

## Stick Quiz 7.5

1.  $5 \log_2 x = \log_2 32$

$x = 2$

2.  $\log_6 0.1 + 2 \log_6 x = \log_6 2 + \log_6 5$   $x = 10$

3. State all transformations and the domain and range.

$f(x) = 15 \log_{14}(x + 1) - 9$

P:  $y = \log_4 x$

D:  $x > -1$

a: 15 v stretch 15

R:  $\mathbb{R}$

h: -1 left 1

k: -9 Down 9

$\log_6 0.1 + 2 \log_6 x^2 = \log_6 2 + \log_6 5$

$\log_6 0.1x^2 = \log_6 10$

$\frac{0.1x^2}{0.1} = \frac{10}{0.1}$

$x^2 = 100$

$x = 10$

? ? Questions

?

?

on

?

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Homework

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?

?  
26  
43  
49 ?

$$26 \log_{10} a + \log_{10}(a+21) = 2$$

$$\log_{10} a(a+21) = 2$$

$$10^2 = a(a+21)$$

$$100 = a^2 + 21a$$

$$0 = a^2 + 21a - 100$$

$$0 = (a+25)(a-4)$$

$$a \neq -25 \quad \boxed{a=4}$$

$$\begin{array}{r|l} -100 & 21 \\ 25 & -4 \end{array}$$

43.

$$2 \log_b 16 + 6 \log_b n = \log_b (x-2)$$

$$\log_b 16^2 + \log_b n^6 = \log_b (x-2)$$

$$\log_b 16^2 n^6 = \log_b (x-2)$$

$$\frac{256n^6}{256} = \frac{(x-2)}{256}$$

$$n^6 = \left( \frac{x-2}{256} \right)^{1/6}$$

$$49 \log_7 64 - \log_7 \frac{8}{3} + \log_7 2 = \log_7 4p$$

$$\log_7 \frac{64}{\frac{8}{3}} + \log_7 2 = \log_7 4p$$

$$\log_7 24 + \log_7 2 = \log_7 4p \quad \begin{matrix} 8 \\ 24 \cdot \frac{3}{8} = 24 \end{matrix}$$

$$\log_7 48 = \log_7 4p$$

$$\frac{48}{4} = \frac{4p}{4}$$

$$p = 12$$

# LESSON 7-8 Using Exponential and Logarithmic Functions

## Target 7-4

I can use the properties of exponents and logarithms to write and solve equations in real world scenarios.

Example:

Suppose you invest \$1,000 at 3.5% annual interest. How long will it take you to double your money? *— chg to decimal*

$$y = a(1+r)^t$$

$$2000 = 1000(1 + .035)^t$$

$$2 = 1.035^t$$

$$\log_{1.035} 2 = t$$

$$\frac{\log 2}{\log 1.035} = t$$

$$t \approx 20.14 \text{ years}$$

Example: *chg to dec.*

Suppose your charity has an initial investment of \$1,000 but is losing 5% each year through expenditures. How long will it take until half of your money is gone? (This is modeling exp decay)

$$y = a(1-r)^t$$

$$500 = 1000(1-.05)^t$$

$$\frac{1}{2} = (.95)^t$$

$$\log_{.95} \frac{1}{2} = t$$

$$\frac{\log \frac{1}{2}}{\log .95} = t$$

about 13.5 years

You Try:

Suppose you invest \$2,500 at 2.25% annual interest compounded quarterly. How long will it take you to double your money?

$$y = a\left(1 + \frac{r}{n}\right)^{nt}$$

$$5000 = 2500\left(1 + \frac{.0225}{4}\right)^{4t}$$

$$2 = (1.0056)^{4t}$$

$$\log_{1.0056} 2 = 4t$$

$$\frac{\log 2}{\log 1.0056} = 4t$$

$t \approx 31$  years

## Example

If the population of a country decreases by 3% every year and the starting population is 143,922 people, how many people would be in the country after 5 years? How long will it take for the population to reach 80% of its' initial size?

The number  $n$  of pet owners in thousands after  $t$  years can be modeled by:

$$n = 35[\log_4(t + 2)]$$

$$n = 35(\log_4 12)$$

$$n = 35(\log(12) / \log(4))$$

Let  $t = 0$  represent 2000.

How many pet owners were there in 2010?  $t = 10$

How long until there are 80000 pet owners? When will this occur?

$$n = 80$$

$$\frac{80}{35} = \frac{35}{35} [\log_4(t+2)]$$

62,000 pet owners

$$2.2857 = \log_4(t+2)$$

$$4^{2.2857} = t + 2$$

$$\approx 21.7 \text{ years}$$

Five years ago the grizzly bear population in a certain national park was 325. Today it is 450. Studies show that the park can support a population of 750.

a. What is the average annual rate of growth in the population if the grizzly bears reproduce once a year? **6.72%**

$(0, 325)$   $(5, 450)$

$$y = 325(1.0672)^t$$

$$y = ab^x$$

$$450 = 325b^5$$

$$1.3846 = b^5$$

$$b = 1.0672$$

b. How many years will it take to reach the maximum population if the growth continues at the same average rate?

