# ***Report***

# ***Minimum Time in mess***

importing required libraries

```
from scipy.stats import norm
import statistics
import matplotlib.pyplot as plt
import numpy as np
from scipy.stats import expon
import pandas
```

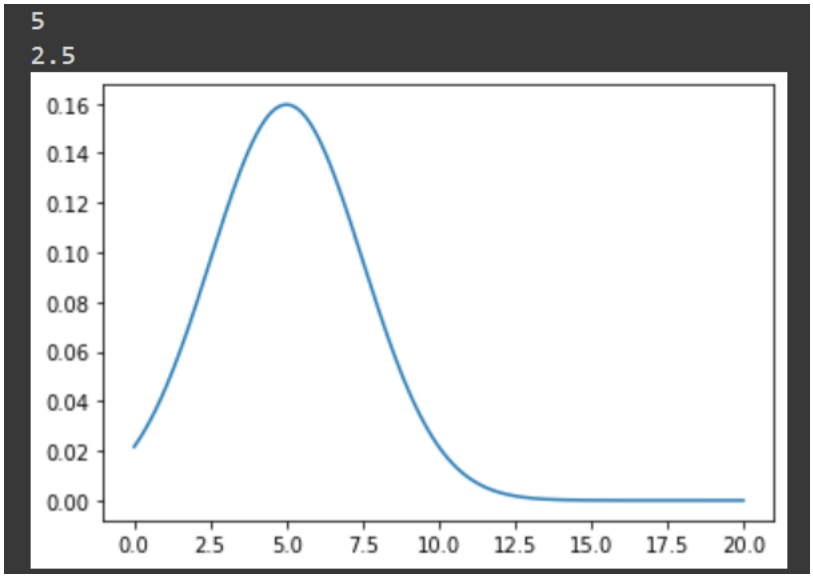
Defining a gaussian for entry rate:

Why gaussian?

Because we can assume 10(centre of x axis) to be feasible entry rate with highest probability

The other two ends of graph i.e. entry rate 0 and entry rate 20 can be assumed to be with lowest probability i.e. there are least chances of 20 or 0 persons entering in one sec, hence entry rate can be assumed to be gaussian.

```
entryrate = np.arange(0, 20, 0.01)
mean1 = 5
sd1 = 2.5
print(mean1)
print(sd1)
plt.plot(entryrate, norm.pdf(entryrate, mean1, sd1))
plt.show()
```




Defining a gaussian for service rate:

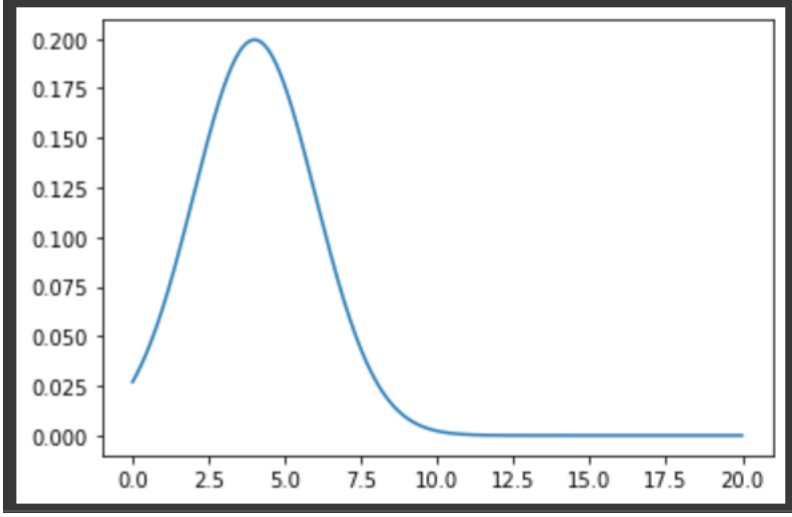
Why gaussian?

