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Assignment 3.1

Input:

```
import numpy as np
array1=np.array([[1,2,3],[4,5,6],[7,8,9]])
array1
```

Output:

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

Input:

```
array2=np.array([[11,12,13],[14,15,16],[17,18,19]])
array2
Output:
```

```
array([[11, 12, 13], [14, 15, 16], [17, 18, 19]])
```

#1 Matrix Operation

Input:

```
#Addition
resultarray=array1+array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.add(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

Output:

Using Operator:

```
[[12 14]
 [16 18]]
```

Using Numpy Function:

```
[[12 14]
 [16 18]]
```

Input:

```
#Subtraction
resultarray=array1-array2
print("\nUsing Operator:\n",resultarray)
```

```
resultarray=np.subtract(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

Output:

```
Using Operator:
[[-10 -10]
 [-10 -10]]
```

```
Using Numpy Function:
[[-10 -10]
 [-10 -10]]
```

Input:

```
#Multiplication
resultarray=array1*array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.multiply(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

Output:

```
Using Operator:
[[11 24]
 [39 56]]
```

```
Using Numpy Function:
[[11 24]
 [39 56]]
```

Input:

```
#Division
resultarray=array1/array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.divide(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

Output:

```
Using Operator:
[[11 24]
 [39 56]]
```

```
Using Numpy Function:
[[0.09090909 0.16666667]
 [0.23076923 0.28571429]]
```

Input:

```
#MOD
resultarray=array1%array2
print("\nUsing Operator:\n",resultarray)
```

```
resultarray=np.mod(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

Output:

Using Operator: [[1 2 3] [4 5 6] [7 8 9]]

Using Numpy Function: [[1 2 3] [4 5 6] [7 8 9]]

Input:

```
#Dot Product
resultarray=np.dot(array1,array2)
print("",resultarray)
```

Output:

```
[[ 90  96 102]
 [216 231 246]
 [342 366 390]]
```

Input:

```
#Transpose
resultarray=np.transpose(array1)
print(resultarray)
```

Output:

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

#2 Horizontal and vertical stacking of Numpy Arrays

Input:

```
#2.1 Horizontal Stacking
resultarray=np.hstack((array1,array2))
resultarray
```

Output:

resultarray=np.hstack((array1,array2))

resultarray array([[1, 2, 3, 11, 12, 13], [4, 5, 6, 14, 15, 16], [7, 8, 9, 17, 18, 19]])

Input:

```
#2.2 Vertical Stacking
resultarray=np.vstack((array1,array2))
resultarray
```

Output:

```
array([[ 1, 2, 3], [ 4, 5, 6], [ 7, 8, 9], [11, 12, 13], [14, 15, 16], [17, 18, 19]])
```

#3 Custom sequence generation

Input:

```
#3.1 Range
nparray=np.arange(0,12,1).reshape(3,4)
nparray
```

Output:

```
array([[ 0, 1, 2, 3], [ 4, 5, 6, 7], [ 8, 9, 10, 11]])
```

Input:

```
#3.2 Linearly Separable
nparray=np.linspace(start=0,stop=24,num=12).reshape(3,4)
nparray
```

Output:

```
array([[ 0. , 2.18181818, 4.36363636, 6.54545455], [ 8.72727273, 10.90909091, 13.09090909,
15.27272727], [17.45454545, 19.63636364, 21.81818182, 24. ]])
```

Input:

```
#3.3 Empty Array
nparray=np.empty((3,3),int)
nparray
```

Output:

```
array([[ 90, 96, 102], [216, 231, 246], [342, 366, 390]])
```

Input:

```
#3.4 Emplly like some other array
nparray=np.empty_like(array1)
nparray
```

Output:

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

Input:

```
#3.5 Index Matrix
nparray=np.identity(3)
nparray
```

Output:

```
array([[1., 0., 0.], [0., 1., 0.], [0., 0., 1.]])
```

#4 Arithmetic and statistical operations,Mathmatical operations,bitwise operators

Input:

