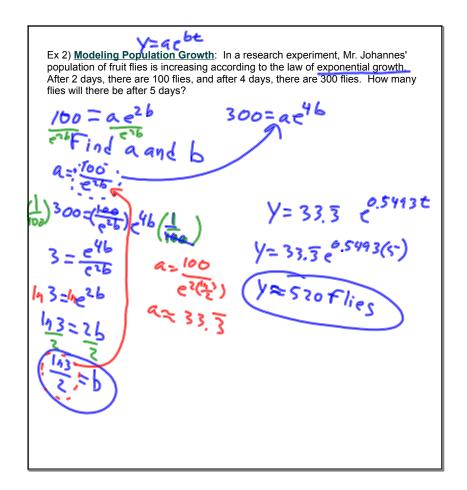
3.5 Exponential and Logarithmic Models

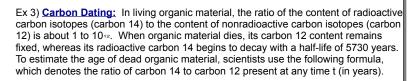
Most of the story problems will have equations written for you. Those that do not will most likely be an exponential growth or decay type problem and you will use the following formulas.

Exponential Growth Model: $y = ae_{bx}$, b > 0Exponential Decay Model: $y = ae_{-bx}$, b > 0

Ex 1) Population Growth: Estimates of the world population (in millions) from 1995 - 2004 are shown in the table. An exponential model that approximates this data is given by $p = 5344e^{-0.2744t}$, $5 \le t \le 14$, where p is the population (in millions) and t = 5 represents 1995. Compare the values given by the model with the estimates shown in the table. According to this model, when will the population reach 6.8 billion?

		(500 6800 = 224A = 005 34AA
year	populat	ion 23 Ayye 37 TY
1995	5685	12 23 53 Wy
1996	5764	h 1322 1 5 3 8 9
1997	5844	10647426
1998	5923	171.27246 -20.0127444
1999	6002	
2000	6079	
2001	6154	
2002	6228	18.9 2002 \$44
2003	6302	· · · · · · · · · · · · · · · · · · ·
2004	6376	18.9-5=13.9
		10.11 3 = 13. 9
		1995+13.9=(2008)
		1777713.7 4 2008 \





$$r = 10^{12} e^{-t/8267}$$

The ratio of carbon 14 to carbon 12 in a newly discovered fossil is $r = \frac{1}{10^{13}}$.

Estimate the age of the fossil.

Ex 4) **Spread of a virus**: On a college campus of 5000 students, one student returns from vacation with a contagious flu virus. The spread of the virus is modeled by

where y is the total number infected after t days.

The college will cancel classes when 40% or more of the students are infected.

- a) How many students are infected after 5 days?
- b) After how many days will the college cancel classes?

Ex 5) On the Richter Scale, the magnitude R of an earthquake of intensity I is given by R = $\log_{10} (I/I_0)$ where I_0 = 1 is the minimum intensity used for comparison. Intensity is a measure of the wave energy of an earthquake	´
In 2001, the coast of Peru experienced an earthquake that measured 8.4 on the Richter scale. In 2003, Colima, Mexico experienced an earthquake that measured 7.6 on the Richter scale. Find the intensity of each earthquake and compare the two intensities.	