Because we can assume 10(centre of x axis) to be feasible service rate with highest probability

The other two ends of graph i.e. service rate 0 and service rate 20 can be assumed to be with lowest probability i.e. there are least chances of  serving 20  or 0 persons in one sec, hence service rate can be assumed to be gaussian.

```
servicerate = np.arange(0, 20, 0.01)
mean2 = 4
sd2 = 2
print(mean2)
print(sd2)
plt.plot(servicerate, norm.pdf(servicerate, mean2, sd2))
plt.show()
```

```
4
2
```




Defining a gaussian for eating time:

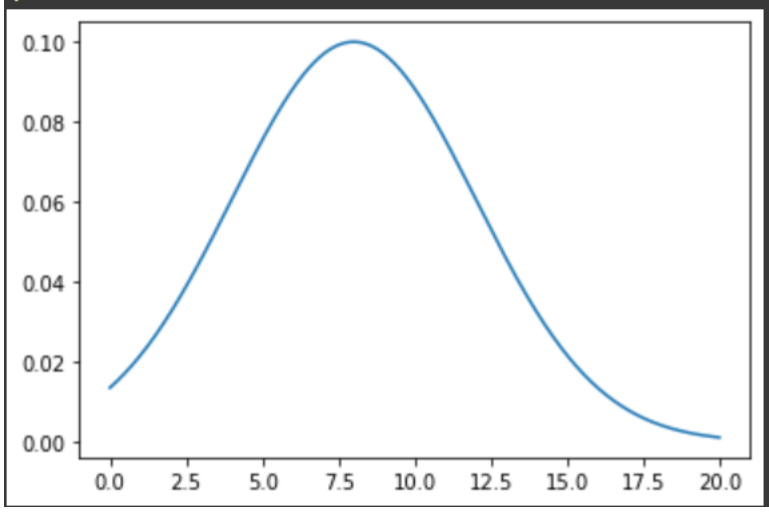
Why gaussian?

Because we can assume 10 seconds (centre of x axis) to be feasible eating time with highest probability.

The other two ends of graph i.e. eating time 0 seconds and 20 seconds can be assumed to be with lowest probability i.e. there are least chances of a person eating in 20 sec or 0 second, hence eating time can be assumed to be gaussian.

```
eatingtime = np.arange(0, 20, 0.01)
mean3 = 8
sd3 = 4
print(mean3)
print(sd3)
plt.plot(eatingtime, norm.pdf(eatingtime, mean3, sd3))
plt.show()
```

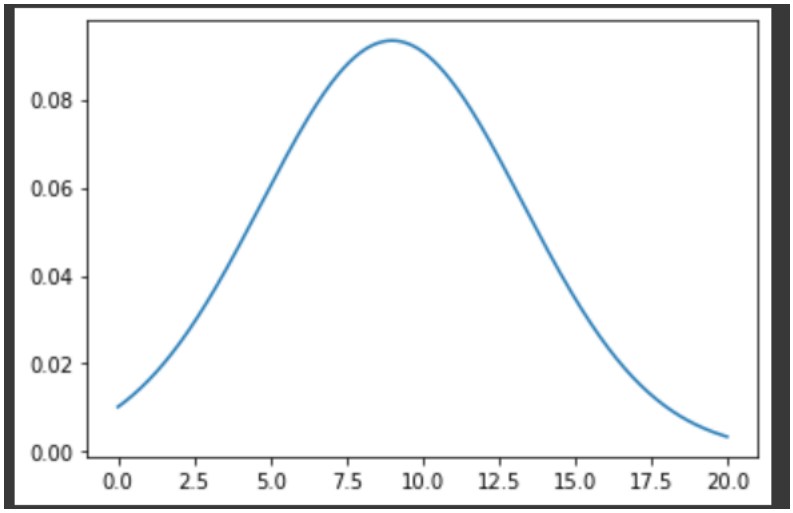
```
8
4
```




Adding normal random variable entry rate, subtracting normal random variable service rate(more the service rate less the time taken in mess) and adding normal random variable eating time will give a resultant normal random variable that will indicate minimum time spent in mess.

```
import matplotlib.pyplot as plt
import numpy as np
import scipy.stats as stats
import math

mu=mean1-mean2+mean3
variance=sd1*sd1-sd2*sd2+sd3*sd3
sigma = math.sqrt(variance)
minimumtime = np.arange(0, 20, 0.01)
plt.plot(minimumtime, stats.norm.pdf(minimumtime, mu, sigma))
plt.show()
```


0.08
0.06
0.04
0.02
0.00
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0