**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

P(x>50)=1-P(X<=50)

m=1-stats.norm.cdf(50,loc=45,scale=8)

=0.26598552904870054

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.

False

m1=1-stats.norm.cdf(44,loc=38,scale=6)= 0.15865525393145707

m2=stats.norm.cdf(44,loc=38,scale=6)-stats.norm.cdf(38,loc=38,scale=6)=0.3413447460685429

p(employees between 44and 38) is more

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

True

P(x<30)=stats.norm.cdf(30,loc=38,scale=6)= 0.09121121972586788

No.of employees under age 30= p(x<30)\*400

=36.48

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.

X1+X2 ~ N(2 μ , 2 σ2)

2X1~ N(2 μ , 4σ2)

Both are not equal in variance

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,

q=stats.norm.interval(.99,loc=100, scale=20)

(48.48341392902199, 151.516586070978)

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.

New distribution is N1~(12, 52)

Confidence interval: q=stats.norm.interval(.95,loc=12, scale=5)

: (2.2001800772997306, 21.79981992270027)

In rupees: (99.00810347848788, 980.9918965215121)

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

z=stats.norm.ppf(.05)= -1.6448536269514729

z=x- μ/ σ

x= 3.7757318652426353\*45

=169.90793393591858

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

Profit1 ~ N(5, 32)