```
#4.1 Arithmetic operation
array1=np.array([1,2,3,4,5])
array2=np.array([11,12,13,14,15])
print(array1)
print(array2)
```

Output:

```
[1 2 3 4 5]
```

```
[11 12 13 14 15]
```

Input:

```
# Addition
print(np.add(array1,array2))
# Subtraction
print(np.subtract(array1,array2))
# Multiplication
print(np.multiply(array1,array2))
# Division
print(np.divide(array1,array2))
```

Output:

```
[12 14 16 18 20]
```

```
[-10 -10 -10 -10 -10] [11 24 39 56 75]
```

```
[0.09090909 0.16666667 0.23076923 0.28571429 0.33333333]
```

Input:

```
#4.2 Statistical and mathmatical operation
array1=np.array([1,2,3,4,5,9,6,7,8,9,9])
# Standard Deviation
print(np.std(array1))
#Minimum
print(np.min(array1))
#Summation
print(np.sum(array1))
#Median
print(np.median(array1))
```

```

#Mean
print(np.mean(array1))
#Mode
from scipy import stats
print("Most Frequent element=",stats.mode(array1)[0])
print("Number of Occarances=",stats.mode(array1)[1])
# Variance
print(np.var(array1))

```

Output:

2.7990553306073913

1

63 6.0

5.7272727272727275

Most Frequent element= [9]

Number of Occarances= [3]

Input:

```

#4.3 Bitwise Operator
array1=np.array([1,2,3],dtype=np.uint8)
array2=np.array([4,5,6])
# AND
resultarray=np.bitwise_and(array1,array2)
print(resultarray)
# OR
resultarray=np.bitwise_or(array1,array2)
print(resultarray)
#LeftShift
resultarray=np.left_shift(array1,2)
print(resultarray)
#RightShift
resultarray=np.right_shift(array1,2)
print(resultarray)

```

Output:

[0 0 2]

[5 7 7]

[4 8 12] [0 0 0]

Input:

```

print(np.binary_repr(10,8))
resultarray=np.left_shift(10,2)

```

```
print(resultarray)
print(np.binary_repr(np.left_shift(10,2),8))
```

Output:

00001010

40

00101000

#5 Copying and viewing array

Input:

```
#5.1 Copy
array1=np.arange(1,10)
print(array1)
newarray=array1.copy()
print(newarray)
##modification in Original Array
array1[0]=100
print(array1)
print(newarray)
```

Output:

[1 2 3 4 5 6 7 8 9]

[1 2 3 4 5 6 7 8 9]

[100 2 3 4 5 6 7 8 9]

[1 2 3 4 5 6 7 8 9]

Input:

```
#5.2 View
array1=np.arange(1,10)
print(array1)
newarray=array1.view()
print(newarray)
##modification in Original Array
array1[0]=100
print(array1)
print(newarray)
```

Output:

[1 2 3 4 5 6 7 8 9]

[1 2 3 4 5 6 7 8 9]

[100 2 3 4 5 6 7 8 9]

[100 2 3 4 5 6 7 8 9]

#6 Serching

Input:

```
#6 Serching
array1=np.array([[1,2,3,12,5,7],[94,5,6,7,89,44],[7,8,9,11,13,14]])
print(array1)
```

Output:

[[1 2 3 12 5 7]

[94 5 6 7 89 44]

[7 8 9 11 13 14]]

Input:

```
np.sort(array1,axis=0)#Horizontally Sort
```

Output:

array([[1, 2, 3, 7, 5, 7], [7, 5, 6, 11, 13, 14], [94, 8, 9, 12, 89, 44]])

Input:

```
np.sort(array1,axis=1)# Vertically Sort
```

Output:

array([[1, 2, 3, 5, 7, 12], [5, 6, 7, 44, 89, 94], [7, 8, 9, 11, 13, 14] 7]])

#7 Searching

Input:

