**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

**Z =(50-45)/8 =0.625**

**P = 1-prob(0.625) = 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 because prob(more than 44) = 16% and prob(between 38 and 44) = 34%**
3. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees. **True ; p(less than 30) = 0.09126**

**0.09123\*400 = 36.5**

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.

**Mean of 2X1 = 2μ Mean of X1 +X2 is μ +μ = 2μ. So the difference is 0.**

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
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.

**Profit ~(12,5)**

**For 95% probability we take 2\* standard deviation . so the range is [$2 – $22] i.e.[rs90-rs.990]**

1. Specify the 5th percentile of profit (in Rupees) for the company **rs170**
2. Which of the two divisions has a larger probability of making a loss in a given year?

**Prob of division1 making loss = 0.04779**

**Prob of division 2 making loss = 0.04**