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Python

```
print("Hello World")
```

```
Hello World
```

```
print('Hello World')
```

```
Hello World
```

```
1+2
```

```
3
```

```
print(1+2)
```

```
3
```

```
1/2
```

```
0.5
```

```
5*5
```

```
25
```

Keywords

```
import keyword
```

```
print(keyword.kwlist)
```

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

Identifier

```
anna_unv = 5
```

```
anna_unv
```

```
5
```

```
assert = 5
```

```
File "<ipython-input-12-afa64a788a4a>", line 1
    assert = 5
          ^
```

```
SyntaxError: invalid syntax
```

```
1anna_unv = 5
```

```
File "<ipython-input-13-9b81eb200c00>", line 1
    1anna_unv = 5
          ^
```

```
SyntaxError: invalid syntax
```

```
anna_unv_1 = 5
```

```
anna_unv1 = 5
```

```
anna_unv@ = 5
```

```
File "<ipython-input-16-e0f83a281de9>", line 1
    anna_unv@ = 5
              ^
```

```
SyntaxError: invalid syntax
```

Comments

```
# Age is stored in variable 'a'
```

```
a = 10
```

```
'''Age is stored in
variable a'''
```

```
a = 10
```

```
"""Age is stored in
variable a"""
```

```
a = 10
```

Statements

Single line statement

```
a = 10+  
3
```

```
print(a)
```

```
File "<ipython-input-24-097d3e8c692a>", line 2  
    a = 10+  
      ^
```

```
SyntaxError: invalid syntax
```

multi line statement

```
a = 10+3\  
+24
```

```
print(a)
```

```
37
```

Variable assignment

```
int_var = 6
```

```
int_var
```

```
6
```

```
float_var = 6.12  
float_var
```

```
6.12
```

```
str_var = 'Hari'  
str_var
```

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

```
a,b,c = 6,6.12,'Hari'
```

```
c
```

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

Data Type

1. Numeric Type

```
num = 10  
num
```

```

type(num)

int

num = 10.12
num

10.12

type(num)

float

num = 10+20j
num

(10+20j)

type(num)

complex

```

2. Sequence Type

String

```

str1 = "Welcome to AI"

str1

{"type":"string"}

type(str1)

str

```

String indexing

```

"""

0 1 2 3 4 5 6 7 8 9 10 11 12

W e l c o m e           t o           A I

-5 -4 -3 -2 -1

"""

{"type":"string"}

str1[7]

{"type":"string"}

str1[-4]

{"type":"string"}

```

String Slicing

```
str1[0:7]

{"type":"string"}

str1[3:7]

{"type":"string"}

str1

{"type":"string"}

str1[-5:-3]

{"type":"string"}

a = "Anna University"
a

{"type":"string"}

a[0:4]

{"type":"string"}

a[-15:-9]

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

String Concatenation

```
fname = 'Hari'
lname = 'Prabu'

fname+lname

{"type":"string"}

fname,lname

('Hari', 'Prabu')

print(fname+' '+lname)

Hari Prabu
```

String function

```
str1 = "    Hello Students    "
str1

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

```
str1.strip()
{"type":"string"}
str1.lstrip()
{"type":"string"}
str1.rstrip()
{"type":"string"}
# HELLO, Hello, hello

str1
{"type":"string"}
str1.lower()
{"type":"string"}
str1.upper()
{"type":"string"}
str1.replace('Hello','Welcome')
{"type":"string"}
str1.replace(' ','')
{"type":"string"}
str1.split()
['Hello', 'Students']
```

List

```
list1 = []

list1

[]

type(list1)

list

list1 = [1,2,3]
list1

[1, 2, 3]
```

```
type(list1)

list

list1 = [1.11, 2.12, 3.75]
list1

[1.11, 2.12, 3.75]

list1 = ['AI', 'DL', 'ML']
list1

['AI', 'DL', 'ML']

list1 = [1, 2.12, 'Hari']
list1

[1, 2.12, 'Hari']

# List indexing

list1[2]

{"type": "string"}

list1[-1]

{"type": "string"} # List

Slicing list1[1:]

[2.12, 'Hari']

list1[-2:]

[2.12, 'Hari']

list1[1:3]

[2.12, 'Hari']

list1 = [1, 2.12, ['Hari', 'Prabu']]
list1

[1, 2.12, ['Hari', 'Prabu']]

list1[2][1]

{"type": "string"}

list1[-2:]

[2.12, ['Hari', 'Prabu']]
```

```
list1
[1, 2.12, ['Hari', 'Prabu']]
list1.append('Srikanth')
list1
[1, 2.12, ['Hari', 'Prabu'], 'Srikanth']
list1.insert(1, 'Hello')
list1
[1, 'Hello', 2.12, ['Hari', 'Prabu'], 'Srikanth']
list1.remove('Hello')
list1
[1, 2.12, ['Hari', 'Prabu'], 'Srikanth']
list1.remove(2.12)
list1
[1, ['Hari', 'Prabu'], 'Srikanth']
l2 = [1, 2, 3]
list1+l2
[1, ['Hari', 'Prabu'], 'Srikanth', 1, 2, 3]
list1 = [25, 45, 1, 32, 12, 11]
list1
[25, 45, 1, 32, 12, 11]
list1.sort()
list1
[1, 11, 12, 25, 32, 45]
list1.sort(reverse=True)
list1
[45, 32, 25, 12, 11, 1]
sorted(list1)
[1, 11, 12, 25, 32, 45]
```



```
list1
[45, 32, 25, 12, 11, 1]
list1[2]='Hi'
list1
[45, 32, 'Hi', 12, 11, 1]
```

Tuples

```
tup1 = ()
tup1

()

type(tup1)

tuple

tup1 = (1,2,'Hi','Hey',15.28)
tup1

(1, 2, 'Hi', 'Hey', 15.28)

tup1[1]

2

tup1[-1]

15.28

tup1[1:3]

(2, 'Hi')

tup1[-4:-2]

(2, 'Hi')

tup1[-1]=21
```

```
-----
-----
TypeError                                Traceback (most recent call
last)
<ipython-input-112-c585bc529734> in <module>
----> 1 tup1[-1]=21
```

```
TypeError: 'tuple' object does not support item assignment
```

Set

```
set1 = {1,2,3}
```

```
type(set1)
```

```
set
```

```
set1={'Hari','IBM','Hyd','Hyd'}  
set1
```

```
{'Hari', 'Hyd', 'IBM'}
```

```
set1[1]
```

```
-----  
-----  
TypeError                                Traceback (most recent call  
last)  
<ipython-input-120-d27c0eee2e56> in <module>  
----> 1 set1[1]
```

```
TypeError: 'set' object is not subscriptable
```

```
set1
```

```
{'Hari', 'Hyd', 'IBM'}
```

```
set1.add('Kovai','Chennai')
```

```
-----  
-----  
TypeError                                Traceback (most recent call  
last)  
<ipython-input-124-18cbef330b02> in <module>  
----> 1 set1.add('Kovai','Chennai')
```

```
TypeError: add() takes exactly one argument (2 given)
```

```
set1
```

```
{'Hari', 'Hyd', 'IBM', 'Kovai'}
```

```
set1.update(['Chennai','TN'])
```

```
set1
```

```
{'Chennai', 'Hari', 'Hyd', 'IBM', 'Kovai', 'TN'}
```

```
set1.remove('TN')
```

```
set1
```

```
{'Chennai', 'Hari', 'Hyd', 'IBM', 'Kovai'}
```

```
set1.clear()
```

```
set1
```

```
set() del
```

```
set1set1
```

```
=====
NameError                                Traceback (most recent call
last)
<ipython-input-132-d18f5a84d934> in <module>
----> 1 set1

NameError: name 'set1' is not defined
```

Dictionary

```
dict1 = {}
```

```
type(dict1)
```

```
dict
```

```
dict1 = {'Name': 'Hari', 'Org': 'IBM', 'Loc': 'cbe'}
```

```
dict1
```

```
{'Name': 'Hari', 'Org': 'IBM', 'Loc': 'cbe'}
```

```
dict1.keys()
```

```
dict_keys(['Name', 'Org', 'Loc'])
```

```
dict1.values()
```

```
dict_values(['Hari', 'IBM', 'cbe'])
```

```
dict1.items()
```

```
dict_items([('Name', 'Hari'), ('Org', 'IBM'), ('Loc', 'cbe')])
```

```
dict1 = {'Name': ['Hari', 'Srikanth'], 'Org': 'IBM', 'Loc': 'cbe'}
```

```
dict1
```

```
{'Name': ['Hari', 'Srikanth'], 'Org': 'IBM', 'Loc': 'cbe'}
```

```
dict1['Name'][1]
```