```
#7 Searching
array1=np.array([1,2,3,12,5,7])
np.searchsorted(array1,7,side="left")#Perform Search After sorting
```

Output:

3

#8 Counting

Input:

```
#8 Counting
```



```
array1=np.array([1,2,3,12,5,7,0])
print(np.count_nonzero(array1))#Return total Non Zero element
print(np.nonzero(array1))#Return Index
print(array1.size)#Total Element
```

Output:

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

#9 Data Stacking

Input:

```
#9 Data Stacking
array1=np.array(np.arange(1,5).reshape(2,2))
print(array1)
array2=np.array(np.arange(11,15).reshape(2,2))
print(array2)
```

Output:

[[1 2] [3 4]] [[11 12] [13 14]]

Input:

```
newarray=np.stack([array1,array2],axis=0)
print(newarray)
```

Output:

[[[1 2] [3 4]]

[[11 12]

[13 14]]]

Input:

```
newarray=np.stack([array1,array2],axis=1)
print(newarray)
```

Output:

[[[1 2]

[11 12]]

[[3 4]

[13 14]]]

#10 Append

Input:

```
#10 Append
array1=np.arange(1,10).reshape(3,3)
print(array1)
array2=np.arange(21,30).reshape(3,3)
print(array2)
```

Output:

```
[[1 2 3] [4 5 6] [7 8 9]] [[21 22 23] [24 25 26] [27 28 29]]
```

Input:

```
np.append(array1,array2,axis=0)
```

Output:

```
array([[ 1,  2,  3], [ 4,  5,  6], [ 7,  8,  9], [21, 22, 23], [24, 25, 26], [27, 28, 29]])
```

Input:

```
np.append(array1,array2,axis=1)
```

Output:

```
array([[ 1,  2,  3, 21, 22, 23], [ 4,  5,  6, 24, 25, 26], [ 7,  8,  9, 27, 28, 29]])
```

#11 Concat

Input:

```
#11 Concat
array1=np.arange(1,10).reshape(3,3)
print(array1)
array2=np.arange(21,30).reshape(3,3)
print(array2)
```

Output:

```
[[1 2 3] [4 5 6] [7 8 9]] [[21 22 23] [24 25 26] [27 28 29]]
```

Assignment 3.2

Input:

```
import numpy as np
d1=np.genfromtxt("/content/testmarks1.csv",delimiter=",")
print(d1)
EDS=d1[:,1]
print(type(EDS))
print(max(EDS))
```

Output:

```
[[ nan      nan      nan      nan      nan]
 [801.      43.05    27.79    28.7     27.79]
 [802.      43.47    28.52    28.98    27.89]
 [803.      42.24    28.16    28.16    25.63]
 [804.      39.24    26.16    26.16    26.16]
 [805.      40.9     26.03    27.27    25.65]
 [806.      39.47    26.31    26.31    25.21]
 [807.      41.68    25.63    27.79    25.46]
 [808.      42.19    27.61    28.13    26.21]
 [809.      44.75    28.35    29.83    28.21]
 [810.      46.95    28.88    31.3     28.53]]
<class 'numpy.ndarray'>
Nan
```

Input:

```
import numpy as np
d2=np.genfromtxt("/content/testmarks2.csv",delimiter=",")
print(d2)
EDS=d1[:,1]
print(type(EDS))
print(max(EDS))
```

Output:

```
[[ nan      nan      nan      nan      nan]
 [801.      28.48    34.18    30.56    22.23]
 [802.      28.1     33.72    30.68    22.82]
 [803.      26.16    31.39    28.2     22.53]
 [804.      26.16    31.39    28.78    20.93]
 [805.      26.1     31.32    28.22    20.82]
 [806.      25.45    30.54    27.73    21.05]
 [807.      26.16    31.39    28.01    20.51]
 [808.      27.44    32.93    28.83    22.08]
 [809.      28.63    34.35    31.03    22.68]
 [810.      30.35    36.42    31.38    23.1 ]]]
<class 'numpy.ndarray'>
Nan
```

input:

