

Python

Lists (Arrays)

1

Definitions

Mutable

Means list can be modified

Immutable

List cannot be modified

What is a list

List is an object that contains multiple data items.

List are changeable (aka mutable).

You can use indexing, slicing and various methods to work with list.

Also called arrays

List and elements

List contains multiple items, which are stored in the object. Each item is known as an **element**.

Form

Naming

(same rules as a variable,
because it is a variable)

Elements: list enclosed by
brackets []

Define and set a list

Define list and set to zero

Create five elements and set to zero

```
listaa = [0] * 5
```

Define and load (populate) later

Define list

Load using append

```
listcc = []
```

Examples

Same data types

List of numbers:

```
Numb = [2, 4, 6, 8]
```

List of alpha characters:

```
letter = ['aaa', 'bbb', 'ccc']
```


Examples

Mixed data type

Mixed list:

```
mixed = [6,'c',5,'d']
```

Mixed list:

```
mix02 = [1, 'a', 1.5, 'b']
```

Printing a list

Put name of the list in the print statement, python will print out the whole list

Example:

```
mix02 = [1, 'a', 1.5, 'b']
```

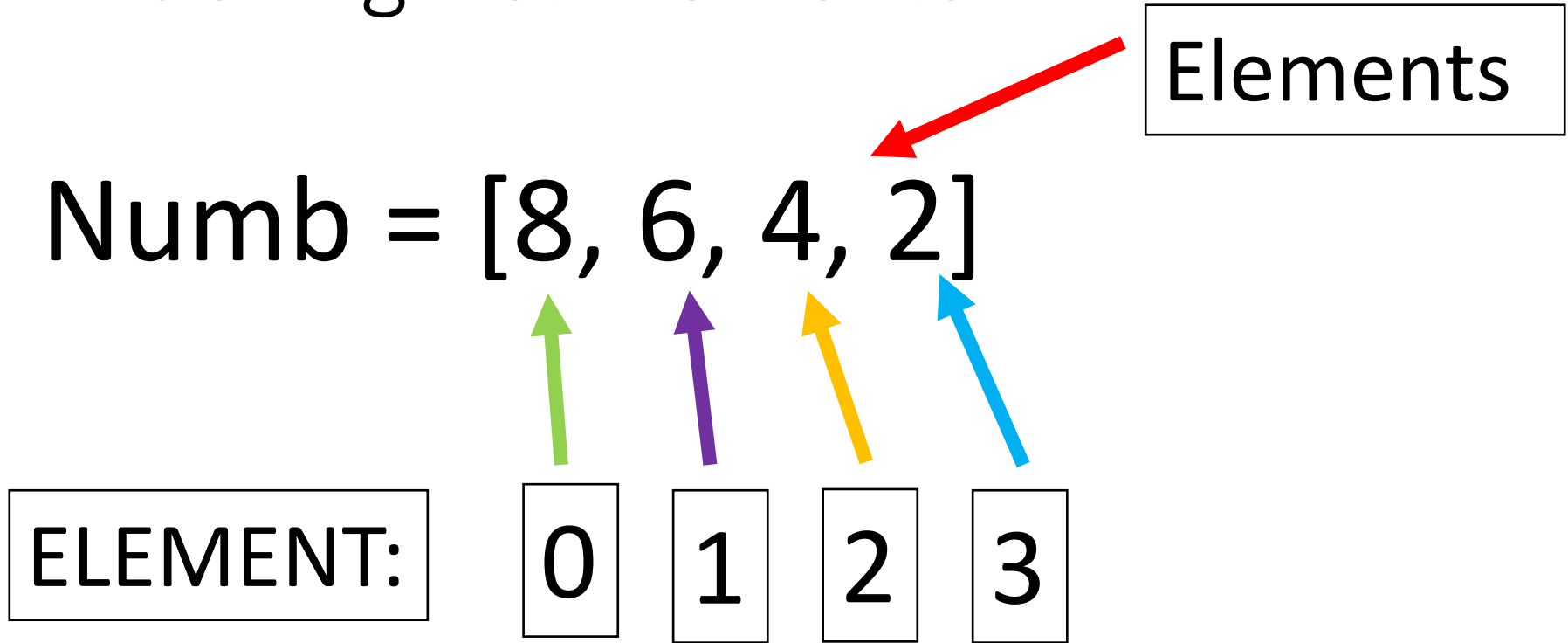
```
print(mix02)
```



Example of mixed data

```
def main():  
    numb = [2,4,6,8]  
    print(numb)  
    letter = ['aaa', 'bbb', 'ccc']  
    print(letter)  
    mixed = [6,'c',5,'d']  
    print(mixed)  
    mix02 = [1, 'a', 1.5, 'b']  
    print(mix02)  
main()
```