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

```
dict1.pop('Loc')
{"type": "string"}
dict1
{'Name': ['Hari', 'Srikanth'], 'Org': 'IBM'}
dict1.clear()
dict1
{}
```

del dict1

dict1

```
-----
NameError                                Traceback (most recent call
last)
<ipython-input-152-e36219336d90> in <module>
----> 1 dict1
```

NameError: name 'dict1' is not defined

Statements/Condition

```
num = input('Enter int values ')
num
```

Enter int values 45.214

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

```
type(num)
```

```
str
```

```
num = int(input('Enter int values '))
num
```

Enter int values 21

21

```
type(num)
```

```
int
```

If statement

```
num = int(input('Enter int values '))
```

```
if num%2 == 0:
    print("Number is even")
```

Enter int values 3

If & else statement

```
num = int(input('Enter int values '))
```

```
if num%2 == 0:
    print("Number is even")
else:
    print("Number is odd")
```

Enter int values 21
Number is odd

If, elif & else statement

```
x = int(input('Enter int values X = '))
y = int(input('Enter int values Y = '))
```

```
if x>y:
    print("X is greater than Y")
elif x==y:
    print("X is equal to Y")
else:
    print("X is lesser than Y")
```

Enter int values X = 12
Enter int values Y = 40
X is lesser than Y

If, elif & else statement

```
x = int(input('Enter int values X = '))
y = int(input('Enter int values Y = '))
```

```
if x>y:
    print("{} is greater than {}".format(x,y))
elif x==y:
    print("{} is equal to {}".format(x,y))
else:
    print("{} is lesser than {}".format(x,y))
```

Enter int values X = 21
Enter int values Y = 12
21 is greater than 12

```
My name is Hari

print("My name is Srikanth")

My name is Srikanth

name = input("Enter your name: ")
print("My name is {}".format(name))

Enter your name: Hari
My name is Hari
```

For loop

```
range(10)

range(0, 10)

for i in range(10):
    print(i,end=" ")

0 1 2 3 4 5 6 7 8 9
```

```
for i in range(10):print(i)
```

```
0
1
2
3
4
5
6
7
8
9
```

```
for i in 'Hari Prabu':print(i)
```

```
H
a
r
i
```

```
P
r
a
b
u
```

```
for i in enumerate('Hari Prabu'):
    print(i)

(0, 'H')
(1, 'a')
(2, 'r')
(3, 'i')
(4, ' ')
(5, 'P')
(6, 'r')
(7, 'a')
(8, 'b')
(9, 'u')
```

While loop

```
i = 0
while i<7: print(i)
    i+=1 # i=i+1
```

```
0
1
2
3
4
5
6
```

```
i = 0
while i<7:
    print(i)i=i+1
```

```
0
1
2
3
4
5
6
```

Functions

```
def func():
    print('Hari')
```

```
func()
```

```
Hari
```

```
def user_details(name,userid,country):
    print('Name: ',name)
    print('UserID: ',userid)
    print('Country: ',country)
```

```
user_details('Hari',1234,'India')
```

```
Name: Hari
UserID: 1234
Country: India
```

```
user_details('Srikanth',1235,'India')
```

```
Name: Srikanth
UserID: 1235
Country: India
```

Lambda

Lambda arg:exp

```
add = lambda num:num+10
```

```
-----
TypeError: Traceback (most recent call
last)
<ipython-input-9-d5d29de3ed94> in <module>
----> 1 add()
```

```
TypeError: <lambda>() missing 1 required positional argument: 'num'
```

```
add(5)
```

```
15
```

```
mul = lambda x,y,z:x*y*z
```

```
mul(12.56,45.278,2)
```

```
1137.38336
```

```
n = lambda name:name+' Prabu'
```

```
n('Hari')
```

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

Numpy

```
import numpy as np
```



```
list1 = [2,5,6]
arr = np.array(list1)

list1,arr

([2, 5, 6], array([2, 5, 6]))

arr[1]

5

dir(arr)

['T',
 '__abs__',
 '__add__',
 '__and__',
 '__array__',
 '__array_finalize__',
 '__array_function__',
 '__array_interface__',
 '__array_prepare__',
 '__array_priority__',
 '__array_struct__',
 '__array_ufunc__',
 '__array_wrap__',
 '__bool__',
 '__class__',
 '__complex__',
 '__contains__',
 '__copy__',
 '__deepcopy__',
 '__delattr__',
 '__delitem__',
 '__dir__',
 '__divmod__',
 '__doc__',
 '__eq__',
 '__float__',
 '__floordiv__',
 '__format__',
 '__ge__',
 '__getattr__',
 '__getitem__',
 '__gt__',
 '__hash__',
 '__iadd__',
 '__iand__',
 '__ifloordiv__',
 '__ilshift__',
 '__imatmul__',
```

```
'__imod__',
'__imul__',
'__index__',
'__init__',
'__init_subclass__',
'__int__',
'__invert__',
'__ior__',
'__ipow__',
'__irshift__',
'__isub__',
'__iter__',
'__itruediv__',
'__ixor__',
'__le__',
'__len__',
'__lshift__',
'__lt__',
'__matmul__',
'__mod__',
'__mul__',
'__ne__',
'__neg__',
'__new__',
'__or__',
'__pos__',
'__pow__',
'__radd__',
'__rand__',
'__rdivmod__',
'__reduce__',
'__reduce_ex__',
'__repr__',
'__rfloordiv__',
'__rlshift__',
'__rmatmul__',
'__rmod__',
'__rmul__',
'__ror__',
'__rpow__',
'__rrshift__',
'__rshift__',
'__rsub__',
'__rtruediv__',
'__rxor__',
'__setattr__',
'__setitem__',
'__setstate__',
'__sizeof__',
'__str__',
```

```
'__sub__',  
'__subclasshook__',  
'__truediv__',  
'__xor__',  
'all',  
'any',  
'argmax',  
'argmin',  
'argpartition',  
'argsort',  
'astype',  
'base',  
'byteswap',  
'choose',  
'clip',  
'compress',  
'conj',  
'conjugate',  
'copy',  
'ctypes',  
'cumprod',  
'cumsum',  
'data',  
'diagonal',  
'dot',  
'dtype',  
'dump',  
'dumps',  
'fill',  
'flags',  
'flat',  
'flatten',  
'getfield',  
'imag',  
'item',  
'itemset',  
'itemsizes',  
'max',  
'mean',  
'min',  
'nbytes',  
'ndim',  
'newbyteorder',  
'nonzero',  
'partition',  
'prod',  
'ptp',  
'put',  
'ravel',  
'real',
```

```
'repeat',
'reshape',
'resize',
'round',
'searchsorted',
'setfield',
'setflags',
'shape',
'size',
'sort',
'squeeze',
'std',
'strides',
'sum',
'swapaxes',
'take',
'tobytes',
'tofile',
'tolist',
'tostring',
'trace',
'transpose',
'var',
'view']
```

```
type(arr)
```

```
numpy.ndarray
```

```
arr.ndim
```

```
1
```

```
arr
```

```
array([2, 5, 6])
```

```
a = np.array([[2,4,5],[7,8,9]])
```

```
a
```

```
array([[2, 4, 5],
       [7, 8, 9]])
```

```
a.ndim
```

```
2
```

```
# arange
```

```
np.arange(10)
```

```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

```

range(10)
range(0, 10)
for i in range(10):print(i)
0
1
2
3
4
5
6
7
8
9

a = np.arange(5,11)
a
array([ 5, 6, 7, 8, 9, 10])
a[1:3]
array([6, 7])
np.arange(5,11,3)
array([5, 8])
np.arange(0,50,7)
array([ 0,  7, 14, 21, 28, 35, 42, 49])
# Zeros and ones
np.zeros(3,dtype='int')array([0, 0,
0]) np.zeros(3)

array([0., 0., 0.])
a= np.zeros((4,4))
a.ndim
2
a
array([[0., 0., 0., 0.],
       [0., 0., 0., 0.]
```

```

        [0., 0., 0., 0.],
        [0., 0., 0., 0.]])

np.ones((4,4),dtype='int')*15

array([[15, 15, 15, 15],
       [15, 15, 15, 15],
       [15, 15, 15, 15],
       [15, 15, 15, 15]])

# Line space

np.linspace(0,10,5)

array([ 0. ,  2.5,  5. ,  7.5, 10. ])

# Argmax & argmin

a = np.array([15,2,17,86,1])
a

array([15,  2, 17, 86,  1])

a.argmax()

3

a.argmin()

4

a[-1]

1

a[1:3]

array([ 2, 17])

a[-3:-1]

array([17, 86])

a.max(),a.min()

