Functions -Let's create a function(with docstring)

```
def is_even(num):
  """
  This function returns if a given number is odd or even
  input - any valid integer
  output - odd/even
  created on - 16th Nov 2022
  """
  if type(num) == int:
    if num % 2 == 0:
      return 'even'
    else:
      return 'odd'
  else:
    return 'pagal hai kya?'

# function
# function_name(input)
for i in range(1,11):
  x = is_even(i)
  print(x)
```

```
odd
even
odd
even
odd
even
odd
even
odd
even
```

```
print(type.__doc__)
```

```
type(object) -> the object's type
type(name, bases, dict, **kwds) -> a new type
```

2 Point of views

```
is_even('hello')
```

{"type":"string"}

Parameters Vs Arguments

Types of Arguments

- Default Argument
- Positional Argument
- Keyword Argument

```
def power(a=1,b=1):
  return a**b

power()

1

# positional argument
power(2,3)

8

# keyword argument
power(b=3,a=2)

8
```

`*args and **kwargs`

`*args and **kwargs` are special Python keywords that are used to pass the variable length of arguments to a function

```
# *args
# allows us to pass a variable number of non-keyword arguments to a
function.

def multiply(*kwargs):
  product = 1

  for i in kwargs:
    product = product * i

  print(kwargs)
  return product

multiply(1,2,3,4,5,6,7,8,9,10,12)

(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12)

43545600

# **kwargs
# **kwargs allows us to pass any number of keyword arguments.
# Keyword arguments mean that they contain a key-value pair, like a
```

```
Python dictionary.

def display(**salman):

  for (key,value) in salman.items():
    print(key,'->',value)

display(india='delhi',srilanka='colombo',nepal='kathmandu',pakistan='i
slamabad')

india -> delhi
srilanka -> colombo
nepal -> kathmandu
pakistan -> islamabad
```

Points to remember while using `*args and **kwargs`

- order of the arguments matter(normal -> `*args` -> `**kwargs`)
- The words “args” and “kwargs” are only a convention, you can use any name of your choice

Without return statement

```
L = [1,2,3]
print(L.append(4))
print(L)

None
[1, 2, 3, 4]
```

Variable Scope

```
x=10 #global
def show():
    x=5 #local
    print(x)

show()
print(x)

5
10

x=10
def show():
    x+=5 #cant find local x
    print(x)

show() #unable to find local x
print(x)
```

```
---------------------------------------------------------------------------
UnboundLocalError                         Traceback (most recent call last)
/tmp/ipython-input-811102097.py in <cell line: 0>()
----> 1 show() #unable to find local x
      2 print(x)

/tmp/ipython-input-960716334.py in show()
      1 x=10
      2 def show():
----> 3     x+=5 #cant find local x
      4     print(x)

UnboundLocalError: cannot access local variable 'x' where it is not associated with a value
```

```
x=10
def show():
    global x
    x+=5
    print(x)

show()
print(x)
```

```
15
15
```

```
def outer():
    x=10

    def inner():
        x+=5
        print(x)

    inner()
    print(x)

outer() #cant find x in local in inner
```

```
---------------------------------------------------------------------------
UnboundLocalError                         Traceback (most recent call last)
/tmp/ipython-input-3667634723.py in <cell line: 0>()
----> 1 outer() #cant find x in local in inner

/tmp/ipython-input-1249364351.py in outer()
      6         print(x)
      7
```

```
----> 8     inner()
      9     print(x)

/tmp/ipython-input-1249364351.py in inner()
      3
      4     def inner():
----> 5         x+=5
      6         print(x)
      7

UnboundLocalError: cannot access local variable 'x' where it is not
associated with a value
```

```python
def outer():
    x=10

    def inner():
        nonlocal x
        x+=5
        print(x)

    inner()
    print(x)

outer()
```

```
15
15
```

```python
def g(y):
    print(x)
    print(x+1)
x = 5
g(x)
print(x)
```

```
5
6
5
```

```python
def f(y):
    x = 1
    x += 1
    print(x)
x = 5
f(x)
print(x)
```

```
2
5
```

```
def h(y):
    x += 1
x = 5
h(x)
print(x)
```

```
---------------------------------------------------------------------------
UnboundLocalError                         Traceback (most recent call last)
/tmp/ipython-input-1829714546.py in <cell line: 0>()
      2     x += 1
      3 x = 5
----> 4 h(x)
      5 print(x)

/tmp/ipython-input-1829714546.py in h(y)
      1 def h(y):
----> 2     x += 1
      3 x = 5
      4 h(x)
      5 print(x)

UnboundLocalError: cannot access local variable 'x' where it is not associated with a value
```

```
def f(x):
   x = x + 1
   print('in f(x): x =', x)
   return x

x = 3
z = f(x)
print('in main program scope: z =', z)
print('in main program scope: x =', x)
```

```
in f(x): x = 4
in main program scope: z = 4
in main program scope: x = 3
```

