Exponential Growth and Decay Worksheet

In the function: $y = a(b)^x$, a is the y-intercept and b is the base that determines the direction of the graph and the steepness. In real-life situations we use x as time and try to find out how things change exponentially over time. Some examples of this are money growing in a bank account by a certain percentage every year or the population of a city growing by a certain percentage every year.

Because *a* is the y-intercept it plays a very important role in word problems involving exponential growth. *a* is known as the **initial value** because it is the value of the function when $x = 0$ or at the beginning of time.

b determines how fast the function increases or decreasing. For this reason, b is known as the **growth factor.** The growth factor is determined by starting with 100% and then adding or subtracting the percentage that the function if being increased by or subtracting the percentage that the function is being decreased by. Finally you take your growth factor as a percentage and change it into a decimal before plugging it into $y = a(b)^x$.

Find the initial value and growth factor for each of the situation below then plug them in to $y = a(b)^x$ *to get the function that models the problem.* ***Answers are at the end.***

1. You deposit $200 into a bank account. Every year that account increases by 12 %. [EXAMPLE]

   Initial value: 200

   Growth factor: 1.12

   Equation: y=200(1.12)^x

2. The population of an apartment building is 4,000 people. Every month the population goes down by 12%.

   Initial value:

   Growth factor:

   Equation:

3. You start a bank account with $500 and the interest on the account is 8% every year.

   Initial value:

   Growth factor:

   Equation:

4. The New York Mets sign a new player for $8,000,000 and his salary goes up by 3% every year.

   Initial value:

   Growth factor:

   Equation:

5. A certain stock was worth $42 at the beginning of the day. Every hour the stock goes down by 15%.

   Initial value:

   Growth factor:

   Equation:

After coming up with an equation that models the situation we can find values in the future by plugging in values for x. For example, in problem one you can find the amount of money in your bank account after 4 years by plugging in 4 for x.

$$y = 200(1.12)^{(4)} = \$314.70$$

Try finding the answers to the following questions by plugging in to *the equations you found in problems 1-6.*

1b) How much money do you have in your bank account after 5 years?

2b) How many people live in the building after 3 months?

3b) How much do you have in your bank account after 4 years?

4b) How much does the player make after 3 years?

5b) How much is the stock worth after 7 hours?

Answers:
2) $y=4000(.88)^x$
3) $y=500(1.08)^x$
4) $y=8000000(1.03)^x$
5) $y=42(.85)^x$

1b. $352.47
2b. 630 people
3b. $680.24
4b. $8,741,816
5b. $13.46