**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:**  Probability that Service manager will not be able tot meet Commitment is **0.2659**

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

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: 34% of clerical employees age between 38-44 and only 15% of employees age more than 44

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

Ans: True: as more than 36% of employees are under age 36 and as total 400 employees are working then it is expected to attract more than 36 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.

Answer: 2x1 is Simply a larger scale version of the random variable X2 if X1 is normally distributed then 2x1 is also normally distributed .

X1 and X2 are normally distributed, the associated, the associates sums and random samples are exactly normal with appropriate parameter.

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 is Correct Which is 48.5, 151.5

Code: stats.norm.ppf(0.995,loc=100,scale=20)

stats.norm.ppf(0.005,loc=100,scale=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.

**Ans:** Mean = 5 + 7 = 12

Mean of population in million is 12\*45 = 540 millions

Standard deviation is 32 + 42 = 25

Standard deviation of population in million is (square root of 25)\*45

= 5\*45 = 215 millions

stats.norm.interval(0.95, 540, 215)

range is (99.00810347848784, 980.9918965215122) in Millions

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

**Ans: 0.049471468033648075**

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

**Ans:**

stats.norm.cdf(0,5,3)

0.0477903522728147

stats.norm.cdf(0,7,4)

0.04005915686381708

Probability of Division 1 making a loss in a given year is more than Division 2.