**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

**Ans:-** *μ = 45 , σ* = 8 , x= 60 - 10 = 50min

Z = x-*μ/σ = 50-45/8=0.625*

*According to Z table Probability of x<=50 is 0.734*

*Therefore the probability of p(x>50)=1-p(x<=50)*

*= 1-0.734*

*= 0.2676*

*= 26.76%*

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.

**Ans:-** *μ* = 38 , *σ* = 6. Z = x-*μ/σ*

1. p(x>44) = p(z>44-38/6) =p(z>1)

p(z=1) = 0.841 :- According to z table

Probability of the processing center are older than 44 = 1 - p(z=1)

= 1- 0.841 = 0.159 = 15.9%

Probability of the processing center are between 38 and 44. = p(x>44) – 0.5

=0.841 - 0.5 = 0.341

=34.1%

**Statement** :- The above statement is False Because the Probability of employees between 38 to 44 is greater than 44 years of employees

B) p(x>30)

z= 30-38/6 = -1.33

p(z=-1.33) = 0.9176

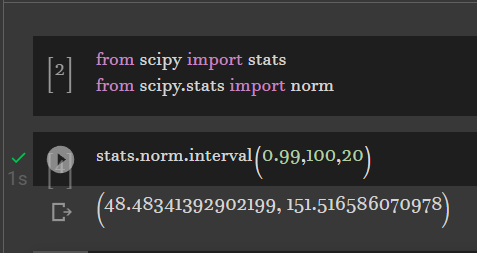
p(z>-1.33) = 1- 0.9176 = 0.082 Therefore number of employees under 30 = 0.08\*400=32.96

**Statement** :- The above statement is False Because the Probability of employees under 30 is 0.082 and the count of people is 32 according to it.

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:-

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



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?