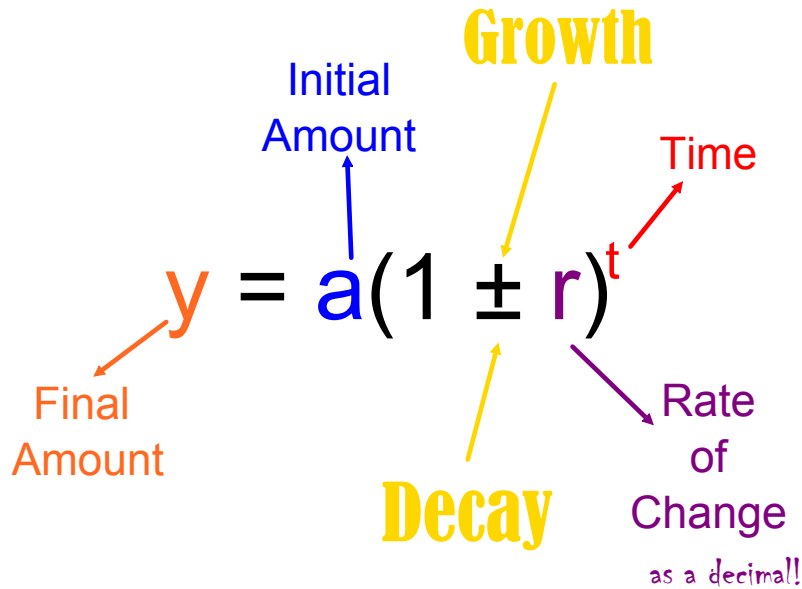
## Homework

Target 7-2 & Target 7-3  
Applications HW worksheet

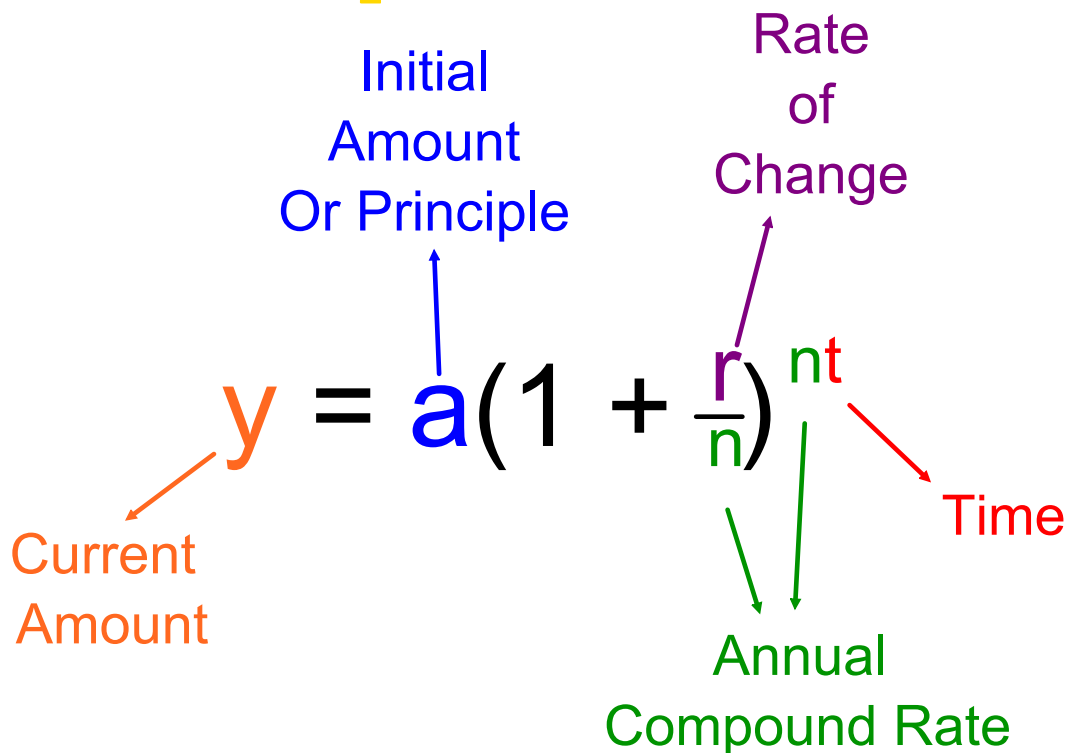
This is now just Target 7-4

# Exponential Growth/Decay

$$y = a(b)^t$$



# Compound Interest





**Extra:**

**Suppose you invest \$1,000 at 3.5% annual interest compounded monthly. How long will it take you to double your money?**

**Example:**

**Suppose you invest \$1,000 at 3.5% annual interest compounded quarterly. How long will it take you to double your money?**