

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 1×10^{-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.)