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

1. The time required for servicing transmissions is normally distributed with *m* = 45 minutes and *s* = 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?

1. 0.3875
2. **0.2676**
3. 0.5
4. 0.6987

1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *m* = 38 and Standard deviation *s* =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 = ) Probability of employees greater than age of 44= Pr(X>44)**

**Pr(X > 44) = 1 - Pr(X d" 44).**

**Z = (X -µ )/ = (X - 38)/6**

**Pr(X d" 44) = Pr(Z d" (44 - 38)/6) = Pr(Z d" 1)=84.1345%**

**Probabilty that the employee will be greater than age of 44 = 100-84.1345=15.86%**

**So the probability of number of employees between 38-44 years of age = Pr(X<44)-0.5=84.1345-0.5= 34.1345%**

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

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

**Ans = True ,Because Z=(X-µ)/σ**

**P(X≤30) =p (Z≤ (30-38)/6) =p(Z≤-1.33) = 0.0918(using z table)**

**Expected count = 0.0918\*400 = 36.72.**

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.

**Ans = As both are independent normal random variable,x1+x2 is normal with N**

**N(µ1+µ2, σ12+σ22 ).and 2X1 will just scale the normal distribution by 2 times.**

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.

1. 90.5, 105.9
2. 80.2, 119.8
3. 22, 78
4. **48.5, 151.5**
5. 90.1, 109.9

Ans =

stats.norm.interval(0.99,100,20)

= 48.5,151.5

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.
3. Specify the 5th percentile of profit (in Rupees) for the company
4. Which of the two divisions has a larger probability of making a loss in a given year?