(86, 1)

a

array([15,  2, 17, 86,  1])

a[3]=24

a[5]=11

```

```
-----  
-----  
IndexError                                Traceback (most recent call  
last)
```

```
<ipython-input-71-1ff844d9e8bc> in <module>  
----> 1 a[5]=11
```

```
IndexError: index 5 is out of bounds for axis 0 with size 5
```

```
# Reshape
```

```
a= np.array([15,  2, 17, 86,  1, 2])
```

```
a
```

```
array([15,  2, 17, 86,  1,  2])
```

```
a.reshape(3,2)
```

```
array([[15,  2],  
       [17, 86],  
       [ 1,  2]])
```

```
# Creating random values
```

```
np.random.rand(2)
```

```
array([0.83648364, 0.43309337])
```

```
np.random.rand(2,5)
```

```
array([[0.623721  , 0.51200912, 0.36777632, 0.39831869, 0.52220845],  
       [0.87711185, 0.457721  , 0.84865154, 0.25295241, 0.81176368]])
```

```
np.random.randn(2,5)
```

```
array([[ 1.82202334, -0.63501578, -1.83936146, -0.34769198,  
         1.75778546],  
       [ 0.45184492,  1.17532952, -0.67522199,  0.07392674,  
         1.63503973]])
```

```
np.random.randint(2,5)
```

```
4
```

```
a = np.random.randint(2,5,6)
```

```
a
```

```
array([2, 2, 4, 3, 2, 3])
```

```
np.sqrt(a)
```

```
array([1.41421356, 1.41421356, 2.          , 1.73205081, 1.41421356,  
       1.73205081])
```

```
np.log(a)

array([0.69314718, 0.69314718, 1.38629436, 1.09861229, 0.69314718,
       1.09861229])

sorted(a)

[2, 2, 2, 3, 3, 4]
```

Pandas

```
import pandas as pd

np.random.rand(5)

array([0.89801474, 0.62738781, 0.28027938, 0.54479857, 0.31833287])

dir(s)

['T',
 '_AXIS_LEN',
 '_AXIS_ORDERS',
 '_AXIS_REVERSED',
 '_AXIS_TO_AXIS_NUMBER',
 '_HANDLED_TYPES',
 '__abs__',
 '__add__',
 '__and__',
 '__annotations__',
 '__array__',
 '__array_priority__',
 '__array_ufunc__',
 '__array_wrap__',
 '__bool__',
 '__class__',
 '__contains__',
 '__copy__',
 '__deepcopy__',
 '__delattr__',
 '__delitem__',
 '__dict__',
 '__dir__',
 '__divmod__',
 '__doc__',
 '__eq__',
 '__finalize__',
 '__float__',
 '__floordiv__',
 '__format__',
 '__ge__',
 '__getattr__',
```



```
'__getattribute__',
'__getitem__',
'__getstate__',
'__gt__',
'__hash__',
'__iadd__',
'__iand__',
'__ifloordiv__',
'__imod__',
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'tz_convert',
'tz_localize',
'unique',
'unstack',
'update',
'value_counts',
'values',
'var',
'view',
'where',
'xs']
```

```
s=pd.Series(np.random.rand(5))
```

```
s
```

```
0    0.015646
1    0.977334
2    0.152281
3    0.914101
4    0.669473
```

```
dtype: float64
```

```
s[2:4]
```



```
2      0.152281
3      0.914101
dtype: float64
```

```
s.index = ['a', 'b', 'c', 'd', 'e']
```

```
s
```

```
a      0.015646
b      0.977334
c      0.152281
d      0.914101
e      0.669473
dtype: float64
```

```
s['e']
```

```
0.6694728328999546
```

```
# DataFrame
```

```
s1=pd.Series(np.random.rand(5))
s2=pd.Series(np.random.rand(5))
s3=pd.Series(np.random.rand(5))
s4=pd.Series(np.random.rand(5))
```

```
s1
```

```
0      0.985379
1      0.670913
2      0.071290
3      0.029618
4      0.737482
dtype: float64
```

```
df = pd.DataFrame([s1,s2,s3,s4])
df
```

	0	1	2	3	4
0	0.985379	0.670913	0.071290	0.029618	0.737482
1	0.399835	0.018559	0.093672	0.713750	0.654045
2	0.454438	0.073028	0.164785	0.184355	0.768255
3	0.924023	0.570724	0.234560	0.960752	0.765374

```
df = df.T
df
```

	0	1	2	3
0	0.985379	0.399835	0.454438	0.924023
1	0.670913	0.018559	0.073028	0.570724
2	0.071290	0.093672	0.164785	0.234560
3	0.029618	0.713750	0.184355	0.960752
4	0.737482	0.654045	0.768255	0.765374

```
label = ['S1', 'S2', 'S3', 'S4']
label
```

```
['S1', 'S2', 'S3', 'S4']
```

```
df.columns=label
```

```
df
```

	S1	S2	S3	S4
0	0.985379	0.399835	0.454438	0.924023
1	0.670913	0.018559	0.073028	0.570724
2	0.071290	0.093672	0.164785	0.234560
3	0.029618	0.713750	0.184355	0.960752
4	0.737482	0.654045	0.768255	0.765374

```
df[['S1', 'S2']]
```

	S1	S2
0	0.985379	0.399835
1	0.670913	0.018559
2	0.071290	0.093672
3	0.029618	0.713750
4	0.737482	0.654045

```
df
```

	S1	S2	S3	S4
0	0.985379	0.399835	0.454438	0.924023
1	0.670913	0.018559	0.073028	0.570724
2	0.071290	0.093672	0.164785	0.234560
3	0.029618	0.713750	0.184355	0.960752
4	0.737482	0.654045	0.768255	0.765374

```
#LOC & ILOC[:, :]
```

```
df.iloc[0:2, 0:3]
```

	S1	S2	S3
0	0.985379	0.399835	0.454438
1	0.670913	0.018559	0.073028

```
df.loc[0:1, 'S1': 'S3']
```

	S1	S2	S3
0	0.985379	0.399835	0.454438
1	0.670913	0.018559	0.073028

```
import numpy as np
import pandas as pd
```

```
d = {'Name': ['Hari', 'Srikanth', 'Navya', 'Mahi'],
      'Age': [29, 37, 23, 41],
```

```
'Gender': ['M', 'M', 'F', 'M'],  
'Salary': [np.NaN, 45000, 30000, 35000]}
```

d

```
{'Name': ['Hari', 'Srikanth', 'Navya', 'Mahi'],  
 'Age': [29, 37, 23, 41],  
 'Gender': ['M', 'M', 'F', 'M'],  
 'Salary': [nan, 45000, 30000, 35000]}
```

```
df = pd.DataFrame(d)  
df
```

	Name	Age	Gender	Salary
0	Hari	29	M	NaN
1	Srikanth	37	M	45000.0
2	Navya	23	F	30000.0
3	Mahi	41	M	35000.0

```
df.isnull()
```

	Name	Age	Gender	Salary
0	False	False	False	True
1	False	False	False	False
2	False	False	False	False
3	False	False	False	False

```
df.isnull().sum()
```

```
Name      0  
Age        0  
Gender     0  
Salary     1  
dtype: int64
```

```
df['Salary'].mean()
```

```
36666.666666666664
```

```
df['Salary']=df['Salary'].fillna(df['Salary'].mean())
```

```
df
```

	Name	Age	Gender	Salary
0	Hari	29	M	36666.666667
1	Srikanth	37	M	45000.000000
2	Navya	23	F	30000.000000
3	Mahi	41	M	35000.000000

```
df1 = df.copy()
```

```
df1
```

	Name	Age	Gender	Salary
0	Hari	29	M	36666.666667
1	Srikanth	37	M	45000.000000
2	Navya	23	F	30000.000000
3	Mahi	41	M	35000.000000

```
dir(df)
```

```
['Age',
 'Gender',
 'Name',
 'Salary',
 'T',
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 '_AXIS_ORDERS',
 '_AXIS_REVERSED',
 '_AXIS_TO_AXIS_NUMBER',
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 '__divmod__',
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 '__getstate__',
 '__gt__',
 '__hash__',
 '__iadd__',
 '__iand__',
 '__ifloordiv__',
```

```
'__imod__',
'__imul__',
'__init__',
'__init_subclass__',
'__invert__',
'__ior__',
'__ipow__',
'__isub__',
'__iter__',
'__itruediv__',
'__ixor__',
'__le__',
'__len__',
'__lt__',
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'__neg__',
'__new__',
'__nonzero__',
'__or__',
'__pos__',
'__pow__',
'__radd__',
'__rand__',
'__rdivmod__',
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'__reduce_ex__',
'__repr__',
'__rfloordiv__',
'__rmatmul__',
'__rmod__',
'__rmul__',
'__ror__',
'__round__',
'__rpow__',
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'__setattr__',
'__setitem__',
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'_check_inplace_setting',
'_check_is_chained_assignment_possible',
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'_get_block_manager_axis',
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'_update_inplace',
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'idxmin',
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'tz_localize',
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'update',
'value_counts',
'values',
'var',
'where',
'xs']

```

