Day 22 MATD 0385 Mon. April 12 Review and Systems, Lesson 8 Activity 1 (We skipped Lesson 7)

Go over the quiz problems.

Plan

- Test 2 Retest: In Testing Center now. Extensions will be granted to as late as April 22 if needed.
- Test 3: Covers Systems, Lessons 1-6 (about 75%-85%) and Exponential Growth, Lessons 8, 10, and 11 (about 15%-25%.) In the Testing Center Thur. Apr. 22 – Thur. Apr. 29.
- Earn 10 points on Test 3 (replacing 10 missed points) for turning in well-organized and labeled and correct solutions to all quizzes assigned from March 3 (on Mar 3, only the log questions) through April 7. Turn this in no later than Wed. April 21.

For this week:

- Day 22. Mon Apr. 12. Some review of Exponential Growth and Systems, Lesson 8, part 1(growth per year)
- Day 23. Wed. Apr. 14. More review of Exponential Growth and Systems, Lesson 8, part 2 (carrying capacity)

Expected schedule for next week:

- Day 24. Mon. Apr. 19. Some review of Systems and wrap-up of Systems in Lesson 10.
- Day 25. Wed. Apr. 21. More review of Systems and more on Systems, Lesson 10

Tentative schedule:

- Day 26. Mon. Apr. 26. Data and Graphs
- Day 27. Wed. Apr. 27. Data and Graphs
- Day 28. Mon. May 3. Data and Graphs
- Day 29. Wed. May 5. Data and Graphs
- Day 30. Mon. May 10. Review
- Day 31. Wed. May 12. Test 4 in class. Can include material from any of the course.

Review of Exponential Growth:

(Inspired by what students have asked questions about from the test reviews.)

1. Consider the following four formulas.
   $A = 29 + (1.8)^n$
   $B = 29 + (1.8)n$
   $C = 29 \cdot (1.8)^n$
   $D = 29 \cdot (1.8)n$
   a. Evaluate each of these formulas for $n = 2$. Discuss whether any of these formulas are the same as each other.
   b. Which of these formulas represent linear growth or exponential growth?

   Why am I giving you this problem? Answer: Several students wrote one of these when the correct answer was a different one of these. I think that some of you are not paying careful attention to all the parts of the formula.

2. For each of these formulas, interpret it in words.
   a. $y = 10 \cdot (1.75)^{x/8.3}$, where x is in years and y represents the population in thousands of people.
   b. $y = 53.4 + (0.8)x$, where x is in years and y represents the population in thousands of people.
   c. $y = 800 \cdot (3)^{0.04x}$, where x is in months and y represents the amount.
   d. $y = 23 \cdot (1.8)^{0.1x}$, where x is in years and y represents the amount.
   e. $y = 73(0.5)^{x/400}$, where x is in years and y represents the amount.
   f. $y = 3200 \cdot (0.5)^{0.5x}$ where x is in years and y represents the amount.
3. For $y = 23 \cdot (1.8)^{0.1x}$, where x is in years and y represents the amount, find the annual growth factor and the annual percentage increase.
4. For $y = 73(2)^{x/8}$, where x is in years and y represents the amount, find the annual growth factor and the annual percentage increase.
5. If the amount triples every 12.3 years, find the annual growth factor and the annual percentage increase.
6. If the amount doubles every 80 years, find the annual growth factor and the annual percentage increase.
7. If the interest rate is 3%, how long does it take to double? Make an estimate, test it, and make a better estimate.
8. If the interest rate is 4%, how long does it take to double? Make an estimate, test it, and make a better estimate.
9. Frost Bank account starts with $500, increased by $30 each year. Texas Bank account starts with $500, increases by 5% of the amount in the account each year. Compare the amount of money in the two accounts with a short table, two formulas, and then say how much is in each account at the end of 12 years.
10. The population of Glen Rose started with 1200 people and increased by 40 people per year for at least 15 years. The population of Meridian started with 1000 people and increased by 5% each year

for at least 15 years. Compare the population of the two towns with a very short table, two formulas, and then say what the population of each is after 15 years.

