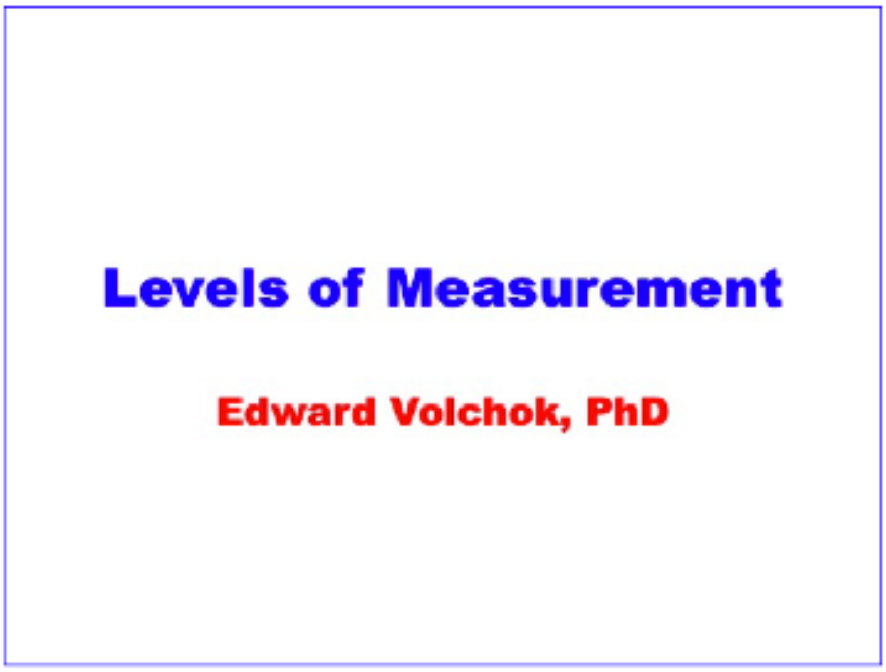
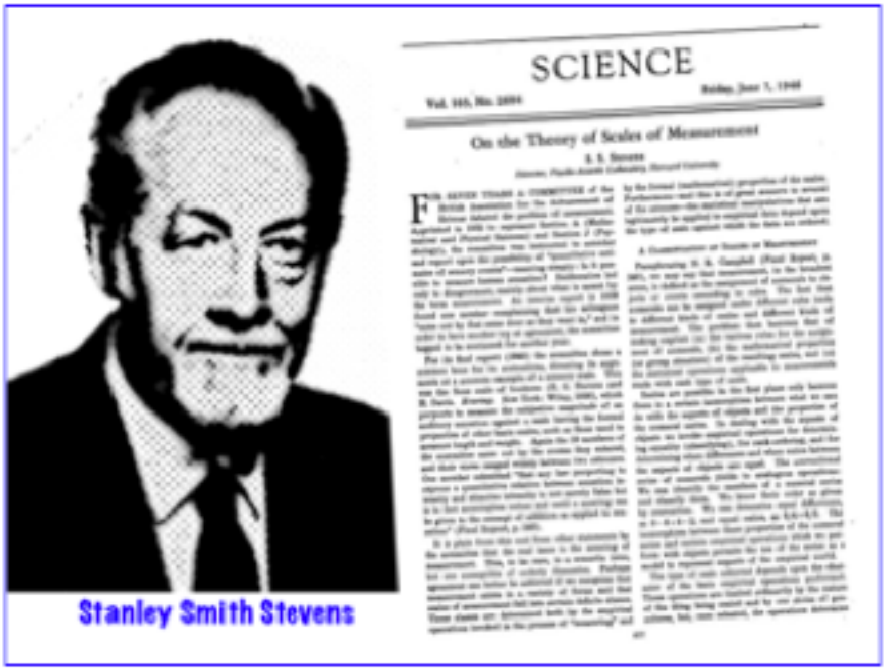


Audio
This is Edward Volchok and welcome to our lecture on measurement scales or, as these scales are frequently called, “levels of measurement.”

