**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

**Ans:- B. 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.
3. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

**Ans:-**

1. **P(x>44)=0.1587 p(38<x<44)=0.3413**

**The statement is False. The probability of employees aged from 38 to 44 is more.**

1. **N\*P(X<30)=36.49**

**The statement is true. The number of employees aged below 30 years attending training is 36.**

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.

**Ans:- s: If X1 = N(μ, σ2 ) and X2 = N(μ, σ2 )**

**Then, 2X1 = N(2μ, 4σ 2 ) and**

**X1 + X2 = N(μ, σ2 ) + N(μ, σ2 ) = N(2μ, 2σ 2 )**

**∴ 2 X1 – (X1 + X2) = N(2σ 2 )**

**2X1-(X1+X2) = N( 4µ,6 σ^2)**

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.
2. 90.5, 105.9
3. 80.2, 119.8
4. 22, 78
5. 48.5, 151.5
6. 90.1, 109.9

**Ans:- D. 48.5, 151.5**

1. 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
2. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.
3. Specify the 5th percentile of profit (in Rupees) for the company
4. Which of the two divisions has a larger probability of making a loss in a given year?

**Ans:-** **A. The range for 95% probability for the company is Rs. 99 to 980.99 Million.**

**B. The 5th percentile of profit for the company is 170 Million.**

**C. P(X1) = 4.78 % & P(X2) = 4 % Probability of Division 1 making a loss in a given year is more than Division 2**