**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)** moue=45 min ,sigma=8 mits,

in 1 hour-10 min drop…so time 50 minits

Then P(T<=50)

z-score for 50 minits =X-moue/sigma = 50-45/8 = 5/8 = 0.7301(or ) pnorm(50,45,8)

=0.730145

For 1 hour = 1-0.73 = 0.26

So B is correct one.

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): False.

b) True . Z=x+-sigma/sqrtn = 30-38/6 = -1.33= p(-1.33) = 0.9

statement B is True as no. of employees aged below 33 yrs attending training is 36

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. Assume x1=1,2,3,4,5 x2= 5,4,3,2,1

2x1=2(1,2,3,4,5) = (2,4,6,8,10)

X1+x2 = (1+5,2+4,3+3,4+2,5+1) = (6,6,6,6,6)

Both are equal but X1+x2 having the lower variance

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

1. X=100 , sigma^2=20 z-score of 99%=2.58

So [100+2.58(20)] [100-2.58(20)]

[100+51.6] [100-51.6]

151.6,48.4

So **ans 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?**
5. X=5, sigma^2= 3^2 and another one is x=7 and sigma^2= 4^2

1$=45Rs/-

45(5+7)=45(12)=540Miliion Rs/-

45(sqrt(3^2+4^2))=45(sqrt(9+16))=45(sqrt(25))=45\*5=225

(540,225) z-score at 95%=1.96

[540+1.96\*225],[540-1.96\*225]

[540+441],[540-441]

981,99

1. Z-score at 90%=1.64

[540-1.64\*225]

[540-396]

144

1. For loss we can find out the probability of zero

For(5,3^2)= x-moue/sigma=0-5/3=-5/3=-1.667

For (7,4^2)= 0-7/4=-7/4=-1.75

We decided the -1.75 is the least value.that means second division.