This tutorial talks about the standard normal distribution. A standard normal distribution is any normal distribution with a mean of 0 and a standard deviation of 1. Now, you can transform any set of normally distributed data into a standard normal distribution by obtaining a z-score for every value.

Now, z-scores-- in case you don't remember the formula for calculating a z-score-- is the value that you're interested in minus the mean divided by the standard deviation. Once you have a z-score, you can use a z-table to find area, and then percent. a z-table is a chart showing the area under the standard normal curve and less than or equal to a particular z-score.

So for example, here's a very rough sketch of our standard normal curve. If this is the value that we're interested in and we obtain a z-score for it, the z-table can tell us what the area of this shaded part is. So it's the area under the curve, and less than or equal to a particular value.

Now, for z-tables, they organize the information by positive and negative numbers, and then 0.1, 0.2, and the hundreds go across the top-- 0.01-- sorry, 0.00, 0.01, 0.02, up until 0.09. And then in the interior here, it contains the areas. The z-scores are on the edge.

So here it says a light bulb, on average, lasts for 500 hours, with a standard deviation of 24 hours. Then they want to know what percent of light bulbs last for less than 540 hours. Now, we would have to assume that our data is normally distributed in order to take it and transform it to go on to our standard normal curve.

Now, I have found a good image of a standard normal curve to start off with, but even if I don't have this image on my paper, I always start by making a quick sketch of something that looks like this-- and it can be pretty rough-- on the side. And then in the middle, I have my mean, and then I have marks for the standard deviation. And these, again, aren't perfect, but it helps to give me a good image.

Now, in our standard normal curve, we have a mean of 0, and every standard deviation is 1. So 0 plus 1 gets us 1, plus another 1's 2, 3, and 4, and so forth. Now, I can do a quick transformation just by writing my mean and the standard deviations along the bottom. So if my mean is 500, then when I add a standard deviation I get 524, 548, and 572.

And going down, we're going to be subtracting 24 each time. So we have 476, 452, and 428. Now, the score that we're interested in is 540. We're going to need to use a z-score in order to transform it to

place it on our standard normal curve.

I know it's somewhere around here, because it's just before 540, but I want to find out exactly. So I use my z-score. z equals-- the score I'm interested in is 540. Minus the mean, divided by the standard deviation. When we simplify and do the subtraction, we get 40 divided by 24. And then when I type that into my calculator, I get 1.66 repeating.

The z-table only goes up to the hundreds place, so I'm just going to use 1.67. I'm rounding it. Again, you can either use a z table, or you can search for the value for a z-score of 1.67. It should come up when you look up online.

Now, when I look up this 1.67 on the table, it corresponds to a value of 0.9525. And that tells me that the area below this curve up to 540 is 0.9525. The area of this whole curve is 1. So when I want to turn that into a percent, it's pretty simple. It's this much out of the total of 1. So I know that that is 95.25%.

So 95.25% of our data is less than 540. If the question wanted to know what percent is more than 540-- this area in the white up here-- I would subtract that from 100% because the graph is 100% total. So I subtract 95.25%, and I end up with 4.75%. The z-table's always going to be giving me percent less than, so I just subtract from 100% in order to find out what percent is more than. Similarly, you can find out what percent lies between two values by doing a combination of problems. This has been your tutorial on the standard normal distribution.