ALBERT

Name _____ Date _____

Exponential Growth and Decay Worksheet

Algebra 1 · Common Core HSF-IF.C.8b

> Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.

Practice

Builds the skill step by step.

1. $y = (1.02)^t$. What is the percent rate of change per period?

2. $y = (0.97)^t$. By what percent does y decrease each period?

3. Is $y = (1.2)^t$ growth or decay?

   A. growth

   B. decay

   C. neither

   D. both

4. $y = 500(0.85)^t$. By what percent does y decrease each period?

5. $y = (1.01)^{12t}$, where t is in years. What is the growth rate per month?

6. $y = 1000(1.06)^t$. What is y when t = 1?

7. What does the factor $(0.5)^t$ do?

   A. It doubles the amount.

   B. It halves the amount each period.

   C. It subtracts 0.5.

   D. It adds 50%.

8. $y = (1.2)^{t/10}$, where t is in years. By what percent does y grow every 10 years?

9. $y = 2^t$. By what percent does y grow each period?

10. Which function shows exponential decay?

    A. $y = (1.01)^t$

    B. $y = 2^t$

    C. $y = (0.99)^t$

    D. $y = (1.5)^t$

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On Level

Grade-level practice.

1. $y = (1.01)^{12t}$, where t is in years. Use $1.01^{12} \approx 1.1268$. What is the yearly growth rate, as a percent to the nearest tenth?

2. $y = (1.2)^{t/10}$, where t is in years. Use $1.2^{1/10} \approx 1.0184$. What is the yearly growth rate, as a percent to the nearest tenth?

3. $y = 300(0.9)^{2t}$, where t is in years. By what percent does y decrease each year?

4. $y = 50(1.04)^{t}$. What is the initial value?

5. Classify $y = 200(1.03)^{t}$ as growth or decay and explain what the numbers mean.

6. Which function grows fastest per year (t in years)?

   A. $y = (1.1)^t$

   B. $y = (1.2)^{t/2}$

   C. $y = (1.05)^t$

   D. $y = (1.01)^{12t}$

7. $y = 80(0.75)^t$. What is y when t = 2?

8. $y = (0.5)^{t/8}$, where t is in years. How many years does it take for y to halve?

9. $y = 1000 \cdot 2^{t/3}$, where t is in hours. Every how many hours does y double?

10. $y = 2500(1.05)^t$. What is the percent rate of change per period?

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Challenge

Multi-step and word problems that stretch it.

1. $y = (0.97)^t$. Use $0.97^3 \approx 0.9127$ and $0.97^4 \approx 0.8853$. What is the first whole number t for which y is below 0.9?

2. $y = 100(1.5)^{t/2}$, where t is in years. Use $1.5^{1/2} \approx 1.2247$. What is the yearly growth rate, as a percent to the nearest tenth?

3. $y = (0.95)^{4t}$, where t is in years. Use $0.95^4 \approx 0.8145$. What is the yearly decay rate, to the nearest whole percent?

4. How do $y = (1.21)^t$ and $y = (1.1)^{2t}$ compare?

   A. They are the same function.

   B. The first grows faster.

   C. The second grows faster.

   D. One is growth and one is decay.

5. $y = a(1.08)^t$, and $y = 583.2$ when $t = 2$. What is a?

6. Explain what $y = (1.2)^{t/10}$ tells you, where t is in years.

7. $y = 2000(0.8)^t$. What is y when t = 3?

8. $y = (1.4)^t$. What is the percent rate of change per period?

9. $y = (1.06)^{4t}$, where t is in years and 6% is added each quarter. Use $1.06^4 \approx 1.2625$. What is the yearly growth rate, to the nearest whole percent?

10. Which function shows exponential decay?

    A. $y = 3(1.5)^{-t}$

    B. $y = 3(1.5)^t$

    C. $y = 3(2)^t$

    D. $y = 3(1.01)^t$