Video
Title of video is shown.

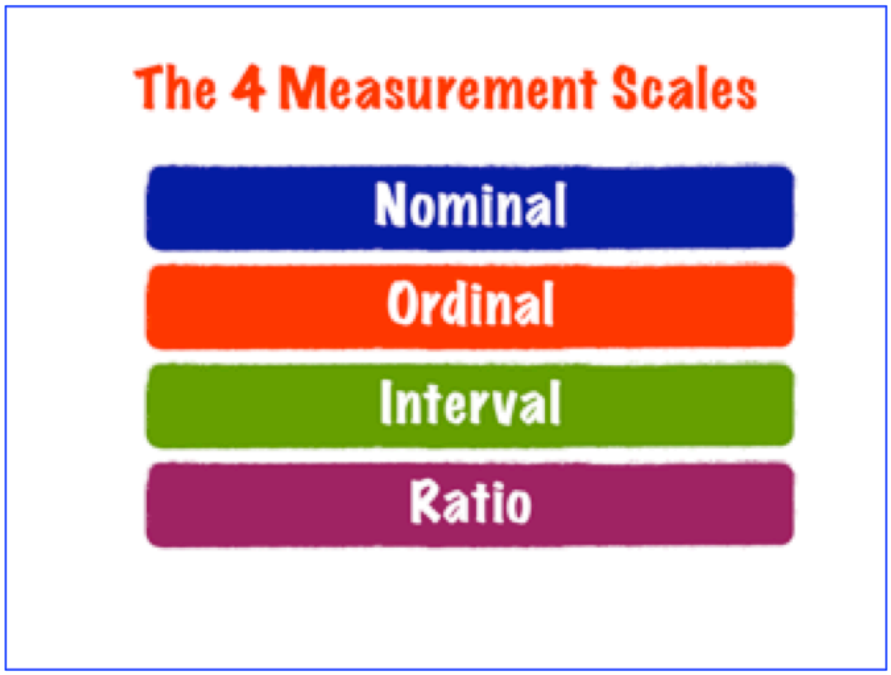
Time Code
0:00



Audio
In 1946, Harvard psychologist Stanley Smith Stevens published an article in *Science* entitled "On the Theory of Scales of Measurement." In this article, Stevens claimed that all measurement in science is conducted using four measurement scales.

Video
Picture of Stanley Smith Stevens and his famous article are displayed.

Time Code
0:05



Audio
Here are the four measurement scales arranged from the simplest to the most complex: Nominal, Ordinal, Interval, and Ratio.

Video
Video displays a chart showing the four levels of measurement.

Time Code
0:21

Audio
Here is a simple trick for remembering the four levels of measurement. Think "*NOIR.*" Those of you who have studied French know that *noir* is the French word for black

Video
The word "NOIR" appears.

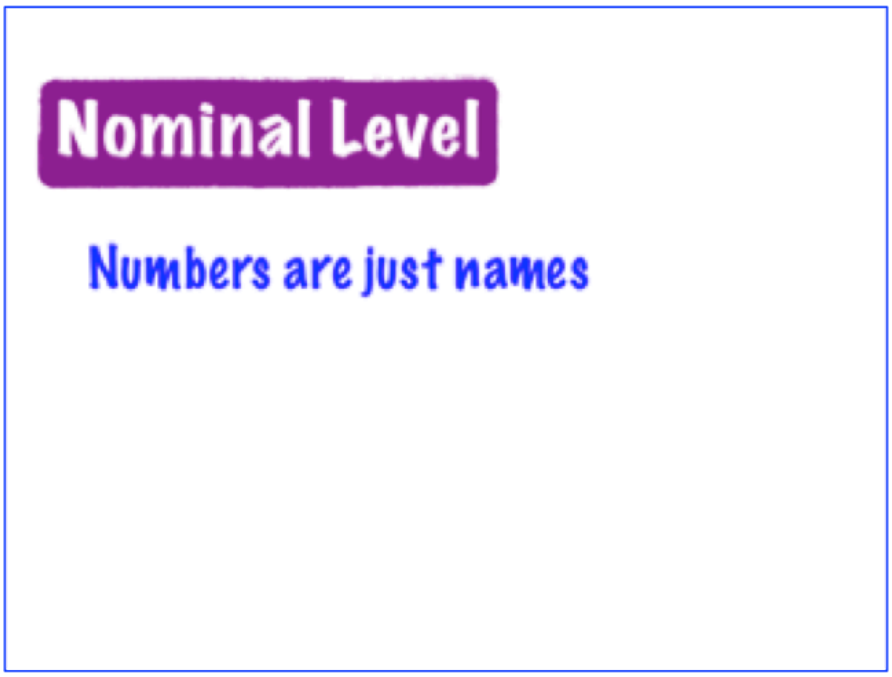
Time Code
0:32

Audio
"N" is for "nominal." With the nominal level, numbers are just names. "O" is for "ordinal." With the ordinal level, we can now order the data: First, Second, Third, and so on. "I" is for "interval." With the interval level, we now know the intervals between orders. And, "R" is for "ratio." With the ratio level, we can now calculate ratios, proportions and fractions because we have added a real, absolute zero.

Now let's turn to the simplest level of measurement: Nominal Level.

Video
The word "NOIR" builds to show the four levels of measurement: Nominal, Ordinal, Interval, and Ratio.

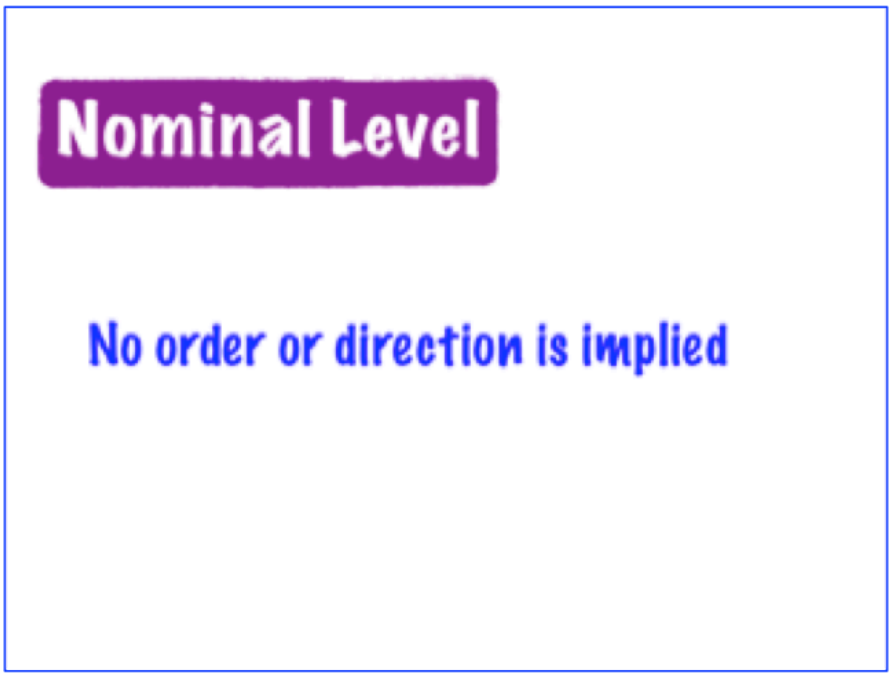
Time Code
0:44



Audio
With nominal level data, numbers are just names.

Video
The video displays the phrase. “Numbers are just names.”

Time Code
1:15



Audio
No order or direction is implied with nominal data. Let's turn to some examples of nominal.

Video
The video displays the phrase. "No order or direction is implied."

Time Code
1:25

Audio
The numbers on athletes' uniforms are nominal level data. These numbers imply no order; they are just substitutes for names.

