**Topics: Normal distribution, Functions of Random Variables**

* The time required for servicing transmissions is normally distributed with = 45 minutes and = 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?
* 0.3875
* 0.2676
* 0.5
* 0.6987

**Ans**: 0.2676

* The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean = 38 and Standard deviation =6. For each statement below, please specify True/False. If false, briefly explain why.
* More employees at the processing center are older than 44 than between 38 and 44.

**Ans**: False

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

**Ans**: True

* 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**: Considering X1 and X2 as two independent and identical variables,

**2X1:** If we multiply a normal random variable by a constant, the result is also a normal random variable. The mean of the new distribution will be twice the original mean, and the variance will be four times the original variance.

So, 2X1​∼N(2μ,4σ2)

**X1 + X2:** The sum of two independent normal random variables is also a normal random variable. The mean of the new distribution will be the sum of the original means, and the variance will be the sum of the original variances.

So, X1​+X2​∼N(2μ,2σ2)

* 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.
* 90.5, 105.9
* 80.2, 119.8
* 22, 78
* 48.5, 151.5
* 90.1, 109.9

**Ans**: [a,b]= 48.5, 151.5

* 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
* Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

**Ans**: The rupee range that contains 95% of probability for annual profit of the company is 9.900000000000002 and 98.1 crore rupees

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

**Ans**: The 5th percentile of profit for the company is 17.0 Crore ruppes

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

**Ans**. The probability of division #1 making a profit is 4.78 %

The probability of division #2 making a profit is 4.01 %

Division 1 has larger probablility of making a loss