**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 probability that the service manager cannot meet his commitment is 0.2659. (B).
7. 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.
8. More employees at the processing center are older than 44 than between 38 and 44.
9. The given statement is “False”. Because, the number of employees older than 44 is less than the number of employees between 38 and 44. i.e.,

63 < 137 .

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.
2. The given statement is “True”.
3. 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.
4. Given *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2)

According to the properties of Normal Random Variables,

[Property of Product]

[ Property of Addition]

The difference between and is,

The mean of and is same but the variance of is twice than the mean.

So, the difference between the two variables says that they 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. (D) is correct answer according to the given information. i.e., (48.5,151.5)
8. 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
9. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

Ans. The range of rupee for annual profit of the company is

Min value : 99.00810347848788

Max value: 980.9918965215121

1. Specify the 5th percentile of profit (in Rupees) for the company

Ans. Z-score at 5th percentile : -1.6448536269514729

5th percentile of profit in rupees: 169.90793393591858 (Aprx 170 Rs)

1. Which of the two divisions has a larger probability of making a loss in a given year?

Ans. First division has a larger probability of making a loss in a given year. i.e.,

0.0477903522728147 > 0.040059156863817086