

## Lesson 7 Practice Problems

1. The half-life of carbon-14 is about 5,730 years. A fossil had 6 picograms of carbon-14 at one point in time. (A picogram is a trillionth of a gram or  $1 \times 10^{-12}$  gram.) Which expression describes the amount of carbon-14, in picograms,  $t$  years after it was measured to be 6 picograms.

A.  $6 \cdot \left(\frac{1}{2}\right)^{\frac{t}{5,730}}$

B.  $6 \cdot \left(\frac{1}{2}\right)^{5,730t}$

C.  $6 \cdot (5,730)^{\frac{1}{2}t}$

D.  $\frac{1}{2} \cdot (6)^{\frac{t}{5,730}}$

2. The half-life of carbon-14 is about 5,730 years. A tree fossil was estimated to have about 4.2 picograms of carbon-14 when it died. (A picogram is a trillionth of a gram.) The fossil now has about 0.5 picogram of carbon-14. About how many years ago did the tree die? Show your reasoning.

3. Nickel-63 is a radioactive substance with a half-life of about 100 years. An artifact had 9.8 milligrams of nickel-63 when it was first measured. Write an equation to represent the mass of nickel-63, in milligrams, as a function of:

a.  $t$ , time in years

b.  $d$ , time in days

4. Tyler says that the function  $f(x) = 5^x$  is exponential and so it grows by equal factors over equal intervals. He says that factor must be  $\sqrt[10]{5}$  for an interval of  $\frac{1}{10}$  because ten of those intervals makes an interval of length 1. Do you agree with Tyler? Explain your reasoning.

(From Unit 4, Lesson 5.)

5. The population in a city is modeled by the equation  $p(d) = 100,000 \cdot (1 + 0.3)^d$ , where  $d$  is the number of decades since 1970.
- What do the 0.3 and 100,000 mean in this situation?
  - Write an equation for the function  $f$  to represent the population  $y$  years after 1970. Show your reasoning.
  - Write an equation for the function  $g$  to represent the population  $c$  centuries after 1970. Show your reasoning.

(From Unit 4, Lesson 6.)

6. The function  $f$  is exponential. Its graph contains the points  $(0, 5)$  and  $(1.5, 10)$ .

a. Find  $f(3)$ . Explain your reasoning.

b. Use the value of  $f(3)$  to find  $f(1)$ . Explain your reasoning.

c. What is an equation that defines  $f$ ?

(From Unit 4, Lesson 6.)

7. Select **all** expressions that are equal to  $8^{\frac{2}{3}}$ .

A.  $\sqrt[3]{8^2}$

B.  $\sqrt[3]{8^2}$

C.  $\sqrt{8^3}$

D.  $2^2$

E.  $2^3$

F. 4

(From Unit 3, Lesson 4.)