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_or_name, bases, dict)
type(object) -> the object's type
type(name, bases, dict) -> 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='islamabad')
```

```
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

How Functions are executed in memory?

Without return statement

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

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

Variable Scope

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

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

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

```
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)
```

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)
<ipython-input-92-c43e34e6d405> in <module>
----> 1 f()

<ipython-input-91-374a68ddd49e> in f()
      3     print('inside function g')
      4     f()
----> 5   g()
      6   print('inside function f')

<ipython-input-91-374a68ddd49e> 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 ...

<ipython-input-91-374a68ddd49e> in f()
      3     print('inside function g')
      4     f()
----> 5   g()
      6   print('inside function f')

RecursionError: maximum recursion depth exceeded
```

```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)
```

```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)
```

Functions are 1st class citizens

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

type(square)

id(square)
```

```
140471717004784
```

```
# 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)
<ipython-input-104-2cfd8bba3a88> in <module>
----> 1 square(3)

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

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

```
9
```

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

```
{<function __main__.square(num)>}
```

```
# returning a function


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

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

# 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))
```

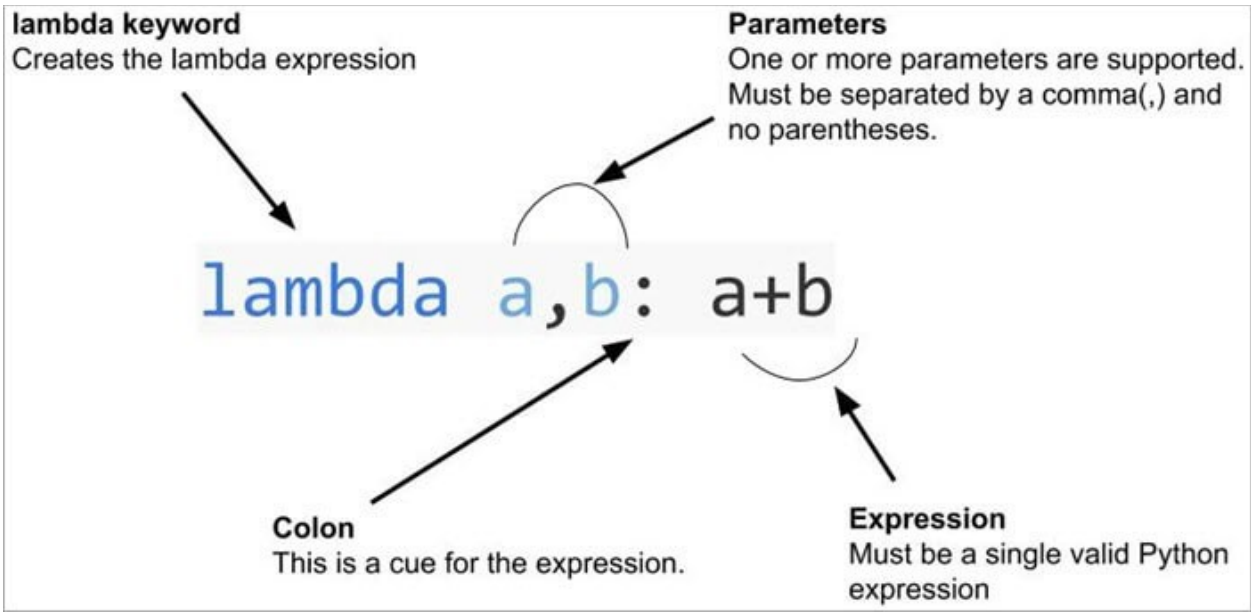
Benefits of using a Function

- 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.




```
# 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
```