c. Calendar years of historic events, such as 1776, 1945, or 2001

d. Temperatures on the Celsius scale

e. Runners' times in the Boston Marathon

SOLUTION

a. As discussed in Example 1, numbers on uniforms don't count or measure anything. They are at the nominal level of measurement because they are labels and do not imply any kind of ordering.

b. A set of rankings represents data at the ordinal level of measurement because the categories (excellent, good, fair, or poor) have a definite order.

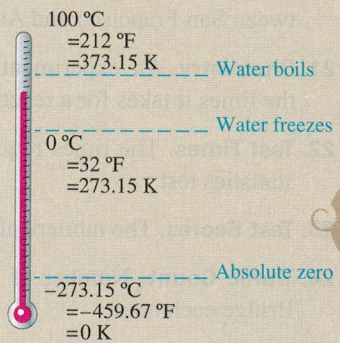
c. An interval of one calendar year always has the same meaning. But ratios of calendar years do not make sense because the choice of the year 0 is arbitrary and does not mean "the beginning of time." Calendar years are therefore at the interval level of measurement.

d. Like Fahrenheit temperatures, Celsius temperatures are at the interval level of measurement. An interval of 1° C always has the same meaning, but the zero point (1° C = freezing point of water) is arbitrary and does not mean "no heat."

e. Marathon times have meaningful ratios—for example, a time of 6 hours really is twice as long as a time of 3 hours—because they have a true zero point at a time of 0 hours. ● ● ●

BY THE WAY

Scientists often measure temperatures on the Kelvin scale. Data on the Kelvin scale are at the ratio level of measurement, because the Kelvin scale has a true zero. A temperature of 0 Kelvin really is the coldest possible temperature. Called *absolute zero*, 0 K is equivalent to about −273.15° C or −459.67° F. (The degree symbol is not used for Kelvin temperatures.)



Section 2.1 Exercises

Statistical Literacy and Critical Thinking

1. **Qualitative/Quantitative.** What is the difference between qualitative data and quantitative data?

2. **Quantitative/Qualitative.** A football player is taking a statistics course and states that the names of the players on his team are qualitative, but they can be made quantitative by using the numbers on the jerseys of their uniforms. Is he correct? Why or why not?

3. **Qualitative/Quantitative.** Is a researcher correct when she argues that all data are either qualitative or quantitative? Explain.

4. **ZIP Codes.** A researcher argues that ZIP codes are quantitative data because they measure location, with low numbers in the east and high numbers in the west. Is she correct? Why or why not?

Concepts and Applications

Qualitative vs. Quantitative Data. In Exercises 5–16, determine whether the data described are qualitative or quantitative and explain why.

5. **Blood Groups.** The blood groups of A, B, AB, and O

6. **White Blood Cells.** The white blood cell counts of different people, consisting of the numbers of white blood cells per microliter of blood

7. **Reaction Times.** Braking reaction times (in seconds) are measured as part of a driver education program.

8. **Physicians.** The specialties of physicians (cardiac surgeon, pediatrician, etc.)

9. **Multiple Choice Test Questions.** The answers (a, b, c, d, e) to multiple choice test questions

10. **Survey Responses.** The responses (yes, no, refuse to answer) from survey subjects when asked a question

11. **Nielsen Survey.** The television shows being watched by households surveyed by Nielsen Media Research

12. **Nielsen Ratings.** The number of households with a television in use when surveyed by Nielsen Media Research

13. **Head Circumferences.** In studying different societies, an archeologist measures head circumferences of skulls

14. **Shoe Sizes.** The shoe sizes (such as 8 or $10\frac{1}{2}$) of test subjects

15. **GPA.** The grade point averages of randomly selected college students