**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**
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.

**Mean = 38**

**SD = 6**

**Z score = (Value - Mean)/SD**

**Z score for 44  = (44 - 38)/6  = 1  =>  84.13 %**

**People above 44 age = 100 - 84.13 =  15.87%  ≈  63    out of 400**

**Z score for 38  = (38 - 38)/6 = 0 => 50%**

**Hence People between 38 & 44  age = 84.13 - 50 = 34.13 % ≈  137 out of 400**

**Hence More employees at the processing center are older than 44 than between 38 and 44. is** F**ALSE**

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

**Z score for 30  = (30 - 38)/6 =  -1.33  =  9.15  %   ≈ 36 out of 400**

**Hence A training program for employees under the age of 30 at the center would be expected to attract about 36 employees** - **TRUE**

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.
2. 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.
3. 90.5, 105.9
4. 80.2, 119.8
5. 22, 78
6. **48.5, 151.5**
7. 90.1, 109.9
8. 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
9. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

**95% of the probability lies between 1.96 std dev of the mean**

**(12-1.96\*5,12+1.96\*5)**

**(2.2$,21.8$)**

**(99Rs,981RS)**

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

**P(z<=(p-12)/5)=0.05**

**From the z score table**

**(p-12)/5)=-1.644**

**P=12=8.22=3.78$**

**3.78\*45=170.1Rs**

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

**The first division**