**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
6. 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.
7. More employees at the processing center are older than 44 than between 38 and 44. - **False**
8. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees. - **True**
9. 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.

To find the difference between 2 and +, let's first calculate each expression individually and then find their difference.

Given that N() and N(), we know that both and are independent and identically distributed normal random variables.

1. 2 *X*1 :

2 *X*1 = 2.N() = N(2, 4]

2. + :

+ = N() + N) = N(2, 2)

Now, let's find the difference between 2 and + :

2 *X*1 - + = N(2, 4) - N(2, 2)

Since both random variables have the same mean (2), the difference in means will be 0.

The variance of the difference will be the sum of the variances:

4 - 2= 2

So, the difference between 2 and + is a normal distribution with mean 0 and variance 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
7. 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
8. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.
9. Rupee range containing 95% probability around the mean: (99.01 Rs, 980.99 Rs)
10. Specify the 5th percentile of profit (in Rupees) for the company
11. 5th percentile of profit in rupees: 169.91 Rs
12. Which of the two divisions has a larger probability of making a loss in a given year?
13. Division 1 has a larger probability of making a loss in a given year.