**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. The answer is B (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.**
3. **A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.**
4. **False. Around 34% employees are in the age category of 38 to 44 while only 15% are above the age of 44.**
5. **True. There are only 9% of the employees who are below the age of 30. And 9% of 400 is 36.**
6. **If X1 ~ N(μ, σ2) and X2 ~ N(μ, σ2) are iid normal random variables, then what is the difference between 2 X1 and X1 + X2? Discuss both their distributions and parameters.**

**Ans**. **2X1-(X1+X2) = N( 4µ,6 σ^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

**Ans. 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.**

**The mean will be summation of both divisions = 12 million$**

**And in rupees = 540 million rupees.**

**The standard Deviation is 225.0 million rupees.**

1. **The profit range is in between (99.00810347848784, 980.9918965215122) million rupees.**
2. **5th percentile of profit is 170.0 Million Rupees**

**C)The first division has a larger probability of making a loss with 4.7%.**