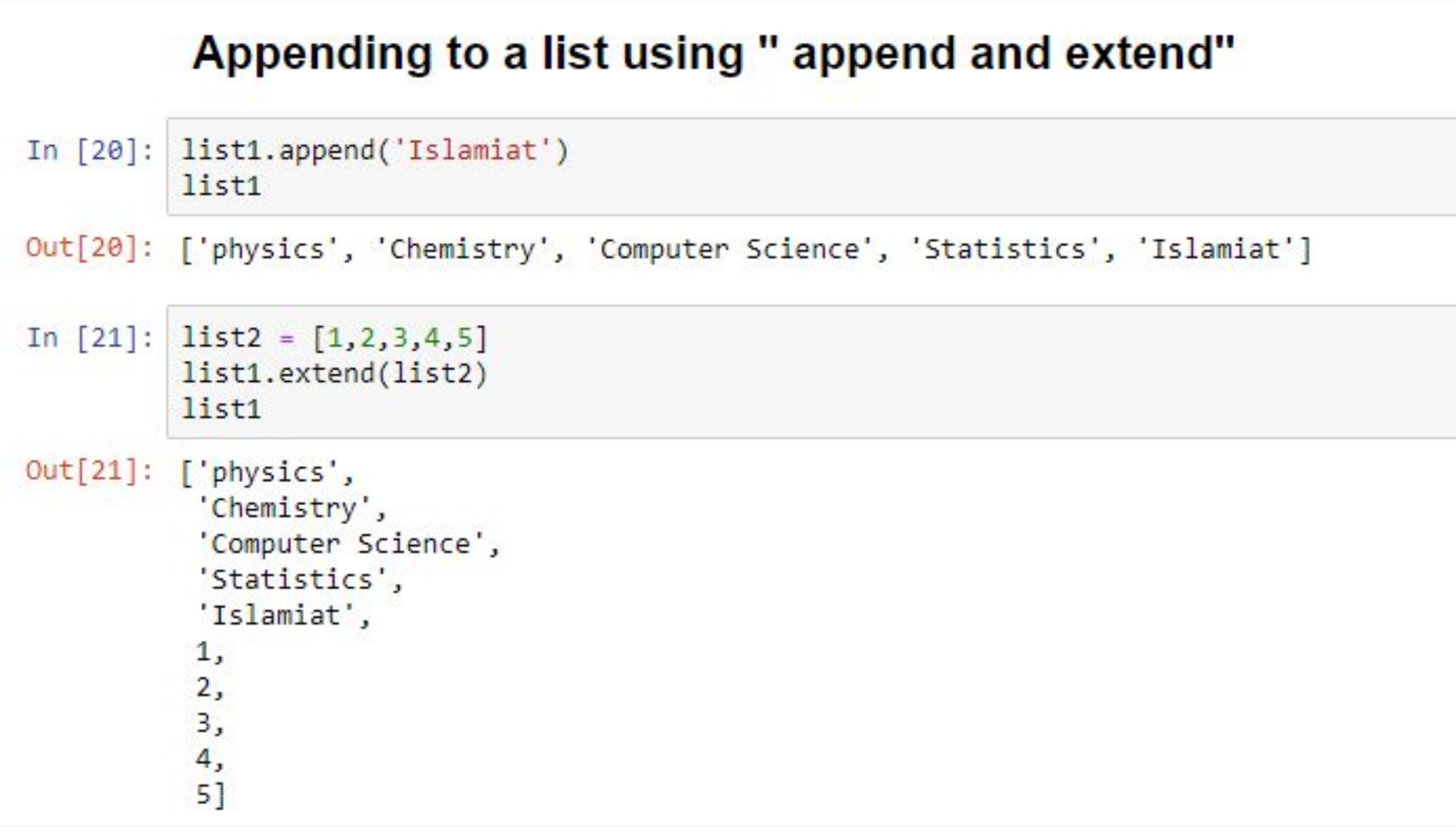
List

```
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'])
```



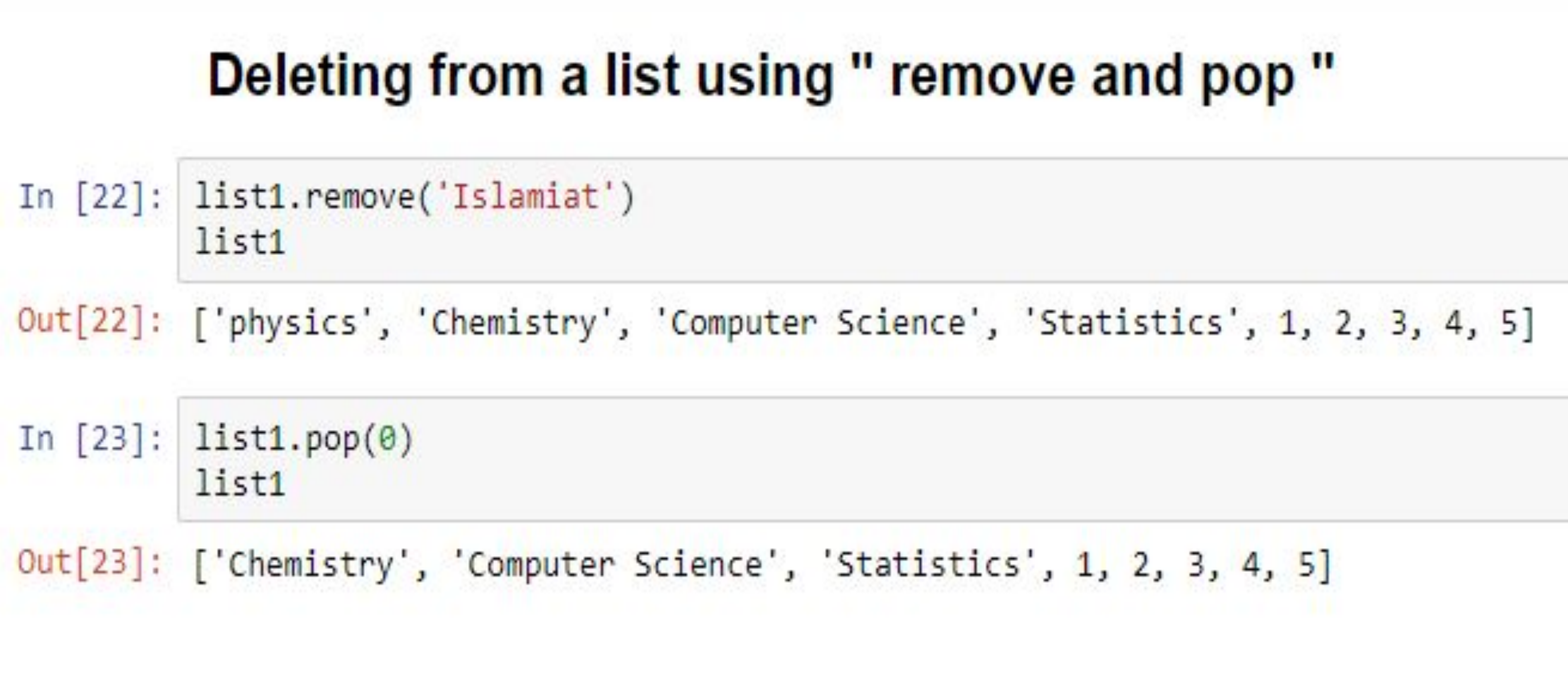
Lists are mutable

```
