

How Many Fish

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Teacher: Mrs. Hooker	School: Wicomico High	E-mail chooker@wcboc.org	Subject: Basic Algebra	Grades 9 th – 12 th	Time Required: 50 minutes
Objectives:					
To model ratios and proportion using the capture/recapture method. Review for functional math.					
Core Learning Goals Addressed					
3.1.1 The student will design and/or conduct an investigation that uses statistical methods to analyze data and communicate results.					
3.2.1 The student will make informed decisions and predictions based upon the results of simulations and data from research.					
1.1.3 The student will apply addition, subtraction, multiplication, and/or division of algebraic expressions to mathematical and real-world problems.					
Materials needed for lesson					
5 Shoe boxes (ponds) Paper fish of different colors 55 red, 50 blue, 60 yellow, and 55 green Record keeping sheets			Set up the shoe boxes as follows: Box 1 - 10 red 10 blue 10 yellow 10 green Box 2 - 10 red 15 blue 5 yellow 5 green Box 3 - 5 red 10 blue 10 yellow 15 green Box 4 - 15 red 10 blue 15 yellow 20 green Box 5 - 15 red 5 blue 20 yellow 5 green		
Lesson Outline					
<i>Warm up</i>	Solve the following proportions $\frac{n}{12} \bullet \frac{3}{4}$ $\frac{5}{8} \bullet \frac{15}{n}$ $\frac{9}{n} \bullet \frac{3}{10}$ $\frac{1}{4} \bullet \frac{n}{20}$				
<i>Engagement</i>	Ask students 1. How do they could count the number of fish in a pond? 2. What are some of the factors that may affect the number of fish in a pond? 3. Who might be interested in knowing the number of fish in a pond? Why?				
<i>Exploration</i>	Have students complete worksheet				
<i>Explanation</i>	Go over the capture/recapture method used by game commission.				
<i>Extension</i>	Homework problem				
<i>Evaluation</i>	Have students answer the following question: Why is the use of proportions a good way to find the total number of fish? Additional proportion problems if needed.				



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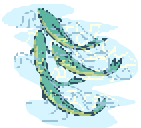
The game commission would like to know how many fish are in Schuemaker Pond. The information would be valuable for stocking the pond and for studying the availability of fish in the pond. How would you approximate the size and makeup of the pond's fish population?

Build a model

You will be given a shoebox that will represent the pond. In the box will be four different colors of fish.

1. Draw a sample of 10 fish. Mark the 10 fish and return them to the pond. Shake the pond. Record the results.
2. Draw a sample of 15 fish and record the number of marked fish.
3. Return the fish to the pond. Shake the pond.
4. Record your data in the table provided.
5. Repeat steps 2 through 4 until you have 12 samples.

Use the following proportion to estimate the number of fish in the pond.



Let n = the total number of fish in the pond
 p = the number of tagged fish
 q = sample size
 m = the number of tagged fish caught in the sample

$$\frac{p}{n} = \frac{m}{q}$$

Number of fish in initial sample(marked)

Red _____ Blue _____ Yellow _____ Green _____

Sample Catch	Size of Sample	Number of marked fish				Estimated number of fish in pond
		Red	Blue	Yellow	Green	
1	15					
2	15					
3	15					
4	15					
5	15					
6	15					
7	15					
8	15					
9	15					
10	15					
Totals						

Find the average number of marked fish. $\bar{x} =$ _____

Replace m with \bar{x} to find a more accurate estimate of the total number of fish in the pond.

Estimated number of fish using \bar{x} _____.

Actual number of fish in your pond _____.

How close was your estimated?

Do you think this is a good method to estimate the number of fish in a pond? Why?

Homework

Suppose that the each color represent a different find of fish. Red (catfish) yellow (bass) green (trout) and blue (bluegills). Estimate the number of each type of fish in the pond? Adapt the capture/recapture procedure to accomplish this task.