Accelerated Algebra 2   Name_____

Review 5.5

1. Suppose you had a winning NCAA bracket and you won $500. You invested the money in a savings account in which the interest is compounded continuously. The annual interest rate of the account was 2.5%.
    a. How long would it take to double your money?
    b. How much would your investment be worth after 10 years?

2. Determine the time necessary for an investment of $1000 to triple if it is invested in an account earning 5% interest if the interest is compounded…
    a. Monthly
    b. Continuously

3. The half-life of ^{210}Pb (lead-210) is 22.3 years. How long does it take for 64 grams of ^{210}Pb to decay to 2 grams?

4. The half-life of the radioactive isotope ^{14}C (Carbon 14) is 5715 years. If you have 0.6 grams after 1000 years, determine the initial quantity.

5. Radioactive iodine is a by-product of some types of nuclear reactors. Its half-life is about 60 days. Suppose a contained nuclear accident occurs and gives off radioactive iodine. Determine how long it will take for the radioactive iodine to decay to a level 20% of the original amount.

6. In a research experiment, a population of fruit flies is increasing exponentially. After 3 days there are 200 flies and after 5 days there are 400 flies. How many flies will there be after 7 days?

7. Estimate the age of a newly discovered fossil in which its ratio of Carbon 14 to Carbon 12 is $\frac{1}{9^{13}}$.
    (Use the formula $R = \frac{1}{10^{12}} e^{\frac{-t}{8223}}$)

8. Suppose a conservation organization releases 500 animals into a game preserve. The preserve has a carrying capacity of 10,000 animals. The population of the animals can be modeled by the logistic curve $P(t) = \frac{10,000}{1+19e^{-1.209t}}$
    a. Estimate the population after 4 years.

b. After how many years will the population be 2000?

9. The acidity model , $pH = -log[H^+]$, gives the acidity (pH) of a solution, in terms of its hydrogen ion concentration $[H^+]$, measured in moles of hydrogen per liter.

a. Find the pH of a solution if $[H^+] = 4.3 \ x \ 10^{-4}$

b. If the pH of apple cider is approximately 3.1, determine its hydrogen ion concentration.

10. The loudness L, of a sound (in decibels) is related to the intensity I of the sound (in watts per square meter) by the equation $L = 10log\frac{I}{I_0}$ where I_0 is an intensity of 10^{-12} watt per square meter, roughly the faintest sound that can be heard by humans.

The decibel level of a jackhammer is 130 and the decibel level of a lawn mower is 90. The intensity of the jackhammer is about how many times greater than the intensity of a lawn mower?

11. The Richter scale is given by the equation $R = log\frac{I}{I_0}$ where $I_0 = 1$ is the minimum intensity used for comparison.

a. Find the intensity per unit of area for the earthquake in Japan in 2011 with R = 9.0.

b. Find the intensity per unit of area for the earthquake in Lahore in 2014 with R = 4.2.

c. The intensity of the earthquake in Japan was approximately how many times greater than the earthquake in Lahore?

12. A coroner was called to the home of a person who had died. In order to estimate the time of death, the coroner took the person's temperature. At 5:00 pm, the temperature was $84.2°F$. From this temperature, the coroner was able to determine that the time elapsed since death and the body temperature were related by the formula $t = -10ln\frac{T-70}{98.6-70}$ where t is the time in hours elapsed since the person died and T is the temperature in degrees Fahrenheit. Assume the person had a normal body temperature of $98.6°F$ and the room temperature was a constant $70°F$. Use the formula to estimate the time of death of the person.

13. Calculate the half-life of a radioactive isotope if 4.2 grams decays to 2.9 grams in 50 days.

Answers

1. a. 27.726 years

   b. $642.01

2. a. 22.018 years

   b.   21.972 years

3.   111.5 years

4. 0.677 grams

5. 139.315 days

6. 800 fruit flies

7. 7,671.223 years

8. a. 8,689 animals

   b.   1.289 years

9. a. 3.367

   b. 7.943×10^{-4}

10. 10,000

11. a. 1,000,000,000

   b. 15,848.932

   c. 63,095

12. 10 a.m.

13. 93.574 days