**Name:Nandini Jain**

**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

Solution: B is the correct ans

*μ* = 45, *σ* = 8 ,x=50 min

1- NORM.DIST(50,45,8,TRUE) =0.26

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.

Solution: *μ* = 38 ,*σ* =6

Z score = (x-*μ*)/*σ*

Z score for 44  = (44 - 38)/6  = 1  =>  84.13 %

People above 44 age = 100 - 84.13 =  15.87%  ≈  63  out of 400

Z score for 38  = (38 - 38)/6 = 0 => 50%

Therefore,People between 38 & 44  age = 84.13 - 50 = 34.13 % ≈  137 out of 400

Hence More employees at the processing center are older than 44 than between 38 and 44. is **False.**

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees. True
2. 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.

Solution: As both are independent normal random variables, X1 + X2 is normal with N(µ1+µ2,σ12+σ22). And 2X1 will just scale the normal distribution by 2 times.

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.

Solution: Option D

#given

#X ~ N(100, 20)

# mean=100 ,sd=20

#Z(0.5) =

stats.norm.ppf(0.005)

#Z(99.5) = stats.norm.ppf(0.995)

#Z = (x - 100)/20 = > x = 20z+100

a = -(20\*2.576) + 100

b = (20\*2.576)+100

print(a,b)

48.48 151.52

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?

Solution:

**A.** NORM.INV (0.025,45\*5,3) =219.1201

NORM.INV (0.975,45\*5,3)= 230.8799

NORM.INV(0.025,45\*7,3)=309.1201

NORM.INV(0.975,45\*7,3)= 320.8799

The Rupee range with 95% probability for the annual profit of the company is given as,

=Profit1 + Profit2

= (219.12, 230.87) + (309.12, 320.87)

**= (528.24, 551.74)**

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

NORM.INV (0.05,45\*7,3)= 310.0654

NORM.INV(0.05,45\*5,3)= 220.0654

5th percentile of profit = 310.0654+ 220.0654 = **530.1308 Million Rs**

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

Solution: Division 2 with distribution N(7, 42)