**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? B
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. True

Since the proportion of employees older than 44 (15.87%) is less than the proportion between 38 and 44 (34.13%), it's true that more employees at the processing center are older than 44 than between 38 and 44.

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

Since the Z-score value for under age 30 would be 0.0918 which is 9.18%. So, the expected number of employees under the age 30 would be 9.18% of 400 which is 36.72 since you cant have the fraction it would be 36 employees.

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.

It’s a normal distribution (bell-shaped distribution) its important distribution in statistics , mainly because of its link with the Central Limit Theorem.

For 2X1 the variance is 4*σ*2 and mean is 2*μ*

*For X1+X2 the variance is 2 σ*2  *and mean is* 2*μ*

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. Rs.3162.6, Rs.4397.4
9. Specify the 5th percentile of profit (in Rupees) for the company
10. Which of the two divisions has a larger probability of making a loss in a given year?