**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

Answer: 0.2676

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.

**False**

Reason:-Employees above 44 years = 0.1586

probability of employees between 38 and 44 years = 0.3413

Then it will make false.

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

**A)True**

Reason**:-**Probability of employees age = 0.0912

Number of employees = 400

No of employees come under age 30 = 0.0912\*400 =36.4

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.

-According to the Central Limit Theorem, any large sum of independent, identically distributed random variables is approximately Normal.

From the properties of normal random variables,x and y are two independent identically distributed random variables

The mean of 2 *X*1 and *X*1 + *X*2 is same but the var(σ2) of  2 *X*1 is 2 times more than the variance of *X*1 + *X*2

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

48.5,151.5 are the random value that came of 0.9899

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.

Mean=12

Var= 25

SD=5

Rupees mean = 540 , SD = 225

Interval is **(99.0, 980.9)** with 95% confidence

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

Answer:- 5th Percentile X=μ + Zσ

Z = -1.645

X**=** 540**+**(**-**1.645)**\***(225) = 170

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

Answer:- Division 1

Divison 1 has larger probability 4.7% and division 2 has probability 4.0