**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

* probability that the service manager cannot meet his commitment : 0.2676
* Refer ‘A 2] set 2.ipynb’ for calculations.

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.

* False
* Since P(age > 44) is less than P(38 < age < 44) , it implies more

Employees between age of 38 and 44 are there than employees with age

More than 44

* Refer ‘A 2] set 2.ipynb’ for calculations.

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

* True
* Refer ‘A 2] set 2.ipynb’ for calculations and explaination.

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 X1 ‘ will have Mean of ‘ 2 μ ’ and Variance of ‘ 4 σ2  ’ while
* ‘ X1 + X2 ’ will have Mean of ‘ 2 μ ’ and variance of ‘ 2 σ2 ’
* So both distributions will be normal distributions. With same Means. But

‘ 2 X1 ‘ will have variance twice that of ‘ X1 + X2 ’.

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

* Refer ‘A 2] set 2.ipynb’ for calculations.
* Option D. 48.5, 151.5 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.

* Rupee range that contains 95% probability for the annual profit of the company is (306.65, 773.35) in million rupees.
* Refer ‘A 2] set 2.ipynb’ for calculations.

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

* 5th percentile of profit for the company is 344.17 million rupees.
* Refer ‘A 2] set 2.ipynb’ for calculations.

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

* ‘First Division’ have larger probability of making a loss in a given year . it is around 0.19 %
* Refer ‘A 2] set 2.ipynb’ for calculations.