Video
The video displays the backs of three baseball jerseys. Each jersey shows a different player's number.

Time Code
1:31

Audio
The numbers that appear on racecars are also examples of nominal level data.

Video
The video displays a picture of an old Porsche racecar bearing the number 130.

Time Code
1:36

Audio
Your affiliation with a political party is also nominal level data too.

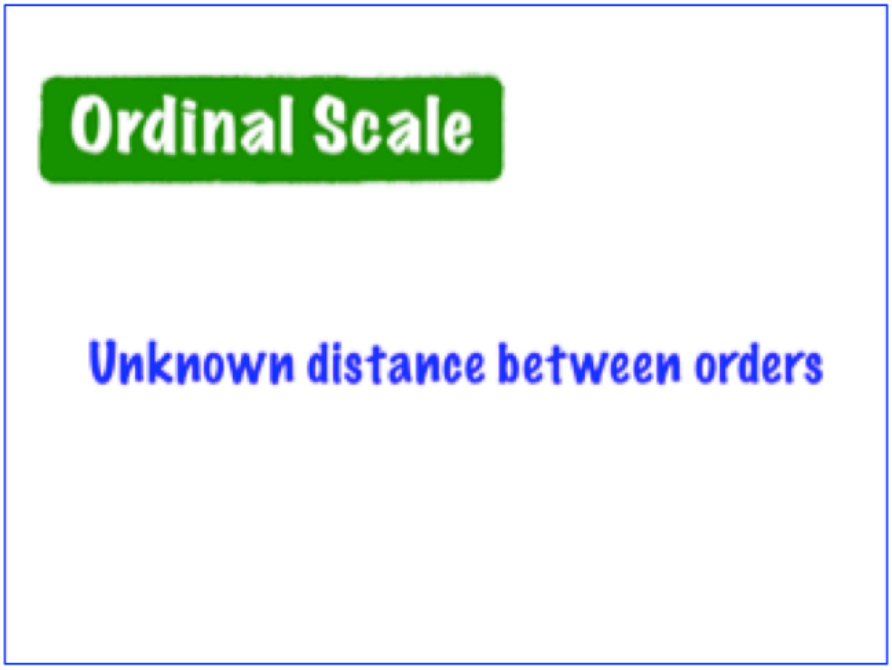
Video
The logos of the Republican Party and Democratic Party are displayed.

Time Code
1:48

Audio
Now let's turn to the ordinal scale a more sophisticated scale where categories are ordered.

Video
Video displays the words, "Ordinal Scale: Categories are ordered."

Time Code
1:52



Audio
The key feature of the ordinal scale is that while categories are ordered there is an unknown distance between the orders. Let's turn to a few examples of the ordinal scale.

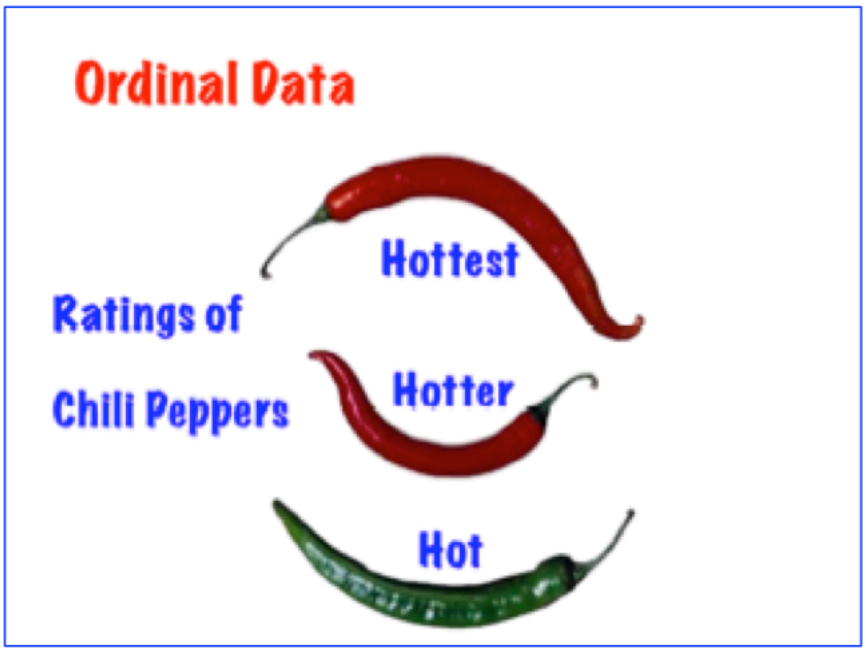
Video
Video displays the words, "Ordinal Scale: Unknown distance between orders."

