

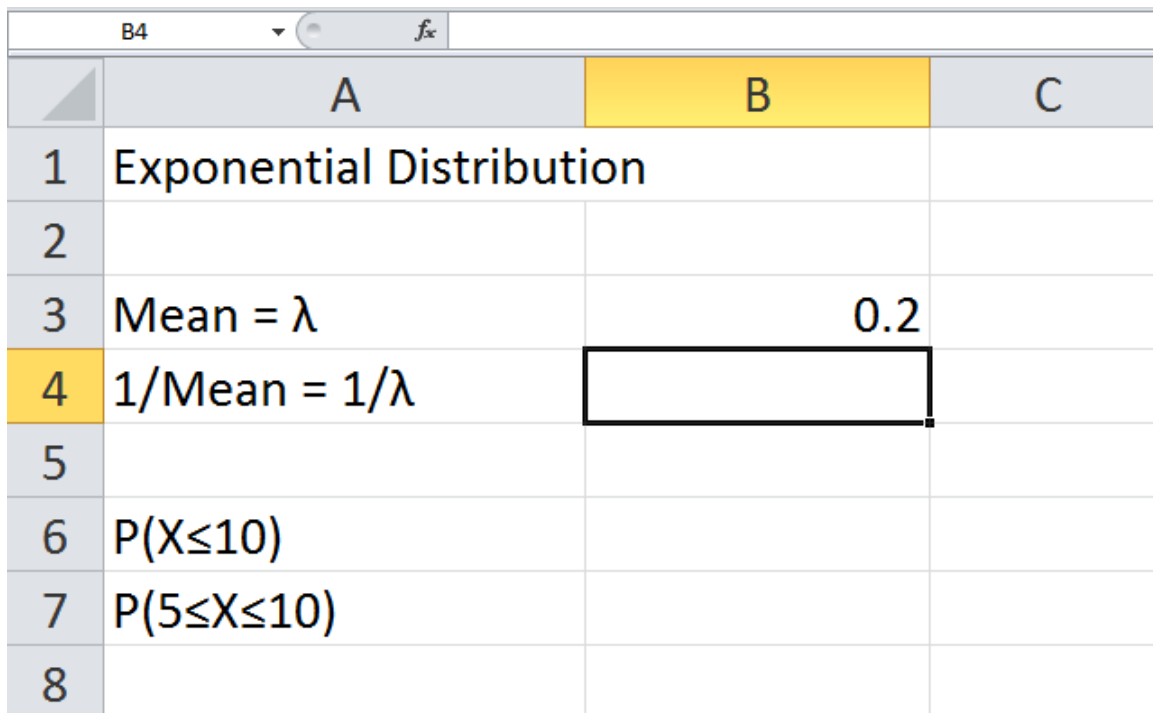
## Exponential Distribution Using Excel

In this tutorial, we are going to use Excel to calculate problems using the exponential distribution.

We will solve a problem with data that is distributed exponentially with a mean of 0.2, and we want to know the probability that X will be less than 10 or lies between 5 and 10.

The first thing we're going to do is set up a table for mean, 1 divided by the mean, probability of X is less than or equal to 10, and the probability of X lies between 5 and 10.

Here we have set up a Microsoft Excel file showing a table where we input the mean, which in this case is equal to 0.2 and 1 over the mean ( $1/\text{Mean}$ ), which we will put a formula in for later; then we will have a place to put our formulas for the probability that X is less than or equal to 10 and the probability that X lies between 5 and 10.




The screenshot shows an Excel spreadsheet with the following content:

|   | A                           | B   | C |
|---|-----------------------------|-----|---|
| 1 | Exponential Distribution    |     |   |
| 2 |                             |     |   |
| 3 | Mean = $\lambda$            | 0.2 |   |
| 4 | $1/\text{Mean} = 1/\lambda$ |     |   |
| 5 |                             |     |   |
| 6 | $P(X \leq 10)$              |     |   |
| 7 | $P(5 \leq X \leq 10)$       |     |   |
| 8 |                             |     |   |

The next thing you want to do is set up a table area with formulas for  $1/\text{Mean}$ , the probability that  $X \leq 10$ , and the probability that X lies between 5 and 10 ( $5 \leq X \leq 10$ ).

Now on our spreadsheet in cell B4, we will enter formula  $=1/B3$  and click the checkmark icon next to the  $f_x$  button or hit Enter on the keyboard; that will give us 1 divided by the mean, which gives us 5 in this case.

|   | A                        | B   | C   |
|---|--------------------------|-----|---|
| 1 | Exponential Distribution |     |   |
| 2 |                          |     |   |
| 3 | Mean = $\lambda$         | 0.2 |   |
| 4 | 1/Mean = $1/\lambda$     | 5   |  |
| 5 |                          |     |   |
| 6 | $P(X \leq 10)$           |     |   |
| 7 | $P(5 \leq X \leq 10)$    |     |   |
| 8 |                          |     |   |

For the probability that  $X \leq 10$  we are going to use the EXPON.DIST. To do so, select cell **B6** and click the function button ( $f_x$ ).

|   | A                        | B | C   |
|---|--------------------------|---|-----|
| 1 | Exponential Distribution |   |     |
| 2 |                          |   |     |
| 3 | Mean = $\lambda$         |   | 0.2 |
| 4 | 1/Mean = $1/\lambda$     |   | 5   |
| 5 |                          |   |     |
| 6 | P( $X \leq 10$ )         |   |     |
| 7 | P( $5 \leq X \leq 10$ )  |   |     |
| 8 |                          |   |     |

