**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- (B) 0.2676*

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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.

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*Mean = 38*

*SD = 6*

*Z score = (Value - Mean)/SD*

*Z score for 44  = (44 - 38)/6*

*= 6/6*

*=  1*

*#from z-score table*

*= 84.13%*

*People above 44 age = 100 - 84.13%*

*=  15.87%*

*Z score for 38  = (38 - 38)/6 = 0/6 = 0*

*= 50%*

*Hence People between 38 & 44  age = 84.13 - 50*

*=  34.13%*

***More employees at the processing center are older than 44 than between 38 and 44 is FALSE .***

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

*Ans-* *Z score for 30  = (30 - 38)/6 =  -1.33  =  9.15 %*

*= 36 out of 400*

***Therefore, 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 *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:***

*X1 ~ N(μ, σ2) and X2 ~ N(μ, σ2)*

* *2X1 ~ N(2 μ, 2σ2)*
* *X1+X2 ~ N(μ, σ2)+ N(μ, σ2) ~ N(2 μ , 2 σ2)*
* *2X1 – (X1+X2) ~ N(2 μ-2 μ, 2σ2* ***+****2σ2 ) ~ (0, 4σ2)*

***In the difference between 2X1 and X1+X2 mean getting zero and variance getting doubled.***

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

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*Ans is D*

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- Tap to View*](https://colab.research.google.com/drive/1JCq3FchSd35iHhy_JgOK3MmJXYZNfV6F?usp=sharing)