```

df2=pd.concat([df,df1])
df2

```

	Name	Age	Gender	Salary
0	Hari	29	M	36666.666667
1	Srikanth	37	M	45000.000000
2	Navya	23	F	30000.000000

```

3      Mahi    41      M  35000.000000
0      Hari    29      M  36666.666667
1  Srikanth    37      M  45000.000000
2     Navya    23      F  30000.000000
3      Mahi    41      M  35000.000000

```

```
df2.reset_index(drop=True)
```

```

      Name  Age Gender      Salary
0     Hari   29      M  36666.666667
1  Srikanth   37      M  45000.000000
2     Navya   23      F  30000.000000
3      Mahi   41      M  35000.000000
4     Hari   29      M  36666.666667
5  Srikanth   37      M  45000.000000
6     Navya   23      F  30000.000000
7      Mahi   41      M  35000.000000

```

```
df2.drop_duplicates()
```

```

      Name  Age Gender      Salary
0     Hari   29      M  36666.666667
1  Srikanth   37      M  45000.000000
2     Navya   23      F  30000.000000
3      Mahi   41      M  35000.000000

```

```
pd.DataFrame()
```

```
df['Salary'].astype('int')
```

```

0      36666
1      45000
2      30000
3      35000
Name: Salary, dtype: int64

```

Data Visualization

```
import matplotlib.pyplot as plt
import seaborn as sns
```

```
x = np.array([1,2,3,4,5,6])
```

```
x
```

```
array([1, 2, 3, 4, 5, 6])
```

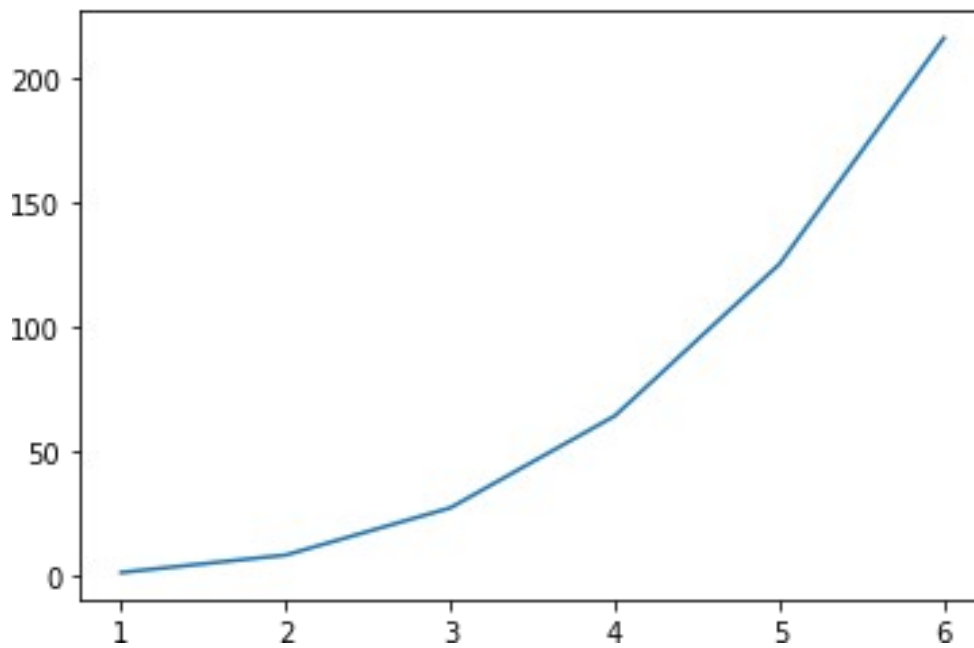
```
y = np.power(x,3)
```

```
y
```

```
array([ 1,  8, 27, 64, 125, 216])
```

```
plt.plot(x,y)
```

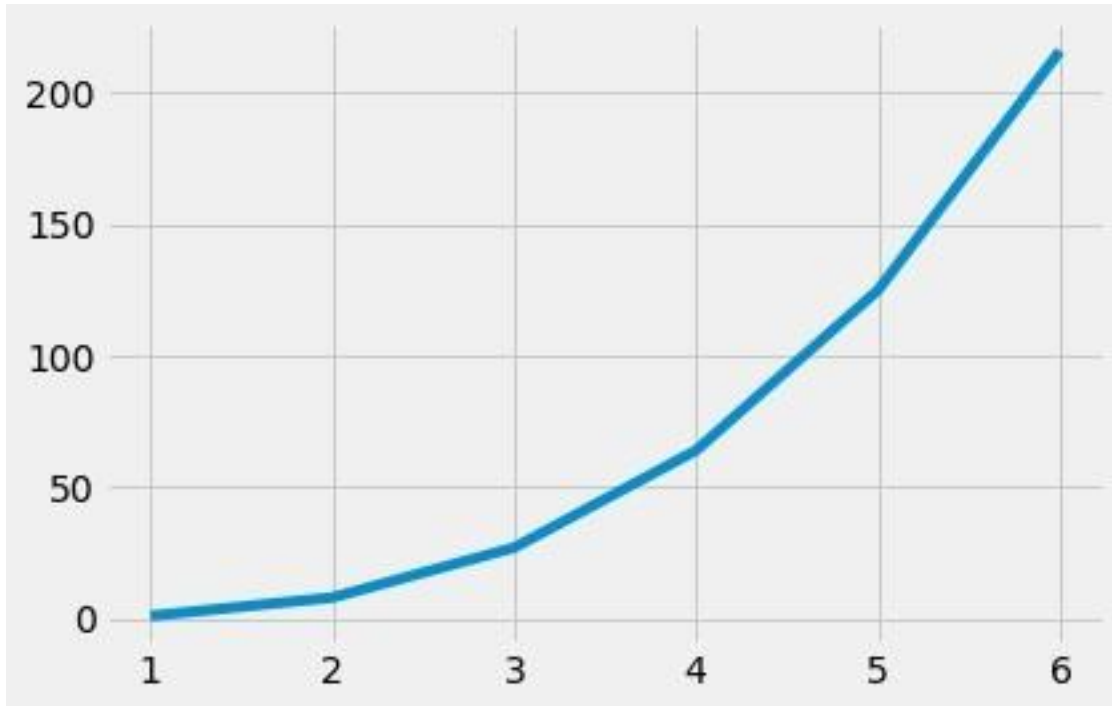
```
[<matplotlib.lines.Line2D at 0x7fe44b403450>]
```



```
plt.style.available
```

```
['Solarize_Light2',  
 '_classic_test_patch',  
 'bmh',  
 'classic',  
 'dark_background',  
 'fast',  
 'fivethirtyeight',  
 'ggplot',  
 'grayscale',  
 'seaborn',  
 'seaborn-bright',  
 'seaborn-colorblind',  
 'seaborn-dark',  
 'seaborn-dark-palette',  
 'seaborn-darkgrid',  
 'seaborn-deep',  
 'seaborn-muted',  
 'seaborn-notebook',  
 'seaborn-paper',  
 'seaborn-pastel',  
 'seaborn-poster',  
 'seaborn-talk',  
 'seaborn-ticks',  
 'seaborn-white',
```

```
'seaborn-whitegrid',  
'tableau-colorblind10']  
  
plt.style.use('fivethirtyeight')  
  
plt.plot(x,y)  
  
[<matplotlib.lines.Line2D at 0x7fe44ae48e50>]
```



```
x = np.linspace(0,10,1000)  
y = np.sin(x)  
  
plt.plot(x,y)  
  