Time Code
2:04

Audio
The order of finish in the horserace is a classic example of the ordinal scale if all we know is who came in first, second, and third. We don't know the distance that separated the three contenders.

Video
The video displays three racehorses approaching the finish line.

Time Code
2:07



Audio
Ratings of chili peppers on hotness is another example of the ordinal scale. All we know is the order of hotness: Hot, Hotter, and Hottest. We don't have any measurement of the degree of hotness separating the three chili peppers.

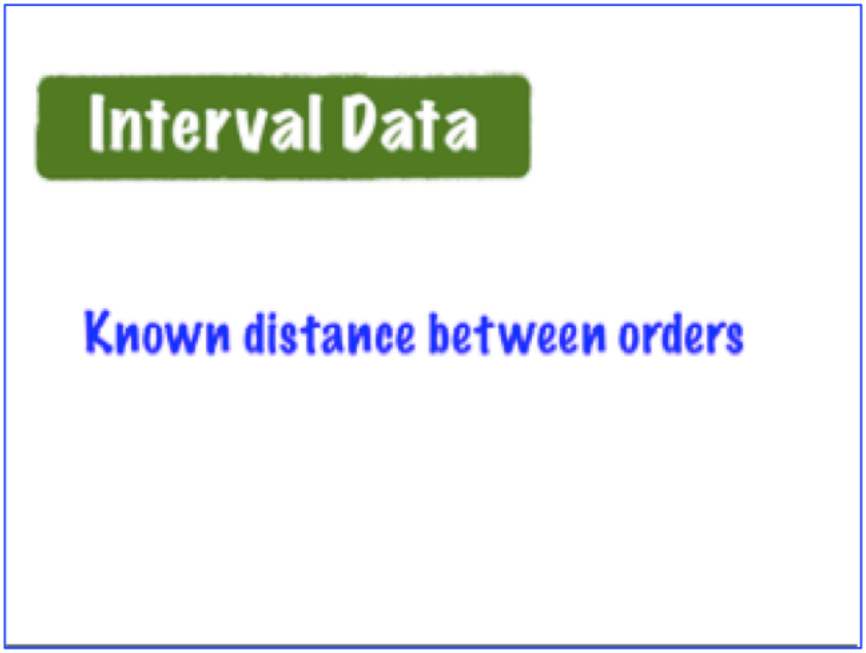
Video
The video shows three different peppers rated Hot, Hotter, and Hottest.

Time Code
2:20

Audio
The next level measurement is called interval data. With interval data categories are ordered just like ordinal data.

Video
The video displays the words, “Interval Data: Categories are Ordered.”

Time Code
2:35



Audio
But, what makes interval data different from ordinal data is that we have a known distance between the orders. So, with a horse race, we would not only know the order of finish, we'd know the distance separating the horses as they crossed the finish line.

Video
The video displays the words, "Interval Data: Known distance between orders."

Time Code
2:47

Audio
The final characteristic of interval level data is that there is no true or absolute zero. We may have a zero, but it is an arbitrary number. Let's turn to some example of interval level data.

