**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
6. 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.
7. More employees at the processing center are older than 44 than between 38 and 44.
8. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

Ans:

= 38

= 6

Z score = (value – mean)/standard deviation

Therefore, Z score for 44 = (44-38)/6 = 6/6 =1 =84.13%

People above 44 age = 100 – 84.13 = 15.87% = 63 out of 400

Z score for 38 = (38-38)/6 = 0/6 = 0 = 50%

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

Therefore, more employees at the processing center are older than 44 than

between 38 to 44 is FALSE

Z score for 30 = (30 – 38)/6 = -1.33 = 9.15% =36 out of 400

Therefore, a training program for employees their 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 distributions and parameters.

Ans:

And

Therefore, difference between two

the mean of 2 *X*1 and *X*1 + *X*2  is same but var( of 2X1 is 2 times more than the variance of

So we can say than the difference between the two iid normal random variables are identically and independently distributed.

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
7. 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
8. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.
9. Specify the 5th percentile of profit (in Rupees) for the company
10. Which of the two divisions has a larger probability of making a loss in a given year?

Ans: division 1= profit 1 N(5,32) = N(X1=5,S12=32)

Division 2 = profit 2 N(7,42)=N(X2=7,S22=42)

= company = profit 1 + profit 2 = Mean profit of division1 + division 2

= 5+7=12

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

Variance of the company distribution = = 32+42=9+16=25=52

Standard Deviation of the company distribution = = = 5

Confidence level = cl = 0.95

Therefore, confidence interval = cl=

=5401.96(225)

= (99981) in millions

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

To calculate the 5th percentile from Z table za/2 =0.05 = -1645

5th percentile = -Za/2=0.05(=540-1.45(225)=169.87 million

Division 1 of the two divisions has a larger pro0bability of making a loss in a given year.