**![C:\Documents and Settings\kkelly3\Local Settings\Temporary Internet Files\Content.IE5\H6S1H2JZ\MC900440556[1].wmf]()Bacteria Growth**

If you don’t brush your teeth regularly, it won’t take long for large colonies of bacteria to grow in your mouth. Suppose a single bacterium lands on your tooth and starts multiplying by a factor of 4 every hour.

1. Complete the table below to model the bacteria growth over several hours.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Hours** | 0 | 1 | 2 | 3 | 4 | 5 |
| **Number of Bacteria** | 1 | 4 | 16 |  |  |  |

1. Graph the data in the table below. Be sure to label your graph and axes.



1. Is this graph linear or exponential?
2. Write the *NOW-NEXT* form to show the pattern of growth.

 *NEXT* = \_\_\_\_\_\_ • *NOW*

1. What is the common ratio *r*?
2. Use the common ratio *r* to write a rule to showing how to calculate the number of bacteria *y* after *x* hours.

*y* = the number of bacteria produced in that hour

*x* = the number of hours

*r* = the common ratio or rate of change

*a1* = the initial term of the sequence or the starting point

Use the above information to write the explicit form of the exponential function

*y* = *a1*• *rx*. Notice how similar it is to the NOW-NEXT recursive form.

*NEXT = NOW • r*

 *y = a1 • rx*

 *y*  = 1 • 4*x*

The *NEXT* and *y* components both represent the number of bacteria generated during the hour. The *NOW* and *a1*both represent the starting point and *r* is the rate of change or the common ratio, which is 4 in this example.

1. Use the rule in step 6 to determine the number of bacteria in the colony after 7 hours. Verify the number of bacteria by either continuing the table in step 1 or continuing the graph in step 2.
2. After how many hours will there be at least 1,000,000 bacteria in the colony?
3. Suppose that instead of 1 bacterium, 50 bacteria land in your mouth. Write an explicit equation which describes the number of bacteria *y* in this colony after *x* hours.
4. What is different in this equation from the equation in step 6?
5. Using your new equation, determine the number of bacteria in the colony after 8 hours and after 10 hours.
6. Which method for determining the number of bacteria is easier for you? Using a table, graph, NOW-NEXT, or equation? Explain.