**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

> pnorm(50,45,8)

[1] 0.7340145

> 1-0.7340

[1] 0.266

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.

> pnorm(38,38,6)

[1] 0.5

> pnorm(44,38,6)

[1] 0.8413447

Probability of people age more than 44 is 16% & probability of people age between 38 to 44 is 34%.

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees. True the probability is 0.09 % out of 400 = 36 employees

> pnorm(30,38,6)

[1] 0.09121122

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. 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.
3. 90.5, 105.9
4. 80.2, 119.8
5. 22, 78
6. 48.5, 151.5
7. 90.1, 109.9
8. 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
9. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

0.5 Million $ - 23.5 Million $ ( 2,25,00,000 INR – 1,05,75,00,000 INR)

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

0.485 million $ (2,18,25,000 INR)

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

> pnorm(0,5,3)

[1] 0.04779035

> pnorm(0,7,4)

[1] 0.04005916

1st division is having larger probability to make a loss.