**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) 1-stats.norm.cdf(50, loc =45, scale = 8 )

0.2659855

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.

Here µ=38, *σ* =6

Then, µ+*σ= 38+*6=44

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

Ans)

Z=(X-µ)/ *σ*

P(X≤30)=p(Z≤(30-38)/6)=p(Z≤-1.33)= 0.0918(using z table)

Expected count=0.0918\*400= 36.72

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)

If is normally distributed then 2X1 is also normally distributed. Because X1+X1=X2 therefore 2 X1 is normally distributed. X1+X2 are normally distributed with the parameters.

1. Let X ~ N(100, 202). Find two values, *a* and *b*, symmetric about the mean, such that tXhe 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)

µ=100 =20

By empirical rule µ±3

(100±(20)3)=(100±60)=((100-60),(100+60))

=(40,160)

Option D

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)

E[X]= E[45\*(profit 1+profit 2)]

= 45\*(5+7)=540 million rupees

SD[X]= SD[profit 1 +profit 2]

= 45\*()

= 45\*= 225 million rupees

X~ N(540,)

A)

μ ± 2σ = 540±2\*225

=(540-450, 540+450)

= (90,990)

B)

μ - 1.5σ

= 540-(1.5\*225)

=202.5 million rupees

C)

stats.norm.cdf(0, loc =5, scale = 3 )

0.04779035

stats.norm.cdf(0, loc =7, scale = 4 )

0.04005916