```
a=40
b=3.66
print(type(a))
print(type(b))
```

```
<class 'int'>
<class 'float'>
```

```
print((a+b))
```

```
43.66
```

```
10**2
```

```
100
```

```
10//2
```

```
5
```

```
name="00"
type(name)
```

```
str
```

```
list=[60,25,98,51]
print(60 in list)
```

```
True
```

```
list1=[20,90,45,35]
print(25 in list1)
```

```
False
```

```
def addition (a,b):
    return a+b

addition(27,58)
```

```
85
```

```
def taxc(s,t):
    tax=((t/100)*s)
    return tax

taxc(50000,10)
```

```
5000.0
```

Q...write a program for tax deducation:
1.if salary is less than 10000,apply 5% tax
2.salary is more than 10000 but less than 50000,apply 10% tax.

```
3.salary is more than 50000 but less than 200000 apply 15% tax
4.if salary is more than 2lakhs,apply 20% tax
```

```
<>:2: SyntaxWarning: invalid decimal literal
<>:2: SyntaxWarning: invalid decimal literal
C:\Users\DELL\AppData\Local\Temp\ipykernel_2544\960817773.py:2:
SyntaxWarning: invalid decimal literal
  1.if salary is less than 10000,apply 5% tax

  Cell In[12], line 3
    2.salary is more than 10000 but less than 50000,apply 10% tax.
     ^
SyntaxError: invalid decimal literal
```

```
def tax(sal):
    if sal>0 and sal<10000:
        return 0.05*sal
    elif sal>=10000 and sal<50000:
        return 0.1*sal
    elif sal>=50000 and sal<200000:
        return 0.15*sal
    elif sal>=200000:
        return 0.2*sal
    else:
        return " invalid "

tax(200000)
```

```
40000.0
```

```
salary=float(input("enter your salary:"))
tax=tax(salary)
print("tax to be paid:{tax}")
```

```
loops
```

```
w=[87,56,85,50]
h=[179,146,170,149]
output:bmi = w/h^2
```

```
w=[87,56,85,50]
h=[179,146,170,149]
for i,j in zip(w,h):
    print(i/(j*j))
```

```
0.002715271058955713
0.0026271345468192905
0.0029411764705882353
0.002252150804017837
```

```
for i in range(len(w)):
    print(w[i]/(h[i]*h[i]))
```

```
0.002715271058955713
0.0026271345468192905
0.0029411764705882353
0.002252150804017837
```

Numpy

```
lst1=[58,45,66]
lst2=[45,88,44]
print(lst1+lst2)
```

```
[58, 45, 66, 45, 88, 44]
```

```
import numpy as np
ar1=np.array([58,45,66,66])
ar2=np.array([45,88,44,77])
print(ar1+ar2)
```

```
[103 133 110 143]
```

```
arr1 = np.zeros((2,3))
print(arr1)
```

```
[[0. 0. 0.]
 [0. 0. 0.]]
```

```
arr2=np.ones((2,3))
print(arr2)
```

```
[[1. 1. 1.]
 [1. 1. 1.]]
```

```
arr3=np.eye(3)
print(arr3)
```

```
[[1. 0. 0.]
 [0. 1. 0.]
 [0. 0. 1.]]
```

```
arr4=np.array([[3,4,5],[6,9,4]])
print(arr4)
print(np.ndim(arr4))
```

```
[[3 4 5]
 [6 9 4]]
2
```

```
arr4=np.array([[3,4,5],[6,9,4]])
print(arr4)
print(np.shape(arr4))
```

```
[[3 4 5]
 [6 9 4]]
(2, 3)
```

```
arr5=np.array([6,7,8,9,3,4,5,7])

arr5.reshape(2,4)
```

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

```
arr5.reshape(4,2)
```

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

```
arr5
```

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

```
arr6=np.array([6,7,8,9,3,4,5,7])

arr6.resize(4,2)

arr6
```

