**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:

Probability will be B.0.2676

Fro normal distribution we use formula z = (X-μ)/б

X = 60,mu=55

Z=0.625

In jupyter we will use(1-stats.norm.cdf(0.625)

Probability = 0.2659.

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

Answer: A: False

Given mean = 38,std = 6

Zscore = z = (X-μ)/б

Employess at 44 age which Z score at 44. X=44,mean = 38,std=6

Z at 44 =( 44-38)/6=1 =>84.13%

People above at 44 age =100-84.13%=15.87% ~63 out of 400

Z score for 38 =(38-38)/6=0 =>50%

Then people between 38 and 44 age = 84.13-50 =34.3% ~ 137 out of 400

Hence at 44 old age employess are falling at 38 and 44 the it is False.

1. TRUE

Z score at 30= (30-38)/6 = -1.33 = 9.15%~ 36 out of 400

Under the age of 30 will be attracted to 36 employess – 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 parameters.

Answer:

Asumme x1+x2 have some values mean =1 , std = 2

Then 2XI =2(1,2\*2) = 2(1,4) = (2,8)

Then x1+x2 =(1+1,2\*2+2\*2) = (2,8).

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

Anwers:

(D) is correct

The probability of getting value between a and b should be 0.99.

The area at probability wull be 0.01. probability(1-0.99=0.01).

The probability towards left from a=-0.005(0.01/2).the probability towards from b =+0.005(0.001/2).

Zvalue z=(mean-mu)/std at 0.005 probability from z table value is -2.57

By calculating Z =(-2.57)\*20+100 = 48.6. D is the correct (48.5,151.)

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?

Answer: