**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’ mew = 55 std = 8 q1 = 1-stats.norm.cdf(60, loc =mew, scale = std)

Q1 = 0.2659

The probability that the service manager can not meet his commitment is 0.2659

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. Because the probability for employees at the processing center are more

Between 38 & 44 than older than 44. Mean = 38 std1 = 6

Lessthan\_38 = stats.norm.cdf(38, loc = mean, scale = std1)

Lessthan\_38 = 0.5

Lessthan \_44 = 0.841

Between\_38\_and\_44 = lessthan\_44 – lessthan\_38

np.round(between\_38\_and\_44100,2)

The probability of employee age between 38 & 44 is 34.13%

Morethan\_44 = 1-stats.norm.cdf(44, loc=mean, scale =std1)

np.round(morethan\_44100,2)

The probability of employee age more than 44 is 15.87%

True\_or\_False = (morethan\_44 > between\_38\_and\_44)

Print(True\_or\_False)

Answer is : False

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

Ans : True. B = stats.norm.cdf(30, loc = mean, scale =std1)100

Print(np.round((b400)/100,0)

A training program for employees under the age of 30 at the center would be expected to attract about 36.0 employees

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 : The difference between 2X1 and (X1 + X2) is the magnitude they hold of two different

Sample subsets (X1 and X2) from the same source. X1 and X2 can be a different subset of a

Sample from similar source but If X1 ~ N(μ, σ2) then, 2 X1 ~ N(2 μ, 4 σ2) and N(μ, σ2)

are iid normal random variables then(X1 +X2) (2 μ, 2 σ2) Hence, 2X1 –(X1+X2)~

(2 μ -2 μ, 4 σ2 +2 σ2)

The distribution remains the same for every sample subset of similar source,

It tends to fall under Normal distribution and slight deviation in parameters.

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 : np.round(stats.norm.interval(0.99, loc = 100, scale = 20), 1)

The two values of a and b, symmetric about the mean are such that the probability of the

Random variable taking a value between them is 0.99 : [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 : Rupees ranges in between [9.9 to 98.1] crore rupees, 95% of the time for the annual

Profit of the company.

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

Ans : The 5th percentile of profit for the company is 17 crore rupees.

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

Ans : The division #2 (profit2 ~ N(7, 42) has a large probability of making a loss in a given year