```
import numpy as np
d1=np.genfromtxt("/content/testmarks1.csv",delimiter=",")
print(d1)
EDS=d1[1:,1]
print(type(EDS))
print(max(EDS))
```

Output:

```
[[ nan      nan      nan      nan      nan]
 [801.      43.05    27.79    28.7     27.79]
```

```
[802.    43.47  28.52  28.98  27.89]
[803.    42.24  28.16  28.16  25.63]
[804.    39.24  26.16  26.16  26.16]
[805.    40.9   26.03  27.27  25.65]
[806.    39.47  26.31  26.31  25.21]
[807.    41.68  25.63  27.79  25.46]
[808.    42.19  27.61  28.13  26.21]
[809.    44.75  28.35  29.83  28.21]
[810.    46.95  28.88  31.3   28.53]]
<class 'numpy.ndarray'>
46.95
```

Input:

```
import numpy as np
d1=np.genfromtxt("/content/testmarks2.csv",delimiter=",")
print(d2)
EDS=d1[1:,1]
print(type(EDS))
print(max(EDS))
```

Output:

```
[[ nan      nan      nan      nan      nan]
 [801.    28.48  34.18  30.56  22.23]
 [802.    28.1   33.72  30.68  22.82]
 [803.    26.16  31.39  28.2   22.53]
 [804.    26.16  31.39  28.78  20.93]
 [805.    26.1   31.32  28.22  20.82]
 [806.    25.45  30.54  27.73  21.05]
 [807.    26.16  31.39  28.01  20.51]
 [808.    27.44  32.93  28.83  22.08]
 [809.    28.63  34.35  31.03  22.68]
 [810.    30.35  36.42  31.38  23.1  ]]
```

```
<class 'numpy.ndarray'>
30.35
```

Input:

```
d1=np.genfromtxt("/content/testmarks1.csv",delimiter=",")
print(d1)
EDS=d1[1:,1]
print(type(EDS))
print(max(EDS))
np.count_nonzero(EDS>40)
```

Output:

```
[[ nan nan nan nan nan]
 [801. 43.05 27.79 28.7 27.79]
 [802. 43.47 28.52 28.98 27.89]
 [803. 42.24 28.16 28.16 25.63]
 [804. 39.24 26.16 26.16 26.16]
 [805. 40.9 26.03 27.27 25.65]
 [806. 39.47 26.31 26.31 25.21]
 [807. 41.68 25.63 27.79 25.46]
```

```
[808.  42.19  27.61  28.13  26.21]
[809.  44.75  28.35  29.83  28.21]
[810.  46.95  28.88  31.3   28.53]]
<class 'numpy.ndarray'>
46.95
8
```

Input:

```
d1=np.genfromtxt("/content/testmarks2.csv",delimiter=",")
print(d2)
EDS=d1[1:,1]
print(type(EDS))
print(max(EDS))
np.count_nonzero(EDS>40)
```

Output:

```
[[ nan  nan  nan  nan  nan]
 [801.  28.48  34.18  30.56  22.23]
 [802.  28.1   33.72  30.68  22.82]
 [803.  26.16  31.39  28.2   22.53]
 [804.  26.16  31.39  28.78  20.93]
 [805.  26.1   31.32  28.22  20.82]
 [806.  25.45  30.54  27.73  21.05]
 [807.  26.16  31.39  28.01  20.51]
 [808.  27.44  32.93  28.83  22.08]
 [809.  28.63  34.35  31.03  22.68]
 [810.  30.35  36.42  31.38  23.1 ]]
<class 'numpy.ndarray'>
30.35
0
```

Input:

```
#Addition
result=d1+d2
print("\nUsing Operator:\n",result)
resultarray=np.add(d1,d2)
print("\nUsing Numpy Function:\n",result)
```

Output:

