**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

* the probability that service manager cannot meet his commitment is B => 0.26 76 or 26 %

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.

* its False because the when we calculate the z scores we get the value 1 ie percentage will be 0.8413, and later to calculate probability we subtract from 100 ie 15.87% and we also find the z score for employees lesser or equal to 38, which indicates the percentage higher ie 34.12 %.

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

* its true since we calculate the z score for 30 and using the z table we get the percentage for the Z score and we get the value 36 out of 400 employees when solving the percentage.

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.

* The mean of 2 *X*1 and *X*1 + *X*2 is same but the var () of   is 2 *X*1 times more than the variance of *X*1 + *X*2

The two given variables are identically and independently distributed.

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: Option D 48.5 and 151.5

The value is given as stats.norm.ppf(pvalue)

Z value at 0.5th percentile is given as

                               Z(0.5) = stats.norm.ppf(0.005)= -2.576

Z value at 99.5 percentile is given as

                         Z(99.5) = stats.norm.ppf(0.995) = 2.576

Z = (x - 100)/20 = > x = 20z+100

      a = -(20\*2.576) + 100= 48.5

      b = (20\*2.576)+100= 151.5

= Two values symmetric about mean for the given standard normal distribution are[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.

* the range in rupees at 95% probability is 99.008 -980.99 crore,as we calculate by adding the mean of profits and variance and then use the code to find the intervals

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

* the fifth percentile of profit is Rs 170 crore, we calculate the z for 5th percentile and then we compute the equation

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

* Division 2

Has slightly probability of making loss compared to division2 in the given year but if we don’t look at depth none of the division have possible loss in the given year.