NumPy Exercises

Now that we've learned about NumPy let's test your knowledge. We'll start off with a few simple tasks, and then you'll be asked some more complicated questions.

Import NumPy as np

In [34]:
```
import numpy as np
```

Create an array of 10 zeros

In [36]:
```
arr = np.array([0]*10)
```

In [37]:
```
arr
```

Out[37]:
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

Create an array of 10 ones

In [39]:
```
arr_ones = np.ones((1)*10)
```

In [40]:
```
arr_ones
```

Out[40]:
```
array([1., 1., 1., 1., 1., 1., 1., 1., 1., 1.])
```

Create an array of 10 fives

In [42]:
```
arr_fives = np.array([5]*10)
```

In [43]:
```
arr_fives
```

Out[43]:
```
array([5, 5, 5, 5, 5, 5, 5, 5, 5, 5])
```

Create an array of the integers from 10 to 50

In [44]:
```
arr_arange = np.arange(10,51)
```

In [45]:
```
arr_arange
```

Out[45]:
```
array([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, 50])
```

Create an array of all the even integers from 10 to 50

In [46]:
```
arr_even = np.arange(10,51,2)
```

In [47]:
```
arr_even
```

Out[47]:
```
array([10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42,
       44, 46, 48, 50])
```

Create a 3x3 matrix with values ranging from 0 to 8

In [48]:
```
arr_val = np.arange(9).reshape(3,3)
```

In [49]:
```
arr_val
```

Out[49]:
```
array([[0, 1, 2],
       [3, 4, 5],
       [6, 7, 8]])
```

Create a 3x3 identity matrix

In [50]:
```
identity_matrix = np.eye(3)
```

In [51]:
```
identity_matrix
```

Out[51]:
```
array([[1., 0., 0.],
       [0., 1., 0.],
       [0., 0., 1.]])
```

Use NumPy to generate a random number between 0 and 1

In [52]:
```
rand_nums = np.random.rand(1)
```

In [53]:
```
rand_nums
```

Out[53]:
```
array([0.37266609])
```

Use NumPy to generate an array of 25 random numbers sampled from a standard normal distribution

In [54]:
```
ran_25 = np.random.randn(25)
```

In [56]:
```
ran_25
```

Out[56]:
```
array([-0.25729797,  0.03613467, -1.0679011 ,  0.85538505,  1.21964165,
       -0.16852472,  0.49654254, -0.65534152, -0.86438027,  1.22151673,
        0.72187239, -1.63604915,  0.4990157 ,  0.60757282, -0.15950911,
        2.17175913, -1.91587324, -0.69474991,  0.64223923,  0.36507357,
       -1.17183107,  0.87532009,  0.26666783, -0.28463055,  1.13343603])
```

Create the following matrix:

In [57]:
```
mat1 = np.arange(1,101).reshape(10,10)/100
```

In [58]:
```
mat1
```

Out[58]:
```
array([[0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.1 ],
       [0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2 ],
       [0.21, 0.22, 0.23, 0.24, 0.25, 0.26, 0.27, 0.28, 0.29, 0.3 ],
       [0.31, 0.32, 0.33, 0.34, 0.35, 0.36, 0.37, 0.38, 0.39, 0.4 ],
       [0.41, 0.42, 0.43, 0.44, 0.45, 0.46, 0.47, 0.48, 0.49, 0.5 ],
       [0.51, 0.52, 0.53, 0.54, 0.55, 0.56, 0.57, 0.58, 0.59, 0.6 ],
       [0.61, 0.62, 0.63, 0.64, 0.65, 0.66, 0.67, 0.68, 0.69, 0.7 ],
       [0.71, 0.72, 0.73, 0.74, 0.75, 0.76, 0.77, 0.78, 0.79, 0.8 ],
       [0.81, 0.82, 0.83, 0.84, 0.85, 0.86, 0.87, 0.88, 0.89, 0.9 ],
       [0.91, 0.92, 0.93, 0.94, 0.95, 0.96, 0.97, 0.98, 0.99, 1.  ]])
```

Create an array of 20 linearly spaced points between 0 and 1:

In [59]:
```
linear_arr =np.linspace(0,1,20)
```

In [60]:
```
linear_arr
```

Out[60]:
```
array([0.        , 0.05263158, 0.10526316, 0.15789474, 0.21052632,
       0.26315789, 0.31578947, 0.36842105, 0.42105263, 0.47368421,
       0.52631579, 0.57894737, 0.63157895, 0.68421053, 0.73684211,
       0.78947368, 0.84210526, 0.89473684, 0.94736842, 1.        ])
```

Numpy Indexing and Selection

Now you will be given a few matrices, and be asked to replicate the resulting matrix outputs:

In [61]:
```
mat = np.arange(1,26).reshape(5,5)
mat
```

Out[61]:
```
array([[ 1,  2,  3,  4,  5],
       [ 6,  7,  8,  9, 10],
       [11, 12, 13, 14, 15],
       [16, 17, 18, 19, 20],
       [21, 22, 23, 24, 25]])
```

In [39]:
```
mat[2:,1:]
```

Out[39]:
```
array([[12, 13, 14, 15],
       [17, 18, 19, 20],
       [22, 23, 24, 25]])
```

In [64]:
```
mat[3,4]
```

Out[64]:
```
20
```

In [65]:
```
mat[0:3,1:2]
```

Out[65]:
```
array([[ 2],
       [ 7],
       [12]])
```

In [42]:
```

```

Out[42]:
```
array([[ 2],
       [ 7],
       [12]])
```

In [66]:
```
mat[4, :]
```

Out[66]:
```
array([21, 22, 23, 24, 25])
```

In [46]:

Out[46]:
```
array([21, 22, 23, 24, 25])
```

In [32]:

In [49]:

Now do the following

Get the sum of all the values in mat

In [67]:
```
sum = mat.sum()
```

In [68]:
```
sum
```

Out[68]:
```
325
```

Get the standard deviation of the values in mat

In [69]:
```
dev = mat.std()
```

In [70]:
```
dev
```

Out[70]:
```
7.211102550927978
```

Get the sum of all the columns in mat

In [71]:
```
sum_all = mat.sum(axis=0)
```

In [72]:
```
sum_all
```

Out[72]:
```
array([55, 60, 65, 70, 75])
```

Great Job!