

How can I calculate normal cumulative distribution function (CDF) probabilities in Excel?

Authored by
stats writer

April 26, 2024

RECOMMENDED CITATION

stats writer (2024). *How can I calculate normal cumulative distribution function (CDF) probabilities in Excel?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=139593>

The normal cumulative distribution function (CDF) is a mathematical tool used to determine the probability of a random variable falling within a certain range of values. In Excel, the CDF can be calculated using the NORM.DIST function. This function requires three inputs: the value for which the probability is being calculated, the mean of the distribution, and the standard deviation. By inputting these values, Excel will return the probability of the random variable falling within that range. This allows users to easily and accurately calculate probabilities for normal distributions in Excel, making it a valuable tool for data analysis and statistical modeling.

Calculate NormalCDF Probabilities in Excel

The function on a TI-83 or TI-84 calculator can be used to find the probability that a normally distributed takes on a value in a certain range.

On a TI-83 or TI-84 calculator, this function uses the following syntax

normalcdf(lower, upper, μ , σ)

where:

lower = lower value of range
upper = upper value of range
 μ = population mean
 σ = population standard deviation

For example, suppose a random variable is with a mean of 50 and a standard deviation of 4. The probability that a random variable takes on a value between 48 and 52

can be calculated as:

$$\text{normalcdf}(48, 52, 50, 4) = 0.3829$$

We can replicate this answer in Excel by using the **NORM.DIST()** function, which uses the following syntax:

NORM.DIST(x, σ , μ , cumulative)

where:

x = individual data value
 μ = population mean
 σ = population standard deviation
cumulative = FALSE calculate the PDF; TRUE calculates the CDF

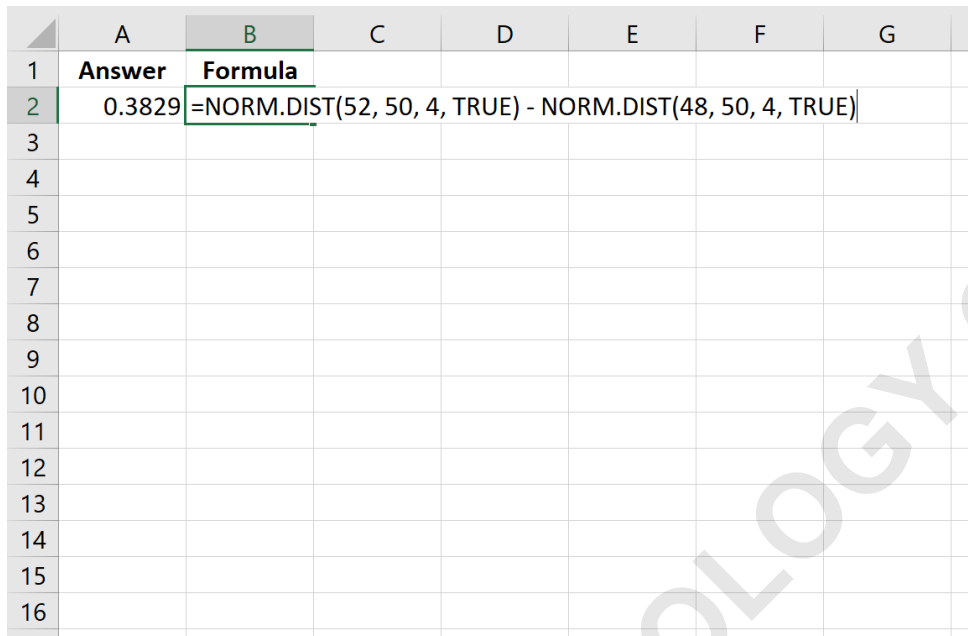
The following examples show how to use this function in practice.

Example 1: Probability Between Two Values

Suppose a random variable is normally distributed with a mean of 50 and a standard deviation of 4. The probability that a random variable takes on a value between 48 and 52 can be calculated as:

=NORM.DIST(52, 50, 4, TRUE) - NORM.DIST(48, 50, 4, TRUE)

The following image shows how to perform this calculation in Excel:



The image shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G
1	Answer	Formula					
2	0.3829	=NORM.DIST(52, 50, 4, TRUE) - NORM.DIST(48, 50, 4, TRUE)					
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Example 2: Probability Less Than One Value

Suppose a random variable is normally distributed with a mean of 50 and a standard deviation of 4. The probability that a random variable takes on a value less than 48 can be calculated as:

=NORM.DIST(48, 50, 4, TRUE)

The following image shows how to perform this calculation in Excel:

	A	B	C	D	E	F	G
1	Answer	Formula					
2	0.3085	=NORM.DIST(48, 50, 4, TRUE)					
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							

The probability turns out to be 0.3085.

Example 3: Probability Greater Than One Value

Suppose a random variable is normally distributed with a mean of 50 and a standard deviation of 4. The probability that a random variable takes on a value greater than 55 can be calculated as:

$$\mathbf{=1 - NORM.DIST(55, 50, 4, TRUE)}$$

The following image shows how to perform this calculation in Excel:

	A	B	C	D	E	F	G
1	Answer	Formula					
2	0.1056	=1 - NORM.DIST(55, 50, 4, TRUE)					
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							

The probability turns out to be 0.1056.

You can also use this to automatically find probabilities associated with a normal distribution.