

```
In [1]: a=3  
b=5
```

```
In [2]: l = [4,5,6,5,5,4,3,5,6,7,8,7]
```

```
In [3]: l[1]
```

```
Out[3]: 5
```

```
In [4]: l[0]
```

```
Out[4]: 4
```

```
In [5]: s = 'Alex'
```

```
In [6]: s[1]
```

```
Out[6]: 'l'
```

```
In [7]: s[0]
```

```
Out[7]: 'A'
```

```
In [8]: l = [4,5,6,7,8,9,]
```

```
In [9]: l = [4,5,6,7,8,9]
```

```
In [12]: l = [  
          4,  
          5,  
          6,  
          7,  
          8,  
          9,  
          ]
```

```
In [15]: l[-1]
```

```
Out[15]: 9
```

```
In [16]: l[-2]
```

```
Out[16]: 8
```

```
In [17]: s = 'abcdefghijk'
```

```
In [18]: s[1:4]
```

```
Out[18]: 'bcd'
```

```
In [19]: l
```

```
Out[19]: [4, 5, 6, 7, 8, 9]
```

```
In [20]: l[1:4]
```

Out[20]: [5, 6, 7]

In [22]: `l[1:6:2]`

Out[22]: [5, 7, 9]

In [24]: `l[-1:0:-2] # slicing`

Out[24]: [9, 7, 5]

In [25]: `1`
`2`
`3`
`4`
`5`
`5 6`
`6`
`7`
`8`

File "<ipython-input-25-866d4248fcc1>", line 6

`5 6`
`^`

SyntaxError: invalid syntax

In [27]: `s[100]`

IndexError Traceback (most recent call last)
<ipython-input-27-2a138df92e52> in <module>
----> 1 s[100]

IndexError: string index out of range

In [28]: `l`

Out[28]: [4, 5, 6, 7, 8, 9]

In [29]: `l[100]`

IndexError Traceback (most recent call last)
<ipython-input-29-e2a0c2623844> in <module>
----> 1 l[100]

IndexError: list index out of range

In [30]: `s`

Out[30]: 'abcdefghijk'

In [31]: `s[0:100000:2]`

Out[31]: 'acegik'

In [32]: `l[0:100000:2]`

Out[32]: [4, 6, 8]

```
len(s)
```

Out[33]:

```
len(l)
```

Out[34]:

```
len(' ')
```

Out[35]:

```
len([])
```

```
Out[37]:
```

```
def f(x):  
    return x+1
```

```
l = [1,1,2,34.23, True, False, 'adfasdf', None, f]
```

