In [1]:
```
#comparisons,amsks and boolean logic
#masking plays a role when you count or modify or extract data based on a criterion
```

In [18]:
```
#comparison operators as ufuncs
import numpy as np
x=np.arange(0,5)
print("x=",x)
print("Array x>2",x>2)
print("Array x<3",x<3)
print("Array x not equal to 2",x!=2)
print("Array x equal to 2",x==2)
print("Array of odd numbers",x%2==1)
#result arrays of above operations is called a boolean arrays
```

```
x= [0 1 2 3 4]
Array x>2 [False False False  True  True]
Array x<3 [ True  True  True False False]
Array x not equal to 2 [ True  True False  True  True]
Array x equal to 2 [False False  True False False]
Array of odd numbers [False  True False  True False]
```

In [29]:
```
#for counting true entries we use count_nonzero
print("x=",x)
print("Number of even numbers:",np.count_nonzero(x%2==0))
print("Number of elements greater than 2:",np.count_nonzero(x>2))
#using sum method we can do the same but in both rows and columns seperately
print("Number of odd elements in array:",np.sum(x%2==1))
print("Is any value of array x greater than 3?",np.any(x>3))
print("Are all values of the array x greater than -1?",np.all(x>-1))
```

```
x= [0 1 2 3 4]
Number of even numbers: 3
Number of elements greater than 2: 2
Number of odd elements in array: 2
Is any value of array x greater than 3? True
Are all values of the array x greater than -1? True
```

In [45]:
```
#for boolean logic in numpy bitwise operators of python are used
print("e=")
e=np.array([1,2,3,4,5,6,7,8,9,10])
print(e)
print("Number of elements of array e which are odd and greater than 3:",np.sum((e>3) & (e%2==1)))# &-and operator
print("Number of elements which are multiples of 3 or less than 6:",np.sum((e%3==0)|(e<6)))# |-or operator
print("Number of elements which greater than 5 and not even:",np.sum((e>5) & (~(e%2==0))))# ~ not operator
```

```
e=
[ 1  2  3  4  5  6  7  8  9 10]
Number of elements of array e which are odd and greater than 3: 3
Number of elements which are multiples of 3 or less than 6: 7
Number of elements which greater than 5 and not even: 2
```

In [50]:
```
#boolean arrays as masks
#to obtain necessary values as seperate array we use masking process
c=np.random.randint(0,10,(4,3))
print("c=")
print(c)
c1=c[c<5]#masking
#by this process we are storing the values that are less than 5 in a seperate array
print("Values that are less than 5 in c=")
print(c1)
```

```
c=
[[4 7 1]
 [4 9 7]
 [5 2 9]
 [1 3 8]]
Values that are less than 5 in c=
[4 1 4 2 1 3]
```

In [ ]:
```
```