**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?** (zscore)=55-45/8=0.625
2. 0.3875
3. 0.2676
4. 0.5
5. 0.6987

* 0.2676

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.**

* FALSE

1. **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.**

* AS BOTH ARE NORMAL DISTRIBUTION WITH

MEAN 2Μ, BUT THE VARIANCE OF THE SUM IS 2Σ2 RATHER THAN 4Σ2.

EXPECTED VALUE = E(2X1) = 2E(X1) = 2Μ

AND

E(X1 + X2) = E(X1) +E(X2) = Μ + Μ

WHEREAS

VAR(2X1) = 4VAR(X1) =4Σ2 AND VAR(X1 + X2) = VAR(X1) + VAR(X2) = 2Σ2

2X1 = X1+X1 AS THE SUM OF TWO NORMAL RANDOM VARIABLES WHERE X1 + X2 IS THE SUM OF TWO INDEPENDENT NORMAL RANDOM VARIABLES.

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.**

* a=48.48 b=151.52

1. **90.5, 105.9**
2. **80.2, 119.8**
3. **22, 78**
4. **48.5, 151.5**
5. **90.1, 109.9**

* D. 48.5, 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?**

* PROFIT1~N(5,32)

PROFIT2~N(7,42)

$1= RS 45

HERE, MEAN1 = 5 , MEAN2=7

STD1=32 STD2=42

ALL PROFIT = PROFIT1~N(5,32) + PROFIT2~N(7,42)

PROFIT~N(MEAN1+MEAN2,STD1+STD2)

PROFIT~N(5+7, 32 + 42) #9+16=25 i.e 52

PROFIT~N(12,52)

A . RANGE IS [99.00810347848784, 980.9918965215122 ] MILLION

1. TO CALCULATE 5TH PERCENTILE, WE USE THE FORMULA:

M= 540

Population mean (mu) = 225

Μ - 1.5\*mu=> 540-(1.5\*225) =202.5

= 202.5 MILLION RUPEES.

THE 5TH PERCENTILE OF PROFIT (IN RUPEES) FOR THE COMPANY = 202.5 MILLION

1. P(0> PROFIT1~N(5,32)

P(0> PROFIT2~N(7,42)

FOR P(0> PROFIT1~N(5,3^2) = 0.0477903522728147 HAS GREATER LOSS