**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

Ans- the serving work will begin after 10 min of drop off so 45+10 which will now take more than the usual time so new mew is 55 minutes and the probability that it will take more than 1 hour to complete"""" mew = 55 std = 8 q1 = 1-stats.norm.cdf(60, loc = mew, scale = std) q1 = 0.2659 The probability that the service manager cannot meet his commitment is 0.2659 .

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.

Ans- False. Since the current age of the employees is normally distributed, P(38<x<44) is 0.3413 i.e. 34.13% and P(x>44) is 0.1587 i.e. 15.87%. The probability of current age of employees lying between 38 and 44 is high as compare to the age greater than 44 that is because the most of the data is lies towards the mean in normal distribution.

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

Ans- 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.

Ans- 2X1 ~ N(2µ,2σ2 ) here X1 is distributed twice and have formed normal distribution.

X1+X2~N(µ1+µ2 ,σ1+σ2 ) here X1+X2  are two variable satisfying additive property of normal distribution with parameter(mean= µ1,µ2 and variance= σ1,σ2 ).

The difference between these two, first one is univariate normal distribution and other one is bivariate normal distribution.

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

Ans- D. [48.5, 151.5]

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.

Ans-Rupee range for 95% probability for the annual profit of the company is 9.900000000000002 crore to 98.1 crore.

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

Ans- 5th percentile of profit in the rupees for the company is 17crore rupees.

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

Ans- Probability of making loss for division1 is 4.78% and for division2 is 4% therefor the division1 has more probability of making loss.