

This tutorial covers the 68-95-99.7 rule. The 68-95-99.7 rule is also known as the empirical rule, and it talks about normal distributions. Within the normal distribution, we know that 68% of the data is within one standard deviation of the mean. 95% of the data is within two standard deviations of the mean. And 99.7% of the data is within three standard deviations of the mean. Now when you're looking at the 68-95-99.7 rule, this is always true for normal distributions. Let's walk through an example.

In this example, it says that a light bulb, on average, lasts for 500 hours with a standard deviation of 24 hours. And let's assume that it's a normal distribution. The first question says, what percent of light bulbs last between 476 and 524? The second question says, what percent of light bulbs last more than 572? And the last one says, what percent of light bulbs last less than 428? Using the 68-95-99.7 rule, we can answer all three of these questions.

First we need to start by drawing a picture of our normal curve and labeling it with the appropriate numbers. And my sketch is a little bit rough, but it looks something like this. In the middle, we're going to have the mean, which in this case is 500. And then I'm going to draw one standard deviation up and one standard deviation down. And we're going to add 24 and then we're going to subtract 24.

And then we're going to go two standard deviations up and two standard deviations down. And again, we're going to add 24 and subtract 24. Oops, and those should be fours. And then we're going to go three, add 24, subtract another 24. So up here, we have 572. And down here, we have 428.

And then next step, I like to label out that 68-95-99.7. So from here to here is 68%. From here to here is 95%. And then from three standard deviations down to three standard deviations up is 99.7%. So now that we've got our graph labeled, we can start to answer the questions.

So the first one wants to know what percent of light bulbs last between 476 and 524. So we're talking about this part of the graph in here. And we can tell pretty quickly, 476 to 524 is from one standard deviation down to one standard deviation up, so that's 68%. So that is our answer, 68%.

Now question two asks, what percent of light bulbs last more than 572? And that's this part up here. Now, I don't know what percent this section is right away. But if I look, I know that between 428 and 572 is 99.7%. So from here over and down, this whole chunk is 99.7%. I also know that the total graph is 100%. So I do 100% minus 99.7%. We get 0.3%. So I know that in the part of my curve outside in these blue shaded chunks, so three standard deviations above the mean or greater and three standard deviations below the mean or lesser, has 0.3% of my data.

Now this question only is asking me for more than 572, so I only want this half right here, this upper chunk. So that's going to be 0.15% because that's half of the 0.3. So the answer for right here, 0.15%

is more than 572. And then as for what percent of light bulbs last less than 428, it's going to be the same thing. It's going to be 0.15%.

So using my 68-95-99.7 rule, I can answer a lot of these questions asking me about what percents lie between values. Or I can even do more than or less than values using that information, and the fact that our curve altogether has 100%. This has been your tutorial on the 68-95-99.7 95 rule.