Name .

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Interdisciplinary Application

For use with the lesson "Apply Exponent Properties Involving Quotients"

Carbon-14 Dating

Chemistry Prior to World War II archeologists depended upon recorded histories for dating the past. Assuming the sites with similar types of pottery and tools were the same age, they dated sites relatively. Relative dating, however, still could not date most sites. In the late 1940s a team of scientists led by Willard Libby developed a dating method that would revolutionize the field of archeology. The importance of carbon-14 dating was recognized when Libby received the 1960 Nobel Prize in Chemistry for his work.

The discovery that all living organisms absorb a radioactive isotope of carbon called carbon-14 makes carbon-14 dating possible. When an organism dies, it stops absorbing carbon-14. The amount of this radioactive isotope then steadily decreases over time. Professor Libby found that carbon-14 has a half-life of 5730 years, or decays to half of its original amount each 5730 years. This method can only be used to date artifacts less than about 50,000 or 60,000 years.

Carbon-14 dating has been used to date such artifacts and fossils as the Dead Sea Scrolls and the famous Iceman found in Italy in 1991. With more recent developments in carbon-14 dating, it is possible to date very small samples. Even a single human hair can now be dated.

In Exercises 1–3, use the following information.

The equation for carbon-14 dating given below is based on a half-life of 5730 years.

$$A(t) = A_0 \left(\frac{1}{2}\right)^t$$

where A(t) is the amount of carbon-14 left, A_0 is the initial amount of carbon-14, and t is the number of 5730-year intervals.

- **1.** Make a table of values for A(t) when $A_0 = 100$ grams and t = 0, 1, 2, 3, 4, and 5.
- **2.** Graph the points from the table of values in Exercise 1 and draw a smooth curve through the points.
- **3.** After considering the graph in Exercise 2, why do you think carbon-14 dating can only be used to date up to about 50,000 or 60,000 years?

LESSON 7.2