Nested Functions

```
def f():
  def g():
    print('inside function g')
    f()
  g()
  print('inside function f')

f()
```

```
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----------------------------------------------------------------------
-----
RecursionError                            Traceback (most recent call
last)
/tmp/ipython-input-3782956317.py in <cell line: 0>()
----> 1 f()

/tmp/ipython-input-1167694951.py in f()
      3     print('inside function g')
      4     f()
----> 5   g()
      6   print('inside function f')

/tmp/ipython-input-1167694951.py in g()
```

```
      2   def g():
      3     print('inside function g')
----> 4     f()
      5   g()
      6   print('inside function f')

... last 2 frames repeated, from the frame below ...

/tmp/ipython-input-1167694951.py in f()
      3     print('inside function g')
      4     f()
----> 5   g()
      6   print('inside function f')

RecursionError: maximum recursion depth exceeded while calling a
Python object
```

```python
def g(x):
    def h():
        x = 'abc'
    x = x + 1
    print('in g(x): x =', x)
    h()
    return x

x = 3
z = g(x)
```

```
in g(x): x = 4
```

```python
def g(x):
    def h(x):
        x = x+1
        print("in h(x): x = ", x)
    x = x + 1
    print('in g(x): x = ', x)
    h(x)
    return x

x = 3
z = g(x)
print('in main program scope: x = ', x)
print('in main program scope: z = ', z)
```

```
in g(x): x =  4
in h(x): x =  5
in main program scope: x =  3
in main program scope: z =  4
```

Functions are 1st class citizens

```
# type and id
def square(num):
  return num**2

type(square)

id(square)

137175330777952

# reassign
x = square
id(x)
x(3)

9

a = 2
b = a
b

2

# deleting a function
del square

square(3)

---------------------------------------------------------------------------
-----
NameError                                 Traceback (most recent call
last)
/tmp/ipython-input-1056684087.py in <cell line: 0>()
----> 1 square(3)

NameError: name 'square' is not defined

# storing
L = [1,2,3,4,square]
L[-1](3)

---------------------------------------------------------------------------
-----
NameError                                 Traceback (most recent call
last)
/tmp/ipython-input-1257803414.py in <cell line: 0>()
      1 # storing
----> 2 L = [1,2,3,4,square]
      3 L[-1](3)
```

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

```
s = {square}
s
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
/tmp/ipython-input-1383657274.py in <cell line: 0>()
----> 1 s = {square}
      2 s

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

```
# returning a function

def f():
    def x(a, b):
        return a+b
    return x

val = f()(3,4)
print(val)
```

```
7
```

```
# function as argument

def func_a():
    print('inside func_a')

def func_b(z):
    print('inside func_c')
    return z()

