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

* 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?
* 0.3875
* 0.2676
* 0.5
* 0.6987

**Ans: 0.2676**

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

**False, because the probability for employees at the processing center are between 38 and 44 ,are more older than 44.**

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

**True**

* 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.

**The Difference between 2X1 and (X1 + X2) is the magnitude they hold of two different sample subsets (X1 and X2) from the same source. X1 and X2 can be a different subset of a sample from a similar source .If *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are *iid* normal random variables then the distribution remains the same for every sample subset of similar source, it tends to fall under Normal distribution and slight deviations in parameters**.

* 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.
* 90.5, 105.9
* 80.2, 119.8
* 22, 78
* 48.5, 151.5
* 90.1, 109.9

**Ans: 90.1,109.9**

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

**The mean of the sample is 5+7=12**

**The standard deviation sample is sqrt(9+16)=sqrt(25)=5**

**The standard devation 95% whose z value is 1.96**

**the sample size is n= 2**

**then the range such that it contains 95% data =(mean +/- z\*SD/sqrt(n))**

**=(12-1.96\*5/1,12+1.96\*5/1)=$ (2.2,21.8)=(99,981) in millions**

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

**(12,25)-(6,12.5)=(6,12.5)=6.5**

**The 5th percenticle of profit for the company is 1.5\*standard deviation**

**=7+1.5\*5= $14.5= 652 millions**

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

**The division of Profit2~N(7,4^2) has the larger probability of making a loss in a given year with the probability value stats.norm.cdf(1,7,4)=0.066**