**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?



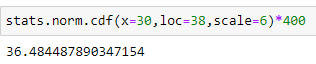
1. 0.3875
2. 0.2676 **(CORRECT ANS)**
3. 0.5
4. 0.6987
5. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.
6. More employees at the processing center are older than 44 than between 38 and 44.

**FALSE**



1. 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.

Here, both X1 and X2 follows normal distribution and X1,X2~ *N*(μ, σ2) and are identically

2X1 = 2 *N*(μ, σ2) = N(2μ, 2σ2)

X1 + X2 = N(μ, σ2) + N(μ, σ2)

= N(2μ, 2σ2)

Hence, there is no significance difference between 2X1 and X1+X2.

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 **(CORRECT ANS)**
6. 90.1, 109.9

Z score for 99% confidence

x = 20z+100

      a = -(20\*2.576) + 100= 48.5

b = (20\*2.576)+100= 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?

* Total profit = profit 1 + profit 2 = P.
* Hence P ~ N(12,74).

**A )** Specifying a Rupee range ( Centered on the mean ) that contains 95% probability for annual profit of the company.

$13.41 = Rs 603.68

**B)** Specifying the 5th percentile of profit.

p = $10.59 ≈ Rs 476.33

**C)** The division that has a larger probability of making a loss in a given year is the first division.