**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

1. 0.2676

µ=45 min,σ=8 min,

µ=10 min after =45+10=55

Car will be ready in 1 hr=60min(x)

Z=x-µ/σ

=60-55/8

=0.625

1=stats.norm.cdf(z)

1=stats.norm.cdf(0.625)

=0.2659

P value for z score is 0.2359 app. To 0.2676.

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

ANS:

A) P(x>44)=0.1587 P(38<x<44)0.3413

The statement is false.the probability of employees aged from 38 to 44 is more.

1. N\*P(X<30)=36.49

The statement is true. The number of employees aged below 30 years attending training is 36.

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: if X1=N(µ,σ2) and X2=N(µ,σ2)

Then,2X1 = N(2µ,4σ2)=N(2µ,2σ2)

So,2X1-(X1+X2)=N(2σ2)

2X1-(X1+X2)=N(4µ,6σ^2)

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.

1. 90.5, 105.9
2. 80.2, 119.8
3. 22, 78
4. 48.5, 151.5
5. 90.1, 109.9

ANS: D) 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.
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) the range for 95% probability for the company is Rs.99 to 980.99 Million.

B) The 5th percentile of profit (in million rupees)is 202.5.

C) Probability of division 1 making a loss P(X<0)

0.047

Probability of division 2 making a loss P(X<0)

0.040