[<matplotlib.lines.Line2D at 0x7fe44ae3bc50>]
```



```
plt.plot(x,y,color='r',marker='o')
```

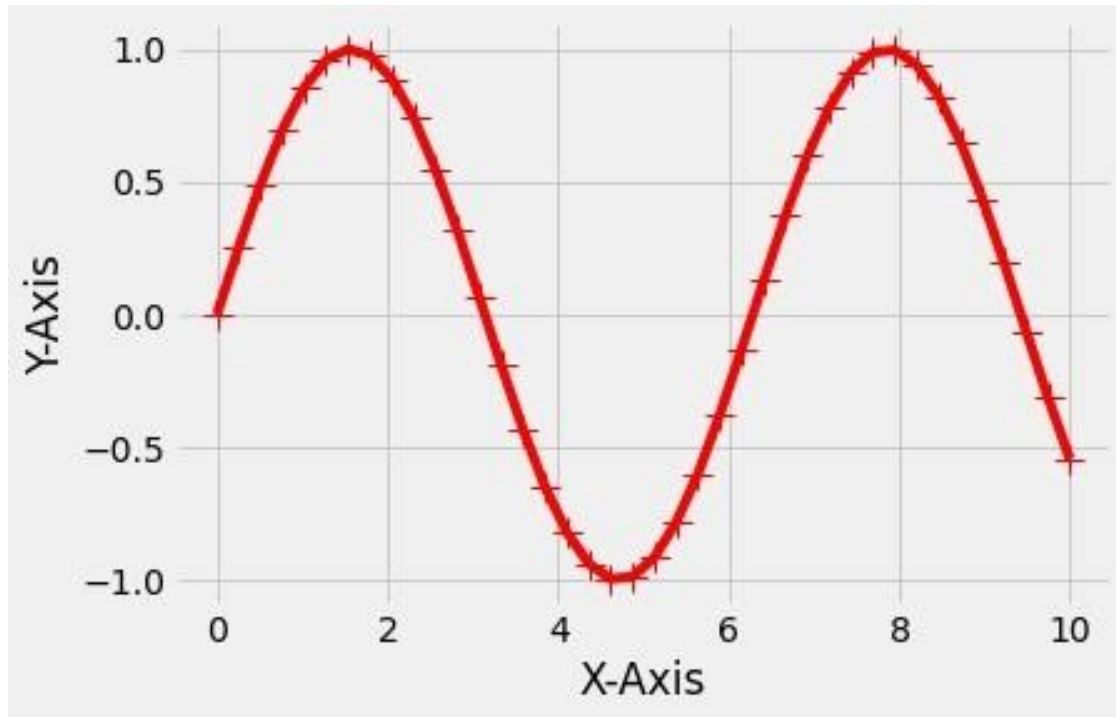
```
[<matplotlib.lines.Line2D at 0x7fe44acc4490>]
```



```
x = np.linspace(0,10,40)  
y = np.sin(x)
```



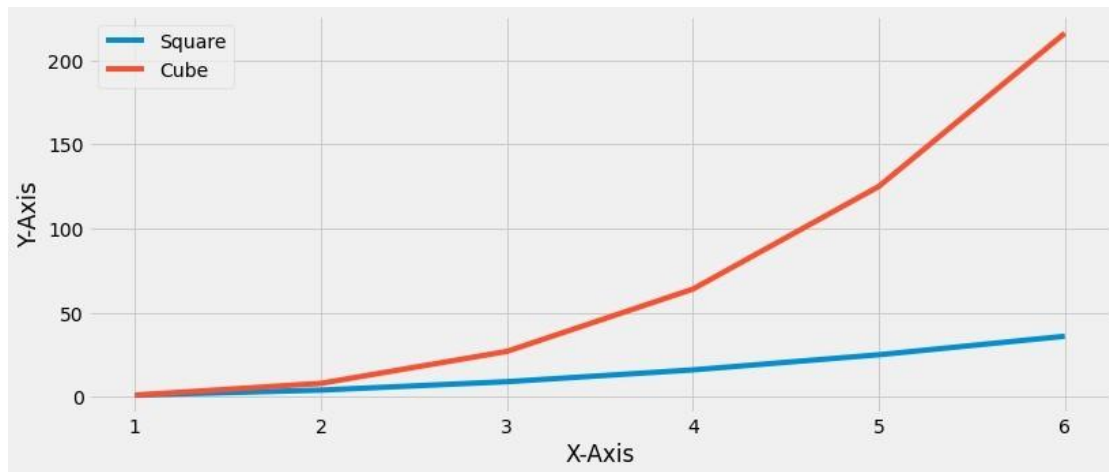
```
plt.plot(x,y,color='r',marker='+',markersize=12)
plt.xlabel('X-Axis')
plt.ylabel('Y-Axis')
Text(0, 0.5, 'Y-Axis')
```



```
x = np.array([1,2,3,4,5,6])
y1 = np.power(x,2)
y2 = np.power(x,3)

plt.figure(figsize=(12,5))
plt.plot(x,y1,label='Square')
plt.plot(x,y2,label='Cube')
plt.xlabel('X-Axis')
plt.ylabel('Y-Axis')
plt.legend()

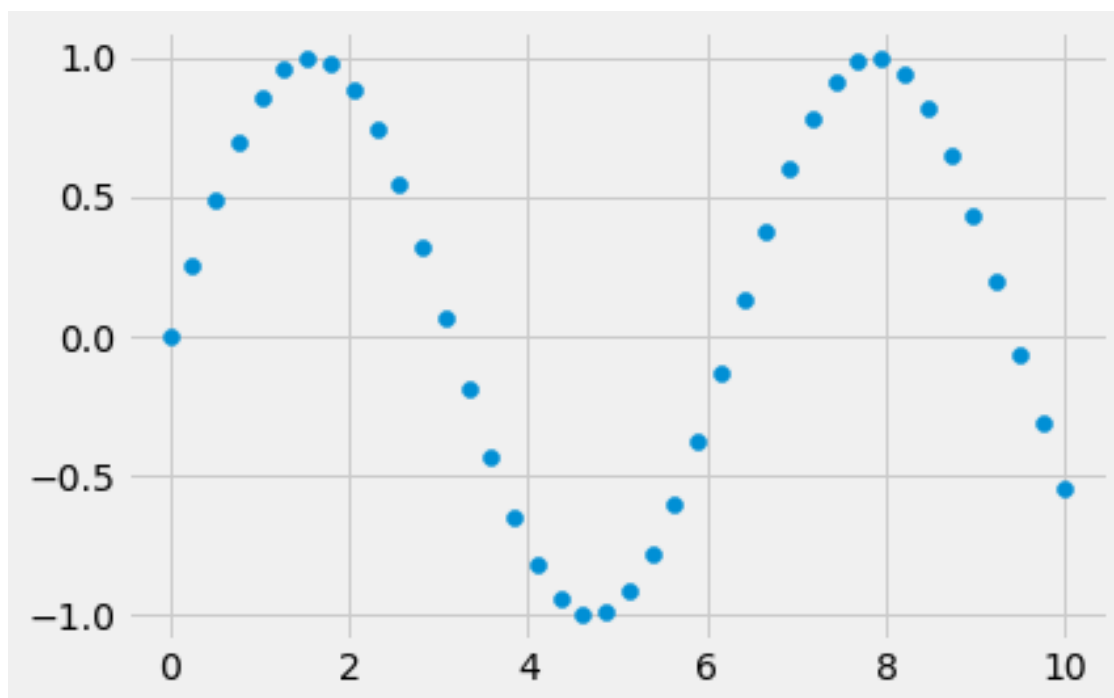
<matplotlib.legend.Legend at 0x7fe44a8e7a10>
```



```
x = np.linspace(0,10,40)
y = np.sin(x)
```

```
plt.scatter(x,y)
```

```
<matplotlib.collections.PathCollection at 0x7fe44a854e90>
```

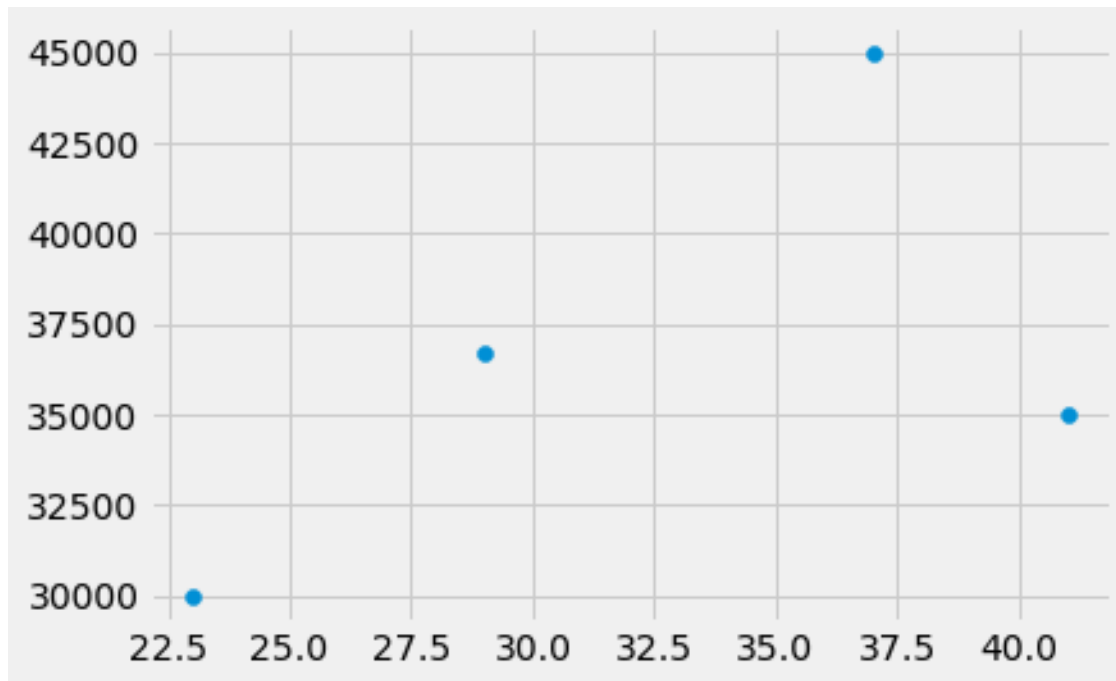


