Are there any Homework Questions you would like to see on the board?

"*The Ultimate* Exponent Law Worksheet"

Today's Learning Goal(s):

By the end of the class, I will be able to:

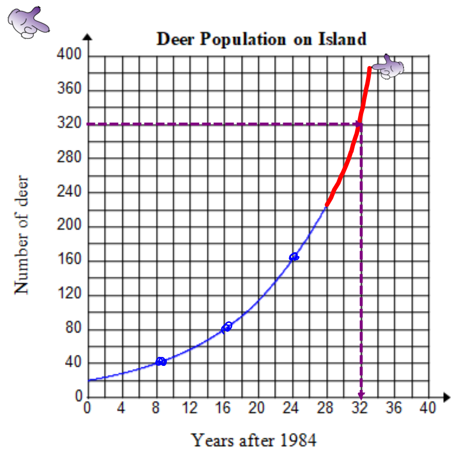
a) Use exponential functions to model and solve problems involving exponential growth.

MCF 3MI

7.6 Solving Problems Involving Exponential Growth, $P(n) = P_0(1+r)^n$

Date: M

Ex. 1: In 1984, researchers placed a group of 20 deer on a large island in the middle of a lake.
The researchers estimate that the island has enough resources to support a population of 320 deer.
The deer had no natural predators on the island.
Researchers collected population data and created a graphical model.



a) In what year will the deer population be too large for the island?

Method 1:
Extend the graph to predict when the deer population will be greater than 320.

32 + 1984
= 2016

Method 2:
Is there a pattern in the data that will allow you to predict future years?
Complete a table of values using the graph.

Year	Number of Deer
0	20
8	40
16	80
24	160
32	320

From the graph, using multiples of 8 appear to give accurate values.

From the pattern of doubling every 8 years, it again looks like the deer population will be greater than 320 in 32 years, or 2016.

b) What are some of the advantages and disadvantages of making predictions from a graph?

Advantages
- quick
- visual
- easy to see

Disadvantages
- may not be accurate

The exponential function $P(n) = P_0(1+r)^n$ can be used as a model to solve problems involving exponential growth, where:

- $P(n)$ is the final amount or number
- P_0 is the initial amount or number
- r is the rate of growth
- n is the number of growth periods

Notes: The rate of growth must be expressed as a fraction or decimal
The units for growth rate and growth periods must be compatible
(ex. If growth is "per hour", then the number of growth periods must be measured in hours)

Ex. 2: There are 1500 cells in a bacteria culture. The number of cells grows at a rate of 18% per day.
a) Write an equation that models the number of cells in the culture, given the number of days.
[*Create an algebraic model to predict the number of cells in the culture after a given number of days* .]

$P(n) =$ $r = 18\%$
$P_0 = 1500$ $= 0.18$
$n =$

$P(n) = 1500(1+0.18)^n$
$= 1500(1.18)^n$

b) Determine the number of cells present after 2 weeks.

2 weeks $= 14$

$P(14) = 1500(1.18)^{14}$
$\doteq 15\,220.8$
$\doteq 15\,220$ cells

Ex. 3: In 1995, Canada's population was 29.6 million, and was growing at about 1.24% per year.
a) Write an equation that models Canada's population growth.

$P_0 = 29.6$
$r = 1.24\%$
$= 0.0124$

$P(n) = 29.6(1+0.0124)^n$
$= 29.6(1.0124)^n$

b) According to that growth rate, what was the population in 2000? (Round to the nearest ½ Million)

$P(5) = 29.6(1.0124)^5$
$\doteq 31.48$
$\doteq 31.5$

c) If the trend continues, what will the population be in 2025? (Round to the nearest ½ Million)

$n = 2025 - 1995$
$= 30$

$P(30) = 29.6(1.0124)^{30}$
$\doteq 42.84$
$\doteq 42.8$

Ex. 4: Suppose you invest \$1500 at 8% per year, compounded <u>annually</u>.
a) Write an equation that models the growth of your investment.

$P_0 = 1500$
$r = 8\%$
$= 0.08$

$P(n) = 1500(1+.08)^n$
$= 1500(1.08)^n$

b) Determine the amount of money you will have at the end of 6 years.

$P(6) = 1500(1.08)^6$
$\doteq 2380.311$
$\doteq 2380.31$

Today's Homework: Complete pp. 429-431 # 1–10