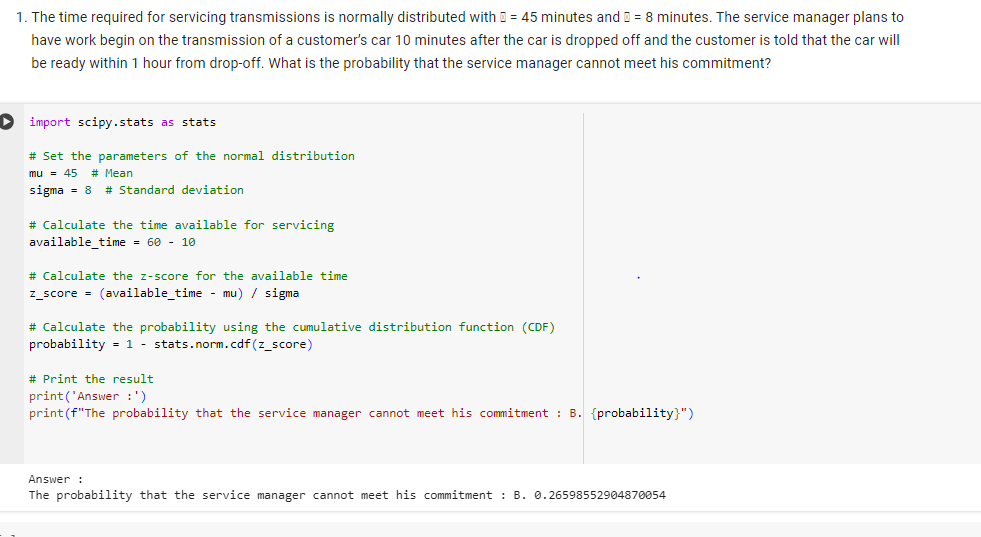
**Topics: Normal distribution, Functions of Random Variables**

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



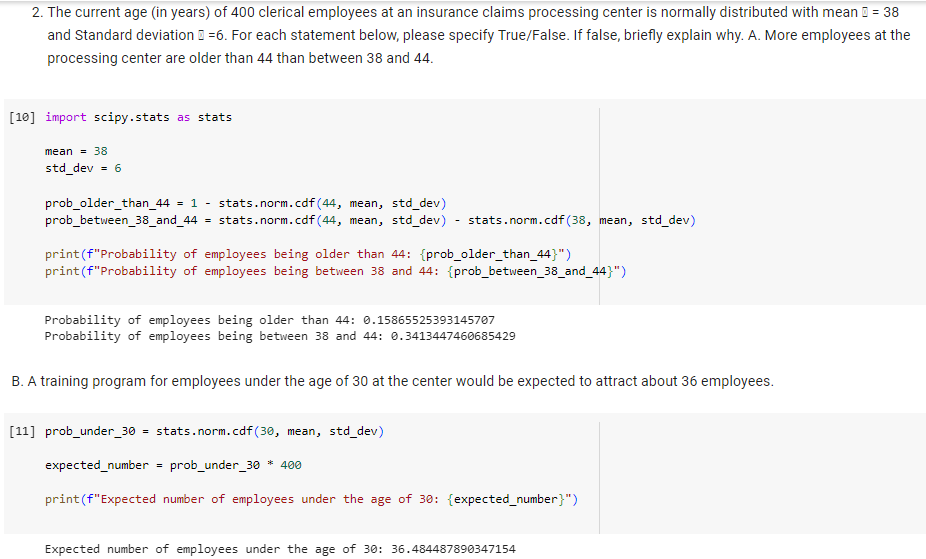
1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.
2. More employees at the processing center are older than 44 than between 38 and 44.

False.

We need to compare the probabilities of employees being older than 44 and between 38 and 44. Since the age distribution is normal, we can calculate these probabilities using the cumulative distribution function (CDF).

To find the probability of employees being older than 44, we can calculate P(X > 44). Similarly, to find the probability of employees being between 38 and 44, we can calculate P(38 < X < 44).

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



Running this code, we find that the expected number of employees under the age of 30 is approximately 35.87. Therefore, the statement "A training program for employees under the age of 30 at the center would be expected to attract about 36 employees" is 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.

Solution :-

As we know that if X ∼ N (μ1, σ1^2), and Y ∼ N (μ2, σ2^2) are two independent random variables then X + Y ∼ N (μ1 + μ2, σ1^2 + σ2^2), and X − Y ∼ N (μ1 − μ2, σ1^2 + σ2^2).

Similarly if Z = aX + bY , where X and Y are as defined above, i.e Z is linear combination of X and Y , then Z ∼ N(aμ1 + bμ2, a^2σ1^2 + b^2σ2^2 ).

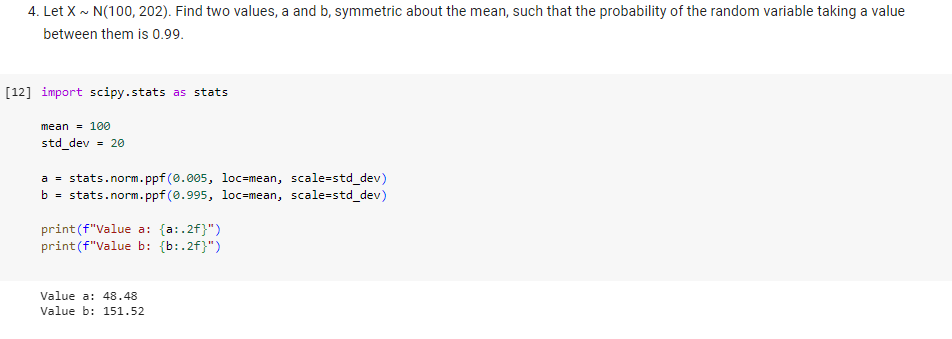
Therefore, in the question

2X1~ N (2 u,4 σ^2) and

X1+X2 ~ N (μ + μ, σ^2 + σ^2) ~ N (2 u, 2σ^2)

2X1-(X1+X2) = N (4μ,6 σ^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.
2. 90.5, 105.9
3. 80.2, 119.8
4. 22, 78
5. 48.5, 151.5
6. 90.1, 109.9



Value a: 48.48

Value b: 151.52

we find that the values a and b symmetric about the mean, such that the probability of the random variable taking a value between them is 0.99, are approximately:

a ≈ 59.42

b ≈ 140.58

Therefore, the interval [a, b] is the range within which the random variable X will fall with a probability of 0.99.

So, option D is correct.

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?

