NAME _____ DATE _____ Grade: x/12

3-1 Word Problem Practice

Exponential Functions

1. **FINANCIAL LITERACY** Suppose Jamal has a savings account with a balance of $1400 at a 4% interest rate compounded monthly. If there are no other deposits or withdrawals, what will be Jamal's account balance in three years?

   $1578.18

2. **BIOLOGY** Suppose a certain type of bacteria reproduces according to the model $P(t) = 100e^{0.271t}$, where t is time in hours and $P(t)$ is the number of bacteria.

   a. Determine the growth rate.

   27.1% per hour

   b. What was the initial number of bacteria?

   100

   c. Find the number of bacteria in 5, 10, 24, and 72 hours. Round to the nearest whole number.

   - $P(5) = 388$; $P(10) = 1503$;
   - $P(24) = 66{,}781$;
   - $P(72) = 2.98 \times 10^{10}$ OR 3×10^{10}

3. **FINANCAL LITERACY** You have $1000 to put into the bank. One bank offers a 5.7% interest rate compounded monthly. Another bank offers 5.6% compounded continuously. Which would you choose to make the most money after 2 years? after 5 years? Explain.

   Sample answer: I would choose the higher monthly rate. To check, the balance is $1120.45 versus $1118.51; after 5 years, the balance is $1328.87 versus $1323.13.

4. **TECHNOLOGY** In 1965, Gordon Moore stated that since the invention of the integrated circuit in 1958, the number of transistors that can be placed on that circuit has doubled every two years. This statement has been true to the present day. Almost all measures of computing power come from this statement so that we can say that the computing power doubles nearly every two years.

   a. If there were about 2100 transistors on every circuit in 1971, write an exponential equation to model the number of transistors in a given year t after 1971.

   $N = 2100 \cdot 2^{\frac{t}{2}}$

   b. Approximately how many transistors were on one circuit in 2009?

   1.1×10^9

   c. A 1971 computer could manage one process per second. Every two years, the number of processes also doubles on a computer. Write an equation to calculate the number of processes a computer can manage every second in each year after 1971. Then complete the table below.

   $P = 1 \cdot 2^{\frac{t}{2}}$

1991	2001	2011	2021	2031
2^{10}	2^{15}	2^{20}	2^{25}	2^{30}

5. If your precalculus teacher offers to give you 1 second of homework for the first week of school and double the amount of homework each week until the end of the school year (i.e. 2 seconds the second week), should you say yes? Explain.

   No; week 21 has 2^{20} seconds of homework or about 291 hours of homework.