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

1. The time required for servicing transmissions is normally distributed with *m* = 45 minutes and *s* = 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

1-stats.norm.cdf(abs(z)) = 0.2659

Where, z = (x-mean)/sd = (50-45)/8 = 0.625

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

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: 2X1 will be greater scale version than X1+X2. if X1 and X2 are normally distributed than sum of the random sample will be exactly same.

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: D

stats**.**norm**.**interval(0.99,100,20)

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: A) stats.norm.ppf(0.975,5\*45,3),stats.norm.ppf(0.025,5\*45,3)

= (219.12, 230.879)

stats.norm.ppf(0.975,7\*45,4),stats.norm.ppf(0.025, = (307.160,322.839)

The rupee range value will be [219.12, 230.879] + [307.160,322.839] =[526.28,553.718]

B)stats.norm.ppf(0.05,5\*45,3) = 220.065

stats.norm.ppf(0.05,7\*45,4) = 308.420

5th percentile of profit (in rupees) for the company = 220.065+308.420 = 528.485

C) 2nd Division