**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 custo3mer’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

Mean=45,std=8,X=time

In order to service done by 1 hour where (X≤50),for service manager cannot able to meet his commitment.

P(X>50)=(1-(X≤50)

Converting to standard normal Transform Z=(X-*µ)/ σ*

*50-45/8=0.625*

*Z(0.625)=0.7324*

*(T>50)=1-0.73424=0.2672*

*B*

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.

True

P(X>44)=(1-P(X≤44))

Z=(44-38)/6=1 ->P(Z)= 0.8413447460685429

Employees older than 44= 100 – 84.135= 15.86%

P(X<44)=34.1345%

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

Z(P(X≤30))=(30-38/6)= 9.121%

0.09121\*400=36.48

Hence the given Statement is TRUE

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 *X1*=N(2µ,4 σ2 ) if X1 is normally distributed then 2X1 is normally distributed.

*X1+X2=N(*2µ+2 σ2 )

*If X1 & X2 are normally distributed the associated sums and random sample are in normal.*

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

The probability of the random variable taking a and B is 0.99

So the probability of going wrong = 1-0.99=0.01 which is -0.005 on left and 0.005 on right

Converting to standard normal Transform Z=(X-*µ)/ σ*

Z\**σ +µ=X*

(-2.87)(20)+100=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?

Mean=45(5+7)=540

Standard Deviation = 45(sqrt(9+16))=45\*5=225

(540,225)

A ) 95%

Range

Mean±2std=540±2\*225=(90,990)

B) 5%

0.008200025

C) Division 2 has higher probability of making loss