**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

**Answer: B is correct**

**Attached ipynb file.  
File Name= Assignments 2 code**

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 =False**

**p(x>44) =0.15 < P(38<x<44) =0.34. Therefore, there is more employee in bet 38 to 44 age than age is greater than 44.**

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

**Answer= True,**

**P(x<30)=0.01921**

**no of employee falls under age 30 is 0.01921\*400=36.4**

**That is equal to 36.**

**Attached ipynb file.  
File Name= Assignments 2 code**

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= Difference in these two normal random variables is with variance only. mean is same of them 2 X1 ~ N(2μ, 4σ2) andx1+x2~ N(2μ, 2σ2). Variance=square of SD**

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 given value between a and b should be 0.99.**

**So, the Probability of going wrong, or the Probability outside the a and b area is 0.01 (i.e., 1-0.99).**

**The Probability towards left from a = -0.005 (i.e., 0.01/2).**

**The Probability towards right from b = +0.005 (i.e., 0.01/2).**

**So, since we have the probabilities of a and b, we need to calculate X, the random variable at a**

**and b which has got these probabilities.**

**By ﬁnding the Standard Normal Variable Z (Z Value), we can calculate the X values.**

**Z= (X- μ) / σ**

**For Probability 0.005 the Z Value is -2.57 (from Z Table).**

**Z \* σ + μ = X**

**Z (-0.005) \*20+100 = -(-2.57) \*20+100 = 151.4**

**Z (+0.005) \*20+100 = (-2.57) \*20+100 = 48.6**

**So, option D is correct**

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:

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

**Attached ipynb file.  
File Name= Assignments 2 code**