```
Using Operator:
[[  nan      nan      nan      nan      nan]
 [1602.    56.96    68.36    61.12    44.46]
 [1604.    56.2     67.44    61.36    45.64]
 [1606.    52.32    62.78    56.4     45.06]
 [1608.    52.32    62.78    57.56    41.86]
 [1610.    52.2     62.64    56.44    41.64]
 [1612.    50.9     61.08    55.46    42.1  ]
 [1614.    52.32    62.78    56.02    41.02]
 [1616.    54.88    65.86    57.66    44.16]
 [1618.    57.26    68.7     62.06    45.36]
```

```
[1620.      60.7      72.84      62.76      46.2  ]]
```

Using Numpy Function:

[nan	nan	nan	nan	nan]
[1602.	56.96	68.36	61.12	44.46]	
[1604.	56.2	67.44	61.36	45.64]	
[1606.	52.32	62.78	56.4	45.06]	
[1608.	52.32	62.78	57.56	41.86]	
[1610.	52.2	62.64	56.44	41.64]	
[1612.	50.9	61.08	55.46	42.1]	
[1614.	52.32	62.78	56.02	41.02]	
[1616.	54.88	65.86	57.66	44.16]	
[1618.	57.26	68.7	62.06	45.36]	
[1620.	60.7	72.84	62.76	46.2]]	

Input:

```
#Subtraction
resul=d1-d2
print("\nUsing Operator:\n",resul)
resultarray=np.subtract(d1,d2)
print("\nUsing Numpy Function:\n",result)
```

```
print("\nUsing Numpy Function:\n",result)
```

Output:

Using Operator:

	nan	nan	nan	nan	nan
[1602.	56.96	68.36	61.12	44.46]	
[1604.	56.2	67.44	61.36	45.64]	
[1606.	52.32	62.78	56.4	45.06]	
[1608.	52.32	62.78	57.56	41.86]	
[1610.	52.2	62.64	56.44	41.64]	
[1612.	50.9	61.08	55.46	42.1]	
[1614.	52.32	62.78	56.02	41.02]	
[1616.	54.88	65.86	57.66	44.16]	
[1618.	57.26	68.7	62.06	45.36]	
[1620.	60.7	72.84	62.76	46.2]]	

Using Numpy Function:

	nan	nan	nan	nan	nan]
[1602.	56.96	68.36	61.12	44.46]	
[1604.	56.2	67.44	61.36	45.64]	
[1606.	52.32	62.78	56.4	45.06]	
[1608.	52.32	62.78	57.56	41.86]	
[1610.	52.2	62.64	56.44	41.64]	
[1612.	50.9	61.08	55.46	42.1]	
[1614.	52.32	62.78	56.02	41.02]	
[1616.	54.88	65.86	57.66	44.16]	
[1618.	57.26	68.7	62.06	45.36]	
[1620.	60.7	72.84	62.76	46.2]]	

Input:

```
#Division
resultarry=d1/d2
print("\nUsing Operator:\n",result)
resultarray=np.divide(d1,d2)
print("\nUsing Numpy Function:\n",result)
```

Output:

Using Operator:

	nan	nan	nan	nan	nan]
[1602.	56.96	68.36	61.12	44.46]	
[1604.	56.2	67.44	61.36	45.64]	
[1606.	52.32	62.78	56.4	45.06]	
[1608.	52.32	62.78	57.56	41.86]	
[1610.	52.2	62.64	56.44	41.64]	
[1612.	50.9	61.08	55.46	42.1]	
[1614.	52.32	62.78	56.02	41.02]	
[1616.	54.88	65.86	57.66	44.16]	
[1618.	57.26	68.7	62.06	45.36]	
[1620.	60.7	72.84	62.76	46.2]]	

Using Numpy Function:

	nan	nan	nan	nan	nan]
[1602.	56.96	68.36	61.12	44.46]	