$$\mathcal{L}[-1](5)$$

Out[40]:

```
l = [ [1,2,3], [7,8,9] ]
```

```
len(l)
```

Out[44]:

```
len(l[0])
```

```
Out[45]:
```

[illegible]

```
len(l)
```

Out[47]:

```
len([ [], [], [] ])
```

Out[48]:

```
a = [1,2,3]
```

```
a = [5,6,a]
```

```
Out[51]: [5. 6. [1. 2. 3]]
```

```
In [52]: [a, [a,a, [a]]]
```

```
Out[52]: [[5, 6, [1, 2, 3]],  
          [[5, 6, [1, 2, 3]], [5, 6, [1, 2, 3]], [[5, 6, [1, 2, 3]]]]]
```

```
In [53]: l = [5,6,7,8,9]
```

```
In [54]: 5 in l
```

```
Out[54]: True
```

```
In [55]: 'mitsos' in l
```

```
Out[55]: False
```

```
In [56]: [5,6] in [5,6]
```

```
Out[56]: False
```

```
In [57]: [5,6] in [5,6,[5,6]]
```

```
Out[57]: True
```

```
In [58]: 'l' in 'Alex'
```

```
Out[58]: True
```

```
In [59]: 'lex' in 'Alex'
```

```
Out[59]: True
```

```
In [60]: 'fdwdf' in 'Alex'
```

```
Out[60]: False
```

```
In [61]: 'abcdefg'.index('e')
```

```
Out[61]: 4
```

```
In [62]: [1,2,3,4,5].index(5)
```

```
Out[62]: 4
```

```
In [63]: 'askjfgghaljerfghalejgfaiejhfgaekjhfgaekjrhfg'.count('g')
```

```
Out[63]: 6
```

```
In [64]: [1,2,3,4,3,2,3,4,5].count(1)
```

```
Out[64]: 1
```

```
In [65]: [4,5,6,7,8].find(7)
```

```
-----  
AttributeError                                Traceback (most recent call last)  
<ipython-input-65-041512efb010> in <module>  
----> 1 [4,5,6,7,8].find(7)
```

```
In [66]: 'gfd sdfghgf'.find('g')
```

```
Out[66]: 0
```

```
In [67]: 'sdfghjhgfd'.find('g')
```

```
Out[67]: 3
```

```
In [68]: 'sdfghjhgfd'.index('g')
```

```
Out[68]: 3
```

```
In [69]: 'sdfghjhgfd'.index('z')
```

```
-----  
ValueError                                Traceback (most recent call last)  
<ipython-input-69-ff69278f61c8> in <module>  
----> 1 'sdfghjhgfd'.index('z')
```

```
ValueError: substring not found
```

```
In [70]: 'sdfghjhgfd'.find('z')
```

```
Out[70]: -1
```

```
In [71]: [4,5,6,7,8].index(9)
```

```
-----  
ValueError                                Traceback (most recent call last)  
<ipython-input-71-3f3c9233de30> in <module>  
----> 1 [4,5,6,7,8].index(9)
```

```
ValueError: 9 is not in list
```

```
In [72]: [4,5,6,7,]
```

```
Out[72]: [4, 5, 6, 7]
```

```
In [73]: 'asdfgdsa' + 'gdhfk dshagfsdfgb'
```

```
Out[73]: 'asdfgdsagdhfk dshagfsdfgb'
```

```
In [74]: [1,2,3] + [7,8,9]
```

```
Out[74]: [1, 2, 3, 7, 8, 9]
```

```
In [75]: [1,2,3] * [7,8,9]
```

```
-----  
TypeError                                Traceback (most recent call last)  
<ipython-input-75-7965657d1c01> in <module>  
----> 1 [1,2,3] * [7,8,9]
```

```
TypeError: can't multiply sequence by non-int of type 'list'
```

```
In [76]: [1,2,3] * 7
```

```
Out[76]: [1, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3]
```

```
In [78]: ['a', 'b', 'c'] * 4
```

```
Out[78]: ['a', 'b', 'c', 'a', 'b', 'c', 'a', 'b', 'c', 'a', 'b', 'c']
```

```
In [79]: 'abcd' + 'e'
```

```
Out[79]: 'abcde'
```

```
In [80]: 7+5
```

```
Out[80]: 12
```

```
In [82]: a=7  
a += 5  
a
```

```
Out[82]: 12
```

```
In [83]: s = 'abcd'  
s += 'e'  
s
```

```
Out[83]: 'abcde'
```

```
In [87]: l = [3,4,5,6,]  
l += [7]  
l
```

```
Out[87]: [3, 4, 5, 6, 7]
```

```
In [ ]:
```

```
In [86]: [3,4,5,6,] + [7]
```

```
Out[86]: [3, 4, 5, 6, 7]
```

```
In [88]: l = [1,2,3,4,5]
```

```
In [92]: (l[::-1] + [0])[:-1]# ^%$#@#$$%^$#@
```

```
Out[92]: [0, 1, 2, 3, 4, 5]
```

```
In [95]: l = [0] + l
```

```
In [96]: l
```

```
Out[96]: [0, 1, 2, 3, 4, 5]
```

```
In [97]: l
```

```
Out[97]: [0, 1, 2, 3, 4, 5]
```

```
In [102... l = l[:3] + ['mitsos'] + l[3:]
```

```
In [103... l
```

```
Out[103... [0, 1, 2, 'mitsos', 3, 4, 5]
```

```
In [104... l
```

```
Out[104... [0, 1, 2, 'mitsos', 3, 4, 5]
```

```
In [106... l[:3] + l[4:]
```

```
Out[106... [0, 1, 2, 3, 4, 5]
```

```
In [107... l = [1,2,3,4,5]
```

```
In [108... l.insert('mitsos', 2)
```

```
-----  
TypeError                                Traceback (most recent call last)  
<ipython-input-108-8252445c3c18> in <module>  
----> 1 l.insert('mitsos', 2)
```

```
TypeError: 'str' object cannot be interpreted as an integer
```

```
In [111... help(l.insert)
```

```
Help on built-in function insert:
```

```
insert(index, object, /) method of builtins.list instance  
    Insert object before index.
```

```
In [112... l.insert(2, 'mitsos')
```

```
In [113... l
```

```
Out[113... [1, 2, 'mitsos', 3, 4, 5]
```

```
In [114... a=3
```

```
In [115... a
```

```
Out[115... 3
```

```
In [116... del a
```

```
In [117... a
```

```
-----  
NameError                                Traceback (most recent call last)  
<ipython-input-117-3f786850e387> in <module>  
----> 1 a
```

```
NameError: name 'a' is not defined
```

```
In [118... l
```

```
Out[118... [1, 2, 'mitsos', 3, 4, 5]
```

```
In [120... del l[2]
```

```
In [121... l
```

```
Out[121... [1, 2, 3, 4, 5]
```

```
In [122... l
```

```
Out[122... [1, 2, 3, 4, 5]
```

```
In [124... l.remove(2)
```

```
In [125... l
```

```
Out[125... [1, 3, 4, 5]
```

```
In [130... l = [1, 2, 3, 'mitsos', 4, 5]  
l
```

```
Out[130... [1, 2, 3, 'mitsos', 4, 5]
```

```
In [131... l.remove('mitsos')
```

```
In [133... l
```

```
Out[133... [1, 2, 3, 4, 5]
```

```
In [134... l.append('mitsos')
```

```
In [135... l
```

```
Out[135... [1, 2, 3, 4, 5, 'mitsos']
```

```
In [137... l = [1,2,3,4,5]
```

```
In [146... l.append([7,8,9]) * 2  
len(l)
```

```
TypeError                                Traceback (most recent call last)  
<ipython-input-146-a06facda6fbb> in <module>  
----> 1 l.append([7,8,9]) * 2  
      2 len(l)
```

```
TypeError: unsupported operand type(s) for *: 'NoneType' and 'int'
```

```
In [141... b = l.append('mitsos')
```

```
In [144... print(b)
```

```
None
```

```
In [145... None * 2
```

```
TypeError                                Traceback (most recent call last)  
<ipython-input-145-60f90da77edb> in <module>  
----> 1 None * 2
```


