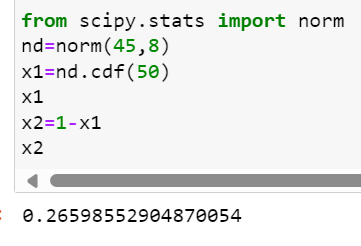
**Topics: Normal distribution, Functions of Random Variables**

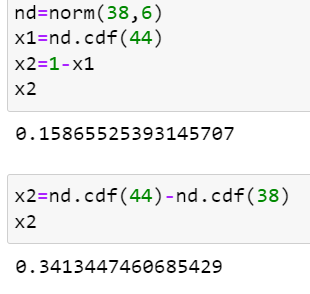
1. The time required for servicing transmissions is normally distributed with *μ* = 45 minutes and *σ* = 8 minutes. The service manager plans to have work begin on the transmission of a customer’s car 10 minutes after the car is dropped off and the customer is told that the car will be ready within 1 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. 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 because there are more employees b/w 38 and 44 than employees more than 44. As you see in the calculation below:



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

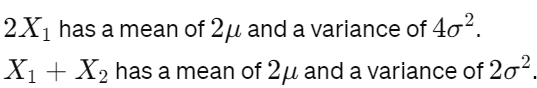
Ans: The probability distribution at the center is 0.5

The prob under the age of 30 is 0.9087

If we subtract these two equations and multiply with the 400 gives no 163. So false it would not attract around 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.

Ans:



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:

Ans: Inorder to find the value of a and b, probability of the random variable

X Mean=100

Variance=202=400

Taking a value between them=0.99 Z\_Score=(X)- μ / σ

As we need to find the z-scores of a and b which represents as Za and Zb By using the standard normal distribution, we can find the z-scores corresponding to the cumulative probability for 0.005 and 0.995

Za=-2.576 Zb=2.576

Now by using the formula of X=μ +Zσ Xa=100+(-2.576)(20)=48.48

Xb=100+(2.576\*20)=151.52

Hence the values of a & b are 48.48,151.5

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?

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