**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

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**0.7340144709512995**

**1-0.7340144709512995 = 0.26598552904870054**

**= 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.

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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.

* **If X1 is normally distributed then 2X1 is also normally distributed and 2X1 is larger scale of X1.**
* **X1 and X2 are normally distributed and their associated sum and samples are exactly normal with suitable parameters.**

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

**The Probability of given value between a and b should be 0.99.**

**So, the Probability of going wrong, or the Probability outside the a and b area is 0.01 (i.e., 1-0.99).**

**The Probability towards left from a = -0.005 (i.e., 0.01/2).**

**The Probability towards right from b = +0.005 (i.e., 0.01/2).**

**So, since we have the probabilities of a and b, we need to calculate X, the random variable at a**

**and b which has got these probabilities.**

**By ﬁnding the Standard Normal Variable Z (Z Value), we can calculate the X values.**

**Z= (X- μ) / σ**

**For Probability 0.005 the Z Value is -2.57 (from Z Table).**

**Z \* σ + μ = X**

**Z (-0.005) \*20+100 = -(-2.57) \*20+100 = 151.4**

**Z (+0.005) \*20+100 = (-2.57) \*20+100 = 48.6**

**So, option D is correct**

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?

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