**=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. FALSE, because

Percentage of people older than 44 = 15.86%. That is, only 63 people out of 400.

Percentage of People in between 44 and 38 = 34.13%. That is, only 136 out of 400

Which is less than half of 400

1. TRUE.
2. **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) iid- Independent Identically Distributed

Even it is SUM of two random variable or DIFFERENCE of two random variables, What all matters is the standard deviation.

X1+X2: - will follow the normal distribution

2X1: - it will double your values. We may lose actual mean, standard deviation

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)

Total profit = Profit 1 + Profit 2

1. Rs. 691.7010
2. Rs. 407.7942
3. Profit 1 have a larger probability of making a loss in a given year. Because, by observing both standard deviation, profit 2 involved in higher risk and high profit & Profit 1 have less standard deviation than profit 2