**Topics: Normal distribution, Functions of Random Variables**

1. The time required for servicing transmissions is normally distributed with *μ* = 45 minutes and *σ* = 8 minutes. The service manager plans to have work begin on the transmission of a customer’s car 10 minutes after the car is dropped off and the customer is told that the car will be ready within 1 hour from drop-off. What is the probability that the service manager cannot meet his commitment?
2. 0.3875
3. **0.2676**
4. 0.5
5. 0.6987

**Answer - 0.2676**

1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.
2. More employees at the processing center are older than 44 than between 38 and 44.

**False -**

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

**Ture**

1. If *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are *iid* normal random variables, then what is the difference between 2 *X*1 and *X*1 + *X*2? Discuss both their distributions and parameters.

**Answer- The 2 *X*1 and *X*1 + *X*2  are normal with mean μ1+ μ2. This case the variance of the sum depends on the correlation between X1 and X2**

1. Let X ~ N(100, 202). Find two values, *a* and *b*, symmetric about the mean, such that the probability of the random variable taking a value between them is 0.99.

**Answer- The Probability values between a and b is 0.99 and probability outside area for a and b is 0.01 (1-0.99)**

**a=0.01/2= -0.005**

**b=0.01/2=0.005**

**Z=(X- μ)/ σ 0.005 the Z value is -2.57 ( from Z table)**

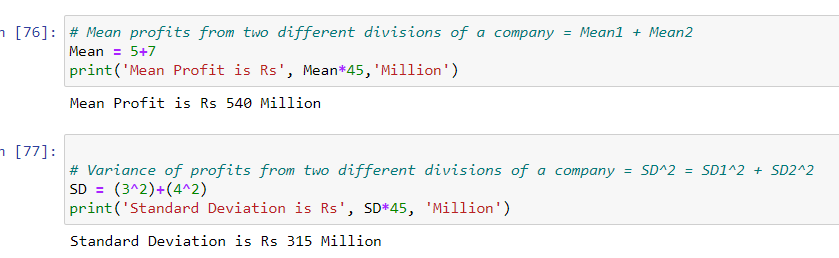
**Z\* σ- μ/X**

**a= -(-2.57)\*20\*100=151.4**

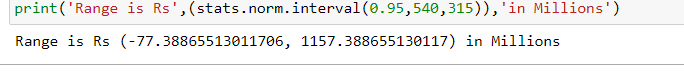
**b=(-2.57)\*20\*100=48.6**

**D is Answer**

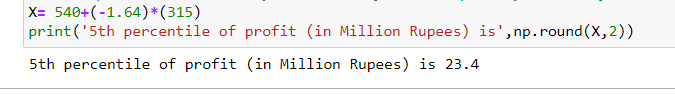
1. 90.5, 105.9
2. 80.2, 119.8
3. 22, 78
4. **48.5, 151.5**
5. 90.1, 109.9
6. Consider a company that has two different divisions. The annual profits from the two divisions are independent and have distributions Profit1 ~ N(5, 32) and Profit2 ~ N(7, 42) respectively. Both the profits are in $ Million. Answer the following questions about the total profit of the company in Rupees. Assume that $1 = Rs. 45



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

**Answer -** 

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



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

