**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 Ans: 0.2676
4. 0.5
5. 0.6987
6. 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.
7. More employees at the processing center are older than 44 than between 38 and 44.

False : As 84% employee are having age less then 44

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

True: As about 9% of employs comes under age 30 and also out of 400 if we consider 9 % it will be 36 persons.

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:

In 2X1 : 2X1~N(2µ,4σ²) normally distributed with mean 2\*mean(X) = 2µ and variance var(2\*X1) = 4\*var(X1) = 4σ²

In X1+X2 : X1+X2~N(2µ,2σ²) normally distributed with mean mean(X)+ mean(Y) = µ+µ = 2µ and variance σ²+σ² = 2σ²

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 Ans: D
6. 90.1, 109.9
7. 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
8. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

Ans: $2.2 million to $21.79 million

i.e. 99million rupees to 980.55million rupees.

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

Ans : $3.775732 million i.e. 169.9079 million rupees

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

Ans: Second Division i.e. ~N(7,4²) has higher probability of making loss, due to higher variability.