**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

**Solution:**

Given that

*μ* = 45 minutes

*σ* = 8 minutes

Random variable(x)=Time required for servicing in minutes

P(x>50) =1-P(x<=50) =1-0.734=0.2676(**B**)

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**)

P(x>44) =1-P(x<=44) =1-0.841=0.159

P(38<x<44) =P(x<=44)-P(x<=38) =0.841-0.5=0.341

False, because the probability of employees being older than 44 years is less when compared to probability of employees in the age range of 38 and 44 years.

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

P(x<30) =0.0901

Probability=number of employees under the age of 30/total employees

Number of employees under the age of 30=probability\* total employees

=0.0901\*400

=36

1. If *X1* ~ *N* (μ, σ2) and *X*2 ~ *N* (μ, σ2) are *the* 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. (**D**)
3. 90.5, 105.9
4. 80.2, 119.8
5. 22, 78
6. 48.5, 151.5
7. 90.1, 109.9

**Solution:**

1.Standardize the data Z~ N (0, 12)

2.Do reverse look up in z-table for probability α/2=0.005

3.=±2.575

4.a=100-2.575\*20=48.5

5.b=100+2.575\*20=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.

**Solution in Assignment2-Final.ipynb**

(99.00810347848784, 980.9918965215122)

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

5th percentile of profit 170.10000000000002 million rupees.

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

Probability of Division 1 making a loss 0.0478

Probability of Division 2 making a loss 0.0401

Inferences:

The probability of making a loss in a year is high for Division 1 when compared to Division 2