

## Exponential Growth & Decay Worksheet

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- Determine the growth or decay factor ("b" value) that corresponds to each of the following:  
[Recall: increase  $\rightarrow$  growth factor and decrease  $\rightarrow$  decay factor]  
a) increase of 12%    b) decrease of 6%    c) increase of 3.4%    d) decrease of 10.5%
- Given the following growth or decay factor, find the corresponding rate of change (as a %).  
Be sure to state whether the percentage is an increase or decrease.  
a) 1.05    b) 0.6    c) 2.25    d) 0.875
- The population,  $P$ , of cells in a culture can be estimated using the formula  $P = 400(2.4)^t$ , where  $t$  is the time, in hours.  
a) What is the initial population of cells in the culture?  
b) Determine the number of cells after 6 hours.
- The population of coyotes,  $P$ , can be modelled by the equation  $P = 1024(1.078)^n$ , where  $n$  is the number of years since 2005.  
a) What was the initial population of coyotes in 2005? (Hint: number of years = 0)  
b) Determine the rate (as a %) that the coyote population has been **growing** at since 2005.  
c) Assuming the growth rate stays the same, what will the coyote population be in 2020? (Hint:  $n$  = the number of years from 2005 to 2020).
- In late summer, as the evening temperature decreases, the population of black flies can be modelled by the equation  $P = 8850(0.97)^t$ , where  $P$  is the number of black flies, and  $t$  is the time in days from the start of the study.  
a) What was the initial population of black flies at the start of the study?  
b) What was the population at the end of the first week? (Hint: time = 7 days)  
c) Determine the rate (as a %) that the population of black flies is **decreasing** during the study.
- Joel invested \$12000. The value of his investment increases by 5% each year.  
a) Write an exponential equation to relate the value of his investment ( $V$ ) to the number of years,  $n$ . (Hint: first determine the growth factor)  
b) Using your equation, determine the value of his investment in 10 years.  
c) Estimate the number of years it will take for his original investment to double. Show your calculations to support your answer.
- A new car decreases in value exponentially after it is purchased. The value,  $V$  dollars, of a new car  $n$  years after it is purchased is given by the equation  $V = 25000(0.84)^n$ .  
a) What was the purchase price of the car?  
b) By what percent does the value of the car decrease each year?  
c) Determine the value of the car 6 years after it was purchased.

## Answers:

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|---------------------------|-------------------|------------------|-------------------|
| 1. a) 1.12                | b) 0.94           | c) 1.034         | d) 0.895          |
| 2. a) 5% increase         | b) 40% decrease   | c) 125% increase | d) 12.5% decrease |
| 3. a) 400                 | b) approx. 76 441 |                  |                   |
| 4. a) 1024                | b) 7.8%           | c) approx. 3159  |                   |
| 5. a) 8850                | b) approx. 7151   | c) 3%            |                   |
| 6. a) $V = 12000(1.05)^n$ | b) \$19 546.74    | c) 14 – 15 years |                   |
| 7. a) \$25 000            | b) 16%            | c) \$8782.45     |                   |