Names _____ Per _____

Directional Selection
With a side of Beans and Dice

Background: Directional selection occurs when one part of a population has a slightly different version of a particular trait, which gives those individuals greater fitness. Increased fitness gives an individual a better chance of living longer and reproducing more. For this activity, lima beans and pinto beans represent members of the same species, but the lima beans have slight competitive edge because they reproduce more easily. You will work in groups of two to three, and turn in one paper per group.

Materials: Your game board will consist of several paper plates, which are labeled B, 1, 2, 3, 4R, 5R, 6R, and 7R. Numbers indicate the age of the individuals on the plate. Game tokens are lima beans and pinto beans, several of each. Rolls of a six-sided die (D6) determine which individuals reproduce. The B plate is for new individuals born that year. The R indicates when the individuals are of reproductive age. Use the table on the back to record data and make calculations.

Setup: Lay out the plates in order, with B at the end next to 1. Place one of each kind of bean on each of the numbered plates. Roll the D6 and place another pair of beans on the plate with the resulting number. There should be a total of 16 beans on the plates, 8 of each kind. Record these numbers in the data sheet as the population at year 0.

Game Play: Beginning with plate 4R, roll the D6 one time for each bean. Lima beans reproduce on a roll of 4 or higher. Pinto beans reproduce on a roll of 5 or higher. When an individual reproduces, place a new bean of the same type on the B plate. After you have rolled for all the individuals, count the beans and record the totals at year 1. This is the end of the first year.

Now, age the beans. Any individuals on plate 7 will die of old age and be returned to their cups. Beans from plate 6 move to plate 7. Beans from plate 5 move to plate 6, and so on down the line. Repeat the reproduction process, recount the beans, and record the number at year 2. Repeat until you have recorded 12 years. Calculate the percentage for each type of bean in each year.

Clean Up: This is important. After compiling data from 12 years, <u>sort the beans by type</u> and put them back in their cups. Confirm there are eight plates in your group's set. Get a stamp to verify clean up, and return the cups and plates to the bin at the front of the room.

Data Table

Year #	Lima Pop. (A)	Pinto Pop. (B)	Total Pop. (C)	% Lima (A/C)	% Pinto (B/C)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Questions

1. How would the population shift be affected if lima beans could reproduce on a roll of 2 or higher? _____

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2. What are some factors other than reproductive rate that could shift the population in this way? _____

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