

Lab Framework

Text: CORD

Unit number and title: Unit 9 Ratios and Proportions

Short Description: Imagine that you are asked to determine the number of fish in a nearby pond. To count the fish one by one, you could remove the fish from the pond and stack them to one side, or mark each fish so you would not count them over and over again. Counting like this could be hazardous to a fish's health! To determine the number of animals in a population, scientists often use the *capture-recapture* method. A number of animals are captured, carefully tagged, and returned to their native habitat. Then a second group of animals is captured and counted, and the number of tagged animals is noted. Scientists then use proportions to estimate the number in the entire population. Students work in groups of three to four.

Developed by: Lisa Williksen

Contact Information: East Valley High School
williksenl@evsd.org

Date: June 24, 2010

Go Fish!

LAB PLAN

TEACHER: Plan

- **Lab Objective**
For students to recognize how to use proportions to solve real life problems.
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)
Ratio, Proportion, Averages
- **Vocabulary**
Ratio, Proportion Averages
- **Materials List**
Each group needs:
 1. 1 paper lunch sack - represents the “lake”
 2. A supply of goldfish crackers - represent the “fish” in the lake
 3. A supply of pretzel fish crackers - represent the “tagged fish”
 4. 1 styrofoam cup - represents the “net”
 5. 1 paper plate
- **State Standards addressed**
Math:
<https://www.appliedmath.org/>
7.2.B Solve single- and multi-step problems involving proportional relationships and verify the solutions.

7.2.C Describe proportional relationships in similar figures and solve problems involving similar figures.

7.2.E Represent proportional relationships using graphs, tables, and equations, and make connections among the representations.

7.2.H Determine whether or not a relationship is proportional and explain your reasoning.

A1.6.B Make valid inferences and draw conclusions based on data.

- **Leadership Skills**

2.1 The student will communicate, participate, and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals.

2.2 The student will demonstrate knowledge of conflict resolution and challenge management.

2.3 The student will analyze the complex responsibilities of the leader and follower and demonstrate the ability to both lead and follow.

- **SCAN Skills/Workplace Skills**

Writing

B. Records information completely and accurately.

Arithmetic

A. Performs basic computations

D. And uses tables, graphs, diagrams, and charts to obtain or convey quantities

- **Set-up information**

Need to prepare all of the supplies listed above for the total number of groups you will be instructing.

One copy of the Go Fish Worksheet for each group.

Pre-assigned groups

Demonstrate the process of tagging and capturing fish one time to the students.

A. Collect the Data

Capture:

1. Each team receives a paper lunch bag with goldfish crackers inside.

2. With the “net,” scoop a sample of goldfish out of your “lake” onto the paper plate.

3. Replace your sample of goldfish with pretzel fish. These are your “tagged” fish.

4. Count the number of "tagged" (pretzel) fish and then return them to the bag.

5. There are tagged fish in the entire lake.

Recapture:

6. Shake the bag gently.

7. For the first casting, use your net (cup) to remove a sample of fish.

Count the number of “tagged” (pretzel) fish in your sample and record the total in the first column below.

8. Return all of these fish to the lake (bag) and shake gently to mix them up.
9. Repeat this process until you have gathered information on 10 samples and filled in the table below.

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)

- Students are to work in groups, of 3 individuals.
- Data collection is collaborative.
- One student is the team lead and counts the fish.
- One student is the recorder.
- One student is handles the capture and release of fish.
- Students are expected to work together collaboratively.

- **Teacher Assessment of student learning** (scoring guide, rubric)

Correct calculation of the estimated population of fish in the pond in comparison to the actual population.

- **Summary of learning** (to be finished after student completes lab)

Classroom discussion on other real world applications there are for this sampling technique combined with the use of proportions

- **Optional activities**

None

- **Career Applications**

Construction
Foresters
Health Services
Auto Industry
Animal Husbandry

<https://wa-appliedmath.org/>

Go Fish!

Using Proportions to Count Fish

Group Names:

Bag #

Imagine that you are asked to determine the number of fish in a nearby pond. To count the fish one by one, you could remove the fish from the pond and stack them to one side, or mark each fish so you would not count them over and over again. Counting like this could be hazardous to a fish's health! To determine the number of animals in a population, scientists often use the *capture-recapture* method. A number of animals are captured, carefully tagged, and returned to their native habitat. Then a second group of animals is captured and counted, and the number of tagged animals is noted. Scientists then use proportions to estimate the number in the entire population. Students work in groups of three to four.

Lab Procedures:

A. Collect the Data

Capture:

1. Each team receives a paper lunch bag with goldfish crackers inside.
2. With the "net," scoop a sample of goldfish out of your "lake" onto the paper plate.
3. Replace your sample of goldfish with pretzel fish. These are your "tagged" fish.
4. Count the number of "tagged" (pretzel) fish and then return them to the bag.
5. There are tagged fish in the entire lake.

Recapture:

6. Shake the bag gently.
7. For the first casting, use your net (cup) to remove a sample of fish. Count the number of "tagged" (pretzel) fish in your sample and record the total in the first column below.
8. Return all of these fish to the lake (bag) and shake gently to mix them up.
9. Repeat this process until you have gathered information on 10 samples and filled in the table below.

<https://wa-appliedmath.org/>

Sample Number	Number of Tagged Fish in Sample	Total Number of Fish from Sample
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Average		

B. Analyze the Data

- To find the AVERAGE number of tagged fish, add up all 10 samples of the tagged fish and divide by 10. Do the same thing to find the AVERAGE number of total fish in your samples. (Using the AVERAGE number with 10 samples is more reliable than using any one sample's data.)
- Use the proportion below to estimate the total number of fish in your lake:

$$\frac{\text{Average \# tagged in samples}}{\text{Average total \# in samples}} = \frac{\text{\# tagged in lake (A5)}}{\text{Total \# fish in lake}}$$

Estimated population is _____.

- Now count the total number of fish in your lake to determine how close your estimate from the "sampling" is to the actual number of fish in the lake.

Actual population is _____.

- How close were you to the actual number of fish? As a result of this activity, students learn how to gather information about a large population based on a representative sample whose makeup is similar.

<https://wa-appliedmath.org/>

1. Where else would scientists use this capture/recapture method? Answer in complete sentences.

2. What are some of the factors that could have caused an estimate to be close or not so close to the actual number of fish? Answer in complete sentences.

Washington Applied Math Council

<https://wa-appliedmath.org/>