

MHF 4UI – Prob Set # 26 - Applications of Logarithmic and Exponential Functions

- A bacteria culture doubles every $\frac{1}{4}$ hour. At time $1\frac{1}{4}$, an estimate of 40 000 bacteria are found.
a) What was the initial size of the culture? b) What is it after 3 hours?
- A bacteria culture starts with 3000 bacteria. After 3 hours, the estimated count is 48 000. What is the doubling period?
- A bacteria culture starts with 6000 bacteria. After half an hour the bacteria count is 33 600. Calculate the number of minutes it takes for the culture to double.
- If the number of bacteria in a container of milk left in a student's desk doubles in one hour, in how many hours will it be 100 times the original amount?
- Inflation is causing items to cost approximately 2% more per year. If gasoline is currently \$0.65/L, when will it cost \$1.00/L?
- Radium-221 has a half-life of 30 s. How long will it take for 95% of it to decompose?
- If 25 mg of a radioactive element decays to 20 mg in 48 hours, find the half-life of the element.
- Julie wishes to invest \$3000 in savings certificates that bear an interest rate of 9.25% compounded semi-annually. How long a time period should she choose in order to save an amount of \$3700?
- A sum of \$1000 was invested for four years and the interest was compounded semi-annually. If this sum amounts to \$1463.44 after the four years, what was the interest rate?
- The 1908 earthquake in San Francisco had a magnitude of 8.3 on the Richter scale. At the same time in Japan there was an earthquake of magnitude 4.8 which caused only minor damage. How many times more intense was the San Francisco earthquake than the Japanese earthquake?
- A power mower makes a noise that is measured at 106 dB. Ordinary traffic registers about 70 dB. How many times louder is the mower than the traffic?
- Sean lives near a busy street. He has all the windows open in his apartment and measures the noise level as 79 dB. He closes the windows and find the noise level is now 68 dB. By what factor did the intensity of the noise decrease when Sean closed the windows?

ANSWERS

- | | | |
|-------------------------|-----------------------|-----------------------------|
| 1a) 1250 bacteria | b) 5,120,000 bacteria | 2. $\frac{3}{4}$ of an hour |
| 3. 12 minutes | | 4. 6 hours, 39 minutes |
| 5. 21.75 years | | 6. 129.6 seconds |
| 7. 149 hours, 6 minutes | | 8. $2\frac{1}{2}$ years |
| 9. 9.75% | | 10. 3162 times more intense |
| 11. 3981 times louder | | 12. 13 times |