

4.2 Exponential Probability using the Excel Spreadsheet provided and Excel only

To use the Excel spreadsheet to compute probabilities for the continuous probability distribution function, [click here to download the Excel spreadsheet](#).

Definition: Exponential Distribution

Suppose a random variable X is distributed Exponential with an average of 10. Compute the following values round the values to two decimal places.

1. The mean
2. The standard deviation
3. 45th percentile
4. $P(X > 12)$
5. $P(X < 8)$
6. $P(4 < X < 9)$
7. $P(X > 59 | X > 54)$

The first step is to determine the parameter lambda or m . Lambda is equal to $1/\text{average}$; therefore, enter $=1/10$ in cell B1.

The mean is given to be 10. In the Exponential distribution, the mean and standard deviation are equal. Thus, cells B2 and B3 are equal to 10.

Next, to find the 45th percentile, enter 0.45 in cell E1.

The answer is 5.97837.

Be sure to round the value to two decimal places, 5.98.

To compute the probability $P(X > 12)$, you can enter the following formula on the scratchpad spreadsheet in the Excel workbook.

`=1 - expon.dist(12, 1/10, true)`

0.30119421

Round the answer to two decimal places, 0.30.

To compute the probability $P(X < 8)$, you can enter the following formula on the scratchpad spreadsheet in the Excel workbook.

`=expon.dist(8, 1/10, true)`

0.55067104

Round the answer to two decimal places, 0.55.

To compute the probability $P(4 < X < 9)$, you can enter the following formula on the scratchpad spreadsheet in the Excel workbook.

`=expon.dist(9, 1/10, true) - expon.dist(4, 1/10, true)`

0.26375039

Round the answer to two decimal places, 0.26.

To compute the probability $P(X > 59 | X > 54)$, remember that the Exponential distribution is memoryless. That means we start counting from zero at 54. Therefore, $P(X > 59 | X > 54) = P(X > 59 - 54) = P(X > 5)$. Since the probability statement uses the greater than symbol, we subtract the $P(X < 5)$ from 1 to get our answer. Enter the following formula to get the answer.

`= 1 - expon.dist(5, 1/10, true)`

0.60653066

Round the answer to two decimal places, 0.61.

✓ Example 1

Using the Excel workbook provided

First, open the ContinuousProbabilityDistributionModified Excel workbook. Then click on the Exponential Distribution tab at the bottom. Follow the instructions below.

1. Make sure you enter $=1/10$ in cell B1.
2. The mean is in cell B2, 10.
3. The standard deviation is in cell B3, 10.
4. To find the 45th percentile, enter .45 in cell E1. The answer is in cell E2, 5.97837. *Make sure you round the answer to two decimal places, 5.98.*
5. To find $P(X > 12)$, Scroll down to 12 in the A column, cell A18. Then move to the right to cell B18. Since we use the greater than symbol in the probability statement, we subtract 0.6988 from 1 to get the solution 0.3012 ($1 - .6988$). *Make sure you round it to two decimal places 0.30*
6. To find $P(X,8)$, locate 8 in the A column, cell A14. Then move to the value in the B column, 0.5507. *Make sure you round the answer to two decimal places, 0.55.*
7. To find $P(4 < X < 9)$, first find 9 in column A, cell A15. Move to the right and find the probability $P(X < 9) = 0.5934$. Next, find the number 4 in the A column, cell A10. Move to the right and find the $P(X < 4) = 0.3297$. Subtract 0.3297 from 0.5934 to get 0.2637. *Make sure you round the answer to two decimal places, 0.26.*
8. To find $P(X > 59|X > 54)$ we need to remember that Exponential distribution is memoryless; therefore $P(X > 59|X > 54) = P(X > 59-54) = P(X > 5)$. To find the solution find 5 in column A, A11. Then move to column B and find $P(X < 5)$, 0.3935. Since we want $P(X > 5)$ subtract $P(X < 5)$ from 1, $1 - .3935 = 0.6065$. *Make sure you round the answer to two decimal places, 0.61.*

Solution

Add example text here.

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