**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 10mins after the car is dropped,the time left to complete work is 50mins.

Probability that service manager cannot meet his commitment=P(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=73.23%(the number in z-tablet)

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=Pr(x>44)=1-Pr(x<=44)

Z=(X- µ)/ σ =(x-38)/6

Pr(x<=44)=Pr(z<=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=pr(x<=44)-Pr(x>=38)

Here,Pr(x<=44)=0.84134

Pr(x>=38)=Pr(z>=(38-38)/6)=Pr(z>=0)=0.5

Therefore,Pr(x<=44)-Pr(x>=38)=0.84134-0.5=0.34134=34.134%

So,the statement “more employees at the processing center are older than 44than between 38 and 44”is True

1. probability of employees lessthan 30=Pr(X<30)

Z=(X- µ)/ σ =(30-38)/6

Pr(x<30)=Pr(z<(30-38)/6=Pr(z<-1.3333)=.09176=9.17%

So,the number of employees with probility 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=0.05

Since we have probabilities if a &b which has these probabilities

By finding standard normal variable(z),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.

ANS:-> mean profit is RS540 Million

Std deviation is RS 225 million

Range is RS

State norms interval (0.95,540,225)

Range is rs 99.0081034,980.991896

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

ANS: -> formula X=X=µ+Zσ,where in from z table, 5 percentile=-1.645

->540(-1.645)\*225

X=169.875

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

**Ans:** probability of division 1 making a loss p(X<0)

Stats.norm.cdf(0,5,3)

0.0477903

Probability od division 2 making a loss p(X<0)

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

0.0400591