**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: ITS SOLVED IN JUPYTER NOTEBOOK.

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

ANSWER: ITS SOLVED IN JUPYTER NOTEBOOK.

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: As we know that if X ∼N(μ1, σ1^2 ), and Y ∼N(μ2, σ2^2 ) are two independent random variables then X + Y ∼N(μ1 + μ2, σ1^2 + σ2^2 ) , and X − Y ∼N(μ1 − μ2, σ1^2 + σ2^2 ) .

Similarly if Z = aX + bY , where X and Y are as defined above, i.e Z is linear combination of X and Y , then Z ∼N(aμ1 + bμ2, a^2σ1^2 + b^2σ2^2 ).

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

=ANSWER: Option ‘D’ is correct,

Becouse , 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 = XZ(-0.005)\*20+100 = -(-2.57)\*20+100 = 151.4Z(+0.005)\*20+100 = (-2.57)\*20+100 = 48.6So,

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.

 Ans: Range is Rs (-77.38865513011706, 1157.388655130117) in Millions.

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

Ans: 5th percentile of profit (in Million Rupees) is 23.4.

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

Ans: Inference: Probability of Division 1 making a loss in a given year is more than Division 2.

And Also its solved in JUPYTER NOTEBOOK.