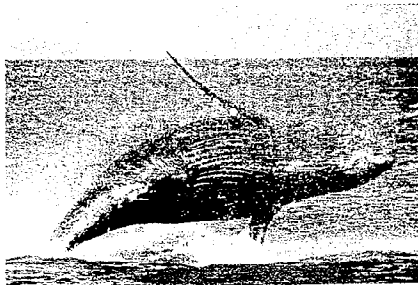


EXPONENTIAL DECAY HOMEWORK

- ① A laboratory has a 500-g sample of nitrogen-13. This substance has a half-life of approximately 10 min.
- Write an equation to represent the mass of the sample, y grams, left after x half-lives.
 - How many half-lives will have elapsed in 1 h?
 - How much of the sample is left after 1 h?
- ② A radioactive isotope has a half-life of 5 years. A laboratory has a 24-g sample of the isotope.
- Write an equation to represent the mass of the sample, y grams, left after x half-lives.
 - How many half-lives will have elapsed in 125 years?
 - How much of the sample is left after 125 years?
- ③ A new car decreases in value exponentially after it is purchased. The value, V dollars, of a new car n years after it is purchased is given by the equation $V = 20\,000(0.84)^n$.
- What was the purchase price of the car?
 - By what percent does the value of the car decrease each year?
 - Estimate the value of the car 6 years after it was purchased.
- ④ The infant mortality rate in Canada has been declining. An equation that models this situation is $D = 6(0.96)^n$, where D is the number of deaths per 1000 children under 1 year of age, and n is the number of years since 1995.
- What does “infant mortality” mean?
 - In 1995, how many deaths were there per 1000 children under 1?
 - Estimate the number of deaths per 1000 children under 1 in 2000.
- ⑤ When light passes through ice, its intensity is reduced by 4% for every 1 cm thickness of ice.
- Write an equation to express the percent of light, y , that penetrates x centimetres of ice.
 - What percent of light penetrates a sheet of ice 4.5 cm thick?
- ⑥ An endangered species of birds has a current population of 4000. Biologists estimate that the population decreases by 5% per year.
- Write an equation to estimate y , the number of birds x years from now.
 - Estimate the number of birds at each time.
 - 5 years from now
 - 10 years from now
- ⑦ **Thinking/Inquiry/Problem Solving**
An endangered whale species has a population of 1000. Biologists estimate that the population decreases by 5% per year. At this rate, how many years will it be before only 500 of the species remain?



8 Communication

- a) Suppose you have a table of values that represents an exponential function. How do you know whether the table represents exponential growth or decay?
- b) Suppose you have an equation that represents an exponential function. How do you know whether the equation represents exponential growth or decay?
- c) Suppose you have a graph that represents an exponential function. How do you know whether the graph represents exponential growth or decay?

Answers

- ① a) $y = 500\left(\frac{1}{2}\right)^x$ b) 6 half-lives c) 7.81 g
- ② a) $y = 24\left(\frac{1}{2}\right)^x$ b) 25 half-lives c) 7.15×10^{-7} g
- ③ a) \$20 000 b) 16% c) \$7025.96
- ④ a) The number of children who die under the age of one
b) 6 deaths c) 5
- ⑤ a) $y = 100(0.96)^x$ b) 83.22%
- ⑥ a) $y = 4000(0.95)^x$
b) i) 3095 ii) 2395
- ⑦ 13.5 years
- ⑧ a) For growth, when x increases, y increases. For decay, when x increases, y decreases.
b) The equation has the form $y = Ab^x$. For exponential decay, $b > 0$ and $b < 1$; for exponential growth, $b > 1$
c) The graph for exponential decay goes down to the right. The graph for exponential growth goes up to the right.