Lab: Determining the Size of an   **Names:** _____
Animal Population   _____
                                                                           _____
                                                                           _____

Background: *Scientists can determine the number of animals in a large population by using a sampling technique. Her is how it works. They trap and mark a few animals in a specified area. The animals are released and the raps are reset. Among the animals caught this second time, some are marked and some are unmarked. Scientists then calculate the total population for their specified area based on the ratio of marked animals to unmarked animals.*
    In this activity, a bag represents the area of land where the population study is being conducted. Beans will represent animals. All the beans in the bag represent the total animal population being studied.

Problem: What do you estimate is the population represented by the beans in your bag?

Hypothesis:

_____
_____
_____

Experiment:
    Materials:
    plastic bag containing beans (including 20 marked beans)
    calculator

    Procedure:
1.   Shake your bag of beans. The marked beans represent caught and marked animals
2.   Without looking into the bag, reach in and remove 30 beans.
3.   Record the number of marked beans (recaught and marked) and the number of unmarked beans (caught and unmarked) in your data table as trial 1.
4.   Return all the beans to the bag.
5.   Repeat steps 1 to 4 four more times for trials 2 to 5.
6.   Calculate averages for each of the columns.
7.   Using the average values, calculate the original size of the bean population in the bag by using the following formula:
        M = number initially marked
        CwM = average number caught during the trials **with** marks
        Cw/oM = average number caught during the trials **without** marks

$$\textbf{Calculated Population Size} = \frac{M \times (CwM + Cw/oM)}{CwM}$$

8. Record the calculated population size in the data table.
9. Verify the actual population size, count the total number of beans in the bag and record this value in the data table.

Data:

Trial	Total caught	Number caught with marks	Number caught without marks
1			
2			
3			
4			
5			
Averages			

Calculated population size = _____

Actual population size = _____

Conclusions:

1. This experiment is a simulation. Explain why this type of activity is best done as a simulation.
_____
_____
_____

2. Give an example of how this technique could actually be used by a scientist. _____
_____
_____
_____

3. Compare the calculated to the actual population size. _____
Explain why they may not agree exactly. _____
_____ What
changes to the procedure would improve the accuracy of the activity? _____
_____
_____
_____

4. Explain why this technique is used more often with animals than with plants when calculating population size. _____
_____
_____

5. Assume you were doing this experiment with living animals. What would you be doing before the first step? _____
_____

   In the first step? _____
_____