**Assignment Number 7**

COMPUTING PROBABILITIES OF NORMAL DISTRIBUTION USING EXCEL

Register Number: 1740256

**Date:** 29/1/2018

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**Aim** – Plastic bags used for packing are manufactured so that the breaking strength of the bags is normally distributed with mean 5 and standard deviation 1.5. What is the probability that the breaking strength is –

1. Between 3 and 3.5 pounds.
2. Between 3.2 & 4.2 pounds
3. Atleast 3.6 pounds.
4. Less than 3.17 pounds.

**Procedure -**

1. Let X be the random variable denoting the breaking strength of the bags. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations -**

**Conclusions -**

The Probabilities of the breaking strength for –

1. Between 3 and 3.5 pounds = **0.067444**
2. Between 3.2 & 4.2 pounds = **0.181832**
3. Atleast 3.6 pounds = **0.8247**
4. Less than 3.17 pounds = **0.111232**

**Question 2**

**Aim** – X is a normally distributed variable with mean μ = 30 and standard deviation σ = 4. Find   
  
a) P(x < 40)   
  
b) P(x > 21)   
  
c) P(30 < x < 35)

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations -**

**Conclusions –**

The Probabilities are –

a) P(x < 40) = **0.99379**  
  
b) P(x > 21) = **0.987776**  
  
c) P(30 < x < 35) = **0.394350**

**Question 3**

**Aim** – A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations -**



**Conclusions –**

The Probability is = **0.158655**

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**Question 4**

**Aim** – For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours.

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**



**Conclusions –**

The Probability is = **0.408789**

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**Question 5**

**Aim** – The length of similar components produced by a company are approximated by a normal distribution model with a mean of 5 cm and a standard deviation of 0.02 cm. If a component is chosen at random

a) what is the probability that the length of this component is between 4.98 and 5.02 cm?   
  
b) what is the probability that the length of this component is between 4.96 and 5.04 cm?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**



**Conclusions –**  
The Probability is - **0.682689492**

1. the probability that the length of this component is between 4.98 and 5.02 cm = **0.682689492**
2. the probability that the length of this component is between 4.96 and 5.04 cm =

**0.9545**

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**Question 6**

**Aim** – The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last   
  
a) less than 7 months.   
  
b) between 7 and 12 months.

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**



**Conclusions –**

The probability that an instrument produced by this machine will last   
  
a) less than 7 months = **0.00621**  
  
b) between 7 and 12 months = **0.49379**

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**Question 7**

**Aim** – The time taken to assemble a car in a certain plant is a random variable having a normal distribution of 20 hours and a standard deviation of 2 hours. What is the probability that a car can be assembled at this plant in a period of time   
  
a) less than 19.5 hours?   
  
b) between 20 and 22 hours?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**

**Conclusions –**

The probability that a car can be assembled at this plant in a period of time   
  
a) less than 19.5 hours = **0.401294**  
  
b) between 20 and 22 hours = **0.341345**

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**Question 8**

**Aim** – A large group of students took a test in Physics and the final grades have a mean of 70 and a standard deviation of 10. If we can approximate the distribution of these grades by a normal distribution, what percent of the students   
  
a) scored higher than 80?   
  
b) should pass the test (grades≥60)?   
  
c) should fail the test (grades<60)?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**

**Conclusions –**

The percentage that –

a) scored higher than 80 = **0.158655 = 15.86%**  
  
b) should pass the test (grades≥60) = **0.841345** = **84.13%**  
c) should fail the test (grades<60) = **0.158655254** = **15.86%**

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**Question 9**

**Aim** – The annual salaries of employees in a large company are approximately normally distributed with a mean of $50,000 and a standard deviation of $20,000.   
  
a) What percent of people earn less than $40,000?   
  
b) What percent of people earn between $45,000 and $65,000?   
  
c) What percent of people earn more than $70,000?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**

**Conclusions –**

1. The percent of people who earn less than $40,000 = **0.308538** = **30.85%**
2. The percent of people who earn between $45,000 and $65,000 = **0.372079** = **37.20%**
3. The percent of people who earn more than $70,000 = **0.158655** = **15.86%**

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**Question 10**

**Aim** – Suppose SAT scores are normally distributed with a mean of 1000 and a standard deviation of 100.

a) What percentage will be between 900 and 1100?  
b) What percentage of scores will be between 1100 and 1200?  
c) What percentage of scores will be below 850?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**

**Conclusions –**

1. The percentage between 900 and 1100 = **0.682689** = **68.26%**
2. The percentage of scores between 1100 and 1200 = **0.135905122** = **13.59%**

c) The percentage of scores below 850 = 0.066807 = **6.68%**

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**Question 11**

**Aim** – Replacement times for CD players are normally distributed with a mean of 7.1 years and a standard deviation of 1.4 years (data from *Consumer Reports*). What is the probability that a randomly-selected CD player will have to be replaced in 8 years or less? More than 7 years? Between 6.5 and 7.5 years?

