**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:** Since work beings 10 mins after the car is dropped, the time left to complete work is 50 mins. Probability that Service Manager cannot meet his commitment =P(X>50) =1-Pr(x<=50) (X is the time taken to complete work). Convert 50 to z-score.

Standard normal variable Z= (X- *μ/σ =(x-45)/8*

P(X<=50) =P (Z<= (50-45)/8) =PR(Z<=0.625) =0.73237=73.237% (the number in z-table)

Probability that service manager will not meet his commitment is :100-73.237=26.763%= 0.2676 So, the answer is B.

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.

**Ans:** μ=38 & *σ* = 6

1. Probability of employees >44- Prix>44)-1-Pr(x=44)

Z=(X-μ)/ σ = (x-38)/6

Pr(x+44) =Pr(2c+(44-38)/6)-Pr(Z=1) =0.84134-84.134%

Probability that employees will be greater than 44-100-84.134-15.866

Probability of employees between 38 & 44- Prix<=44)-Pr(x=38)

Here, Prtxc-44) =0.84134

Pr(x38)-Prize>-38-38)/6)-Pr(z>=0)-05

Therefore, Prix-44)-Pr(x-38)-0.84134-0.5-0.34134-34.134% So, the statement "More employees at the processing center are older than 44 than

between 38 and 44" is TRUE

1. Probability of employess less than 30 = Pr(x < 30) z = (x - 30)

Z=(x-μ)/ σ=(30-38)/6

Pr(x < 30) = Pr(z < 30 - 38) / 6 )=Pr(z<-1.333)=.09176=9.1796

So, the number of employees with probability 0.0917 of them being under

30=400^ \* 0.0917 = 36.68 = 36

The statement of "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.

Ans: Not Sure….

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: The probability of getting value between a & b is 0.99

So, the probability of getting value outside a & b is 1-0.99=0.01

The probability towards left of a = -0.01/2 -0.05 The probability towards right of b 0.01/2-0.0

Since we have probabilities of a & b, we need calulcate the probability of X-the random variable at a & b which has these probabilities

By finding Standard Normal Variable (2),need to calculate X

Z=(X-Mue)/Sigma

For a probability of 0.005, z values is -2.57

Z\* σ +μ=x

(-2.57)\*20+100-151.4

(-2.57)\*20+100-48.6 Option D is the correct answer

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

Ans: Not sure….