Exponential Story Problems

Half-life, doubling, tripling type.

$$y = a(b)^{t/c}$$

or

$$A(t) = A_0(b)^{\frac{t}{c}}$$

- $A(t)$: amount over time
- A_0: initial amount at $t=0$
- b: rate
- c: time increments in time (how often the rate is applied)
- t: time

ex.1) A bacteria culture has a half-life of 10 mins. If there were 18000 bact/km^2 initially, how much will remain after 40 mins?

$$A(t) = A_0(b)^{t/k}$$

$$= 18000\left(\frac{1}{2}\right)^{\frac{40}{10}}$$

$$= 18000\left(\frac{1}{2}\right)^4$$

$$= 1125 \text{ bact/km}^2$$

2. A GIC doubles in value every 6 years. If Sally invests $250, what will the account be worth in 28 years?

$A(t) = A_0(b)^{\frac{t}{c}}$ $\Rightarrow$ $6349.60 from function

$= 250(2)^{\frac{28}{6}}$

$= 250(2)^{4.7}$ ← rounded

$= \$6198.02$

Worksheet

1. $A(t) = A_0\left(\frac{1}{2}\right)^{\frac{t}{1200}}$ — half-life of 1200 yrs

$= 150\left(\frac{1}{2}\right)^{\frac{4800}{1200}}$

$= 150\left(\frac{1}{2}\right)^{4}$

$= 9.4$ grams

2. $A(t) = A_0(b)^{\frac{t}{6}}$

$\frac{8000}{1000} = \frac{1000(2)^{\frac{t}{6}}}{1000}$

$8 = 2^{t/6}$

$2^3 = 2^{t/6}$

$3 = \frac{t}{6}$

$t = 18$ yrs

3. $A(t) = A_0(b)^{\frac{t}{c}}$

$\frac{2916}{36} = \frac{36}{36}(3)^{\frac{t}{4}}$

$81 = 3^{t/4}$

$3^4 = 3^{t/4}$

$4 = \frac{t}{4}$

$t = 16$ yrs.