Exponential Decay (Day 6–4)

Recall: The cost of Bob's house in 2005 was $220,000. If his house appreciates in value at a rate of 3.5% every year, what will the price of his house be in 2015?

Example 1: A ball is dropped from a height of 100 centimeters. When it hits the ground and rebounds, the new height won't be as high as it was at first. The height after each bounce decreases by a rate of 20% from the previous height. What would the height of the ball be after the 4th bounce? Use the table below to help you find your answer.

Number of bounces, x	Height after x bounces	20% of height lost	New height after the bounce
0	100	20	80
1	80		
2			
3			
4			

1. What did you do to find the height of the ball after each bounce?

2. What is the ratio between the value after 1 bounce and the start height? What is the ratio between the height after 2 bounces and the height after 1 bounce? What about the height after 3 bounces and height 2 bounces? Etc…

3. What does the value 0.80 have to do with a 20% height loss?

Recall: In the last question, the equation $H(b) = 100(.80)^b$ that models the height after each bounce looks quite similar to the formula/equations we were using in the last two lessons for exponential growth. Is the height of the ball's bounce increasing?

What about the equation could tell you that it is not a growth model?

Practice: For each of the following:

   a) State whether it a growth or decay.
   b) State the initial value.
   c) State the percent rate of growth or decay.

1. $f(t) = 2(1.5)^t$

2. $b(t) = 5(.8)^t$

3. $g(t) = \frac{1}{2}(.45)^t$

4. $h(t) = 2000\left(\frac{2}{3}\right)^t$

5. Ryan bought a new computer for \$2,100. The value of the computer decreases by 50% each year. After what year will the value drop below \$300?

6. Kelli's mom takes a 400 mg dose of aspirin. Each hour, the amount of aspirin in a person's system decreases by about 29%. To the nearest tenth of a milligram, how much aspirin is left in her system after 6 hours?

For questions #1-4:

    a) State whether it a growth or decay.
    b) State the initial value.
    c) State the percent rate of growth or decay.

1. $c(t) = 100(.75)^t$ 2. $p(n) = 40(1.80)^n$

3. $t(x) = 10,000(1.02)^x$ 4. $f(n) = 50(.1)^n$

5. A huge ping-pong tournament is held in Beijing, with 65,536 participants at the start of the tournament. Each round of the tournament eliminates half the participants.

    a) If r represents the number of participants remaining after r rounds of play, write a formula to model the number of participants remaining.

    b) Use your model to determine how many participants remain after 10 rounds of play.

    c) How many rounds of play will it take to determine the champion ping-pong player?

6. Kathy plans to purchase a car that depreciates at a rate of 9.2% per year. The initial cost of the car is $21,000. Determine the value of the car after 3 years.

7. A construction company purchased some equipment costing $300,000. The value of the equipment depreciates at a rate of 14% per year.

a) Write a formula $C(t)$ that models the value of the equipment.

b) What is the value of the equipment (to the nearest dollar) after:

   i) 2 years?

   ii) 4 years?

   iii) 6 years?

   iv) 8 years?

   v) 10 years?

c) Graph the points from *part b* on the grid below.

t	C(t)
2	
4	
6	
8	
10	

Value of equipment

90,000
60,000
30,000

16   0   2   4   6   8   10   12

# of years