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

1. 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?
2. 0.3875
3. 0.2676
4. 0.5
5. 0.6987

ANS. Since it takes 10 min to being the work after the car is dropped,the time left to complete the work is 50 min,probability tht service cnt meet his commitment is P(X&g=50)=1-Pr(x&t=50).

Standard normal variable Z=(X-****µ)/(x-45)/8****

****P(X&t=50)=P(Z&t=(50-45)/8)****

****= PR(Z&t=0.625)****

****= 0.73237****

****= 73.237%****

****Probability that service manager will not meet his comment is 100-73.237=26.763%****

****=0.2676****

1. 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.
2. More employees at the processing center are older than 44 than between 38 and 44.

ANS.False

Around 70% of the data falls within one std of the mean=38+6=44

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

ANS. TrueP(X<=30)=P(Z<=(30-38)/6)=p(Z<=-1.33)=0.0918

=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. 2X1 will be greater scale version tahn X1+X2.

If X1 and X2 are normally distributed then sum o dthe random sample will be exactly

the same.

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

ANS. ****The probability towards left of a =-0.01/2=-0.05****

****The probability towards right of b= 0.01/2=0.05****

****Z\*σ+µ=x****

****-(-2.57)\*20+100=151.4****

****(-2.57)\*20+100=48.6****

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?

ANS.

****Mean profit is Rs 540 million and****

****standard Deviation is Rs 225.0 million****

****A. Ans is 90.990****

****B. To compute 5 th percentile ,****

****we use the formula X = μ + Zσ;****

****from z table, 5 th percentile = -1.645 X****

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

****Therefore, 5th percentile of profit (in Million) is 202.05 millions.****

****C.Using stats.norm.cdf(0,5,3) Probability of division 1 making a loss P(X&amp;t;0)****

****is 0.04780 and stats.norm.cdf(7,4) probability of division 2 making a loss P(X&amp;t;0)****

****is 0.04005.****