print(func_b(func_a))
```

```
inside func_c
inside func_a
None
```

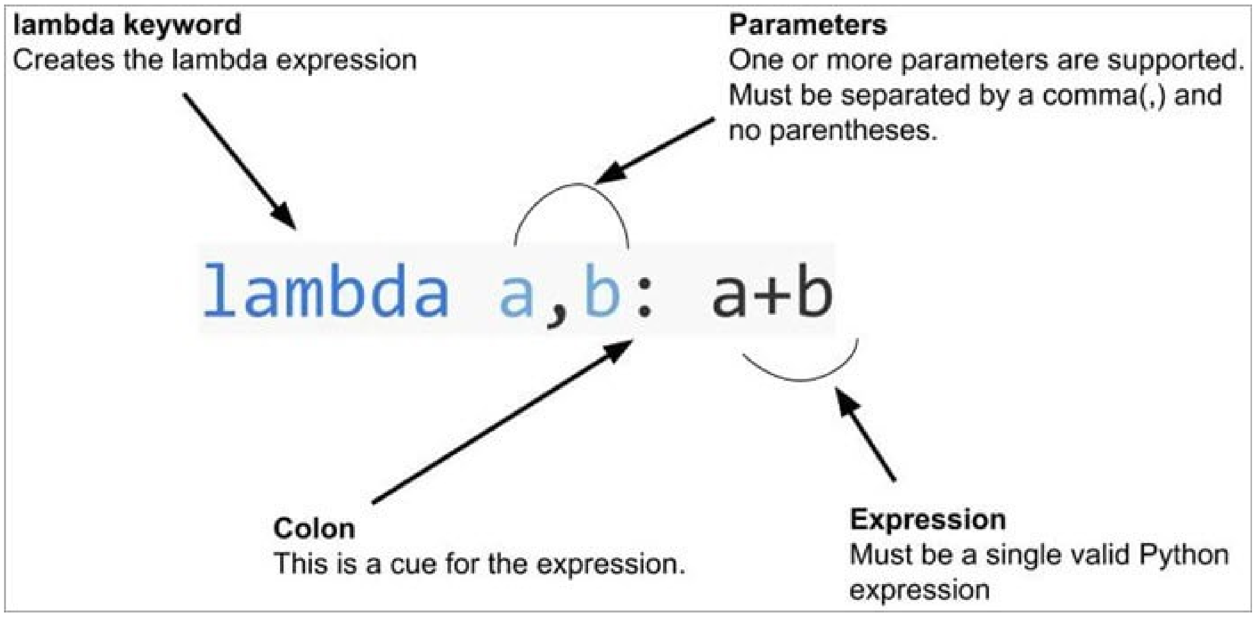
Benefits of using a Function

- Code Modularity
- Code Readibility
- Code Reusability

Lambda Function

A lambda function is a small anonymous function.

A lambda function can take any number of arguments, but can only have one expression.


lambda keyword
Creates the lambda expression
Parameters
One or more parameters are supported. Must be separated by a comma(,) and no parentheses.
lambda a,b: a+b
Colon
This is a cue for the expression.
Expression
Must be a single valid Python expression

```
# x -> x^2
lambda x:x**2

<function __main__.<lambda>(x)>

# x,y -> x+y
a = lambda x,y:x+y
a(5,2)

7
```

Diff between lambda vs Normal Function

- No name
- lambda has no return value(infact,returns a function)
- lambda is written in 1 line
- not reusable

Then why use lambda functions? **They are used with HOF**

```
# check if a string has 'a'
a = lambda s:'a' in s
a('hello')

False

# odd or even
a = lambda x:'even' if x%2 == 0 else 'odd'
a(6)
```

```
{"type":"string"}
```

Higher Order Functions

```
# Example

def square(x):
  return x**2

def cube(x):
  return x**3

# HOF
def transform(f,L):
  output = []
  for i in L:
    output.append(f(i))

  print(output)

L = [1,2,3,4,5]

transform(lambda x:x**3,L)
```

```
[1, 8, 27, 64, 125]
```

Map

```
# square the items of a list
list(map(lambda x:x**2,[1,2,3,4,5]))
```

```
[1, 4, 9, 16, 25]
```

```
# odd/even labelling of list items
L = [1,2,3,4,5]
list(map(lambda x:'even' if x%2 == 0 else 'odd',L))
```

```
['odd', 'even', 'odd', 'even', 'odd']
```

```
# fetch names from a list of dict

users = [
    {
        'name':'Rahul',
        'age':45,
        'gender':'male'
    },
    {
        'name':'Nitish',
        'age':33,
        'gender':'male'
    },
    {
        'name':'Ankita',
        'age':50,
        'gender':'female'
    }
]

list(map(lambda users:users['gender'],users))
```

```
['male', 'male', 'female']
```

Filter

```
# numbers greater than 5
L = [3,4,5,6,7]

list(filter(lambda x:x>5,L))
```

```
[6, 7]
```

```
# fetch fruits starting with 'a'
fruits = ['apple','guava','cherry']

list(filter(lambda x:x.startswith('a'),fruits))
```

```
['apple']
```

Reduce

```
# sum of all item
import functools

functools.reduce(lambda x,y:x+y,[1,2,3,4,5])
```

```
15
```

```
# find min
functools.reduce(lambda x,y:x if x>y else y,[23,11,45,10,1])
```

```
45
```