`TypeError: unsupported operand type(s) for *: 'NoneType' and 'int'`

```
In [147... l = [4,5,6]
l.append([7,8,9])
```

```
In [148... l
```

```
Out[148... [4, 5, 6, [7, 8, 9]]
```

```
In [150... l = [4,5,6]
l.extend([7,8,9])
l
```

```
Out[150... [4, 5, 6, 7, 8, 9]
```

```
In [152... 'aaaa' 'bbbb'
```

```
Out[152... 'aaaabbbb'
```

```
In [157... a = [
    'abc',
    'def',
    'ghi',
]
```

```
In [158... a
```

```
Out[158... ['abc', 'defghi']
```

```
In [159... int('34567')
```

```
Out[159... 34567
```

```
In [160... str(65434567)
```

```
Out[160... '65434567'
```

```
In [161... bool('sasds')
```

```
Out[161... True
```

```
In [163... list('fghjkjhgfdfghjkjhgfd')
```

```
Out[163... ['f',
            'g',
            'h',
            'j',
            'k',
            'j',
            'h',
            'g',
            'f',
            'd',
            'f',
            'g',
            'h',
            'j',
            'k',
            'j',
```

```
'h',  
'g',  
'f',  
'd']
```

```
In [164... list('h')
```

```
Out[164... ['h']
```

```
In [ ]: list(7) # [7]
```

```
In [165... l = ['a', 'b', 'c']
```

```
In [167... list('abc')
```

```
Out[167... ['a', 'b', 'c']
```

```
In [168... l
```

```
Out[168... ['a', 'b', 'c']
```

```
In [169... '<-->'.join(l)
```

```
Out[169... 'a<-->b<-->c'
```

```
In [170... '+'.join(l)
```

```
Out[170... 'a+b+c'
```

```
In [171... ' mitsos '.join(l)
```

```
Out[171... 'a mitsos b mitsos c'
```

```
In [172... ''.join(l)
```

```
Out[172... 'abc'
```

```
In [173... l
```

```
Out[173... ['a', 'b', 'c']
```

```
In [ ]: # askish 5678  
def f(x):  
    return x+1
```

```
In [174... l = [4,5,6,7,8]
```

```
In [177... l + 10
```

```
-----  
TypeError                                Traceback (most recent call last)  
<ipython-input-177-ff865001d10f> in <module>  
----> 1 l + 10
```

```
TypeError: can only concatenate list (not "int") to list
```

```
In [178... def f(x):  
    return x+10
```

