This tutorial is going to talk to you about significant digits. So you're going to learn about, what exactly do we mean when we talk about significant digits, in terms of precision and accuracy? So significant digits refers to the level of exactitude or precision that we can talk about with our measurements.

Now, suppose a CEO of a company makes exactly this much money, $351,815.84. Oftentimes, we don't really require such an exact number. Oftentimes, we report something like this to be $350,000. Basically, we're rounding to the nearest $10,000.

This is an example of going to two significant digits. We use the 300,000's and the 50,000's as our digits and then round off on the rest. We could also have gone to three significant digits. And we would have rounded on this third number. Instead of calling it $351,000, we're going to say it's closer to $352,000 than it is to $351,000.

Here, we said it was closer to 350 than 360. So it's closer to 352, to the nearest 1,000. That's three significant digits, the 100,000's, the 10,000's, and the 1,000's.

We could take it to four significant digits or five. And again, taking a look, we rounded that to 20 because it's closer to $351,820 than it is to $351,810. We could even take it to six significant digits, all the way down to the dollar amount.

Now, let's look at another example here. Suppose that a weatherman says there's a 40% chance of rain tomorrow. That's something that you hear quite a bit on the news. But what if you heard the weatherman say, there's a 42.156% chance of rain.

Now, you might look at the TV funny. Because that would make it sound like that weatherman guy knows the probability to some ultra-precise level. And he probably doesn't. When he conveys the chance of rain, 40% is a reasonable number. Because he can only be sure to within the nearest 10%.

So we use one significant digit if we can only reasonably report to within 10% of the actual quantity. The actual quantity of percent of chance of rain could be some massive decimal like this. But if we can only report to within 10% of it, we're going to use one significant digit, which would have been the 40.

If we were able to report to within 1% of the actual amount, then maybe we could have changed this 40% chance of rain to a 42% chance of rain. And so the idea is that if we can report to more accurate levels, we can give more significant digits.

So when we calculate a statistic, we want to use precise values. But we want to use precise values that are

reasonable. We'll round when we need to. But during intermediate steps-- and there are lots of calculations that we're going to do that require intermediate steps. Something like calculating a standard deviation has lots and lots of steps.

We're going to use very exact values all the way through and then round them at the end. We're not going to round during the middle steps. We'll round all the way at the end. So for instance, here in this case of the Chicago Bulls basketball team, we ended up with a standard deviation. The last step we did was just take the square root of 14 and 2/3.

And we end up with this. Notice we kept this to a lot of digits, which is a good thing. But now once we're here at the end of the problem and we're down here back to inches, now we need to start to make a decision. Do we really, honestly believe that the standard deviation is in fact 3.82970843 blah, blah, blah-- do we really, honestly believe that we can measure reasonably down to the hundred-trillionth of an inch, which is what that 5 is?

No, let's not think about it that way. I don't think we can measure exactly to the hundred-trillionth of an inch. I don't even think we can measure accurately to the thousandth of an inch. Maybe, maybe to the hundredth of an inch-- but even then, it's best to probably go with 3.8 as our standard deviation for our answer.

Because we can reasonably measure down to tenths of an inch, but maybe not even to hundredths of an inch. So two significant digits is probably all we're going to need in this particular problem, maybe three. And so it's left up to you to make that judgment call. And it's all about what you think you can measure precisely.

And so to recap, significant digits are tools that we use. It's a way to determine the precision. And it's a way of relaying the precision with which you're making your measurement to a reader. The more digits that we can put in, the more exact we claim the measurement to be.

So if we don't think that we can claim a measurement to be super-duper exact, we're not going to take it down to lots and lots of digits. And if we take a look, it's dangerous to report digits beyond what we can reasonably measure, certainly.

And in cases like that, we have what's called false precision, where we're implying that we can be super-duper precise when, in fact, we just can't, based on the way that we can measure things. And so we talked about significant digits and false precision. Good luck. And we'll see you next time.