**Procedure -**

1. Let X be the random variable. Since it is given that X follows normal distribution, we use Excel to compute the probabilities.
2. Open an Excel sheet and type in any empty cell =NORMDIST(x,mean,s.d,cumulative).
3. Type the value of mean and standard deviation as given in the question and type true if we require cumulative values, otherwise type false.

**Calculations –**

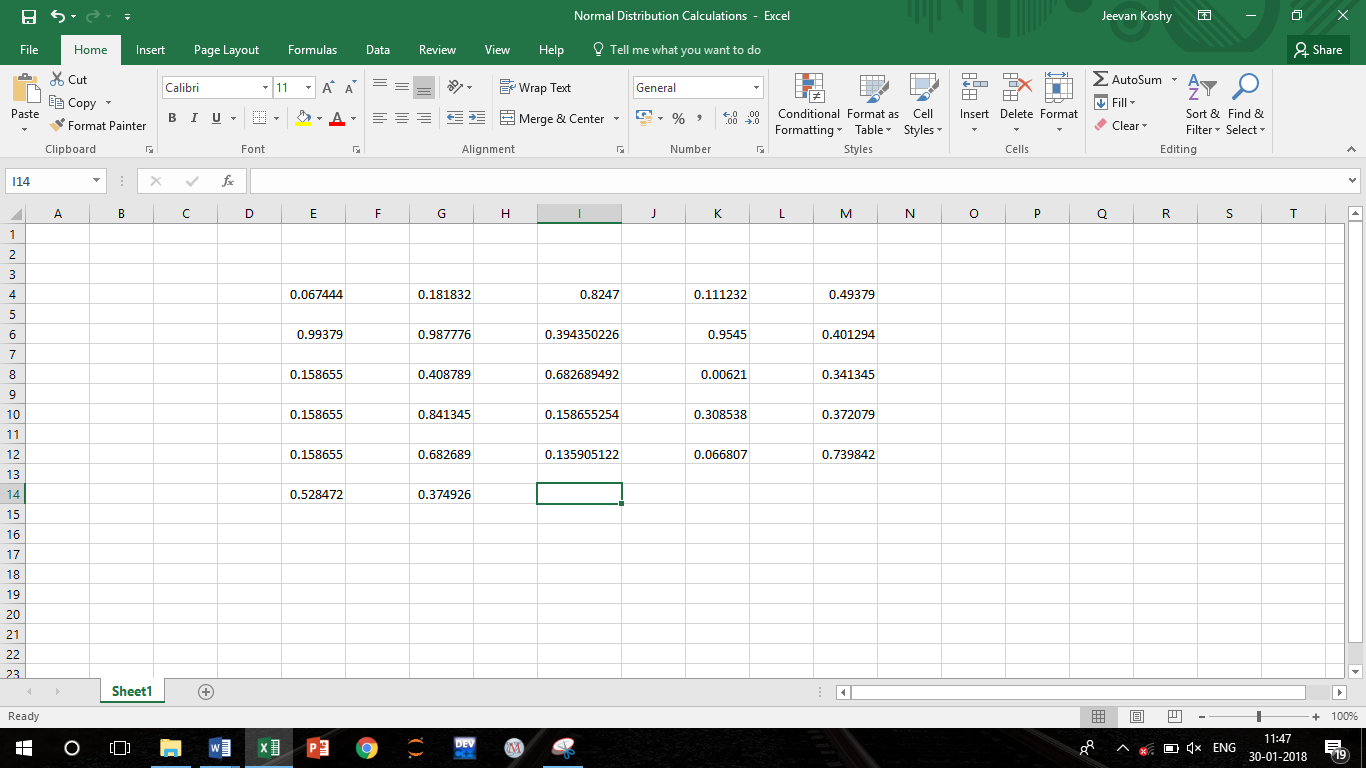
  

**Conclusions –**

The probability that a random CD has to be replaced –

1. In 8 years or less = **0.739842**
2. More than 7 years = **0.528472**
3. Between 6.5 & 7.5 years = **0.374926**

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