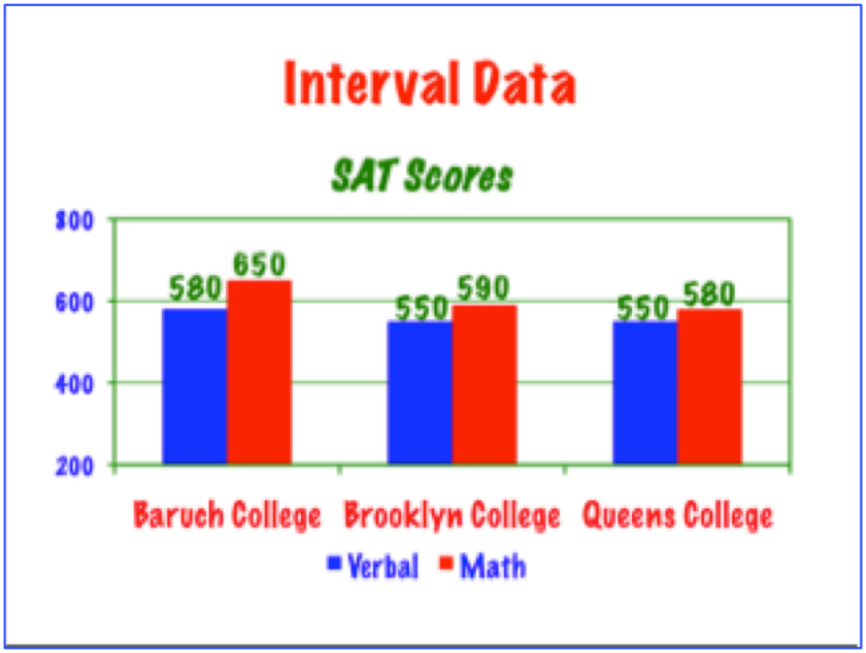
Video
The video displays the words, "Interval Data: No true zero."

Time Code
3:07

Audio
The classic example of interval level data is temperature measured on either of the Fahrenheit or Celsius scales. These scales don't have an absolute zero. As a result, we cannot calculate proportions or ratios. For example, if the high temperature today is 45°, it doesn't mean it's half is warm when it's the temperature is 90°. This is because 0° on the Fahrenheit and Celsius scales is arbitrary.

Video
Video shows a picture of a fever thermometer.

Time Code
3:20



Audio
SAT scores are another example of interval level data because with the lowest possible score of 200, there is no absolute zero. Consequently, you can't say of someone who gets at 800 on the English SAT performed twice as well someone who received a 400.

Video
Video displays a column chart showing the Verbal and Math SAT scores for three colleges.

Time Code
3:50

Audio
Dates on the calendar are also interval data because there is no absolute zero on the calendar.

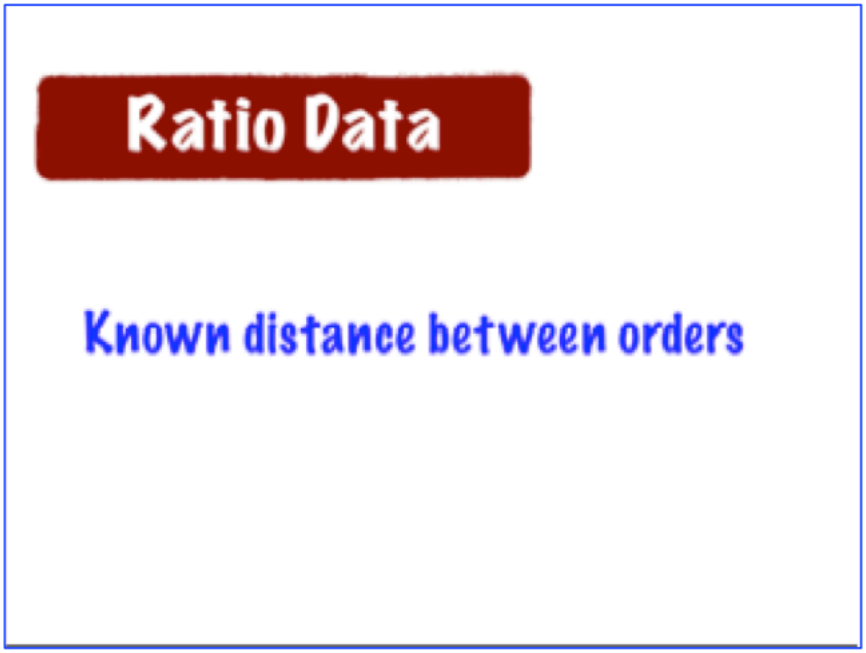
Video
Video displays an old calendar.

