**Classwork L8-1 Continued**

Exponential Functions

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| ***Directions*:** For each annual rate of change, use the justifications at the left to find the corresponding ***growth (or decay) factor***. Fill in the blanks as you complete each step.  |
| 1. **0.03% increase**
 |

|  |  |
| --- | --- |
| **Justification** | **Steps** |
| An increase means I want to find the ***growth*** ***factor***. In the equation$ y=a\left(b\right)^{x}$, the ***growth*** ***factor*** is represented by the variable \_\_\_\_\_. I **cannot** do mathematical calculations with a percent (%). I can convert the *percent increase* to a decimal by dividing by 100 or moving the decimal point two places to the left. |  |
| 0.03% $÷$ |  | = |  |  |
|  |
| I **always** start with 1 whole of what I have (people, wild cats, the price of a car, etc.). A(n) increase/decrease means I add to/subtract from 1. |  |
| 1 $-/+$ |  | = |  |
|  |
| I found my ***growth*** ***factor***. I should **not** write a % sign. In the equation, the growth factor is not a percent.  | ***growth factor***: $b= $\_\_\_\_\_\_\_\_\_\_$$y=a\left(\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\right)^{x}$$ |

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| 1. $0.49\%$ **decrease**
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| **Justification** | **Steps** |
| A decrease means I want to find the \_\_\_\_\_\_\_\_\_\_\_ ***factor***. In the equation$ y=a\left(b\right)^{x}$, the \_\_\_\_\_\_\_\_\_\_\_\_ ***factor*** is represented by the variable \_\_\_\_\_. I **cannot** do mathematical calculations with a percent (%). I can convert the *percent* *decrease* to a decimal by dividing by 100 or moving the decimal point two places to the left.  |  |
| 0.49% |  |  | = |  |
|  |
| I **always** start with 1 whole of what I have (people, wild cats, the price of a car, etc.). A(n) increase/decrease means I add to/subtract from 1. |  |
| 1 $-/+$ |  | = |  |
|  |
| I found my \_\_\_\_\_\_\_\_\_\_ ***factor***. I should **not** write a % sign. In the equation, the \_\_\_\_\_\_\_\_\_\_\_\_ factor is not a percent. | ***growth factor***: $b= $\_\_\_\_\_\_\_\_\_\_$$y=a\left(\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\right)^{x}$$ |

***Directions*:** Match each situation on the left to an exponential function that could be used to model it.

|  |  |
| --- | --- |
| 1. A population of mice increases 0.10% each week.
 | 1. $y=a\left(1.2\right)^{m}$
 |
| 1. A house depreciates 6% each year.
 | 1. $y=a\left(0.94\right)^{x}$
 |
| 1. The number of Corey’s Twitter followers increases 20% each month.
 | 1. $y=\left(0.9969\right)^{x}$
 |
| 1. A population of endangered wildcats decreases 0.31% each year.
 | 1. $y=a\left(1.001\right)^{w}$
 |

***Directions***: For each exponential function **a)** identify the ***growth (or decay) factor***, and **b)** find the functions’ *percent increase or decrease*.

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| 1. $y=5\left(4.32\right)^{x}$
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| **Justification** | **Steps** |
| In the equation$ y=a\left(b\right)^{x}$, the ***growth factor*** is represented by the variable \_\_\_\_\_. | ***growth factor***: $b= $\_\_\_\_\_\_\_\_ |
| The ***growth factor*** is equal to the increase/decrease (as a decimal) added to/subtracted from 1. Set up an equation and solve for$ x$. |  |
| 1 |  | $$x$$ | = |  |
|  |
| Convert the increase/decreaseto a percent. Do this by multiplying/dividing the factor by \_\_\_\_\_ or by moving the decimal point two places to the left/right. |  |
|  | $$⋅$$ |  | = |  |
|  |
|  | There was a \_\_\_\_\_\_\_\_% increase/decrease. |

|  |
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| 1. $y=\frac{1}{2}\left(0.77\right)^{x}$
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| **Justification** | **Steps** |
| In the equation$ y=a\left(b\right)^{x}$, the ***decay factor*** is represented by the variable \_\_\_\_\_. | ***decay factor***: $b= $\_\_\_\_\_\_\_\_ |
| The ***decay factor*** is equal to the increase/decrease (as a decimal) added to/subtracted from 1. Set up an equation and solve for$ x$. |  |
| 1 |  | $$x$$ | = |  |
|  |
| Convert the increase/decreaseto a percent. Do this by multiplying/dividing the factor by \_\_\_\_\_ or by moving the decimal point two places to the left/right. |  |
|  | $$⋅$$ |  | = |  |
|  |
|  | There was a \_\_\_\_\_\_\_\_% increase/decrease. |

***Directions***: Determine **a)** whether each function is exponential growth or decay, **b)** identify the growth (or decay) factor, and **c)** find the functions’ percent increase or decrease.

1. $y=327(0.05)^{x}$ 2. $f\left(x\right)=1.023(0.98)^{x}$

3. $y=8(1.3)^{x}$ 4. $f\left(x\right)=9.2(2.3)^{x}$

5. $f\left(x\right)=2(\frac{9}{10})^{x}$ 6. $f\left(x\right)=4.1(0.72)^{x}$

7. A truck cost $30,000 in the year 2004. For each year after 2004, the value of the truck was 20% less than the previous year.

**a)** Write an equation to model the depreciation of the truck’s value.

**b)** What was the value of the truck in the year 2007?

8. Mr. Murphy’s company used a total of 5000 gallons of gasoline in the year 2007. Mr. Murphy planned to reduce the amount of gasoline used by his company each year by 10% from the previous year.

**a)** Write a function to model the decline in gasoline use at Mr. Murphy’s company.

**b)** Based on the function you wrote, what is the total amount of gasoline that his company will use in the year 2010?

9. A magazine had 4000 subscribers at the end of year 2011. The number of subscribers increased by 10% each year as compared with the previous year.

**a)** Write a function to model the increase in magazine subscribers.

**b)** What is the number of subscribers at the end of year 2015?

10. **Social Studies** The table show information about the population of the four largest cities in the world in 1994.

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank in 1994** | **City** | **1994 Population** | **Average Annual Growth Rate** |
| 1 | Tokyo, Japan | 26,518,000 | 1.4% |
| 2 | New York City, U.S. | 16,271,000 | 0.3% |
| 3 | Sao Paulo, Brazil | 16,110,000 | 2.0% |
| 4 | Mexico City, Mexico | 15,525,000 | 0.7% |

**a)** Suppose these rates of growth continue. Write equations that model the future growth of each city.

**b)** Use your equation to predict the population of each city in 2004. Does the ranking change?

11. Economics The 1994 gross domestic product and the real growth rate for several countries are given in the table.

|  |  |  |
| --- | --- | --- |
| **Country** | **1994 Gross Domestic Product (in billions)** | **1994 Real Growth Rate** |
| Armenia | $8.1 | -2% |
| Canada | $639.8 | 4.5% |
| Colombia | $172.4 | 5.7% |
| New Zealand | $56.4 | 6.2% |

**a)** Write an equation for each country to describe the change in the gross domestic product.

b. Suppose this real growth rate continues. Determine the gross domestic product in 2000, 2005, and 2015 for each country.