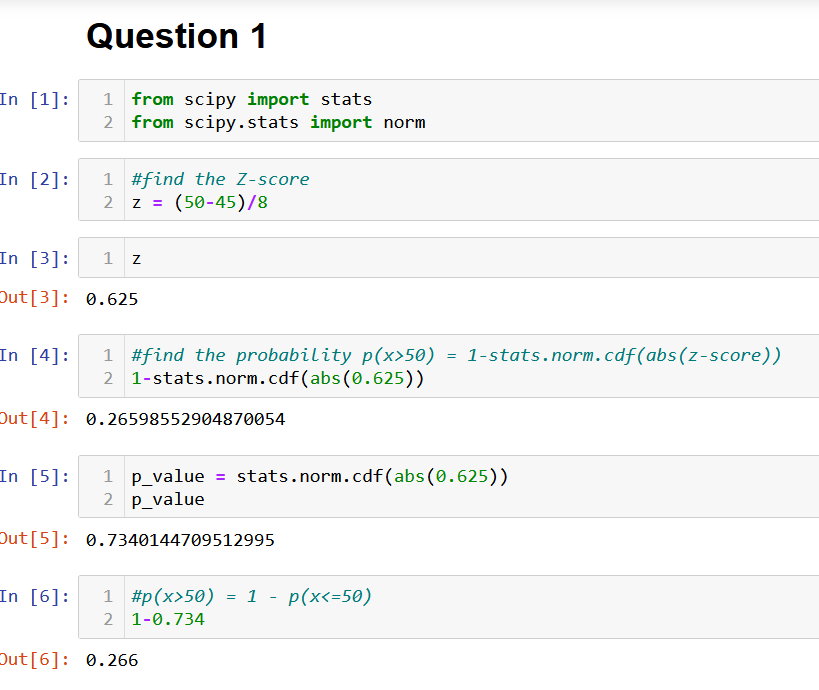
**Topics: Normal distribution, Functions of Random Variables**

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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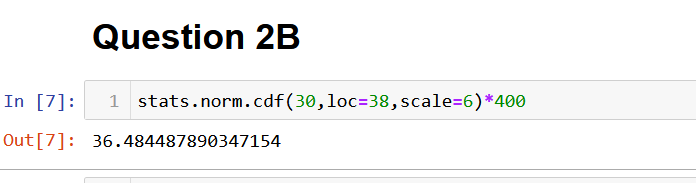
1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.
2. More employees at the processing center are older than 44 than between 38 and 44.

**Ans: A)False**

The 44 has an z value of 1.38 has an z value of 0.68% values lies between -1 & 1 z scores. Therefore 34% data points lies between 0 & 1.the 32% values lies outside(-1,1).therefore 16%lies above an z score of 1.therefore more employees are between 38 & 44 than above 44.

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

**Ans: A)True**

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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.

Ans: Since x1 & x2 are independent E(x1+x2)=E(x1)+E(x2)

Since x1 & x2 are independent E(2x1)=2E(x1)=2µ

Variance(x1+x2) = V(x1)+V(x2)+2Cov(x1,x2)

Since x1 & x2 are independent,Cov(x1,x2)=0

Therefore Var(x1+x2) = V(x1)+V(x2)=2 σ²

V(2x1) = 2²V(x1)

= 4V(x1)

=4 σ²

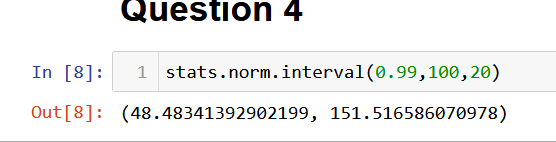
Therefore 2x1 follows the normal distribution with mean 2 µ & variance 4 σ² & x1+x2 follows the normal distribution with mean 2µ & 2σ²

Therefore x1+x2 ~ N(µ,2σ²)

And 2x1 ~ N(µ,4σ²)

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

**Ans: D. 48.5, 151.5**

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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.

Ans: Since the profits are independent,profit1,profit2 ~ N(5+7,3²+4²)

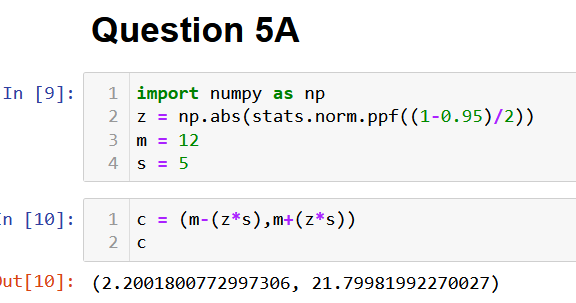
Profit1+profit2 ~ N(12,25)

Therefore the new profit distribution mean=12

Std=250.5 =5

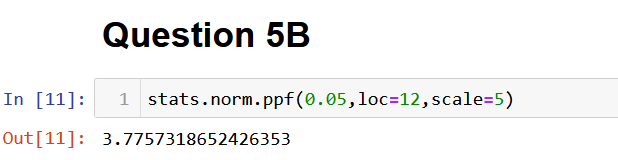
95 % of the values lies between the z values (-1.6,1.6)

Therefor 95% of the values lies between (2.20,21.80)



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

Ans: A). 3.78



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

A)For the first deviation of the chance of loss = 4.78% for the 2nd division has a higher chance of making profit.