```
[1604.    56.2    67.44    61.36    45.64]
[1606.    52.32    62.78    56.4     45.06]
[1608.    52.32    62.78    57.56    41.86]
[1610.    52.2     62.64    56.44    41.64]
[1612.    50.9     61.08    55.46    42.1  ]
[1614.    52.32    62.78    56.02    41.02]
[1616.    54.88    65.86    57.66    44.16]
[1618.    57.26    68.7     62.06    45.36]
[1620.    60.7     72.84    62.76    46.2  ]]
```

Input:

```
#MOD
resultarry=d1%d2
print("\nUsing Operator:\n",result)
resultarray=np.mod(d1,d2)
print("\nUsing Numpy Function:\n",result)
```

Output:

```
Using Operator:
[[      nan      nan      nan      nan      nan]
 [1602.    56.96    68.36    61.12    44.46]
 [1604.    56.2     67.44    61.36    45.64]
 [1606.    52.32    62.78    56.4     45.06]
 [1608.    52.32    62.78    57.56    41.86]
 [1610.    52.2     62.64    56.44    41.64]
 [1612.    50.9     61.08    55.46    42.1  ]
 [1614.    52.32    62.78    56.02    41.02]
 [1616.    54.88    65.86    57.66    44.16]
 [1618.    57.26    68.7     62.06    45.36]
 [1620.    60.7     72.84    62.76    46.2  ]]
```

```
Using Numpy Function:
[[      nan      nan      nan      nan      nan]
 [1602.    56.96    68.36    61.12    44.46]
 [1604.    56.2     67.44    61.36    45.64]
 [1606.    52.32    62.78    56.4     45.06]
 [1608.    52.32    62.78    57.56    41.86]
 [1610.    52.2     62.64    56.44    41.64]
 [1612.    50.9     61.08    55.46    42.1  ]
 [1614.    52.32    62.78    56.02    41.02]
 [1616.    54.88    65.86    57.66    44.16]
 [1618.    57.26    68.7     62.06    45.36]
 [1620.    60.7     72.84    62.76    46.2  ]]
```

Input:

```
#Dot Product
resultarray=np.dot(d1,d2)
print("",resultarray)
```

Output:

Input:

```
#Transpose
```



```
resultarray=np.transpose(d1)
print(resultarray)
```

Output:

```
[[ nan 801.  802.  803.  804.  805.  806.  807.  808.  809.
 810. ]
 [ nan 28.48 28.1 26.16 26.16 26.1 25.45 26.16 27.44 28.63
 30.35]
 [ nan 34.18 33.72 31.39 31.39 31.32 30.54 31.39 32.93 34.35
 36.42]
 [ nan 30.56 30.68 28.2 28.78 28.22 27.73 28.01 28.83 31.03
 31.38]
 [ nan 22.23 22.82 22.53 20.93 20.82 21.05 20.51 22.08 22.68
 23.1 ]]
```

Input:

```
#Mean
resultd=d1+d2/2

print("\nUsing Operator:\n",resultd)
resultd=np.add(d1,d2)
print("\nUsing NumpyFunction:\n",resultd)
```

Output:

```
Using Operator:
[[ nan nan nan nan nan]
 [1201.5 42.72 51.27 45.84 33.345]
 [1203. 42.15 50.58 46.02 34.23 ]
 [1204.5 39.24 47.085 42.3 33.795]
 [1206. 39.24 47.085 43.17 31.395]
 [1207.5 39.15 46.98 42.33 31.23 ]
 [1209. 38.175 45.81 41.595 31.575]
 [1210.5 39.24 47.085 42.015 30.765]
 [1212. 41.16 49.395 43.245 33.12 ]
 [1213.5 42.945 51.525 46.545 34.02 ]
 [1215. 45.525 54.63 47.07 34.65 ]]
```

Using NumpyFunction:

```
[[ nan nan nan nan]
 [1602. 56.96 68.36 61.12 44.46]
 [1604. 56.2 67.44 61.36 45.64]
 [1606. 52.32 62.78 56.4 45.06]
 [1608. 52.32 62.78 57.56 41.86]
 [1610. 52.2 62.64 56.44 41.64]
 [1612. 50.9 61.08 55.46 42.1 ]
 [1614. 52.32 62.78 56.02 41.02]
 [1616. 54.88 65.86 57.66 44.16]
 [1618. 57.26 68.7 62.06 45.36]
 [1620. 60.7 72.84 62.76 46.2 ]]
```

Input:

```
#Horizontal Stacking
```

```
resultarray=np.hstack((d1,d2))
resultarray
```

Output:

```
array([[ nan, nan, nan, nan, nan, nan, nan, nan, nan], [801. ,
28.48, 34.18, 30.56, 22.23, 801. , 28.48, 34.18, 30.56, 22.23], [802. ,
28.1 , 33.72, 30.68, 22.82, 802. , 28.1 , 33.72, 30.68, 22.82], [803. ,
26.16, 31.39, 28.2 , 22.53, 803. , 26.16, 31.39, 28.2 , 22.53], [804. ,
26.16, 31.39, 28.78, 20.93, 804. , 26.16, 31.39, 28.78, 20.93], [805. ,
26.1 , 31.32, 28.22, 20.82, 805. , 26.1 , 31.32, 28.22, 20.82], [806. ,
25.45, 30.54, 27.73, 21.05, 806. , 25.45, 30.54, 27.73, 21.05], [807. ,
26.16, 31.39, 28.01, 20.51, 807. , 26.16, 31.39, 28.01, 20.51], [808. ,
27.44, 32.93, 28.83, 22.08, 808. , 27.44, 32.93, 28.83, 22.08], [809. ,
28.63, 34.35, 31.03, 22.68, 809. , 28.63, 34.35, 31.03, 22.68], [810. ,
30.35, 36.42, 31.38, 23.1 , 810. , 30.35, 36.42, 31.38, 23.1 ]])
```

Input:

```
#2.2 Vertical Stacking
resultarray=np.vstack((d1,d2))
resultarray
```

Output:

```
array([[ nan, nan, nan, nan, nan], [801. , 28.48, 34.18, 30.56, 22.23],
[802. , 28.1 , 33.72, 30.68, 22.82], [803. , 26.16, 31.39, 28.2 ,
22.53], [804. , 26.16, 31.39, 28.78, 20.93], [805. , 26.1 , 31.32,
28.22, 20.82], [806. , 25.45, 30.54, 27.73, 21.05], [807. , 26.16,
31.39, 28.01, 20.51], [808. , 27.44, 32.93, 28.83, 22.08], [809. ,
28.63, 34.35, 31.03, 22.68], [810. , 30.35, 36.42, 31.38, 23.1 ], [
nan, nan, nan, nan, nan], [801. , 28.48, 34.18, 30.56, 22.23], [802. ,
28.1 , 33.72, 30.68, 22.82], [803. , 26.16, 31.39, 28.2 , 22.53], [804.
, 26.16, 31.39, 28.78, 20.93], [805. , 26.1 , 31.32, 28.22, 20.82],
[806. , 25.45, 30.54, 27.73, 21.05], [807. , 26.16, 31.39, 28.01,
20.51], [808. , 27.44, 32.93, 28.83, 22.08], [809. , 28.63, 34.35,
31.03, 22.68], [810. , 30.35, 36.42, 31.38, 23.1 ]])
```

Input:

```
#3.1 Range
nparray=np.arange(0,12,1).reshape(3,4)
nparray
```

Output:

```
array([[ 0,  1,  2,  3], [ 4,  5,  6,  7], [ 8,  9, 10, 11]])
```

Input:

```
#3.2 Linearly Separable
nparray=np.linspace(start=0,stop=24,num=12).reshape(3,4)
nparray
```

Output:

```
array([[ 0. ,  2.18181818,  4.36363636,  6.54545455], [ 8.72727273,
10.90909091, 13.09090909, 15.27272727], [17.45454545, 19.63636364,
21.81818182, 24. ]])
```

Input:

```
#3.3 Empty Array
nparray=np.empty((3,3),int)
nparray
```

Input:

```
#3.4 Empty like some other array
nparray=np.empty_like(d1)
nparray
```

Output:

```
array([[nan, nan, nan, nan, nan],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 0.,  0.,  0.,  0.,  0.]])
```

Input:

```
#3.5 Index Matrix
nparray=np.identity(3)
nparray
```

Output:

```
array([[1.,  0.,  0.], [0.,  1.,  0.], [0.,  0.,  1.]])
```

Input:

```
#4.1 Arithmetic operation
array1=np.array([1,2,3,4,5])
array2=np.array([11,12,13,14,15])
print(d1)
print(d2)
```

Output:

```
[[   nan     nan     nan     nan     nan]
 [801.    28.48  34.18  30.56  22.23]]
```

```
[802.      28.1      33.72      30.68      22.82]
[803.      26.16      31.39      28.2       22.53]
[804.      26.16      31.39      28.78      20.93]
[805.      26.1       31.32      28.22      20.82]
[806.      25.45      30.54      27.73      21.05]
[807.      26.16      31.39      28.01      20.51]
[808.      27.44      32.93      28.83      22.08]
[809.      28.63      34.35      31.03      22.68]
[810.      30.35      36.42      31.38      23.1 ] ]
[ [      nan         nan         nan         nan         nan]
[801.      28.48      34.18      30.56      22.23]
[802.      28.1       33.72      30.68      22.82]
[803.      26.16      31.39      28.2       22.53]
[804.      26.16      31.39      28.78      20.93]
[805.      26.1       31.32      28.22      20.82]
[806.      25.45      30.54      27.73      21.05]
[807.      26.16      31.39      28.01      20.51]
[808.      27.44      32.93      28.83      22.08]
[809.      28.63      34.35      31.03      22.68]
[810.      30.35      36.42      31.38      23.1 ] ]
```

Input:

```
# Addition
print(np.add(d1,d2))
# Subtraction
print(np.subtract(d1,d2))
# Multiplication
print(np.multiply(d1,d2))
# Division
print(np.divide(d1,d2))
```

Output:

[illegible]

```

[[ nan nan nan nan
nan]
[6.4160100e+05 8.1111040e+02 1.1682724e+03 9.3391360e+02
4.9417290e+02]
[6.4320400e+05 7.8961000e+02 1.1370384e+03 9.4126240e+02
5.2075240e+02]
[6.4480900e+05 6.8434560e+02 9.8533210e+02 7.9524000e+02
5.0760090e+02]
[6.4641600e+05 6.8434560e+02 9.8533210e+02 8.2828840e+02
4.3806490e+02]
[6.4802500e+05 6.8121000e+02 9.8094240e+02 7.9636840e+02
4.3347240e+02]
[6.4963600e+05 6.4770250e+02 9.3269160e+02 7.6895290e+02
4.4310250e+02]
[6.5124900e+05 6.8434560e+02 9.8533210e+02 7.8456010e+02
4.2066010e+02]
[6.5286400e+05 7.5295360e+02 1.0843849e+03 8.3116890e+02
4.8752640e+02]
[6.5448100e+05 8.1967690e+02 1.1799225e+03 9.6286090e+02
5.1438240e+02]
[6.5610000e+05 9.2112250e+02 1.3264164e+03 9.8470440e+02
5.3361000e+02]]
[[nan nan nan nan nan]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]
[ 1.  1.  1.  1.  1.]]

```

Input:

```

# Standard Deviation
print(np.std(d1))
#Minimum
print(np.min(d1))
#Summation
print(np.sum(d1))
#Median
print(np.median(d1))
#Mean
print(np.mean(d1))
#Mode
from scipy import stats
print("Most Frequent element=",stats.mode(d1)[0])
print("Number of Occarances=",stats.mode(d1)[1])
# Variance
print(np.var(d1))

```

Output:

nan nan nan nan nan Most Frequent element= [[801. 39.24 25.63 26.16 25.21]] Number of Occarances= [[1 1 1 1 1]]