**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 Answer**
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.

**Answer- TRUE**

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

**Answer- 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.

**Answerif the x1 and x2 are normal random variables then,**

**2X1~*N*(2μ, (2σ)2)= 2X1~ *N*(2μ, 4σ2) &**

**X1+X2~*N*(2μ, 2σ2)**

**i.e. there is the difference in the value of the variance.**

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 Answer**
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.

**Answer**

**Annual profit will be A.P(Pa) = P1 +P2**

**Profit1 ~ N(5, 32) and Profit2 ~ N(7, 42)**

**Pa ~ (12, 72)**

**Z score for 95% is: Z(0.975)=1.96.**

**Z= (x- μ) / σ**

**a = Z(σ) + μ**

**b = Z(σ) – μ**

**[a, b] = [1.72, 25.72]**

**Which is in Dollars so we need to convert it into rupees.**

**[77.4, 1157.4]**

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

**Answer**

**Z= (x- μ) / σ**

**a = Z(σ) + μ**

**Z score for 5 % is:**

**1.959964**

**a = -77.38866**

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

**Answer - Second one with Profit2 ~ N(7, 42)) Because the standard deviation is most.**