**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.**

**A ] More employees at the processing center are older than 44 than between 38 and 44.**

**Ans:-** False because prob(38<x<44) > prob(x>44)

prob(x>44) = 0.1586

prob(38<x<44) = 0.3414

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

**Ans:-**  True because prob(x<30) = 9.12% , and 9.125 0f 400 = 36.48 which is around 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 :-** for 2X1,

= N((2mu), (2sigma)^2) = N(2(mu), 4(sigma)^2)

For X1+X2,

= N((mu), (sigma)^2) + N((mu), (sigma)^2) = N(2(mu), 2(sigma)^2)

For (2X1 - (X1+X2)),

=~N(4(mu), 6(sigma)^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**

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

Rupee ranges in between [9.9 to 98.1] Crore Rupees, 95% of the time for the Annual Profit of the Company.

**B. Specify the 5th percentile of profit (in Rupees) for the companyans**: The 5TH Percentile of profit for the company is 17 Crore Rupee

**C**. **Which of the two divisions has a larger probability of making a loss in a given year?** The Division #2 (Profit2 ~ N(7, 42) ) has a larger probability of making a loss in a given year