**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 – We can start by standardizing the time it takes to service a transmission using the standard normal distribution formula:

Were,

z = (x - mu) / sigma

z = (60 - 45) / 8

z = 1.875

If the service manager had exactly one hour to service the transmission, the z-score corresponding to the service time would be 1.875 standard deviations above the mean.

Now we want to find the probability that the service manager cannot meet his commitment. This means that the service time must be greater than 60 minutes. We can find this probability using the standard normal distribution table or calculator.

P(z > 1.875) = 0.0301

By using the Z score value is 60-45/8 = 0.0301 and 1-stats.norm.cdf (0.0.301)

Therefore, the answer is B(0.2676).

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= because people between 38-44 and more than 44 in the age group 137 and 63 out of 400.

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= By using the properties of mean and variances.

* The mean of a sum of random variables is equal to the sum of their means.
* The variance of a sum of independent random variables is equal to the sum of their variances.

we can find the mean and variance of 2X1 and X1 + X2:

Therefore, we can see that 2X1 and X1 + X2 have the same mean of 2μ, but different variances of 4σ^2 and 2σ^2.

To discuss their distributions, we can say that both 2X1 and X1 + X2 follow normal distributions since they are linear combinations of independent normal random variables. Specifically, 2X1 follows a normal distribution with mean 2μ and standard deviation 2σ, while X1 + X2 follows a normal distribution with mean 2μ and standard deviation sqrt(2σ^2) = sqrt(2)\*σ.

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= we can say that there is a 95% probability that the annual profit of the company will fall between –(3.93 Million and 27.93 Million )or(32,14,85,986 Rupees and 2,23,26,05,816 Rupees)

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

Ans=5th percentile of profit for the company is −1.77 Million

In Rupees is 14,48,12,461.

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

Ans= Profit 2.