Name: ______________________ Date: ______________________

BLM 7–12

Section 7.6 Solve Problems Involving Exponential Growth and Decay

1. The population in a small fishing village on the east coast is decreasing by 9% per year. In 2006, there were 12 600 people in the village.
a) Write the exponential relation that models the population, P, with $t = 0$ representing the year 2006.
b) Use this relation to determine the population in 2008 and in 2010.
c) In what year will the population decrease to half of its 2006 number?

2. At the end of 22 min, one sixteenth of a sample of radioactive material remains. What is the half-life of the material?

3. The population, P, of penguins in one region can be modelled by the relation $P = P_0 2^{\left(\frac{t}{60}\right)}$, where t is time in months and P_0 is the initial population.
a) What does the value of 60 represent in this relation?
b) If there are 400 penguins in this region today, approximately how many penguins will there be in two years?
c) If there are 1000 penguins in this region today, approximately how many penguins will there be in $3\frac{1}{2}$ years?

4. The energy produced by wind turbines in a region increased exponentially from 1980 to 1995. The amount of energy, E in gigawatt-hours, can be modelled by the relation $E = 6.49(1.58)^t$, where t is the time in years since 1980.
a) How much energy was produced by wind turbines in 1980?
b) How much energy was produced by wind turbines in 1992?
c) In what year were 500 gigawatt-hours produced?

5. A radioactive material has a half-life of 18.4 days.
a) How much time is needed for a 50 mg sample to decay to 12.5 mg?
b) After 55.2 days, there were 177 mg of the material. What mass of the material was originally present?

6. Radon has a half-life of 25 days. The mass of material, M, in milligrams, can be modelled by the relation $M = M_0\left(\frac{1}{2}\right)^{\left(\frac{t}{25}\right)}$.
a) How much of a 4.000 mg sample is left after 63 days?
b) How long will it take a 400 mg sample to decay to 25 mg?
c) How many days are needed for a sample to decay to 0.5% of its original mass?

7. An investment is growing with interest compounding monthly. The amount, A, can be found using the relation $A = A_0(1.12)^{\frac{t}{12}}$, where t is the time in years. Find the amount of a $3000 investment after 3 years.

8. Eight days ago, the population of a cell culture was 4200. Today, the population is 77 500. Assume the growth is exponential.
a) Write an exponential relation for this situation.
b) Use the relation to find the population after 3 days (5 days ago).