Doubling time Discussion: page 480. If we know the doubling time, what is an appropriate formula to find the amount at any given time?

Activity 1: After reviewing p. 481, Examples 1 and 2, do 8B 26, 27, 32, 34.

Discussion: page 482. What is the "Rule of 70"? What does it give you? Is it an equally good approximation for all possible growth rates?

Activity 2: Three parts:

a. Assume a population grows at a rate of 5% per year and starts at 10,000 people. Use a spreadsheet to make a table similar to Table 8.3 and estimate the doubling time from that table. Does the "Rule of 70" give a good estimate for this?

b. Assume a population of flies grows at a rate of 20% per day and starts with 50 flies. Use a spreadsheet to make a table similar to Table 8.3 and estimate the doubling time from that table. Does the "Rule of 70" give a good estimate for this?

c. From the information you had been given, should you have expected the "Rule of 70" to work well for both of these? Discuss.

Activity 3:

a. Assume a population grows at a rate of 8% per month. What is its approximate doubling time?

b. Assume a population has a doubling time of 35 years. What is its approximate growth rate?

Discussion: page 483. Suppose our population is not growing exponentially, but is "shrinking" exponentially. How do we handle that? Answer: Instead of talking about a "doubling time" we talk about a "half-life." So instead of a "growth factor of 2" now we have a "decay factor of $\frac{1}{2}$." And our "Rule of 70" works in just the same way for "halving time" as it did for "doubling time."

Activity 4: (Groups) Work through Examples 5, 6, and 7 on pages 484-485.

Logarithms.

Last time in class we briefly discussed logarithms. What do you need to know about them?

a. Find the logarithm of a number using a calculator and / or spreadsheet. (Spreadsheet: =log10(1000) find the log of 1000. We already learned that is 3, so you can check your formula.)

b. The logarithm of a number is an exponent. It is the exponent we have to put on 10 to get that number.

c. Be able to write the table of powers of 10 and then the corresponding log statement about each.

d. For a given number, tell which two integers the logarithm is between. (Example. $\log_{10} 3465$ is between 3 and 4 because 3465 is between $1000 = 10^3$ and $10,000 = 10^4$.)

Activity 5: Exact formulas for doubling time and half-life on page 485. Read Example 8 on page 486. Then do the following.

a. Assume a population grows at 8% per year.

- What does the "Rule of 70" give for the approximate doubling time?
- What does the exact formula give for the doubling time?

b. Assume a population is declining at 2% per month.

- What does the "Rule of 70" give for the approximate half-life?
- What does the exact formula give for the half-life?

Activity 6: Do Exercises 13 – 22 to solidify your understanding of the meaning of logarithms.