Time Code
4:13

Audio
The last and most sophisticated level measurement is ratio data. As with ordinal and interval level data, ratio level data is ordered.

Video
The video displays the words, “Ratio Data: Categories are ordered.”

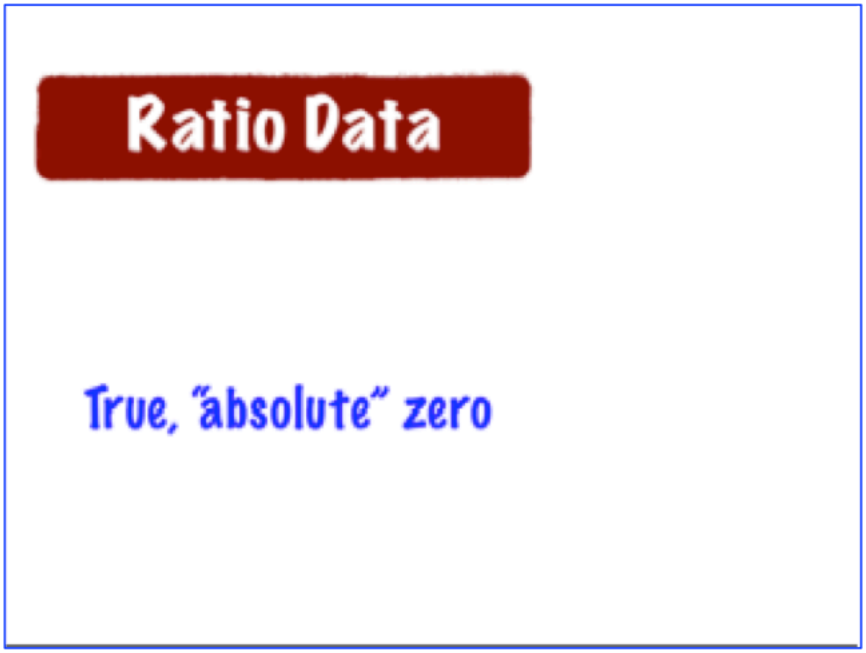
Time Code
4:22



Audio
And, just like interval data, there is a known distance between orders.

Video
The video displays the words, “Ratio Data: Known distance between orders.”

Time Code
4:33



Audio
And, finally there is a true, absolute zero, which allows us to calculate proportions, ratios, and percentages. Let's turn to a few examples of ratio level data.

Video
The video displays the words, "Ratio Data: True, 'absolute' zero."

Time Code
4:39

Audio
The amount of money in Donald Trump's wallet is an example of ratio data. If he starts the day with $3,000 in his wallet and ends the day with $1,500, he has 50 percent of his cash left. With ratio data, we can calculate such percentages.

