6.1 Writing Exponential Equations

Exponential function $P(t) = ab^t$ where a is initial amount, b>0, b≠1 and t is time.

We have an established colony of 100 bacteria. The colony triples in population every day.

t	P(t) in terms of a and b	P (t) using a and exponents on b
0		
1		
2		
3		
4		

Do you see the connection between the values of t and the exponent?

Write an exponential equation for this problem.

We have a beehive of 20000 bees. The hive increase by a factor of 2.5 every 6 weeks.

t	P(t) in terms of a	P(t) in terms of a and exponents on b
0		
6		
12		
18		

What is the relationship between the values of t and the exponent this time?

Write an exponential equation for this problem.

Now a mosquito population is reduced to ¾ its previous size every two weeks. The original population was estimated at 250,000.

Write an exponential equation for this problem.

How many mosquitoes remain in three weeks?

The population of Summerville is currently 12 hundred people. If the population has a constant growth rate of 1.5 per year, write a function to describe the growth of the town.

The number of perch in Hidden Lake has declined to half its previous value every 5 years since 1970, when the population was estimated at 8000.

Write an exponential function for this problem.

What was the perch population in 1978?

In all these problems the growth/decay factor was given as a factor with different time rates. What happens if the growth/decay is given as a %.

Then for growth: $b = 1 + r$ r% in decimal form

And decay: $b = 1 - r$ r% in decimal form

When change is annually, the exponent is just t. (years)

When change is NOT annually the exponent will be t/k. (k "change factor")

If tuition at a certain college is currently $8000 and increases at 6% per year, what will the cost be in 8 years? You need to write exponential equation first.

In 2000 a house was worth $175,000 and the value decreases by 7.5% each two years thereafter.

Write an exponential function for the problem.

What was the house worth in 2006?

Practice Problems for exponential functions. Write the exponential function that models the given data. The idea is then you will use function to answer question when given a value for t and others when given P(t) and you find t.

1) A certain colony of bacteria doubles every three hours. The colony started with 700 bacteria.

2) A very lucky graduate finds a job starting at $40,000 that will increase by a factor of 1.2 every 6 years.

3) The world population is currently doubling every 69 years. The current population is approximately 4.7 billion.

4) A rabbit hutch has 12 rabbits in it. It will double in size every 7 weeks.

5) A colony of bacteria decreases in size every 4 hours by half of previous amount when an antibiotic is given. The original amount was estimated at 13000.

6) A certain pesticide decrease bugs previous population by a factor of 2/3 every 14 hours. The bug population was estimated at 75,000.

Sometimes the growth/decay factor is given by a %. Then we use:

For growth   b = 1 + r   for decay   b= 1 – r

Where r is the % in decimal form.

7) A new house purchased in 1995, for $76,000 increases by 4.5% each year.

8) In a certain state the amount of farm land is decreasing by 6.5% every 3 years. The state had 340,000 acres when the study started.

9) Lake Sam is populated by 245 perch. It is expected the perch will increase by 2.4 % every 6 months.(note every 6 months is ½ a year)

10) A house purchased in mid 2006 for $225,000. Current market has the value decreasing in value by 1.8% every year.