

GONE
FISHIN'

Proportions and Probability in a Real Scientific Context



Two schools of thought

Checklist



**Mathematical
Reasoning
and
Connections**



Connections

- Instructional programs from prekindergarten through grade 12 should enable all students to—
- recognize and use connections among mathematical ideas;
 - understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
 - recognize and apply mathematics in contexts outside of mathematics.

NCTM Principles and Standards (2000)



High Impact Mathematical Task

- Engaging
- Depth of knowledge
- Accessible for all students
- Rich connections
- Important and relevant mathematics



What's in the Pond?

Connections:

- To a real context:
scientific estimation of
populations
 - Within mathematical
content areas:
 - Proportional reasoning
 - Statistical variability
- 7th graders
 - Pre-service teachers
 - Elementary
 - Middle
 - High
 - Middle and high school
teachers



Match Pond Numbers and Names

A biological research company, Fish Inc., stocked five ponds with 20 fish each. The following amounts were used for stocking the different ponds with three different kinds of fish.

	Trout	Catfish	Bass
Pond 1	6	14	0
Pond 2	4	4	12
Pond 3	6	8	6
Pond 4	2	4	14
Pond 5	16	0	4

Now, several months later, Fish Inc. would like to determine which pond has the best conditions for increasing the number of fish. Unfortunately, no one wrote down which pond number above corresponded to the actual ponds: ***The Spot, Fishing Hole, Retreat, Lonely, and What-a-catch.*** The current fish populations are represented in the provided bags with each tile representing one fish.



Match Pond Numbers and Names

Objective 1: Determine which pond number corresponds to each pond name.

- Sample only 10 fish from each bag.
- Record results in the table.
- Tag your fish before returning them to the bag for the next step.
- Record your reasoning



Match Pond Numbers and Names

The Spot	Fisherman's Friend	Retreat	Lonely	What-a-catch
4	5	3	2	1
2	5	3	4	1
2	5	3	4	1
2	5	3	4	1

Why can we use a sample to find out the pond population?

Do you think that we have the same fish in each bag?

What were the easiest ones to match?

What reasoning did you use?

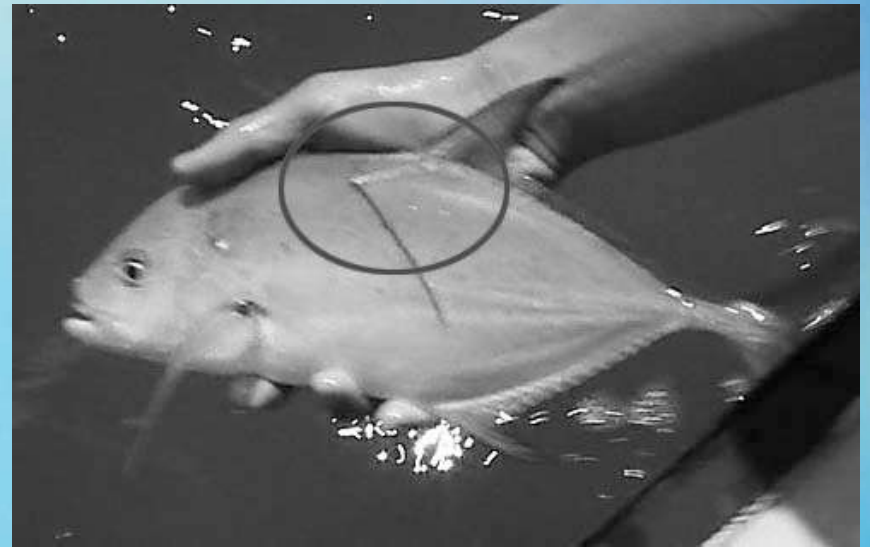
Did you calculate anything?

Why did we not all get the same matches?



Estimate Fish Populations

One technique used to estimate fish populations is capture-recapture where some fish are tagged and released back into the population to be possibly sampled again.



Estimate Fish Populations

Objective 2: Estimate the fish population in each pond.

- Sample only 10 fish from each bag.
- Record results in the table.
- Record your reasoning



Estimate Fish Populations

The Spot	Fisherman's Friend	Retreat	Lonely	What-a-catch
14	33	100	14	20
13	20	25	20	25
14	25	lots	20	25
13	17	25	25	33

Can we definitely determine which pond has the best conditions?

What reasoning led to your estimates?

There are 10 tagged fish in a bag of 20 fish.

How many tagged fish would you expect in your sample?

How many tagged fish are possible in your sample?

Which values of tagged fish are likely?

If there are 40 fish in the bag instead, how do your previous answers change?



Mathematical Ideas

Connections

- Connections between scientific procedures for counting populations and sampling populations
- Connections between mathematical ideas of proportions and ratios, statistical variability, probability and fractions

Proportions

- Comparing proportions occurs in the first part of the activity, match equivalent or close ratios
- The second activity through algorithms or nonstandard procedures uses known ratios to solve for a related value
- Percentages and flexibility with other forms of rational numbers becomes important in both activities

Statistical Variability and Probability

- Ideas about sampling, likelihood and possible results occur in both activities
- Variation from true proportions addresses theoretical and experimental probabilities



Alternatives

- Instead of having students mark the tiles, have them put a different color tile in for the tagged fish.
- Use paper instead of tiles although it works best if crumpled.
- Each group could be in charge of one pond instead of all of them.
- Each objective can be a stand-alone activity.
- An online version can be found at www.jillcochran.com/fishing





Activity Setup

- As you set up the bags it helps to have about the same number of each color of fish in a set.
- When considering pond proportions and population sizes some distinctive pond and some very similar ponds make for good discussion.
- I generally do not give my students the “right” answer at the end because I want them to understand this situation in a real context.



How would you use this activity?



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