In [179... `l`

Out[179... `[4, 5, 6, 7, 8]`

In [180... `f(4)`

Out[180... `14`

In [181... `list(map(f, l))`

Out[181... `[14, 15, 16, 17, 18]`

In [182... `map(f, l)`

Out[182... `<map at 0x7f8ed85866a0>`

In [184... `list(map(f, l))`

Out[184... `[14, 15, 16, 17, 18]`

In [185... `list(map(f, map(f, l)))`

Out[185... `[24, 25, 26, 27, 28]`

In [186... `def f(x):
 return x + ' hello'`

In [187... `list(map(f, ['a', 'b', 'c']))`

Out[187... `['a hello', 'b hello', 'c hello']`

In [188... `def f(x):
 return x + 1`

In [189... `f(3)`

Out[189... `4`

In [190... `l = [10, 20, 30]`

In [191... `f(l[0])`

Out[191... `11`

In [192... `f((l[1]))`

Out[192... `21`

In [195... `f(l[2])`

Out[195... `31`

In [196... `new_list = [f(l[0]), f(l[1]), f(l[2])]
new_list`

Out[196... `[11, 21, 31]`

```
In [194... new_list = list(map(f, l))
new_list
```

```
Out[194... [11, 21, 31]
```

```
In [197... l = [3,4,5,6,7,8,9,]
```

```
In [198... def g(x):
    return x>5.5
```

```
In [208... def f(x):
    return x + 1
```

```
In [203... g(8)
```

```
Out[203... True
```

```
In [204... list(filter(g, l))
```

```
Out[204... [6, 7, 8, 9]
```

```
In [207... l
```

```
Out[207... [3, 4, 5, 6, 7, 8, 9]
```

```
In [209... list(filter(g,map(f, l)))
```

```
Out[209... [6, 7, 8, 9, 10]
```

```
In [210... l = [4,5,6,7,8]
```

```
In [211... l
```

```
Out[211... [4, 5, 6, 7, 8]
```

```
In [212... sum(l)
```

```
Out[212... 30
```

```
In [216... min(l)
```

```
Out[216... [1, 'alex']
```

```
In [ ]:
```

```
In [214... max(l)
```

```
Out[214... 8
```

```
In [227... l = [ [3,'mitsos'], [1, 'helen'], [2, 'alex'] ]
#l = [ [3,'mitsos'], ['alex', 1], [2, 'helen'] ]
```

```
In [228... min(l)
```

```
Out[228... [1, 'helen']
```

```
In [229... l = [ [3,'mitsos'], [1, 'helen'], [1, 'alex'] ]
```

```
In [230... min(l)
```

```
Out[230... [1, 'alex']
```

```
In [219... 'alex' < '1'
```

```
Out[219... False
```

```
In [231... l = [ [3,'mitsos'], [1, 'helen'], [1, 'alex'] ]
```

```
In [232... min(l)
```

```
Out[232... [1, 'alex']
```

```
In [233... min([1,2,3,2,1,2,3,1,1,1,1,1])
```

```
Out[233... 1
```

```
In [234... min([3,3,3,3,3,3])
```

```
Out[234... 3
```

```
In [235... l = [ [3,'mitsos'], [1, 'helen'], [1, 'helen'] ]  
min(l)
```

```
Out[235... [1, 'helen']
```

```
In [236... [1] < [1,'alex']
```

```
Out[236... True
```

```
In [237... l = [ [3,'mitsos'], [1, 'helen'], [2, 'alex'] ]  
min(l)
```

```
Out[237... [1, 'helen']
```

```
In [240... def f(x):  
    #return x[::-1]  
    return [x[1], x[0]]
```

```
In [242... list(map(f, l))
```

```
Out[242... [['mitsos', 3], ['helen', 1], ['alex', 2]]
```

```
In [243... min(map(f, l))
```

```
Out[243... ['alex', 2]
```

```
In [246... f(min(map(f, l)))
```

```
Out[246... [2, 'alex']
```

```
In [245... min(l, key=f)
```

