Population Change

5602

Introduction

In this activity, students use population information to compute changes and to develop population models to make predictions.

Grades 9-12

NCTM Algebra Standards

- Understand patterns, relations, and functions
- Generalize patterns using explicitly defined and recursively defined functions

Files/Materials Needed

Population1.act

1

Provide students the following information.

The number of fish farms has dramatically increased in the past few decades. Managing fish populations has become big business. Could you manage a fish farm?

A large part of managing a fish farm is controlling the population through restocking and harvesting. Which of the four scenarios below has the most stable harvest or population?

- Assume that the first harvest takes place after one year.
- Assume about 10% of the fish from the previous year die and cannot be sold.
- Additional fish are added to the pond in the fall only.

Scenario A: Stock the pond with 5000 fish. Harvest 10% each year and then stock another 1000 fish in the fall.

Scenario B: Stock the pond with 5000 fish. Harvest 20% each year and then stock another 1000 fish in the fall.

Scenario C: Stock the pond with 3000 fish. Harvest 30% each year and then stock another 3000 fish in the fall.

Scenario D: Stock the pond with 3000 fish. Harvest 40% each year and then stock another 4000 fish in the fall.

2

a. Divide students into groups. This activity works best with groups of four.
b. Have each group member select a different scenario and complete the *first four rows* of the table for their selected scenario.
c. Show how the number harvested and the number of harvest survivors equals the number of spring survivors. Also, the percent harvested and the percent of harvest survivors equals 100%. Ask students if the number of harvest survivors can be found another way from what is shown. (Subtract the number harvested from the number of spring survivors.)

3

a. Launch TI-Navigator™ on the computer and start the session.
b. Have each student log into NavNet on their calculator.

4

a. Load the activity settings file ***Population1.act***.
b. Start the activity. Instruct students to enter their values into the lists on their calculator—Year in L1 and Spring Survivors in L2.
c. Have students send their lists to Activity Center. Discuss any points that seem to be incorrect for each scenario.
d. Stop the activity when the scatterplot is complete.

Population Change

5

a. Clear the activity data and start the activity again.
b. Instruct students to enter their values into the lists on their calculator—Year in L1 and Mid Summer Harvest in L2.
c. Have students send their lists to Activity Center. Discuss any points that seem to be incorrect for each scenario.
d. Stop the activity when the scatterplot is complete.

6

a. Instruct students to exit NavNet, and complete the remaining years in the table.
b. When they are finished, have them log back into NavNet.

7

a. Begin Activity Center, press **Edit** and **Clear Activity Data**.
b. Start the activity and select the **Graph** tab.
c. Have students submit one point to represent the number of spring survivors in year 10: the *x*-value will be 10; the *y*-value will be the number of spring survivors in year 10.
d. Tell students to send their data to Activity Center. Stop the activity when all students have finished.
e. Display these points and discuss any points that seem to be off for each scenario.
f. Repeat for the Mid Summer Harvest for year 10.

8

Discuss the results and ask:

- *Which scenario will lead to higher harvests?*
- *Which one leads to a stable harvest?*

Population Change

Student Activity Sheet — Page 1

Creating tables for the pond populations over time can help you study these four scenarios. Have your group members select and complete a different table for each scenario then share your results. Use the integer part of each value so don't round after each computation.

Scenario A

Stock the pond with 5000 fish. Harvest 10% each year and then order 1000 fish.

Year	Spring Survivors	Mid Summer Harvest	Summer Harvest Survivors	Fall Additions
0	0	0	0	5000
1	0.90(0 + 5000) = 4500	0.10 × 4500 = 450	0.90 × 4500 = 4050	1000
2	0.90(4050 + 1000) =			
3				
4				
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6				
7				
8				
9				
10				

Scenario B

Stock a pond with 5000 fish. Harvest 20% each year and then order 1000 fish.

Year	Spring Survivors	Mid Summer Harvest	Summer Harvest Survivors	Fall Additions
0	0	0	0	5000
1	0.90(0 + 5000) = 4500	0.20 × 4500 = 900	0.80 × 4500 = 3600	1000
2	0.90(3600 + 1000) =			
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Population Change

Student Activity Sheet — Page 2

Scenario C

Stock the pond with 3000 fish. Harvest 30% each year and then order 3000 fish.

Year	Spring Survivors	Mid Summer Harvest	Summer Harvest Survivors	Fall Additions
0	0	0	0	3000
1	0.90(0 + 3000) = 2700	0.30 × 2700 = 810	0.70 × 2700 = 1890	3000
2	0.90(1890 + 3000) =			
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Scenario D

Stock the pond with 3000 fish. Harvest 40% each year and then order 4000 fish.

Year	Spring Survivors	Mid Summer Harvest	Summer Harvest Survivors	Fall Additions
0	0	0	0	3000
1	0.90(0 + 3000) = 2700	0.40 × 2700 = 1080	0.60 × 2700 = 1620	4000
2	0.90(1620 + 4000) =			
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9				
10				

Which scenario will lead to higher harvests?
Which one leads to a stable harvest?