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

```
arr6 =np.arange(10,50).reshape(8,5)
print(arr6)
print(np.shape(arr6))
```

```
[[10 11 12 13 14]
 [15 16 17 18 19]
 [20 21 22 23 24]
 [25 26 27 28 29]
 [30 31 32 33 34]
 [35 36 37 38 39]
 [40 41 42 43 44]
 [45 46 47 48 49]]
(8, 5)
```

```
arr7 =np.arange(8,1001,8)
print(arr7)
print(type(arr7))
```

```
[   8   16   24   32   40   48   56   64   72   80   88   96  104  112
  120  128  136  144  152  160  168  176  184  192  200  208  216  224
  232  240  248  256  264  272  280  288  296  304  312  320  328  336
  344  352  360  368  376  384  392  400  408  416  424  432  440  448
  456  464  472  480  488  496  504  512  520  528  536  544  552  560
  568  576  584  592  600  608  616  624  632  640  648  656  664  672
  680  688  696  704  712  720  728  736  744  752  760  768  776  784
  792  800  808  816  824  832  840  848  856  864  872  880  888  896
  904  912  920  928  936  944  952  960  968  976  984  992 1000]
<class 'numpy.ndarray'>
```

```
mult_seven = np.arange(7,701,7)
print(mult_seven)
```

```
[  7  14  21  28  35  42  49  56  63  70  77  84  91  98 105 112 119
126
 133 140 147 154 161 168 175 182 189 196 203 210 217 224 231 238 245
252
 259 266 273 280 287 294 301 308 315 322 329 336 343 350 357 364 371
378
 385 392 399 406 413 420 427 434 441 448 455 462 469 476 483 490 497
504
 511 518 525 532 539 546 553 560 567 574 581 588 595 602 609 616 623
630
 637 644 651 658 665 672 679 686 693 700]
```

```
mult_five = np.arange(5,500,5)
print(mult_five)
```

```
[  5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85
90
  95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175
180
 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265
270
 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355
360
 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445
450
 455 460 465 470 475 480 485 490 495]
```

```
arr9 = np.linspace(2,8,6)
print(arr9)
```

```
[2.  3.2 4.4 5.6 6.8 8. ]
```

```
arr10 =np.array([[[1,2,3],[6,7,8]], [[4,5,6],[4,7,8]]])
print(arr10)
print(np.shape(arr10))
print(np.ndim(arr10))
```

```
[[[1 2 3]
  [6 7 8]]

 [[4 5 6]
  [4 7 8]]]
(2, 2, 3)
3
```

Matrix Operations

```
mat1 = np.array([9,5,6,4]).reshape(2,2)
mat2 = np.array([1,2,3,4]).reshape(2,2)
print("Matrix 1:\n",mat1)
print("Matrix 2:\n",mat2)
```

```
Matrix 1:
 [[9 5]
 [6 4]]
Matrix 2:
 [[1 2]
 [3 4]]
```

```
print(mat1*mat2)
```

```
[[ 9 10]
 [18 16]]
```

```
print(mat1.dot(mat2))
```

```
[[24 38]
 [18 28]]
```

```
print(mat1@mat2)
```

```
[[24 38]
 [18 28]]
```

```
print(np.linalg.inv(mat1))
```

```
[[ 0.66666667 -0.83333333]
 [-1.          1.5       ]]
```

Statistics

```
ar1 = np.array([90,45,65,78,66])
print(np.mean(ar1))
```

```
68.8
```

```
print(np.median(ar1))
```

```
66.0
```

```
print(np.std(ar1))
```

```
14.985326155943353
```

```
print(np.var(ar1))
```

```
224.56
```

Trigonometry

```
print(np.pi)
```

```
3.141592653589793
```

```
deg = [90,5,34]
for i in deg:
    print(np.sin(i))
```

```
0.8939966636005579
-0.9589242746631385
0.5290826861200238
```

```
deg = [90,5,34]
for i in deg:
    print(np.cos(i))
```

```
-0.4480736161291701
0.28366218546322625
-0.8485702747846052
```

```
deg = [90,5,34]
for i in deg:
    print(np.tan(i))
```

```
-1.995200412208242
-3.380515006246586
-0.6234989627162255
```

```
deg = [np.pi/4,np.pi/2,np.pi/3]
for i in deg:
    print(np.sin(i))
```

```
0.7071067811865476
1.0
0.8660254037844386

print(np.hypot(6,8))

10.0
```

Arithmetic operations

```
a=np.array([8,6,5])
b=np.array([2,4,5])
print(np.sum((a,b)))

30

print(np.cumsum(a))

[ 8 14 19]

c = np.array([[1,2,3],[4,5,6]])
print(np.cumsum(c,axis=0))

[[1 2 3]
 [5 7 9]]

print(np.prod((a,b)))

9600

print(np.cumprod(c))

[  1   2   6  24 120 720]

print(np.cumprod(c,axis = 0))

[[ 1  2  3]
 [ 4 10 18]]

print(np.cumprod(c,axis = 1))

[[  1   2   6]
 [  4  20 120]]

s1 = np.array([90,59,88,68])
s2 = np.array([10,45,56,56])
print(np.mod(s1,s2))

[ 0 14 32 12]

print(np.divmod(s1,s2))

(array([9, 1, 1, 1]), array([ 0, 14, 32, 12]))
```

