Example 4   Nominal Level

Here are examples of sample data at the nominal level of measurement.

1. **Yes/No/Undecided:** Survey responses of *yes*, *no*, and *undecided*

2. **Political Party:** The political party affiliations of survey respondents (Democrat, Republican, Independent, other)

3. **Social Security Numbers:** Social Security numbers are just substitutes for names; they do not count or measure anything.

Because nominal data lack any ordering or numerical significance, they should not be used for calculations. Numbers such as 1, 2, 3, and 4 are sometimes assigned to the different categories (especially when data are coded for computers), but these numbers have no real computational significance and any average (mean) calculated from them is meaningless.

> **DEFINITION** Data are at the **ordinal level of measurement** if they can be arranged in some order, but differences (obtained by subtraction) between data values either cannot be determined or are meaningless.

Example 5   Ordinal Level

Here are examples of sample data at the ordinal level of measurement.

1. **Course Grades:** A college professor assigns grades of A, B, C, D, or F. These grades can be arranged in order, but we can't determine differences between the grades. For example, we know that A is higher than B (so there is an ordering), but we cannot subtract B from A (so the difference cannot be found).

2. **Ranks:** *U.S. News & World Report* ranks colleges. As of this writing, Harvard was ranked first and Princeton was ranked second. Those ranks of 1 and 2 determine an ordering, but the difference between those ranks is meaningless. The difference of "second minus first" might suggest $2 - 1 = 1$ but this difference of 1 is meaningless because it is not an exact quantity that can be compared to other such differences. The *difference* between Harvard and Princeton cannot be quantitatively compared to the *difference* between Yale and Columbia, the universities ranked third and fourth, respectively.

Ordinal data provide information about relative comparisons, but not the magnitudes of the differences. Usually, ordinal data should not be used for calculations such as an average, but this guideline is sometimes ignored (such as when we use letter grades to calculate a grade-point average).

> **DEFINITION** Data are at the **interval level of measurement** if they can be arranged in order, and differences between data values can be found and are meaningful. Data at this level do not have a *natural* zero starting point at which *none* of the quantity is present.

Measuring Disobedience

How are data collected about something that doesn't seem to be measurable, such as people's level of disobedience? Psychologist Stanley Milgram devised the following experiment: A researcher instructed a volunteer subject to operate a control board that gave increasingly painful "electrical shocks" to a third person. Actually, no real shocks were given, and the third person was an actor. The volunteer began with 15 volts and was instructed to increase the shocks by increments of 15 volts. The disobedience level was the point at which the subject refused to increase the voltage. Surprisingly, two-thirds of the subjects obeyed orders even when the actor screamed and faked a heart attack.