**Assignment No.2 Set 2**

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

**Solution:**

Mean=38

SD=6

Z score=(Value – Mean)/SD

Z score for 44 = (44 – 38)/6 = 1 => 84.13 %

People above 44 age =100 – 84.13 = 15.87% ≈ 137 out of 400

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

Hence People between 38 & 44 age = 84.13 – 50 = 34.13% ≈ 137 out of 400

Hence More employees at the processing Centre are older than 44 than between 38 and 44. Is **FALSE**

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

Hence A training program for empolyees under the age of 30 at the centre would be expected to attract about 36 empolyees - **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.**

**Solution:**

2X1 ∼ N(2 µ, σ2)

X1 + X2 ~ N( µ+µ, σ2,+σ2)

~N(2 µ, 2 σ2)

For both distribution location parameter is same only scale parameter is different.

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.**

1. **90.5, 105.9**
2. **80.2, 119.8**
3. **22, 78**
4. **48.5, 151.5**
5. **90.1, 109.9**
6. **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**
7. **Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.**
8. **Specify the 5th percentile of profit (in Rupees) for the company**
9. **Which of the two divisions has a larger probability of making a loss in a given year?**