Lesson 8 Application of Logs

I. Growth and Decay

Doubling Period: The time it takes for a population/substance to double in size.

Half-Life: The time it takes for a population/substance to reduce to half its size. (decompose)

$\boldsymbol{\pi}$ – used in formulas to determine area and circumference of a circle

e – an irrational number (like π) whose value is 2.718… It's a special value used to determine growth of populations; formula for natural growth.

The Law of Natural Growth

This formula is used for continuous growth and decay.

$A = Pe^{rt}$

Where:

A is the final amount

P is the original amount

r is the rate of growth

t is the time

Examples

1. A radioactive substance decays at a daily rate of 0.13. Determine how long it takes for this substance to decompose to half its size.

2. There are 500 gophers in a field on May 31st. If on June 20th there are 800,

   a) determine the rate of growth.

   b) determine how many gophers are there on June 28th.

3. Lead-210 is a radioactive nuclide. If 8g of it decays to 6.75g in 5 years, determine the half-life of lead-210.

II. Earthquakes

The most intense earthquake ever recorded was in Chile in May 1960, with a magnitude of 9.5.

$$M = \log\frac{I}{S}$$

Where: M is the magnitude
I is the intensity of the ground motion
S is the intensity of a standard earthquake

a) Calculate the intensity of the earthquake in Chile in terms of a standard earthquake.

b) An earthquake that occurred in Haiti was 10^7 times as intense as a standard earthquake. How many times as intense as the Haiti earthquake was the Chile earthquake? State your answer to the nearest whole number.