

Math 321 Differential Equations

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Overview

- 1 Collaborate
- 2 Conjecture
- 3 Simulate
- 4 Model
- 5 Solve
- 6 Study

- 1 Think
- 2 Share
- 3 Discuss
- 4 Report

Conjecture

A lake in northern Montana is dominated by Arctic Grayling but the Department of Fish, Wildlife, and Parks is planning to slowly introduce Bull Trout. The lake is popular with sport fishermen who remove both species of fish from the lake regularly.

The Department of Fish, Wildlife, and Parks has carefully estimated the number of fish taken by sport fishing each week, and they have decided to keep the fish population as constant as possible, by replacing the fish lost by an equal number of Arctic Grayling and Bull Trout. Both fish species swim freely throughout the lake and both are targeted by similar bait used by sport fisherman.

Think-Share-Discuss-Report: What do you think will happen to the populations of the two species of fish over a long period of time?

Simulate

Use $N = 40$ pennies to represent the fish in the lake and decide with your partners which coin face represents which species. Start your lake with 100% species A. Assume that $M = 8$ fish are caught each week. Decide with your partner(s) how to simulate the swimming of fish, how fish are caught, and the Department of Fish, Wildlife, and Parks' restocking plan. Simulate 10-15 weeks of the fish population. Keep track of what happens in a table like the following.

Week #	Number in population		Proportion of population	
	species A	species B	species A	species B
0	40	0	1	0
1				
2				
3				
4				
⋮	⋮	⋮	⋮	⋮

Model

- 1 Propose a verbal model for the rate of change of species B in the lake.
- 2 Explicitly state any assumptions that you are using in your verbal model.
- 3 Introduce mathematical notation for your proposed model and write your verbal model mathematically. Be sure to include any necessary condition(s).

- 1 According to your model, what is the long term effect on the fish population in the lake? Use your model to justify your answer algebraically and graphically.
- 2 Solve your mathematical model (either numerically or analytically) and compare with your data.

Study

Go to Moodle to see the weekly process of reading the textbook, engaging in class activities, and completing assignments and projects. Read sections 1.1-3 before next class.