UFunc

```
A=np.array([78,89,45,99,45,"like"])
print(max(A))
```

```
like
```

```
A=np.array([78,89,45,99,45])
print(max(A))
```

```
99
```

```
A=np.array([78,89,45,99,45])
print(min(A))
```

```
45
```

Sorting

```
B=np.array([68,67,43,76,22])
B.sort()
print(B)
```

```
[22 43 67 68 76]
```

```
C=np.array([68,67,43,76,22])
D=np.array([56,98,68,86,88])
print(C)
print(D)
```

```
[68 67 43 76 22]
[56 98 68 86 88]
```

```
C=np.array([68,67,43,76,22])
D=np.array([56,98,68,86,88])
E=np.array(["hi","hlo"])
print(C)
print(D)
print(E)
```

```
[68 67 43 76 22]
[56 98 68 86 88]
['hi' 'hlo']
```

Rounding

```
s2=np.array([9.7,-4.5])
print(np.ceil(s2))
```

```
[10. -4.]
```

```
print(np.floor(s2))
```

```
[ 9. -5.]
```

Random Module

```
import numpy.random as rd

ran1 =rd.rand()
print(ran1)
```

```
0.4485613010984727
```

```
ran2=rd.randint(5)
print(ran2)
```

```
0
```

```
ran3=rd.randint(5,size=(6))
print(ran3)
```

```
[3 4 1 3 1 2]
```

```
ran4=rd.randint(5,size=(6,2))
print(ran4)
```

```
[[1 2]
 [0 0]
 [2 1]
 [2 0]
 [0 1]
 [4 0]]
```

Stack

```
Ar1 = np.array([[7,6,98],[5,7,8]])
Ar2 = np.array([[6,4,8],[3,7,64]])
print(Ar1)
print("\n")
print(Ar2)
```

```
[[ 7  6 98]
 [ 5  7  8]]


[[ 6  4  8]
 [ 3  7 64]]
```

```
Ar3 = np.hstack((Ar1,Ar2))
print(Ar3)
```

```
[[ 7  6 98  6  4  8]
 [ 5  7  8  3  7 64]]
```

```
Ar4 = np.vstack((Ar1,Ar2))
print(Ar4)
```

```
[[ 7  6 98]
 [ 5  7  8]
 [ 6  4  8]
 [ 3  7 64]]
```

```
Ar5 = np.arange(1,13).reshape(3,2,2)
print(Ar5)
```

```
[[[ 1  2]
  [ 3  4]]

 [[ 5  6]
  [ 7  8]]

 [[ 9 10]
  [11 12]]]
```

```
Ar6 = np.dstack(Ar5)
print(Ar6)
```

```
[[[ 1  5  9]
  [ 2  6 10]]

 [[ 3  7 11]
  [ 4  8 12]]]
```

```
num1=81
num2=99
print(np.sqrt(num1))
```

```
9.0
```

```
print(np.lcm(num1,num2))
```

```
891
```

```
print(np.gcd(num1,num2))
```

```
9
```

```
AA=[45,67,88]
print(np.lcm.reduce(AA))
```

```
265320
```

```
print(np.gcd.reduce(AA))
```

```
1
```

```
AB = np.array([0,-7,6,-33])
print(np.absolute(AB))
```

```
[ 0  7  6 33]
```

Logirthims

```
n=45
print(np.log(n))
```

```
3.8066624897703196
```

```
print(np.log2(n))
```

```
5.491853096329675
```

Set

```
S1=np.array([7,8,4,9,5])
S2=np.array([3,6,9,5,2])
print(S1, "\n")
print(S2)
```

```
[7 8 4 9 5]
```

```
[3 6 9 5 2]
```

```
print(np.union1d(S1,S2))
```

```
[2 3 4 5 6 7 8 9]
```

```
print(np.intersect1d(S1,S2))
```

```
[5 9]
```

```
print(np.setdiff1d(S1,S2))
```

```
[4 7 8]
```

Search

```
col1 =np.array([55,66,33,77])
index = np.where(col1%2 == 0)
print(index)
```

```
(array([1], dtype=int64),)
```

```
col2 = np.array([60,45,]) #div by 5 and 3
```

```
col1 =np.array([45,33,21,50,60,15])
arr = np.arange()
```

```
div=arr[(arr%5==0)&(arr%3==0)]
print("numbers divisible by 5 and 3:",divisible)
```