

Name _____
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Date _____
Algebra II

Exponential Equations Word Problems

1. A population of wolves in a county is represented by the equation $P(t) = 80(0.98)^t$, where t is the number of years since 1998. Predict the number of wolves in the population in the year 2008.

2. After an oven is turned on, its temperature, T , is represented by the equation $T = 400 - 350(3.2)^{-0.1m}$, where m represents the number of minutes after the oven is turned on and T represents the temperature of the oven, in degrees Fahrenheit. How many minutes does it take for the oven's temperature to reach 300°F ? Round your answer to the *nearest minute*.

3. Meteorologists can determine how long a storm lasts by using the function $t(d) = 0.07d^{\frac{3}{2}}$, where d is the diameter of the storm, in miles, and t is the time, in hours. If the storm lasts 4.75 hours, find its diameter, to the nearest tenth of a mile.

4. A population of rabbits doubles every 60 days according to the formula $P = 10(2)^{\frac{t}{60}}$, where P is the population of rabbits on day t . What is the value of t when the population is 320?

5. Growth of a certain strand of bacteria is modeled by the equation $G = A(2.7)^{0.584t}$, where G is the final number of bacteria, A is the initial amount of bacteria, and t is the time in hours. In approximately how many hours will 4 bacteria increase to 2500 bacteria? Round your answer to the nearest hour.

6. The number of houses in Central Village, New York, grows every year according to the function $H(t) = 540(1.039)^t$, where H represents the number of houses, and t represents the number of years since January 1995. A civil engineering firm has suggested that a new, larger well must be built by the village to supply its water when the number of houses exceeds 1,000. During which year will this first happen?

7. Drew's parents invested \$1,500 in an account such that the value of the investment doubles every seven years. The value of the investment, V , is determined by the equation $V = 1500(2)^{\frac{t}{7}}$, where t represents the number of years since the money was deposited. How many years, to the nearest tenth of a year, will it take the value of the investment to reach \$1,000,000?

8. Juliette deposits \$3000 into a bank account where the balance of the account $b(t)$ after t years can be represented by $b(t) = 3000(1.063)^t$. To the nearest tenth of a year:

- how long will it take for Juliette's money to double?

- b) how long will it take for Juliette's money to triple?
- c) How long will it take for Juliette's money to increase by 50%?

9. 200 grams of a radioactive substance decays according to the formula $a(t) = 200(.094)^{2t}$ where $a(t)$ is the amount of the radioactive substance remaining after t years. To the nearest hundredth of a year:

- a) How long will it take until there are 150 grams remaining?
- b) How long will it take for the amount of the substance to decrease by 20%?
- c) How long will it take until there is 40% of the substance remaining?

10. The number of subscribers to a website can be modeled by the equation $s(t) = s_0 t^{\frac{4}{3}}$ where $s(t)$ represents the number of subscribers, s_0 represents the initial number of subscribers, and t

represents months. If there were initially 512 subscribers, to the nearest tenth, how long will it take the number of subscribers to increase by 60%?

11. A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0 \left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m. Using this equation, solve for h , to the *nearest ten thousandth*. Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.