**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 (Correct answer)
4. 0.5
5. 0.6987

To calculate the probability that the service manager cannot meet his commitment, we need to find the probability that the servicing time will exceed 50 minutes. We can standardize the servicing time using the z-score formula: z=(x-µ)/ σ

Plugging in the values, we get z = (50 - 45) / 8 = 0.625.

We can then use a standard normal distribution table or calculator to find the probability that a z-score is greater than 0.625. This probability is approximately 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.

Answer: False

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) arenormal random variables, then what is the difference between 2 *X*1 and *X*1 + *X*2? Discuss both their distributions and parameters.

Answer: There will be a difference between the variances. 2X1 will be larger variable than

X1+X2.

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 9
4. 22, 78
5. 48.5, 151.5 (Correct answer)
6. 90.1, 109.9

The area under the standard normal distribution curve between two z-scores can be found using a z-table or a calculator.

In this case, we want the probability to be 0.99. This corresponds to a z-score of 2.576. Therefore, we need to find two values, a and b, such that their z-scores are equal to ±2.576. So the answer is D.

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

print ('Mean Profit is Rs', mean\*45,'Million')

Mean Profit is Rs 540 million.

SD = np.sqrt((9)+(16))

print ('Standard Deviation is Rs', SD\*45, 'Million')

Standard Deviation is Rs 225.0 Million

print('Range is Rs',(stats.norm.interval(0.95,540,225)),'in Millions')

Range is Rs (99.00810347848784, 980.9918965215122) in Millions

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

Answer: X= 540+(-1.645)\*(225)

print('5th percentile of profit (in Million Rupees) is',np.round(X))

5th percentile of profit (in Million Rupees) is 170.

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

Answer: stats.norm.cdf(0,5,3)

0.0477903522728147

stats.norm.cdf(0,7,4)

0.040059156863817086