**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

1-pnorm(60, mean=55, sd=8)

=0.2659 (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.
4. Z score for 44  = (44 - 38)/6  = 1  =>  84.13 %

People above 44 age = 100 - 84.13 = 15.87%

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

Hence People between 38 & 44 age = 84.13 - 50 = 34.13 %

Hence more employees at the processing center are older than 44 than between 38 and 44 is **FALSE**

1. Z score for 30  = (30 - 38)/6 =  -1.33  =  9.15  %   ≈ 36 out of 400

Hence A training program for employees under the age of 30 at the center would be expected to attract about 36 employees - **TRUE**

1. If *X1*~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are *ii d* 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 2X1 and X1 +X2 is same but the var (https://tex.z-dn.net/?f=%5Csigma%5E2) of 2X1 is 2 times more than the variance of X1 + X2. The difference between the two says that 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

* 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

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?
5. 95% of the **probability lies**between 1.96 **standard deviations**of the **mean**.

Thus **range**is:

Total profit = (5, 3) + (7, 4)

= (12 – 1.96 \* 5, 12 +1.96\*5)

= 2.2 M, 22.8 M

= (Rs. 99M, Rs. 1026 M)

B) **Fifth percentile**is calculated as:

From p **values**of z **score table**, we get:

P -12 / 5 = -1.644

P = 12 – 8.22

= 3.78

Thus at $3.78M **dollars**, or Rs. 170.1M **amount,** 5th **percentile**of **profit lies.**

C) Loss is when profit < 0

Thus: p < 0

The first **division** of **company** thus has **larger probability**of making a loss in a given year.