Out[245... [2, 'alex']

```
In [247... l = ['Athens', 'Heraklion', 'Patras']
```

```
In [248... min(l)
```

Out[248... 'Athens'

```
In [249... def f(x):  
    return x[1]
```

```
In [251... min(l, key=f)
```

Out[251... 'Patras'

```
In [252... l
```

Out[252... ['Athens', 'Heraklion', 'Patras']

```
In [253... sorted(l)
```

Out[253... ['Athens', 'Heraklion', 'Patras']

```
In [254... sorted([5,4,5,6,7,6,5,4,3,2])
```

Out[254... [2, 3, 4, 4, 5, 5, 5, 6, 6, 7]

```
In [255... sorted([5,4,5,6,7,6,5,4,3,2], reverse=True)
```

Out[255... [7, 6, 6, 5, 5, 5, 4, 4, 3, 2]

```
In [256... sorted(l, key=f)
```

Out[256... ['Patras', 'Heraklion', 'Athens']

```
In [257... sorted(l, key=f, reverse=True)
```

Out[257... ['Athens', 'Heraklion', 'Patras']

```
In [261... l = [['mitsos', 3], ['helen', 1], ['alex', 2]]  
sorted(l)
```

Out[261... [['alex', 2], ['helen', 1], ['mitsos', 3]]

```
In [260... def f(x):  
    return x[1]
```

```
In [262... sorted(l, key=f)
```

Out[262... [['helen', 1], ['alex', 2], ['mitsos', 3]]

```
In [263... f('dsafsdf')
```

Out[263... 's'

```
In [264... f(['asda', 1000])
```

Out[264... 1000

In [265... `l`

Out[265... `[['mitsos', 3], ['helen', 1], ['alex', 2]]`

In [266... `sorted(l)`
`l`

Out[266... `[['mitsos', 3], ['helen', 1], ['alex', 2]]`

In [268... `l = [5,4,5,4,3,4,5,6,7]`
`k = sorted(l)`
`l`

Out[268... `[5, 4, 5, 4, 3, 4, 5, 6, 7]`

In [269... `l`

Out[269... `[5, 4, 5, 4, 3, 4, 5, 6, 7]`

In [270... `k`

Out[270... `[3, 4, 4, 4, 5, 5, 5, 6, 7]`

In [271... `l.sort()`
`l`

Out[271... `[3, 4, 4, 4, 5, 5, 5, 6, 7]`

In [273... `list(range(10, 20))`

Out[273... `[10, 11, 12, 13, 14, 15, 16, 17, 18, 19]`

In [274... `list(range(10, 20, 2))`

Out[274... `[10, 12, 14, 16, 18]`

In [275... `list(range(20, 10, -2))`

Out[275... `[20, 18, 16, 14, 12]`

In [277... `list(range(10)) # list(range(0,10))`

Out[277... `[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]`

In [278... `l = ['alex', 'helen', 'kostas']`

In [279... `list(enumerate(l))`

Out[279... `[(0, 'alex'), (1, 'helen'), (2, 'kostas')]`

In []: