Solve each Problem Algebraically.

**Practice Exercises – Characteristics of Exponents**

**Deforestation**

The number of square miles per year of rain forest destroyed in Brazil is given by , where x is the number of years from 1990.

1. With this model, how many square miles were destroyed in 1990?
2. With this model, how many square miles will be destroyed this year? [[1]](#footnote-1)

**Drugs in the Bloodstream**

The concentration of a drug in the bloodstream from the time a drug is injected until 10 hours later is given by in which *y* is the percent concentration *t* hours after injection. What is the percent concentration after 5 hours. [[2]](#footnote-2)

**Bird Population**

A bird species in danger of extinction has a population that is decreasing exponentially. Five years ago the population was 1400 and today only 1000 of the birds are alive represented by an exponential model defined by in which is the number of years from five years ago. Once the population drops below 100, the situation will be irreversible. Will this happen within 20 years? 40 years? [[3]](#footnote-3) [[4]](#footnote-4)

**A bit of a riddle**

There is a pond with one lily pad in it. Every day the amount of lily pads in the pond doubles. If the pond is completely covered on the 30th day, on which day was it half full? [[5]](#footnote-5)

**Practice Exercises – Laws of Exponents**

**Radioactive decay**

When the tsunami caused by the 2011 Tohoku earthquake hit Japan, radioactive caesium-137 was released. Caesium-137 has a half-life of 30 years; that is ½ of what was released that day will remain after 30 years. In another 30 years the amount will be reduced by ½ again. Calculations suggest it will take 19,293,719,920 seconds (about ) to reduce the amount of Caesium-137 to safe levels. To approximate the number of years to reach safe levels, multiply by using scientific notation. [[6]](#footnote-6)

**Space travel**

Just how long it will take to get to Mars depends on the location of both the earth and mars in their current orbits and the spacecraft’s cruising speed. With a cruise speed of 24,600 mph and a distance of 292,000,000 miles, use scientific notation to calculate the number of days it will it take to travel to Mars. [[7]](#footnote-7) [[8]](#footnote-8)

**Growing Bacteria**

The equation approximate the number of bacteria in a certain culture after hours. Keep your answers in exponential form and use the laws of exponents, not a calculator.

1. The initial number of bacteria is determined when . What is the initial number of bacteria?
2. How many bacteria are there after 1 hour, 2hours, and 8 hours. [[9]](#footnote-9)

**Earthquakes**

The expression  represents how many times stronger an earthquake measuring 7.8 on the Richter scale (2010 Indonesia) is than one measuring 7.0 Rither (2010 Haiti). The difference in energy released is represented by . Simplify both expressions using the properties of exponents. [[10]](#footnote-10)

1. Modified from: Harshbarger, Ronald J. and Lisa S. Yocco. College Algebra in Context, 4th Edition. Pearson. 2013. pg 353. [↑](#footnote-ref-1)
2. Modified from: Harshbarger, Ronald J. and Lisa S. Yocco. College Algebra in Context, 4th Edition. Pearson. 2013. pg 353. [↑](#footnote-ref-2)
3. Modified from: Blitzer, Robert, Introductory and Intermediate Algera, 5th edition. Pearson Education.2017. pg. 921 [↑](#footnote-ref-3)
4. <https://portal.ct.gov/DEEP/Endangered-Species/Endangered-Species-Listings/Endangered-Threatened--Special-Concern-Birds> [↑](#footnote-ref-4)
5. <https://www.youtube.com/watch?app=desktop&v=fgBla7RepXU> (start at 2:30 mark in video) [↑](#footnote-ref-5)
6. McKell, Melinda Kathryn (2014) “Fukushima: A Model Study,” Undergraduate Journal of Mathematical Modeling: One + Two: Vol. 6: Iss. 1, Article 6. Available at: <https://scholarcommons.usf.edu/ujmm/vol6/iss1/6> [↑](#footnote-ref-6)
7. <https://www.jpl.nasa.gov/edu/learn/video/mars-in-a-minute-how-do-you-get-to-mars/> [↑](#footnote-ref-7)
8. <https://mars.nasa.gov/mars2020/timeline/cruise/> [↑](#footnote-ref-8)
9. Modified from: Angel, Allen R. and Dennis c. Runde. Elementry and Intermediate Algera, 4th edition. Prentice Hall.2011. pg. 639 [↑](#footnote-ref-9)
10. <https://www.youtube.com/watch?v=YXMKSOsv3QA> [↑](#footnote-ref-10)