

CAPTURE-RECAPTURE

Sampling, Predicting, Ratio, Proportion

TOPIC: Sampling, Predicting, Ratio, Proportion

OBJECTIVE: Students will:

- Thoughtfully consider how many samples should be taken to accurately solve the problem.
- Thoughtfully consider the size of each sample in order to accurately solve the problem.
- Set-up and solve proportions.
- Make predictions.
- Find the average of a list of numbers in order to solve a problem.

MATERIALS: The following materials will be needed for this lesson:

- Cheddar cheese goldfish – enough so that each group has a baggie full of about 200 fish (or more).
- Pretzel goldfish for “tagging”.
- Baggies to serve as the “pond” that holds the goldfish.
- Activity sheet
- Data recording sheet

TIME: This lesson can be completed in approximately 1-hour.

SET-UP: Students will be in groups of 3 (preferred) or 4.

DISCUSS: Describe some problems you might face if you tried to count some population from the animal kingdom (wolves, elk, whales, fish, squirrels, etc.).

EXAMPLE: Imagine that a city employee is given the task of counting the number of fish in a city pond in a park. The “capture-recapture” method may be used to approximate the number of fish in the pond. The employee could capture a number of fish, say 20, and tag them and release them back into the pond. Waiting until the fish have a chance to become mixed with the other fish in the pond, the employee can capture more fish. If the number of fish captured is 25 and 4 of them are tagged, we can use proportional reasoning to estimate the number of fish in the pond.

SIMULATION: Use the bag of cheese fish crackers to represent the total number of fish in the pond. How many fish are in the bag?

Capture a scoop of cheese fish from the bag. Replace them with “tagged” fish (pretzel fish).

Before continuing, consider how many tagged fish should be used.

Mix up the crackers in the bag, simulating the tagged fish swimming in the pond and mixing with the rest of the fish. “Capture” another scoop of fish from the bag and solve the proportion given above using the

numbers from your simulation. Repeat 10 times and average the results of each of the 10 simulations. This result should be a good approximation of the number of fish in the pond! Compare results with the other groups.

INTERPRETATION OF RESULTS: This procedure is fundamental to the science of making statistical predictions. In most real-world situations, populations can only be studied by using samples because the populations themselves are too large. Predictions based upon samples are always estimates and therefore contain some degree of error. The error can be quantified, however, by stating the margin of error along with the error.

Returning to your fish population, suppose the margin of error is $\pm 3\%$. What is the interval that contains the number fish in the pond?

FISH POPULATION

Number of fish “captured” and “tagged” and released into the pond: _____

tagged fish in second group	total fish in second group	tagged fish in entire bag	approximate number of fish

Average the estimates from column four to approximate the number of fish in the pond: _____.