### 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.
	1. $6⋅\left(\frac{1}{2}\right)^{\frac{t}{5,730}}$
	2. $6⋅\left(\frac{1}{2}\right)^{5,730t}$
	3. $6⋅\left(5,​730\right)^{\frac{1}{2}t}$
	4. $\frac{1}{2}⋅\left(6\right)^{\frac{t}{5,730}}$
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:
	1. $t$, time in years
	2. $d$, time in days
4. Tyler says that the function $f\left(x\right)=5^{x}$ 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.)
1. The population in a city is modeled by the equation $p\left(d\right)=100,​000⋅\left(1+0.3\right)^{d}$, where $d$ is the number of decades since 1970.
	1. What do the 0.3 and 100,000 mean in this situation?
	2. Write an equation for the function $f$ to represent the population $y$ years after 1970. Show your reasoning.
	3. Write an equation for the function $g$ to represent the population $c$ centuries after 1970. Show your reasoning.
* (From Unit 4, Lesson 6.)
1. The function $f$ is exponential. Its graph contains the points $\left(0,5\right)$ and $\left(1.5,10\right)$.
	1. Find $f\left(3\right)$. Explain your reasoning.
	2. Use the value of $f\left(3\right)$ to find $f\left(1\right)$. Explain your reasoning.
	3. What is an equation that defines $f$?
* (From Unit 4, Lesson 6.)
1. Select **all** expressions that are equal to $8^{\frac{2}{3}}$.
	1. $\sqrt[3]{8^{2}}$
	2. $\sqrt[3]{8}^{2}$
	3. $\sqrt{8^{3}}$
	4. $2^{2}$
	5. $2^{3}$
	6. 4
* (From Unit 3, Lesson 4.)



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