**aTopics: 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

**ANSWER**: **Here, μ = 45, σ = 8 minutes, time taken for the service manager to complete work as per his plan is 50 minutes i.e =50**

**So** **the probability that the service manager meet his commitment= 0.****7340144709512995**

**the probability that the service manager cannot meet his commitment=1-.7340144709512995=0.26598552904870054**

**so the answer is B**

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

**ANSWER : p(x≤44)=** **0.841****3447460685429,p(x38)=.5**

**Therefore p(38x)=.3413447460685429**

**and p(x>44)=1-0.8413447460685429=0.15865525393145707 which is very**

**Low.**

**Hence, the statement is False**

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

**ANSWER:**

**P(x<30)= 0.09121121972586788**

**i.e approx. 9 %**

**And 400\*9/100=36**

**Hence the statement is 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.

**ANSWER:**

2 *X1* ~ *N*(2μ1, 4σ21)

*X*1 +*X*2~ *N*(μ1+ μ2, σ21+ σ22) ~ *N*(2μ,2 σ2)

AND 2 *X1 (X*1 +*X*2 *N*(2μ, 4σ2) *N*(2μ,2 σ2)=N(0,2 σ2)

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

**ANSWER:** **The probability of the random variable taking outside is .01**

**The probability totwards left from *a* =.005**

**The probability totwards left from *b*=.005**

**Z=(X-** **μ)/** **σ**

**AND Z=±2.57**

**When Z=+ 2.57**

**X=151.5**

**When Z=-2.57**

**X=48.5**

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.

**ANSWER For total profit , μ=12, σ=5,**

**(2.2001800772997306\*45, 21.79981992270027\*45)=(99,981)**

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

**ANSWER: For 5th percentile=-1.644  
AND for total profit , μ=12, σ=5,thus X=3.78$=170rupees**

B:Which of the two divisions has a larger probability of making a loss in a given year?

**ANSWER** .**Since standard deviation is more for profit2,the probability of making loss is also more for it.**