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**

**Here 1 hour means 60 min so 60-10=50**

**Z=x-mu/sd 50-45/8=0.734**

**One hour we should consider 1-0.734=0.2776**

**Pnorm(50,45,8) = 0.734-1=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. Ans:- FALSE
3. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

ANS: here we should find z value

**Z=30-37/6= 0.091**

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: assume x1= 1,2,3,4,5 x2=5,4,3,2,1**

**2(x1)=2,4,6,8,10 2(x1+x2)=6,6,6,6,6**

**mean is 6**

**Variance is low**

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:- D**

**x=100**

**Variance= 20**

**Confidance interal= [x+-z1-sigma sd/root N]**

**100+2.58\*20=151.5**

**100-2.58\*20=48.5**

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.

**Ans: Confidance interal= [x+-z1-sigma sd/root N] here z score of 95%=1.96**

**540+1.96\*15=596**

**540-1.96\*15=510**

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

**Ans: Confidance interal= [x+-z1-sigma sd/root N] here z score of 90%=1.65**

**540+1.65\*15= 564**

**540-1.65\*15= 515**

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

**Ans:- -1.667(first division)=0-5/3**

**-1.75(second division)=0-7/4**

**Here the least value is second division and larger probability 0f making loss is second division**