2. Click the function button,  $f_x$ .

1. Select cell B6.

An Insert Function box will display. Select **Statistical** from the dropdown menu next to "Or select a category:", and then scroll down under "Select a function" to locate and select EXPON.DIST as shown here.

|    | A                        | B | C   | D | E | F |
|----|--------------------------|---|-----|---|---|---|
| 1  | Exponential Distribution |   |     |   |   |   |
| 2  |                          |   |     |   |   |   |
| 3  | Mean = $\lambda$         |   | 0.2 |   |   |   |
| 4  | 1/Mean = $1/\lambda$     |   |     |   |   |   |
| 5  |                          |   |     |   |   |   |
| 6  | P( $X \leq 10$ )         | = |     |   |   |   |
| 7  | P( $5 \leq X \leq 10$ )  |   |     |   |   |   |
| 8  |                          |   |     |   |   |   |
| 9  |                          |   |     |   |   |   |
| 10 |                          |   |     |   |   |   |
| 11 |                          |   |     |   |   |   |
| 12 |                          |   |     |   |   |   |
| 13 |                          |   |     |   |   |   |

Insert Function

Search for a function:  
Type a brief description of what you want to do and then click Go

Or select a category: Statistical

Select a function:

- EXPON.DIST
- F.DIST
- F.DIST.RT
- F.INV
- F.INV.RT
- F.TEST
- FISHER

EXPON.DIST(x,lambda,cumulative)  
Returns the exponential distribution.

OK Cancel

Now click **OK**. The Function Arguments window will appear as shown on the next page.

EXPON.DIST       =EXPON.DIST()

|    | A                        | B      | C | D | E | F |
|----|--------------------------|--------|---|---|---|---|
| 1  | Exponential Distribution |        |   |   |   |   |
| 2  |                          |        |   |   |   |   |
| 3  | Mean = $\lambda$         | 0.2    |   |   |   |   |
| 4  | 1/Mean = $1/\lambda$     | 5      |   |   |   |   |
| 5  |                          |        |   |   |   |   |
| 6  | P( $X \leq 10$ )         | =EXPON |   |   |   |   |
| 7  | P( $5 \leq X \leq 10$ )  |        |   |   |   |   |
| 8  |                          |        |   |   |   |   |
| 9  |                          |        |   |   |   |   |
| 10 |                          |        |   |   |   |   |
| 11 |                          |        |   |   |   |   |
| 12 |                          |        |   |   |   |   |
| 13 |                          |        |   |   |   |   |

Function Arguments

EXPON.DIST

X  = number

Lambda  = number

Cumulative  = logical

=

Returns the exponential distribution.

X is the value of the function, a nonnegative number.

Formula result =

[Help on this function](#)

Now we will enter our values for X, Lambda, and Cumulative as shown below. Our X will be 10, Lambda is going to be cell B3, and we are going to choose Cumulative is equal to true.

Function Arguments

EXPON.DIST

X  = 10

Lambda  = 0.2

Cumulative  = TRUE

= 0.864664717


Returns the exponential distribution.

**Cumulative** is a logical value for the function to return: the cumulative distribution function = TRUE; the probability density function = FALSE.

Formula result = 0.8646647168

[Help on this function](#)

Click **OK**, and that will give us a probability of about .865. If you see ##### in cell B6, just simply widen the B column to see the result.

|   | A                        | B            | C   |
|---|--------------------------|--------------|---|
| 1 | Exponential Distribution |              |   |
| 2 |                          |              |   |
| 3 | Mean = $\lambda$         | 0.2          |   |
| 4 | 1/Mean = $1/\lambda$     | 5            |   |
| 5 |                          |              |   |
| 6 | $P(X \leq 10)$           | 0.8646647168 |  |
| 7 | $P(5 \leq X \leq 10)$    |              |   |
| 8 |                          |              |   |

Now to calculate the probability that X lies between 5 and 10 ( $5 \leq X \leq 10$ ), we are going to have to subtract one exponential distribution from another. We will once again use the EXPON.DIST function.

We are going to do it for 10, Lambda is going to be cell B3, Cumulative is true, and then were going to subtract EXPON.DIST for 5, Lambda is cell B3, Cumulative is true.

To do this, simply type `=EXPON.DIST(10, B3, TRUE) - EXPON.DIST(5, B3, TRUE)` into cell **B7** and hit the Enter key or click the checkmark icon. That will give us the probability of X lying between 5 and 10: 0.2325441579.

|   | A                        | B            | C                             |
|---|--------------------------|--------------|-------------------------------|
| 1 | Exponential Distribution |              |                               |
| 2 |                          |              | Function entered into cell B7 |
| 3 | Mean = $\lambda$         | 0.2          |                               |
| 4 | 1/Mean = $1/\lambda$     | 5            |                               |
| 5 |                          |              |                               |
| 6 | P( $X \leq 10$ )         | 0.8646647168 |                               |
| 7 | P( $5 \leq X \leq 10$ )  | 0.2325441579 |                               |
| 8 |                          |              |                               |

[Click here](#) to download the completed spreadsheet so you can compare it to yours.

In summary, the first thing we did was set up the table for entering mean, probability that  $X \leq 10$ , and the probability that X lies between 5 and 10 ( $5 \leq X \leq 10$ ). Then we set up the table area with formulas for  $1/\text{Mean}$ , the probability that  $X \leq 10$ , and the probability that  $5 \leq X \leq 10$ . Once we entered those, we were able to view the results in the table.

This concludes the tutorial on using Excel to calculate problems using the exponential distribution.