Notes and Sample Problems – Applications of Exponential Functions

Exponential Growth/Decay Formula: $y = ab^{\frac{t}{p}}$

Defining the variables

y represents the future amount (at time t)

a represents the initial amount

b represents the growth or decay factor

- **Note 1**: If b > 1, the equation models exponential growth If 0 < b < 1, the equation models exponential decay
- **Note 2**: When given a percentage of growth or decay, determine the growth/decay factor by adding or subtracting the percent, as a decimal, from 1.

Examples:	an amount increases by 3%	b = 1 + 0.03 = 1.03
	an amount decreases by 40%	b = 1 - 0.40 = 0.60

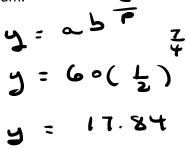
t represents the elapsed time

P represents the period for the growth/decay to occur

Problems

1. A bacterial culture doubles every 2 hours. If the culture started with 24 000 bacteria, how many bacteria will be present in 5 hours?

2. The half-life of a radioactive sample is 4 hours. If 60 g of the sample was initially present, how much will remain after 7 hours? *Round your answer to the nearest hundredth of a gram.*



The amount of radioactive sample will be 17.84 g in 7 hours.

3. A bacteria culture triples every P hours. If the culture started with 13 000 bacteria, and there are 24 000 after 2 hours, what is the value of the period in hours? *Round your answer to the nearest hundredth of an hour.*

$$y = ab = \frac{1}{p}$$

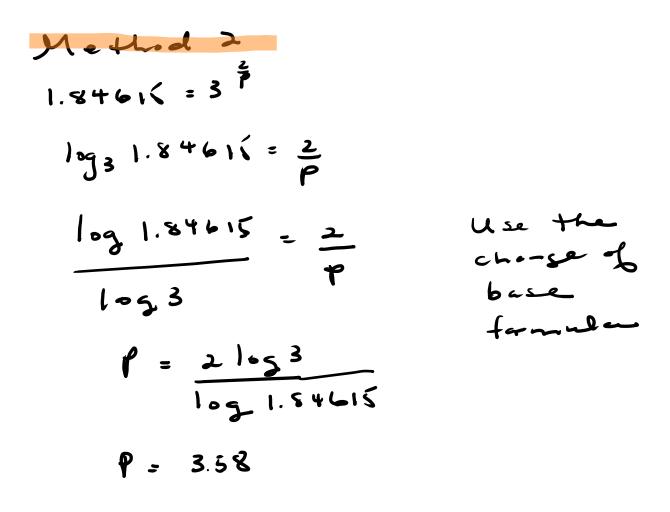
$$\frac{21000}{1.8400} = 13006 (3)$$

$$1.8400 = 3^{\frac{3}{p}}$$

$$\frac{1091.84605 = 1093}{109.1.84605 = 20033}$$

$$P = 21033$$

$$I = 21033$$



The period is 3.58 hours.

4. The half-life of a radioactive sample is 6.2 hours. If 2000 g of the sample is present after 7 hours, how many grams of the sample was initially present? *Round your answer to the nearest gram.*

$$y = ab + \frac{1}{p}$$

$$Z = ab + \frac{1}{p}$$

$$Z = ab = a(\frac{1}{2})$$

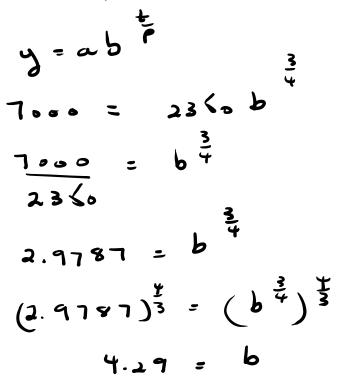
$$Z = a = a(a, 4 \le 7222)$$

$$a = \frac{2 \cdot a}{a \cdot 4 \le 7222}$$

$$a = 4374$$

Initially, there was 4374 g of the radioactive sample.

6. The population of a town changes by an exponential growth factor, b, every 4 years. If the number of people grows from 2350 to 7000 in 3 years, what is the value of *b*? *Round your answer to 2 decimal places.*



The value of the growth factor is 4.29.