**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

Answer:

**Option B. 0.2676**

**1-** stats.norm.cdf(0.625)

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.

Answer: **False**  
 Explanation: p (x>44) =0.15 < P (38<x<44) =0.34. Therefore, there is more employee in

between 38 to 44 age then of age greater than 44.

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

Answer: **True**

Explanation: P(x<30) =0.01921  
 No of employee falls under age 30 is 0.01921\*400=36.4

That is equal to 36.

1. If *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are normal random variables, then what is the difference between 2 *X*1 and *X*1 + *X*2? Discuss both their distributions and parameters.

Answer:

If X1 = N (μ, σ2) and X2 = N (μ, σ2)

Then, 2X1 = N (2μ, 4σ 2) and

X1 + X2 = N (μ, σ2) + N (μ, σ2) = N (2μ, 2σ 2)

Therefore, X1 – (X1 + X2) = N (2σ2)

2X1-(X1+X2) = N (4µ, 6σ2)

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

Answer:

**Option D. 48.5, 151.5**

Stats. norm.interval(0.99, 100, 20)

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.

Answer:

x1,x2 = stats.norm.interval(0.95,540,225)=99.08-98 0.99

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

Answer:

qnorm(0.05,45\*7,3) # 310.0654

qnorm(0.05,45\*5,3) # 220.0654

5th percentile of profit (in Rupees) = 310.0654+ 220.0654 = 530.1308

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

Answer:

P1(x<0) ~ N(5, 32) = 0.0477

Probability of loss is more than p2

P2(x<0) ~ N(7, 42) = 0.0400