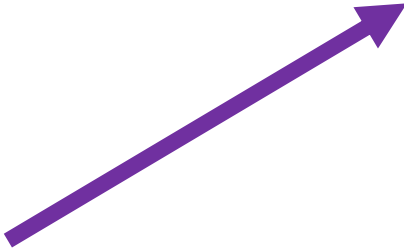
Indexing List Elements



Indexing starts with zero as first element

Indexing form

numb[x]

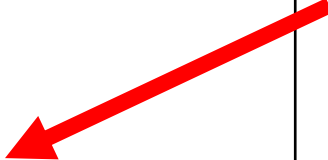


x holds the index number

NOTE

```
def main():  
    numb = [2,4,6,8]  
    for x in range (0,4,1):  
        print(numb[x])  
main()
```

indexing
start with
zero



Try This

```
def main():  
    numb = [2,4,6,8]  
    for x in range (0,4,1):  
        print(numb[x])  
main()
```

Note: indexing start with zero

Count number of Elements

Use length function Example:

```
numb = [ 3, 6, 9, 11, 15]
```

```
len01 = len(numb)
```

Number of elements is 5

note

```
def main():
```

```
    numb = [3, 6, 9, 12, 15]
```


```
    len01 = len(numb)
```

```
    print(numb)
```

```
    print('number of elements -> ', len01)
```

```
main()
```

GET
Number of
elements



Show number of elements



Try This

```
def main():  
    numb = [3, 6, 9, 12, 15]  
    len01 = len(numb)  
    print(numb)  
    print('number of elements -> ',len01)  
main()
```

Use loops for handling lists

For loops for the index

The index value tested with if statement

While loop controlling the index value

Built in functions to handle lists

Initialize fixed element List

`numb = [0] * 10`

List Name



Number of
elements wanted

Set Initial value

Try This

```
def main():  
    numb = [0] * 5  
    for x in range(0,5,1):  
        numb[x] = float(input('Enter number: '))  
        print('number: ',numb[x], 'is at ',x)  
    len1 = len(numb)  
    print('\nnnumber of elements ->',len1,'\n')  
    print(numb)  
main()
```

Using controlled loop (while)

Set Loop and Index control

`x = 0`

`while (x < 5):`

`numb[x] = float(input('Enter number: '))`

`x = x + 1`

Loop control

Increment loop control

```
def main():  
    numb = [0] * 5  
    x = 0  
    while (x < 5):  
        numb[x] = float(input('Enter number: '))  
        x = x + 1  
    len1 = len(numb)  
    print('number of elements ->',len1)  
    for z in range (len1):  
        print('Element ',z, ' is ', numb[z])  
main()
```

Working with Lists

Add elements

Add elements (more data) to existing list

`append()` ← add item in the parens

Example: `list01.append(numb)`
`list02.append(strz)`

Try This part 1

```
def getnumb():  
    z = 0  
    while(z==0):  
        try:  
            aa = float(input('enter a number -> '))  
            break  
        except:  
            print('input not a number')  
    return aa
```

Try This Part 2

```
def main():  
    numblast = []  
    for x in range(0,5,1):  
        aa = getnumb()  
        numblast.append(aa)  
    print('-----')  
    print(numblast)  
main()
```

Remove element from list

`pop()` - remove element by index
(subscript) number

Remove element 3 from list

```
listaa.pop(2)
```

Remove element from list

`remove()` – remove element by value

Remove element by value

```
listbb.remove(20)
```

```
listcc.remove('mm')
```

Note:

item in **parentheses** can be a variable

Combine lists

Combine 2 or more list into one:
(concatenation)

```
Listzz = listaa + listbb + listcc
```