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]
```



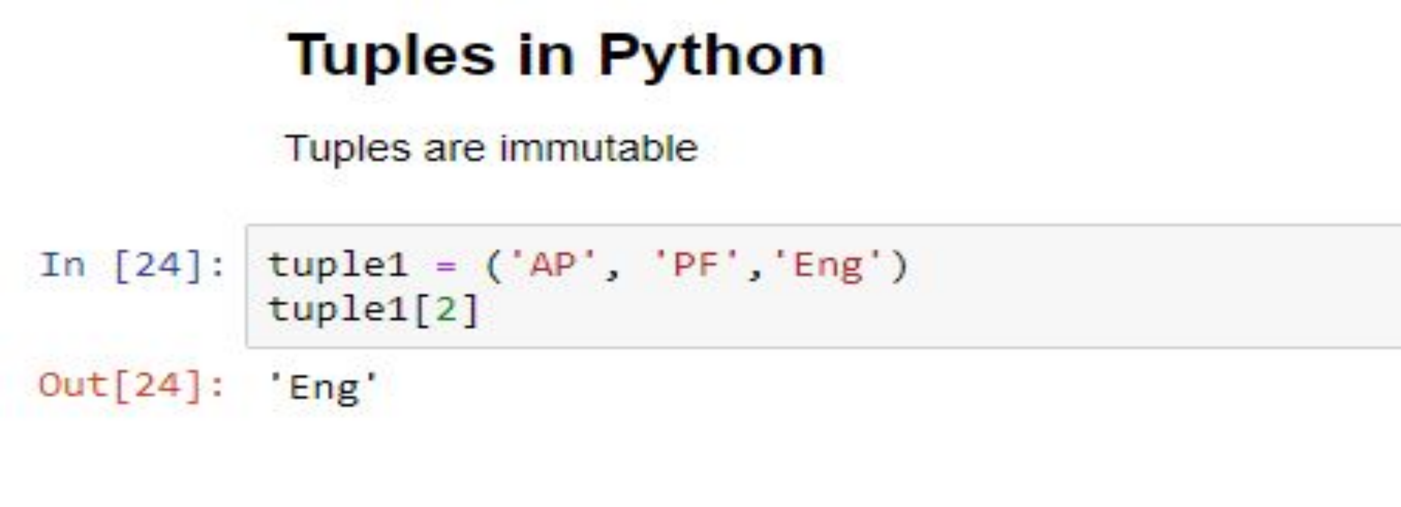
Deleting from a list using " remove and pop "

```
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'
```