11. For each of Populations A, B, and C in the tables below, determine whether it has linear or exponential growth, or neither.
12. If you want to find a good approximation of the population sizes for the mid-decade years of 1955, 1965, etc for which of Tables A, B, and C is it appropriate to use the geometric mean? Find it for each for which it is appropriate.
13. If you want to find a good approximation of the population sizes for the mid-decade years of 1955, 1965, etc, for which of Tables A, B, C is it appropriate to use the geometric mean? Find it for each for which it is appropriate.

Year	Pop'n A		Year	Pop'n B		Year	Pop'n C	
1950	203		1950	1080		1950	400	
1960	247		1960	1500		1960	752	
1970	302		1970	1920		1970	1108	
1980	368		1980	2340		1980	1469	
1990	448		1990	2760		1990	1836	
2000	546		2000	3180		2000	2208	

Year	Pop'n A		Year	Pop'n B		Year	Pop'n C
1950	203		1950	1080		1950	400
1955			1955			1955	
1960	247		1960	1500		1960	752
1965			1965			1965	
1970	302		1970	1920		1970	1108
1975			1975			1975	
1980	368		1980	2340		1980	1469
1985			1985			1985	
1990	448		1990	2760		1990	1836
1995			1995			1995	
2000	546		2000	3180		2000	2208

Systems, Lesson 8. Suppose you were an economic planner for the area of Africa around Lake Victoria. You are interested in making the lives of the people better now and also better in the future. What do you want to know? Read the first paragraph on page 69. Notice that we are going to investigate the effects of fish harvesting on the number of fish in the lake.

Now read the bottom of page 69 about the different ways to calculate growth. You're in charge – which of these will you plan to measure?

Keep reading. Do you agree with what they chose to measure?

Find the growth per year in Table 4.14 on p. 70. Fill it in here

Year	Fish Population Size (1000's of fish)	Growth per Year (1000's of fish)	
1981	0.40	1.15 – 0.40 = 0.75	
1982	1.15		
1983	3.28		
1984	8.46		
1985	16.20		
1986	14.95		

Now, consider, what if we take into account how many fish all the fishermen took out of the lake each year. So the growth of the fish population per year will be ?? higher?? ??lower?? than our previous table indicated? Discuss this and circle one of those words.

Activity 1.

Look at the table in problem 1 of this activity. In this table, we are going to compute the growth per year. Here are some questions to discuss with each other in class.

1. In 1981-1985, how do you compute the growth each year? Have you done that?
2. What changes in 1986?
3. Why do you think the fish population got so low in 1988? Look at all the information in the table. What does the 11.51 tell you that is relevant?
4. In 1986, the fish population decreased from the previous year. Do you see that?
5. If there were no new fish born and no old fish died in 1986, and no fish were caught in the lake, then the fish population in 1987 would be exactly the same as in 1988. But they did catch a substantial number of fish in the lake that year. How many?
6. So, since they caught 4.02 thousand fish in 1986, if no new fish were born and no fish died that year, then the population in the following year should be 14.95 – 4.02 thousand fish. But it's actually higher than that. So what does that mean?
7. Do you see that the amount that it is higher is the growth of the population in that year? How much is that for 1986?
8. Can you write an equation for what you just did? Use these letters.
   g = growth rate for the year
   p = population size for this year

c = total catch size for this year
n = population size for **next** year

9. After you have tried it for yourself, then look at the beginning of Activity 1, on page 70, and look at Equation (3). Write that equation using the letters in the previous problem.
10. Solve that equation for g. Did you get the same thing as you wrote in question 8 just above here?
11. Use your current understanding of this process to fill in the fill table in Activity 1, number 1 (use the copy on this page.)
12. After you have done that, make a graph for Activity 1, number 2. You should get a curve.
13. Answer all the rest of the questions in Activity 1.

Year	Fish Population Size (1000's of fish)	Growth per Year (1000's of fish)	Total Catch Size (1000's of fish)
1981	0.40		0
1982	1.15		0
1983	3.28		0
1984	8.46		0
1985	16.20		0
1986	14.95		4.02
1987	12.21		11.51
1988	6.01		3.16
1989	10.24		6.84
1990	10.25		---

Homework: No additional Homework.
Quiz: Lesson 8, Activity 1, problems 1-8.