**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 mean= 45 but 10 minutes after the car is dropped off so the mean value will be 55**

**Then Mean = 55**

**SD = 8**

**X = 60**

**P(x>60) =1-p(x<60)=1-stats.norm.cdf(60,55,8)**

**=0.2676**

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.

**P(38<x<44)= stats.norm.cdf(44,38,6)-stats.norm.cdf(38,38,6)=0.3413**

**Therefore, more employees at the processing center are older than 44 than**

**between 38 and 44 is flase**

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**

**Stats.norm.cdf(30,38,6)\*400 =36.48**

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. **The 2X 1 and X 1 + X 2 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
7. **Stats.norm.interval(0.99,100,20)= 48.5, 151.5**
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

**Mean profits from two different divisions of a company = (5+7)\*45=540**

**Variance profits from two different divisions of a company=(9+16)=\*45=225**

1. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

**Stats.norm.interval(0.95,540,225)=** **(99.00810347848784, 980.9918965215122)**

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

**X=540+(-1.645)\*(225**)=170

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

**P(x<0)=stats.norm.cdf(0,5,3)**

**P(x<0)=stats.norm.cdf(0,7,4)**

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