```
df
```

	Name	Age	Gender	Salary
0	Hari	29	M	36666.666667
1	Srikanth	37	M	45000.000000
2	Navya	23	F	30000.000000
3	Mahi	41	M	35000.000000

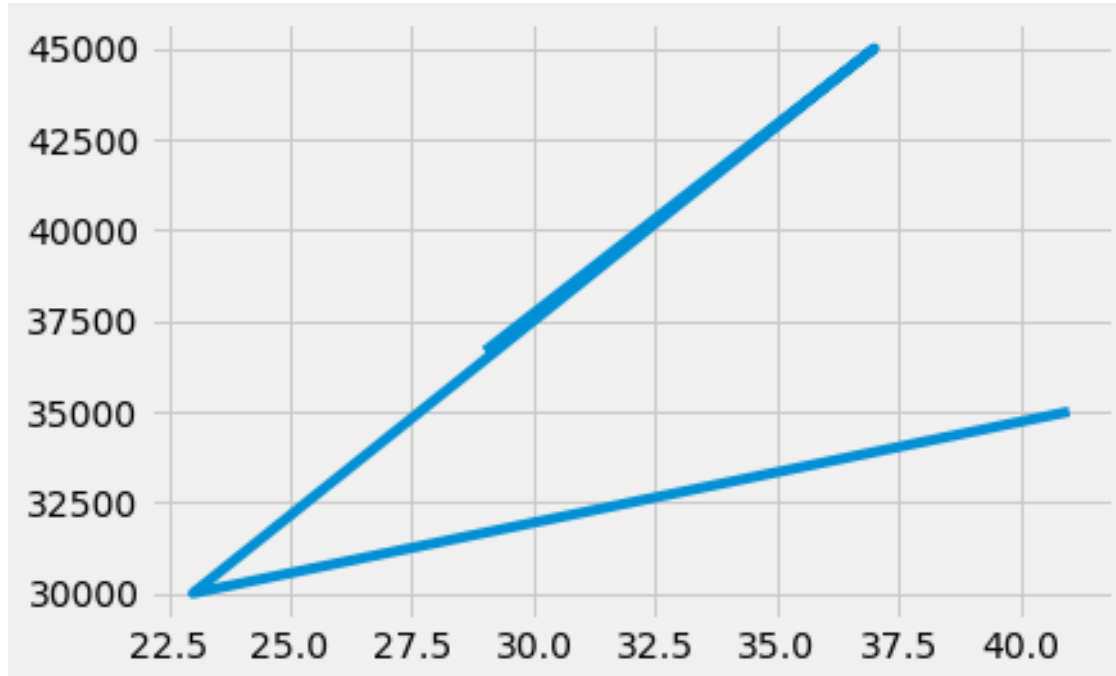
```
plt.scatter(df['Age'],df['Salary'])
```

```
<matplotlib.collections.PathCollection at 0x7fe44a815b50>
```



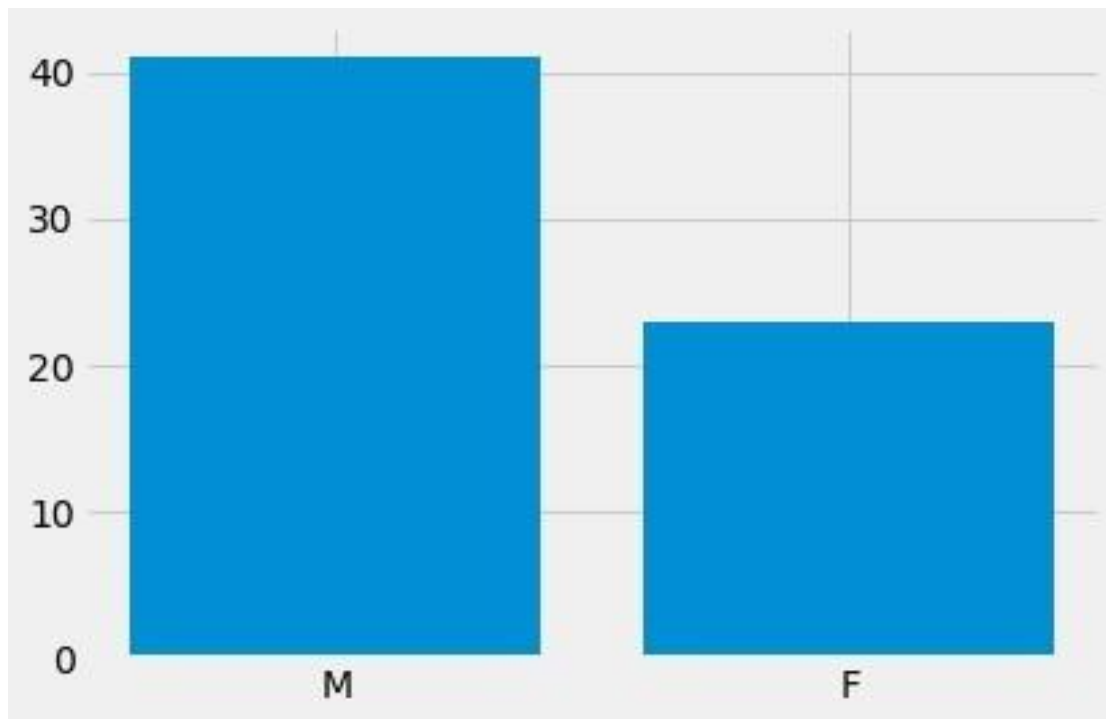
```
plt.plot(df['Age'],df['Salary'])
```

```
[<matplotlib.lines.Line2D at 0x7fe44abad750>]
```



```
plt.bar(df['Gender'],df['Age'])
```

```
<BarContainer object of 4 artists>
```

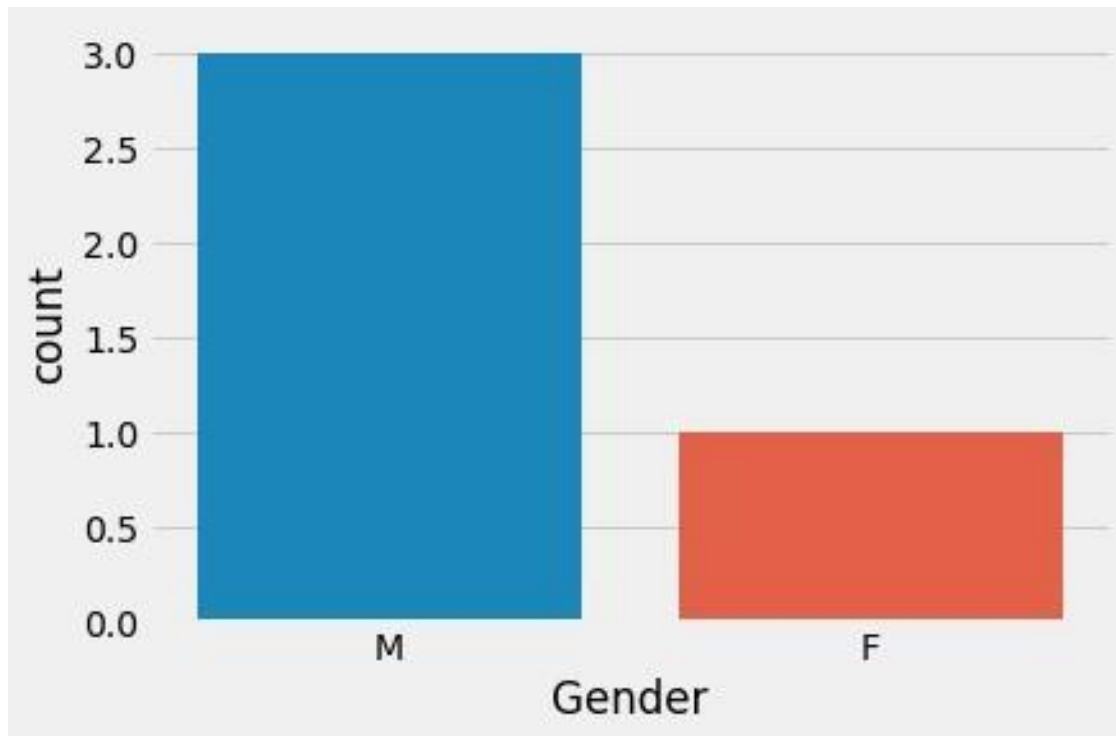


