Example 6 Interval Level

These examples illustrate the interval level of measurement.

1. **Temperatures:** Outdoor temperatures of 40°F and 90°F are examples of data at this interval level of measurement. Those values are ordered, and we can determine their difference of 50°F. However, there is no natural starting point. The value of 0°F might seem like a starting point, but it is arbitrary and does not represent the total absence of heat.
2. **Years:** The years 1492 and 1776 can be arranged in order, and the difference of 284 years can be found and is meaningful. However, time did not begin in the year 0, so the year 0 is arbitrary instead of being a natural zero starting point representing "no time."

DEFINITION Data are at the **ratio level of measurement** if they can be arranged in order, differences can be found and are meaningful, and there is a natural zero starting point (where zero indicates that *none* of the quantity is present). For data at this level, differences and ratios are both meaningful.

Example 7 Ratio Level

The following are examples of data at the ratio level of measurement. Note the presence of the natural zero value, and also note the use of meaningful ratios of "twice" and "three times."

1. **Car Lengths:** Car lengths of 106 in. for a Smart car and 212 in. for a Mercury Grand Marquis (0 in. represents no length, and 212 in. is twice as long as 106 in.)
2. **Class Times:** The times of 50 min and 100 min for a statistics class (0 min represents no class time, and 100 min is twice as long as 50 min.)

HINT This level of measurement is called the ratio level because the zero starting point makes ratios meaningful, so here is an easy test to determine whether values are at the ratio level: Consider two quantities where one number is twice the other, and ask whether "twice" can be used to correctly describe the quantities. Because a person with a height of 6 ft is *twice* as tall as a person with a height of 3 ft, the heights are at the ratio level of measurement. In contrast, 50° F is *not twice* as hot as 25° F, so Fahrenheit temperatures are *not* at the ratio level. See Table 1-2.

Table 1-2 Levels of Measurement

Level of Measurement	Brief Description	Example
Ratio	There is a natural zero starting point and ratios are meaningful.	Heights, lengths, distances, volumes
Interval	Differences are meaningful, but there is no natural zero starting point and ratios are meaningless.	Body temperatures in degrees Fahrenheit or Celsius
Ordinal	Data can be arranged in order, but differences either can't be found or are meaningless.	Ranks of colleges in *U.S. News & World Report*
Nominal	Categories only. Data cannot be arranged in order.	Eye colors