**Topics: Normal distribution, Functions of Random Variables**

1. The time required for servicing transmissions is normally distributed with ** = 45 minutes and ** = 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):

z = (50-45)/8 = 0.625

1 – normalized(z score) = 0.26

So, Option B is the right aswer

1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean ** = 38 and Standard deviation ** =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

#calculate employees age > 44

* 1. 1 - stats.norm.cdf(44,loc = 38, scale=6) =0.16

#calculate employees between 44 and 38

* 1. stats.norm.cdf(44,loc = 38, scale=6) – stats.norm.cdf(38,loc=38,scale=6) = 0.34

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

Ans) True

#calculate employee age <30

* 1. stats.norm.cdf(30,loc=38,scale=6) = 0.0912

#No of employees attended to the training program

* 1. 400\*stats.norm.cdf(30,loc=38,scale=6) = 36.4844

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.

2X1~ N(2 u,4 σ^2) and

X1+X2 ~ N(µ + µ, σ^2 + σ^2 ) ~ N(2 u, 2σ^2 )

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

48.5, 151.5

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)

range is [ 99.008, 980.992] million in INR

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

540+(-1.645)\*(225) = 169.875

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

Division 1