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## Why learn how to model and solve exponential and logarithmic equations?



You have a job assisting an archeologist who has just discovered a fossil that appears to be an animal bone. She assigns you the task of determining how old the bone is. Where do you start?

Fortunately, you know that living things contain a radioactive form of carbon called carbon-14. Like all radioactive elements, carbon-14 decays at a predictable rate known as its half-life. The half-life of a radioactive element is the amount of time required for half of a sample to decay. The half-life of carbon-14 is 5,730 years. Given an original sample of carbon-14 of 100g, the table shows the mass remaining after each half-life.

|                      |     |      |        |        |        |
|----------------------|-----|------|--------|--------|--------|
| Amount of sample (g) | 100 | 50   | 25     | 12.5   | 6.25   |
| Time (years)         | 0   | 5730 | 11,460 | 17,190 | 22,920 |

But, what if the bone started with a different mass of carbon-14 or a different number of years has passed? To better study the bone, you need to know that the rate of decay of a radioactive element can be modeled with an exponential function. Given a couple of data points, you can build a model that represents the decay of carbon over time for your specimen.

As you complete this module, keep the following questions in mind. Then at the end of the module, we will return to develop a model for the decay of carbon-14.

- How do you develop a model for the decay of carbon-14?
- How can you use the model to determine the amount of carbon-14 that remains after any number of years?
- What would a graph of the decay of carbon-14 look like?

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