**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

Ans :- B) 0.266

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

Ans :- A) p(between 38 and 44) =34.13%

p(older than 44 ) = 15.87%

“More employees at the processing center are older than 44 than between 38 and 44”is True

1. P(under the age of 30)=9.12%

So the number of employees with probability 0.0912 of them being under age 30 =0.0912\*400=36

Hence,Statement B is also 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.

Ans :-

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

Ans :- The probability getting values between a & b should be 0.99

So the probability outside the area a & b is 0.01

Becacuse of symmetric about mean,

Probability towards left from a = 0.01/2 = -0.005

Probability towards right from b = 0.01/2 = 0.005

As z=(x-mean)/stdev => z\*stdev + mean =>(-0.005)\*20+100 = 151.4

(0.005)\*20+100 = 48.6

Hence,Option D is correct

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?

Ans :- A) Range is Rs (99.00810347848784, 980.9918965215122) Millions

B)5th percentile of profit(Million)is 170.0

C)0.0477903522728147

0.040059156863817086