

# Estimating Population Size

Objective: You will be expected to estimate the size of a sample population using the mark-recapture technique. Be able to apply the technique to new population problems and compare the mark and recapture technique to other methods of population estimating.



1. If you were in charge of a team given the responsibility to determine the number of sunfish in Horseshoe Lake, discuss with your partner how would you accomplish this task and describe in detail below.

## Technique 1: Sampling

A technique called sampling is sometimes used to estimate population size. In this procedure, the organisms in a few small areas are counted and projected to the entire area. For instance, if a biologist counts 10 squirrels living in a 200 square foot area, she could predict that there are 100 squirrels living in a 2000 square foot area.

2. A biologist collected 1 gallon of pond water and counted 50 paramecium. Based on the sampling technique, how many paramecium could be found in the pond if the pond were 1,000 gallons?
3. What are some problems with this technique? What could affect its accuracy?

## Technique 2 - Mark and Recapture

In this procedure, biologists use traps to capture the animals alive and mark them in some way. The animals are returned unharmed to their environment. Over a long time period, the animals from the population are continued to be trapped and data is taken on how many are captured with tags. A mathematical formula is then used to estimate population size.

### Procedure:

- You will receive a bag that represents your population (beans, pennies, chips, beads)
- Capture 10 "animals" by removing them randomly from the bag.
- Place a mark on them using tape or string
- Return the 10 marked "animals" to the container
- With your eyes closed, grab a handful of the population. This is the **recapture** step. Record the number of "animals" recaptured in total and the number that have a mark on them on the data table
- Return the "animals" to the bag and repeat. Do 10 recaptures.
- When the ten recaptures are completed, enter the totals on the data table

## DATA

Trial Number	Number Captured	Number Recaptured with mark
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Total:		

4. Calculations = Find your Population Estimate

$$\text{Population Estimate} = \frac{(\text{Total number captured}) \times (\text{Number marked})}{(\text{Total Number Captured with Mark})}$$

10

Estimated Size \_\_\_\_\_

5. Use the code-name on your bag to check with the teacher about how many “animals” are really in your population.

Name on Bag \_\_\_\_\_ Actual Size \_\_\_\_\_

**Analysis**

6. Compare the actual size to the estimated size. Did you overestimate or underestimate?

7. **Continue** the experiment by filling out the data table. Recalculate your estimate using the formula. (**Show below**)

- a. Is the second estimate closer than the first one? \_\_\_\_\_
- b. To get the most accurate results, you would generally do [ more / less ] trials . (circle)

8. Given the following data, what would be the estimated size of a butterfly population in Wilson Park.

A biologist originally marked 40 butterflies in Wilson Park. Over a month long period butterfly traps caught 200 butterflies. Of those 200, 80 were found to have tags. Based on this information, what is the estimated population size of the butterflies in Wilson Park?  
**SHOW WORK** to get credit.

Trial Number	Number Captured	Number Recaptured with mark
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Total:	(add original data + new data)	(add original data + new data)