5. Consider a company that has two different divisions. The annual profits from the two divisions are independent and have distributions Profit1 ~ N(5, 32) and Profit2 ~ N(7, 42) respectively. Both the profits are in Million.
Answer the following questions about the total profit of the company in Rupees. Assume that $1 = Rs. 45
A. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.
B. Specify the 5th percentile of profit (in Rupees) for the company
C. Which of the two divisions has a larger probability of making a loss in a given year?

In [20]:
```
import numpy as np
from scipy import stats
from scipy.stats import norm
```

In [21]:
```
# Mean profits from two different divisions of a company = Mean1 + Mean2
Mean = 5+7
print('Mean Profit is Rs', Mean*45,'Million')
```

```
Mean Profit is Rs 540 Million
```

In [22]:
```
# Variance of profits from two different divisions of a company = SD^2 = SD1^2 + SD2^2
SD = np.sqrt((9)+(16))
print('Standard Deviation is Rs', SD*45, 'Million')
```

```
Standard Deviation is Rs 225.0 Million
```

A. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

In [23]:
```
print('Range is Rs',(stats.norm.interval(0.95,540,225)),'in Millions')
```

```
Range is Rs (99.00810347848784, 980.9918965215122) in Millions
```

B. Specify the 5th percentile of profit (in Rupees) for the company

In [24]:
```
# To compute 5th Percentile, we use the formula X=μ + Zσ; wherein from z table, 5 percentile = -1.645
X= 540+(-1.645)*(225)
print('5th percentile of profit (in Million Rupees) is',np.round(X,))
```

```
5th percentile of profit (in Million Rupees) is 170.0
```

C. Which of the two divisions has a larger probability of making a loss in a given year?

In [25]:
```
# Probability of Division 1 making a loss P(X<0)
stats.norm.cdf(0,5,3)
```

Out[25]:
```
0.0477903522728147
```

In [26]:
```
# Probability of Division 2 making a loss P(X<0)
stats.norm.cdf(0,7,4)
```

Out[26]:
```
0.040059156863817086
```

Probability of Division 1 making a loss in a given year is more than Division 2.