NumPy

numpy is python's package for doing math that is more advanced than +-*/

This includes special functions like cosine, exponential, sqrt, ...

On top of this we can use numpy to generate samples from many types of random variables

numpy also has a powerful data type to define vectors, matrices, and tensors

With these data types numpy also allows us to do linear algebra - matrix multiplication and matrix-vector solutions

In [ ]:
```
# the first step of using numpy is to tell python to use it
import numpy as np
```

In [ ]:
```
print(np.cos(np.pi))
print(np.sqrt(1.21))
print(np.log(np.exp(5.2)))
```

In [ ]:
```
# we can create numpy arrays by converting lists
# this is a vector
vec = np.array([1,2,3])
print(vec)
# we can create matrices by converting lists of lists
mat = np.array([[1,2,1],[4,5,9],[1,8,9]])
print('')
print(mat)
print('')
print(mat.T)
```

In [ ]:
```
# there are lots of other ways to create numpy arrays
vec2 = np.arange(0,15)
print(vec2)
print('')
vec3 = np.arange(3,21,6)
print(vec3)
```

In [ ]:
```

vec4 = np.linspace(0,5,10)
print(vec4)
print('')
print(vec4.reshape(5,2))
vec4_reshaped = vec4.reshape(5,2)
print(vec4_reshaped)
print(vec4)
```