**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 Ans: B
3. 0.2676 pnorm (50, mean=45, sd=8,lower.tail= FALSE)
4. 0.5 =0.2659855
5. 0.6987
6. 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.
7. More employees at the processing center are older than 44 than between 38 and 44.

Ans: False

pnorm(44, mean=38, sd=6, lower.tail=FALSE)

=0.1586 (15.86%)

pnorm(44, mean=38, sd=6, lower.tail=TRUE)-pnorm(38, mean=38, sd=6, lower.tail=FALSE)

=0.3413447(34.13%)

More employees at the processing center are less than 44 years of age

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

Ans: True

pnorm(30, mean=38, sd=6, lower.tail=TRUE)

=0.0912

No.of employees under age of 30 at center=0.0912\*400=36.48(36 employees)

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: 2X1 and X1+X2 have same mean

X1+X2 have less variance than 2X1

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 Ans: D, qnorm(0.005, 100, 20)
3. 80.2, 119.8 =48.48
4. 22, 78 qnorm(0.995,100,20)
5. 48.5, 151.5 =151.4
6. 90.1, 109.9
7. 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
8. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.

Ans: qnorm(0.025,12,5)

= 2.20018

qnorm(0.975,12,5)

=21.79982

Range in rupees 99.0081 to 980.9919

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

Ans: z score of 5th percentile is -1.64

profit (in Rupees) for the company=171

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

Ans: probability value of first division is -1.667

Probability value of second division is -1.75

a larger probability of making a loss in a given year is second division.