Find highest in list

Command: `max()`

```
highest = max(listaa)
```

Find lowest in list

command: min()

```
lowest = min(listaa)
```


Get total for list

command: `sum()`

```
total = sum(listcc)
```

Works only if list contain numeric data

NOTE

```
def main():
```

```
    numblast = [5,15,25,66,33,22,99,88,2,44]
```

```
    print(' # of elements-> ',len(numblast))
```

```
    print(numblast)
```

```
    print('-----')
```

```
    print('highest -> ',max(numblast))
```

Find Highest

```
    print('lowest -> ',min(numblast))
```

Lowest

```
    print('Total -> ', sum(numblast))
```

total

```
main()
```

Try This

```
def main():  
    numblast = [5,15,25,66,33,22,99,88,2,44]  
    print(' # of elements-> ',len(numblast))  
    print(numblast)  
    print('-----')  
    print('highest -> ',max(numblast))  
    print('lowest -> ',min(numblast))  
    print('Total -> ', sum(numblast))  
main()
```

more

Find the element in a list for given value

```
ele01 = listcc.index(val)
```

more

Count the occurrences of a value
in the list

```
vala = 5
```

```
valcnt = listee.count(vala)
```

Sort

`cars.sort()`

Name of list



Sort function

Example sort

```
def main():  
    numblast = [5,15,25,66,33,22,99,88,2,44]  
    print(' # of elements-> ',len(numblast))  
    print(numblast)  
    print('-----')  
    numblast.sort()  
    print(numblast)  
main()
```

Finding item in list

Membership operators:

in

not in

use with an if statement

Form


```
if numb in listaa:
```

```
if 'one' not in listbb
```

```
if numb not in listcc
```

```
if 'one' in listdd
```

```
def main():  
    numblast = [5,15,25,66,33,22,99,88,2,44]  
    print('number of elements-> ',len(numblast))  
    print(numblast)  
    aa = int(input('Enter integer: '))  
    if aa in numblast:  
        print('true ',aa, ' is in list')  
    else:  
        print('false ',aa, ' not in list')  
    if aa not in numblast:  
        print('true ', aa, ' is not in list')  
    else:  
        print('false ',aa, ' is in list')  
main()
```



```
def main():
```

```
    numblast = [5,15,25,66,33,22,99,88,2,44]
```

```
    print('number of elements-> ',len(numblast))
```

```
    print(numblast)
```

```
    aa = int(input('Enter integer: '))
```

```
    if aa in numblast:
```

```
        print('true ',aa, ' is in list')
```

```
    else:
```

```
        print('false ',aa, ' not in list')
```

```
    if aa not in numblast:
```

```
        print('true ', aa, ' is not in list')
```

```
    else:
```

```
        print('false ',aa, ' is in list')
```

```
main()
```

Error Handling try-except

Like everything else in python, working with lists can generate system level errors

Errors:

- IndexError
- TypeError

Loading a list

While ... input ... append

While ... read record ... split

Tuple

A tuple is a sequence of immutable Python objects. Tuples are sequences, just like lists. The differences between tuples and lists are, the tuples **cannot** be changed unlike lists and tuples use parentheses, whereas lists use square brackets.

(a constant value list)

Tuple example

```
listkk = (1, 3, 5, 7)
```

Note: tuples use **parentheses**

Reference a tuple with brackets.
Example: `listkk[3]`

Using list to validate (strings)
numbers (with + - , .)

Part 1

```
def chknumb(a):
    dec=['0','1','2','3','4','5','6','7','8','9','.','-','+']
    ndec=['+','-','.']
    x=1
    p=0
    if len(a) ==0:
        return False
    else:
        if len(a)==1:
            if a in ndec:
                return False
        for ch in a:
            if ch == '.':
                p=p+1
            if (ch == '-' or (ch == '+')):
                if x != 1:
                    return False
            x=x+1
            if ch not in dec:
                return False
            if p>1:
                return False
    return True
```

Part 2

```
def edit01():
    agn='y'
    while agn.upper() == 'Y':
        tnumb=input('Enter Payment --> ')
        gd=chknumb(tnumb)
        if gd:
            print(tnumb, ' is a number ')
            fnumb=float(tnumb)
            twice = fnumb * 2
            print(tnumb, ' doubled is: ', twice)
        else:
            print('**** ',tnumb, ' is NOT a number')
            agn=input('Check another (y/n): ')
        print('-----done')
    return
edit01()
```

Done