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1 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

[3]:
```
pip install numpy
import numpy as np
```

```
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Installing collected packages: numpy
Note: you may need to restart the kernel to use updated packages.

  WARNING: Failed to write executable - trying to use .deleteme logic
ERROR: Could not install packages due to an OSError: [WinError 2] The system
cannot find the file specified: 'c:\\Python311\\Scripts\\f2py.exe' ->
'c:\\Python311\\Scripts\\f2py.exe.deleteme'


[notice] A new release of pip is available: 23.1.2 -> 23.2.1
[notice] To update, run: python.exe -m pip install --upgrade pip
```

Create an array of 10 zeros

[31]:
```
import numpy as np
z=np.zeros(10)
z
```

[31]:
```
array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

Create an array of 10 ones

[30]:
```
import numpy as np
u=np.ones(10)
u
```

[30]:
```
array([1., 1., 1., 1., 1., 1., 1., 1., 1., 1.])
```

Create an array of 10 fives

[29]:
```
import numpy as np
u=np.ones(10)*5
u
```

[29]:
```
array([5., 5., 5., 5., 5., 5., 5., 5., 5., 5.])
```

Create an array of the integers from 10 to 50

[28]:
```
import numpy as np
np.linspace(10,50,41)
```

[28]:
```
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

[27]:
```
import numpy as np
np.arange(10,50,2)
```

[27]:
```
array([10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42,
       44, 46, 48])
```

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

[26]:
```
import numpy as np
x= np.arange(0,9).reshape(3,3)
print(x)
```

```
[[0 1 2]
 [3 4 5]
 [6 7 8]]
```

Create a 3x3 identity matrix

[25]:
```
import numpy as np
x=np.eye(3)
x
```

[25]:
```
array([[1., 0., 0.],
       [0., 1., 0.],
       [0., 0., 1.]])
```

Use NumPy to generate a random number between 0 and 1

[24]:
```
import numpy as np
import random
np.random.random()
```

[24]:
```
0.17350181879553495
```

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

[21]:
```
import numpy as np
import random
```

```
print(np.random.normal(0,1,25))
```

```
[ 0.84473364 -0.33384032 -0.74387956 -0.04866638  0.31317284 -0.30620226
  2.49793854  0.92807252  0.93174132  0.46051033  0.65162162 -0.77708463
  1.29141737 -0.6417466  -0.21003633 -1.04048709  0.46428181 -1.41856879
  0.78823938 -0.40237214  0.48137174 -1.01264584  1.24969357 -1.03184866
 -1.48705284]
```

Create the following matrix:

[15]:
```
import numpy as np
x= np.arange(0.01,1.01,0.01).reshape(10,10)
print(x)
```

```
[[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:

[14]:
```
import numpy as np

num_line = np.linspace(0,1,20)

print(num_line)
```

```
[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.        ]
```

1.1 Numpy Indexing and Selection

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

[13]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat
```

[13]:
```
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]])
```

[12]:
```
# WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
# BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
# BE ABLE TO SEE THE OUTPUT ANY MORE
```

[11]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1=mat[2:,1:]
mat1
```

[11]:
```
array([[12, 13, 14, 15],
       [17, 18, 19, 20],
       [22, 23, 24, 25]])
```

[ ]:
```
# WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
# BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
# BE ABLE TO SEE THE OUTPUT ANY MORE
```

[10]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1=mat[3:4,4:]
mat1
```

[10]:
```
array([[20]])
```

[9]:
```
# WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
# BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
# BE ABLE TO SEE THE OUTPUT ANY MORE
```

[8]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1=mat[0:3,1:2]
mat1
```

[8]:
```
array([[ 2],
       [ 7],
       [12]])
```

[7]:
```
# WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
# BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
# BE ABLE TO SEE THE OUTPUT ANY MORE
```

[6]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1=mat[4:,0:]
```

```
mat1
```

[6]:
```
array([[21, 22, 23, 24, 25]])
```

[5]:
```
# WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
# BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
# BE ABLE TO SEE THE OUTPUT ANY MORE
```

[4]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1=mat[3:,0:]
mat1
```

[4]:
```
array([[16, 17, 18, 19, 20],
       [21, 22, 23, 24, 25]])
```

1.1.1 Now do the following

Get the sum of all the values in mat

[3]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1= np.sum(mat)
mat1
```

[3]:
```
325
```

Get the standard deviation of the values in mat

[2]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1= np.std(mat)
mat1
```

[2]:
```
7.211102550927978
```

Get the sum of all the columns in mat

[1]:
```
import numpy as np
mat = np.arange(1,26).reshape(5,5)
mat1= sum(mat)
mat1
```

[1]:
```
array([55, 60, 65, 70, 75])
```