**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

The Work Begin after 10 min, so the average time increase form 40 min to 55min.

1-pnorm(60,mean=55,sd=8)

= 0.2676

The probability that the service manager cannot meet his commitment is 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.
3. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

Mean= 38

SD = 6

A) Z score of 44=(X-Mean)/SD

=(44-38)/6

= 1 =>84.30%

=>People above 44 age = 100-84.30

= 50.8763**% ͌** out of 400

Z score of 38 = (38-38)/6

= 0 =50%

Hence people between 38 and 44 age = 84.13 – 50 = 34.13 %  **͌** 137 out of 400

Hence more employees at the processing center are older then 44 than between

38 and 44 is **FALSE.**

B) Z score for 30 = (30 – 38)/6 = -1.33 = 9.50 %  **͌** 36 out of 400

Hence a training program for employees under the age of 30 at the center would

Be expected to attract about 36 employees **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.

As we know the If *X1*  ~ N (μ1, σ12*)* and If *X2*  ~ *N*(μ, σ22) are to independent random variable

Then *X1*  + *X2* ~ N(μ1- μ2, σ12+ σ22).

Similarly if Z = aX1+ bX2 ,where x1 and x2 are as defined above , that is Z is liner combination of X1 and X2 then ,

Z = N (aμ1 + b μ2 , a^ σ12+b^σ22)

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

Probility = 0.99

Mean = 100

SD = 20

Symmetric values for standard normal distribution such that the area enclosed is

0.99

Z value at 0.5th percentile is given as

Z(0.5) = stats.norm.ppf(0.005) = -2.576

Z value at 99.5 percentile isx given as

Z(99.5) =stats.norm.ppf(0.995) = 2.576

Z = (x-100)/20

* X = 20 Z +100

a = -(20\*2.576) + 100

= 48.5

B = (20\*2.576)+100

= 151.5

Two values symmetric about mean for the given standard normal distribution are

( 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?

1. 90,990
2. 202.5 Million

