Florida Oceanographic Coastal Center

Fish Count

Fish are important both environmentally and as a food source for humans. For some fish more fish are caught each year than are born. When this happens the fish's population goes down. This is called "overfishing." To help prevent overfishing, government has to set limits (called "quotas") on how many fish, fishermen can catch in a year. When the number of fish caught is less than the number of fish born the population will go up. In order to decide on quotas, the government needs to know the total number of fish in the population. They rely on scientists to find out.

But how can scientists tell? They couldn't possibly count every fish, especially when they can't see them all. The ocean is so big and fish spend all of their time underwater!

The truth is, scientists don't count every animal. Instead, they count some of the animals, then make an estimate of the total population using basic math.

One method researchers use is fairly simple. They go out in boats, catch the fish, place "tags" on a certain number of them, and release them back into the ocean. One week, for example, they will tag twenty fish. The next week, they will return to the same area of the ocean and count every fish they see. Maybe they will see and count two hundred. Out of that two hundred, they find that ten of those fish have tags on them. They can assume that if they saw another two hundred fish, they would find the other ten tags. They can then estimate that there are about four hundred fish living in that habitat.

Maybe this mathematics experiment will make it clearer. Guess the number of fish (marbles) without having to count every one.

Materials
Large Cloth Bag
@ 150 black marbles
@ 100 blue marbles
Worksheet

Place the black marbles in a bag. Remove a big handful of the marbles and replace them with a blue marble to "tag" them. Count how many you have "tagged" and write this number next to "A" in the space provided. Mix very well with the blue, "tagged", fish with the black, untagged fish.

With your eyes closed, again remove a big handful of the marbles. Count the number of items you have removed and write this number next to "B" in the space provided. If there are no marked objects in your sample, you need to collect more and add those to your total in B. Count the number of "tagged" marbles in your sample and write that number next to "C."

To estimate the total number of marbles in the bag, multiply "A" times "B," and divide the result by "C."
Thus, (A x B)/C = approximate number of marbles in bag.

Repeat this several times, trying different size samples (two handfuls, three handfuls) Make sure to mix them back into the total population of objects every time. Remember, this is only an estimate. The larger the sample you take, the closer your guess will be to the exact total.

After many guesses, count all of the marbles in the bag and see how close your guesses were.

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Name : _____

Date: _____

1. Take out a handful of black marbles (fish) count and record their number and replace them with blue marbles (tagged fish).
2. Mix the blue marbles (tagged fish) in with the black marbles (untagged fish).
3. Catch a handful of marbles.
4. Count and record the total number of marbles (tagged and untagged fish).
5. Count and record the total number of blue marbles (tagged fish).
6. Repeat steps 3-5 two more times.
7. Using the (Ax B)/C formula figure out the estimates for the total number of marbles (fish) in the bag
8. Count the actual number of marbles (fish) in the bag and see how close your estimates came.
9. Put the black marbles back in your bag and pla ce the blue marbles back in their container.

(A x B) / C

A = Number of fish you caught and tagged (black marbles that are replaced with blue marbles)

B = Total number of fish sampled (blue and black marbles)

C = Number of tagged fish caught during sampling (blue marbles)

A = _____ Number of fish caught and tagged

B_1 _____ B_2 _____ B_3 _____ $B_{1+}B_2$ _____ $B_{1+}B_{2+}B_3$ _____

C_1 _____ C_2 _____ C_3 _____ $C_{1+}C_2$ _____ $C_{1+}C_{2+}C_3$ _____

$(A \times B_1) / C_1$ = Fish

(_____x_____)/____=Fish

_____/_____ = Fish

_____ = Fish

$[A \times (B_{1+}B_{2+}B_3)] / (C_{1+}C_{2+}C_3)$ = Fish

(_____x_____)/____=Fish

_____ / _____ = Fish

_____ = Fish

$[A \times (B_{1+}B_2)] / (C_{1+}C_2)$ = Fish

(_____x_____)/____=Fish

_____ / _____ = Fish

_____ = Fish

Actual count of fish population (Total number of Black Marbles)

_____

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	A		B		C
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
Total					