```
sns.countplot(df['Gender'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:  
FutureWarning: Pass the following variable as a keyword arg: x. From  
version 0.12, the only valid positional argument will be `data`, and  
passing other arguments without an explicit keyword will result in an  
error or misinterpretation.
```

```
FutureWarning
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe44a50f450>
```

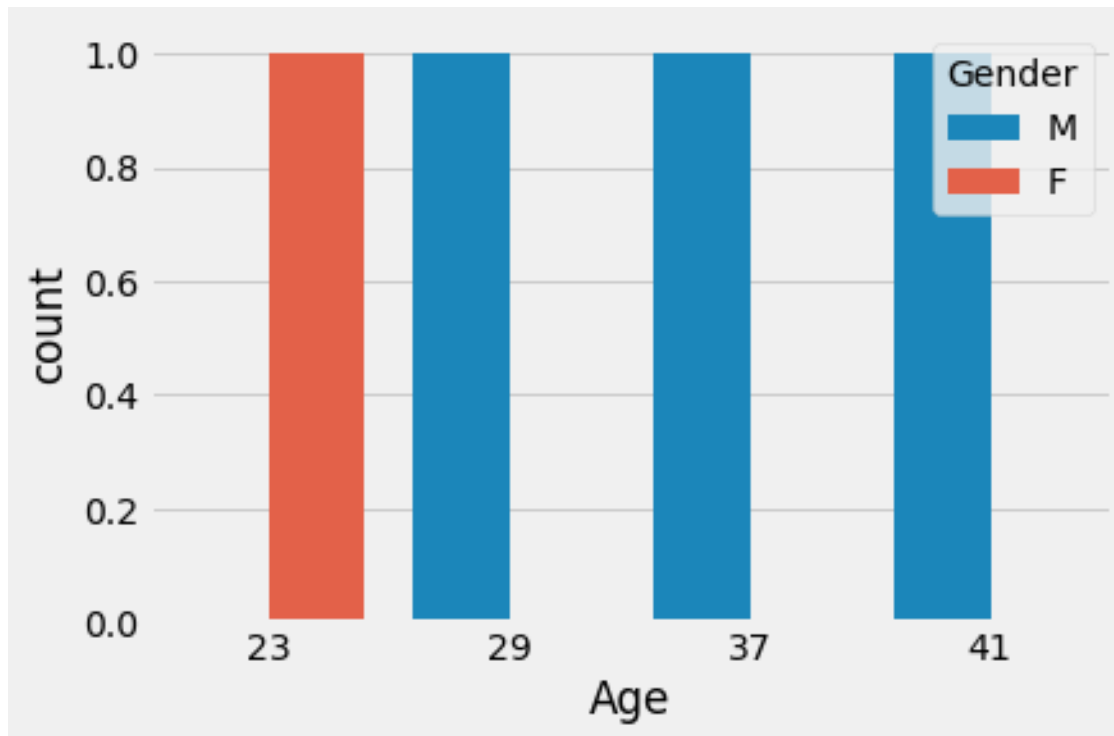


```
sns.countplot(df['Age'],hue=df['Gender'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:  
FutureWarning: Pass the following variable as a keyword arg: x. From  
version 0.12, the only valid positional argument will be `data`, and  
passing other arguments without an explicit keyword will result in an  
error or misinterpretation.
```

```
FutureWarning
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe44a4dd250>
```

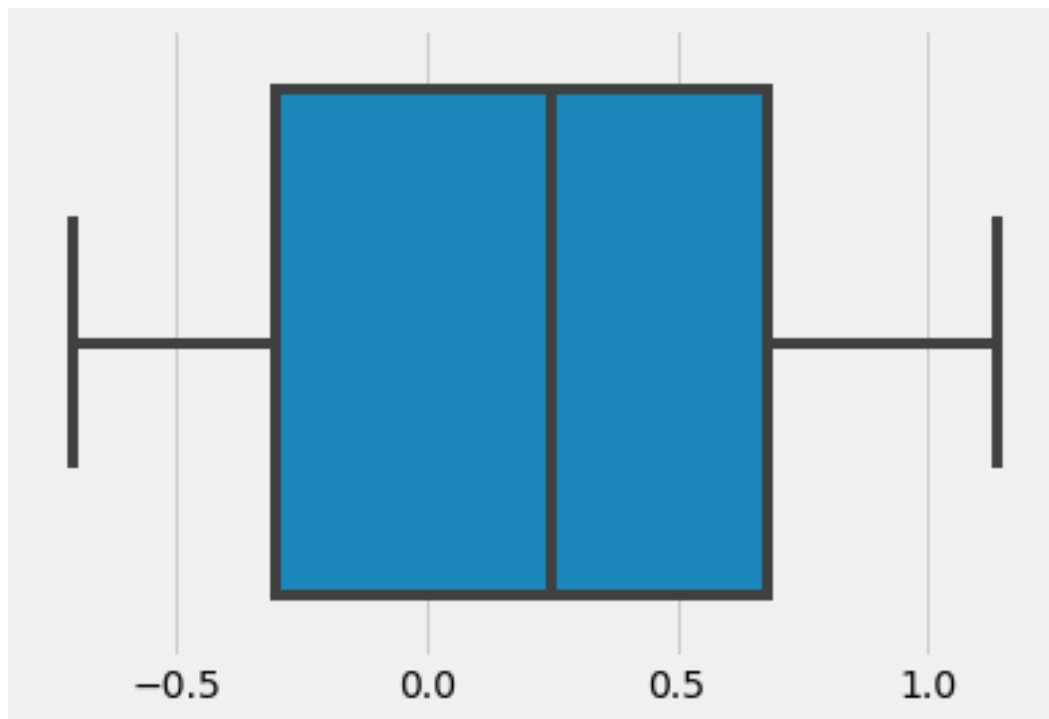


```
sns.boxplot(np.random.randn(6))
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:  
FutureWarning: Pass the following variable as a keyword arg: x. From  
version 0.12, the only valid positional argument will be `data`, and  
passing other arguments without an explicit keyword will result in an  
error or misinterpretation.
```

```
FutureWarning
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe44a45df10>
```



Data Wrangling & Data Pre-Processing

```
df = pd.read_csv('/content/Data1.csv')
```

```
df.head(6)
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	NaN	Yes
5	France	35.0	58000.0	Yes

```
df.tail(3)
```

	Country	Age	Salary	Purchased
7	France	48.0	79000.0	Yes
8	Germany	50.0	83000.0	No
9	France	37.0	67000.0	Yes

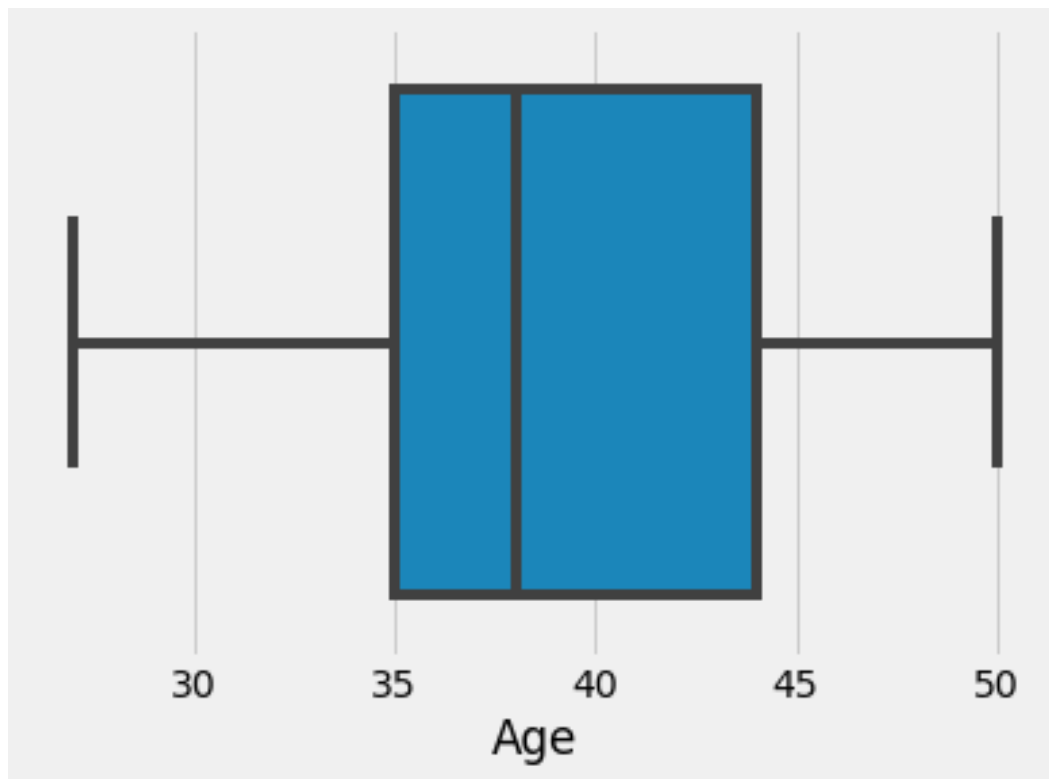
```
sns.boxplot(df['Age'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:
FutureWarning: Pass the following variable as a keyword arg: x. From
version 0.12, the only valid positional argument will be `data`, and
passing other arguments without an explicit keyword will result in an
```