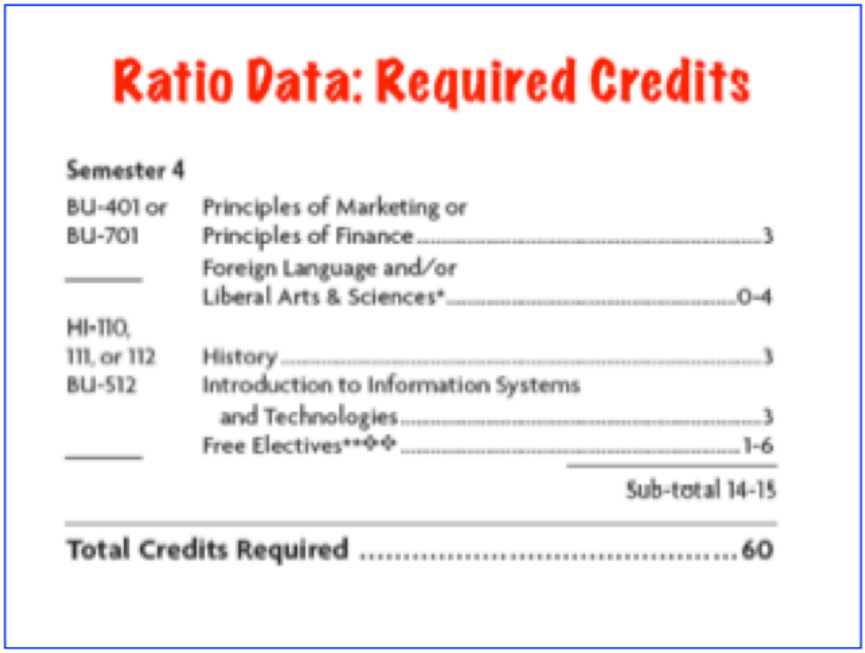
Video
Video displays a picture of a wallet with many $100 bills.

Time Code
4:51

Audio
Likewise, the amount of money in your pocket is an example of ratio level because there is a real, absolute zero in this measurement.

Video
Video displays a picture of a student who is showing her empty pocket.

Time Code
5:07



Audio

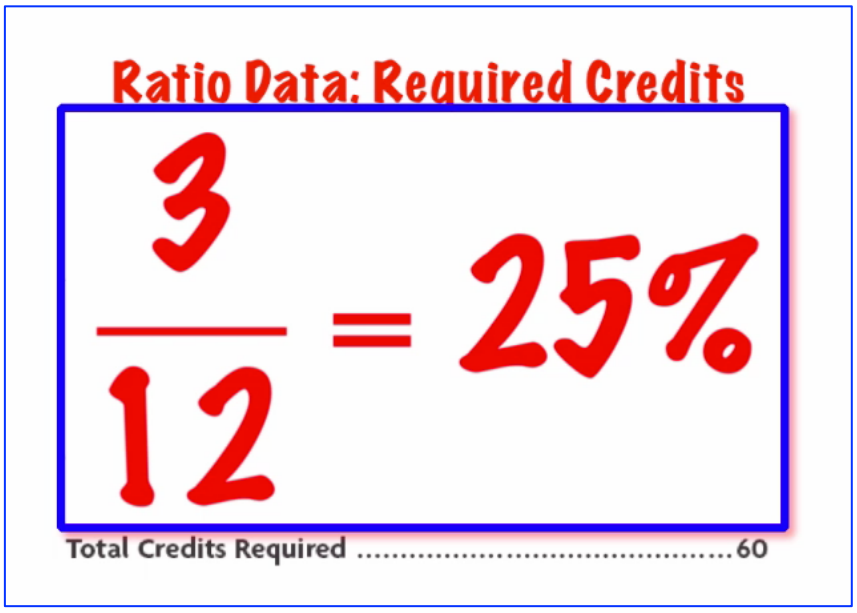
The number of credits you're taking is another example of ratio data. There is a real zero in this scale so we can calculate ratios, proportions and percentage.

Video

Picture shows the recommended course schedule and number of credits for a fourth semester Business student.

Time Code

5:18



Audio
Someone who is taking 15 credits is taking 25 percent more credits than someone taking only 12 credits.

Video
Video displays how percentage differences can be calculated with ratio level data.

Time Code
5:32

Audio
The End.

Video
Video displays the words, “The End.”

Time Code
5:49

* * *