Applications of Exponential Equations

* $y = ar^x$ - this is the general form of exponential exponents.

a = initial value

r = rate of increase/ decrese per period

x = number of periods

y = final value

$\log_{(x)}(y)$

$y = P_f/P_i$

$x = r$

Ex 4: $P_f = P_i\, r^{t}$ (2.77:1.)

plus 25%. $\frac{125}{100} = \frac{100}{100}\cdot(1.0277)^t$ → $1.25 = 1.0277^t$ → $\log_{1.0277}(1.25) = 8.2 = t$

Ex 13: $\frac{85\,000}{50\,000} = \frac{50\,000 r^{24}}{50\,000}$ → $1.7 = r^{24}$ → $\sqrt[24]{1.7} = \sqrt[24]{r^{24}} = 1.02 = r$ 2% monthly interest

Ex 19: $m_f = m_i 0.5^{\frac{t}{\text{half-life}}}$

$\frac{580}{600} = \frac{600(0.5)^{\frac{15}{HL}}}{600}$

$0.96 = (0.5)^{\frac{15}{HL}}$ → $\log_{(0.5)}(0.96)^{\frac{15}{HL}} = {}^{1}\!/_{HL}$ $0.058 = {}^{15}\!/_{HL}\cdot HL$

$\frac{0.058\,HL}{0.058} = \frac{15}{0.058}$

half life = 258.62

- If log isn't given, use 10

Earth quakes

example 4: $M = \log \frac{A}{A_0}$ ← Amplitude / ← Corrected amplitude

$A/A_0 = 107.3$ → $M = \log_{10}(107.3) = 2.03$

b) $8.1 = \log_{(10)} \frac{A}{A_0}$ (to opposite log, make the 10 the base on both sides)

$10^{8.1} = 10^{\log_{(10)} \frac{A}{A_0}}$

$1.26 \cdot 10^{7} = \frac{A}{A_0}$

Comparison

c) $7.9 = \log_{(10)} \frac{A}{A_0}$ → $10^{7.9} = 10^{\log_{10} \frac{A}{A_0}}$ → $79\,432\,823 = \frac{A}{A_0}$

$3.2 = \log_{(10)} \frac{A}{A_0}$ → $10^{3.2} = 10^{\log_{10} \frac{A}{A_0}}$ → $1\,584 = \frac{A}{A_0}$

compare: $\frac{79\,432\,823}{1584} = 50\,146.98$ times bigger

$I = 10^{R_f - R_0}$

R_f = big earthquakes richter # (Hilroy)

R_0 = small earthquakes richter #