error or misinterpretation.

FutureWarning

<matplotlib.axes._subplots.AxesSubplot at 0x7fe44a45de90>



df.describe()

	Age	Salary
count	9.000000	9.000000
mean	38.777778	63777.777778
std	7.693793	12265.579662
min	27.000000	48000.000000
25%	35.000000	54000.000000
50%	38.000000	61000.000000
75%	44.000000	72000.000000
max	50.000000	83000.000000

df.describe(include='all')

	Country	Age	Salary	Purchased
count	10	9.000000	9.000000	10
unique	3	NaN	NaN	2
top	France	NaN	NaN	No
freq	4	NaN	NaN	5
mean	NaN	38.777778	63777.777778	NaN
std	NaN	7.693793	12265.579662	NaN
min	NaN	27.000000	48000.000000	NaN
25%	NaN	35.000000	54000.000000	NaN

50%	NaN	38.000000	61000.000000	NaN
75%	NaN	44.000000	72000.000000	NaN
max	NaN	50.000000	83000.000000	NaN

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
#   Column      Non-Null Count  Dtype
---  -
0   Country     10 non-null     object
1   Age          9 non-null      float64
2   Salary       9 non-null      float64
3   Purchased    10 non-null     object
dtypes: float64(2), object(2)
memory usage: 448.0+ bytes
```

```
df.isnull().sum()
```

```
Country      0
Age           1
Salary        1
Purchased     0
dtype: int64
```

```
df.head(7)
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	NaN	Yes
5	France	35.0	58000.0	Yes
6	Spain	NaN	52000.0	No

```
df['Salary'].mean()
```

```
63777.77777777778
```

```
df['Age'].median()
```

```
38.0
```

```
df['Salary']=df['Salary'].fillna(df['Salary'].mean())
```

```
df['Age']=df['Age'].fillna(df['Age'].median())
```

```
df
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.000000	No

1	Spain	27.0	48000.000000	Yes
2	Germany	30.0	54000.000000	No
3	Spain	38.0	61000.000000	No
4	Germany	40.0	63777.777778	Yes
5	France	35.0	58000.000000	Yes
6	Spain	38.0	52000.000000	No
7	France	48.0	79000.000000	Yes
8	Germany	50.0	83000.000000	No
9	France	37.0	67000.000000	Yes

```
df['Age']>40
```

0	True
1	False
2	False
3	False
4	False
5	False
6	False
7	True
8	True
9	False

```
Name: Age, dtype: bool
```

```
df[df['Age']>40]
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
7	France	48.0	79000.0	Yes
8	Germany	50.0	83000.0	No

```
df.loc[df['Age']>40]
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
7	France	48.0	79000.0	Yes
8	Germany	50.0	83000.0	No

```
df[df['Salary']>70000]
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
7	France	48.0	79000.0	Yes
8	Germany	50.0	83000.0	No

Encoding

Method 1 (One Hot Encoding)

```
country = pd.get_dummies(df['Country'])
country
```

	France	Germany	Spain
0	1	0	0
1	0	0	1
2	0	1	0
3	0	0	1
4	0	1	0
5	1	0	0
6	0	0	1
7	1	0	0
8	0	1	0
9	1	0	0

```
df.join(country)
```

	Country	Age	Salary	Purchased	France	Germany	Spain
0	France	44.0	72000.000000	No	1	0	0
1	Spain	27.0	48000.000000	Yes	0	0	1
2	Germany	30.0	54000.000000	No	0	1	0
3	Spain	38.0	61000.000000	No	0	0	1
4	Germany	40.0	63777.777778	Yes	0	1	0
5	France	35.0	58000.000000	Yes	1	0	0
6	Spain	38.0	52000.000000	No	0	0	1
7	France	48.0	79000.000000	Yes	1	0	0
8	Germany	50.0	83000.000000	No	0	1	0
9	France	37.0	67000.000000	Yes	1	0	0

```
#pd.concat([df,country])
```

```
# Method 2 (Label Encoding)
```

```
from sklearn.preprocessing import LabelEncoder
from collections import Counter as count
```

```
count(df['Country'])
```

```
Counter({'France': 4, 'Spain': 3, 'Germany': 3})
```

```
le = LabelEncoder()
```

```
df['Country'] = le.fit_transform(df['Country'])
```

```
count(df['Country'])
```

```
Counter({0: 4, 2: 3, 1: 3})
```

```
df
```

	Country	Age	Salary	Purchased
0	0	44.0	72000.000000	No
1	2	27.0	48000.000000	Yes
2	1	30.0	54000.000000	No
3	2	38.0	61000.000000	No
4	1	40.0	63777.777778	Yes

5	0	35.0	58000.000000	Yes
6	2	38.0	52000.000000	No
7	0	48.0	79000.000000	Yes
8	1	50.0	83000.000000	No
9	0	37.0	67000.000000	Yes

method 3 (feature map) `df['Purchased']=df['Purchased'].replace(['No','Yes'],[0,1])df`

	Country	Age	Salary	Purchased
0	0	44.0	72000.000000	0
1	2	27.0	48000.000000	1
2	1	30.0	54000.000000	0
3	2	38.0	61000.000000	0
4	1	40.0	63777.777778	1
5	0	35.0	58000.000000	1
6	2	38.0	52000.000000	0
7	0	48.0	79000.000000	1
8	1	50.0	83000.000000	0
9	0	37.0	67000.000000	1

Splitting the data

```
x = df.iloc[:,0:3]
x
```

	Country	Age	Salary
0	0	44.0	72000.000000
1	2	27.0	48000.000000
2	1	30.0	54000.000000
3	2	38.0	61000.000000
4	1	40.0	63777.777778
5	0	35.0	58000.000000
6	2	38.0	52000.000000
7	0	48.0	79000.000000
8	1	50.0	83000.000000
9	0	37.0	67000.000000

```
y = df['Purchased']
y
```

0	0
1	1
2	0
3	0
4	1
5	1
6	0
7	1
8	0

```

9      1
Name: Purchased, dtype: int64

from sklearn.model_selection import train_test_split

xtrain,xtest,ytrain,ytest =
train_test_split(x,y,test_size=0.3,random_state=11)

xtrain

```

	Country	Age	Salary
6	2	38.0	52000.000000
4	1	40.0	63777.777778
5	0	35.0	58000.000000
1	2	27.0	48000.000000
3	2	38.0	61000.000000
0	0	44.0	72000.000000
9	0	37.0	67000.000000

```

xtest

```

	Country	Age	Salary
7	0	48.0	79000.0
8	1	50.0	83000.0
2	1	30.0	54000.0

Scaling

Normalization ----> output(0 to 1)

```

from sklearn.preprocessing import MinMaxScaler

nm = MinMaxScaler()

n_xtrain = nm.fit_transform(xtrain)
n_xtrain

```

```

array([[1.          , 0.64705882, 0.16666667],
       [0.5        , 0.76470588, 0.65740741],
       [0.          , 0.47058824, 0.41666667],
       [1.          , 0.          , 0.          ],
       [1.          , 0.64705882, 0.54166667],
       [0.          , 1.          , 1.          ],
       [0.          , 0.58823529, 0.79166667]])

```

```

n_xtest = nm.transform(xtest)
n_xtest

```

```
array([[0.          , 1.23529412, 1.29166667],
       [0.5        , 1.35294118, 1.45833333],
       [0.5        , 0.17647059, 0.25        ]])
```

