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

1. 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?
2. 0.3875
3. 0.2676
4. 0.5
5. 0.6987

> 1-pnorm(50,45,8)

[1] 0.2659855

1. 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.
2. More employees at the processing center are older than 44 than between 38 and 44.

Ans: False.(63.4621<136.5379)

> 400\*(1-pnorm(44,38,6))

[1] 63.4621

> 400\*(pnorm(44,38,6)-pnorm(38,38,6))

[1] 136.5379

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

Ans: True.

> 400\*pnorm(30,38,6)

[1] 36.48449

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.

As *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2), 2 *X*1 and *X*1 + *X*2 also follows a normal distribution

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

Given, μ= 100, and σ= 20

μ±3 σ = (100-3\*20,100+3\*20) = (40,160)

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: (-3482.48, 52082.48) in rupees

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

ans: 982.12 in rupees

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

Code file: Set2\_Q5.py