**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

Answer : The probability that the service manager cannot meet his 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.

Answer : False -> Because 34 % of employees age is in between 38 to 44 and only 15 % of employees age is 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.

Answer : 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.

Answer : 2 X1 is simply a larger scale version than X1 and X2

If X1 and X2 is normally distributed then the sum of the random sample will be 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

Answer : D. 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.

Answer :

Mean = 5 + 7 SD = √9 + 16

= 12 \* 45 = 5 \* 45

= 540 = 225

Rupee range is 99.00810347848784 , 980.9918965215122

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

Answer : 5th percentile of profit is 169.9079

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

Answer : First division