**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

**A: Here *μ* = 45 but 10 minutes after the car is dropped off so the *μ* value will be 55**

**Then Mean (*μ* ) = 55**

**SD (σ*) = 8***

***X = 60***

***1-*pnorm(X, μ ,σ)**

**1-pnorm(60,55,8)=0.2676**

**\* Refer: “A2.2Q1.ipynb” file**

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.

**A: Mean=38**

**SD=6**

**Z score = (X-Mean)/SD**

**= (44-38)/6**

**=1**

**Hence people between 38 and 44age = 84.13-50**

**=0.3413=137 out of 400**

**Therefore, more employees at the processing center are older than 44 than between 38 and 44 is FLASE**

**\* Refer : “A2.2Q2.ipynb” file**

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

**A: It is TRUE**

**Because P(X&lt;30)=0.09 and [400\*0.09]=36.48**

**\* Refer: “A2.2Q2.ipynb” file**

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.

**A: The 2X1 and X1 and X2 are same if they are independent identically distributed and the**

**data is large.**

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

**A: Given P(a<x<b) = 0.99**

**Mean=100**

**SD=20**

**The probability is : 48.5,151.5**

**\*Refer: “A2.2Q4.ipynb” file**

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.

**A: The annual profit of company is = 12\*45 = 540**

**Specify the Rupees range is centered on the mean**

**It contains 95% probability of the annual profit of the company**

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

**A: Variance of the company distribution = 9 +6 = 25**

**SD = 5**

**Confidence Level = 95% = 0.95**

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

**A: Refer: “A2.2Q5.ipynb” file**

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