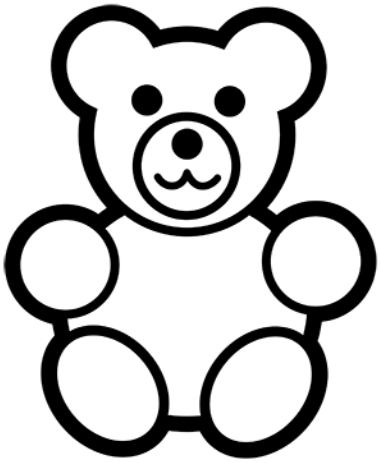
Name:_____

Investigation: Teddy Graham Equilibrium

Introduction:



> *You are a bear-eating monster. There are two kinds of bears: happy bears and sad bears. You can tell the difference between them by the way they hold their hands. Happy bears hold their hands high in the air, and sad bears hold their hands down low. Happy bears taste sweet and are easy to catch. Sad bears taste bitter, are sneaky, and are hard to catch. Because of this, you eat only happy bears.*

New bears are born every 'year' (during hibernation) and the birth rate is one new bear for every old bear left from the last year. The happy trait is recessive, so the happy bears are homozygous recessive. In addition, because the sad trait is dominant, the sad bears are either homozygous or heterozygous dominant.

Make a prediction about what will happen to the phenotypic and genotypic frequencies in the population after a few generations. Explain your reasoning.

Procedure:

1. Obtain a population of 10 bears and record the number of happy and sad bears and the total population number. Assume that the genotypes in your beginning population are homozygous dominant or recessive (there are no heterozygotes).

Using the equation for Hardy-Weinberg equilibrium, calculate the frequencies of both the dominant and recessive alleles and the genotypes that are represented in the population.

$$p^2 + 2pq + q^2 = 1 \qquad p + q = 1$$

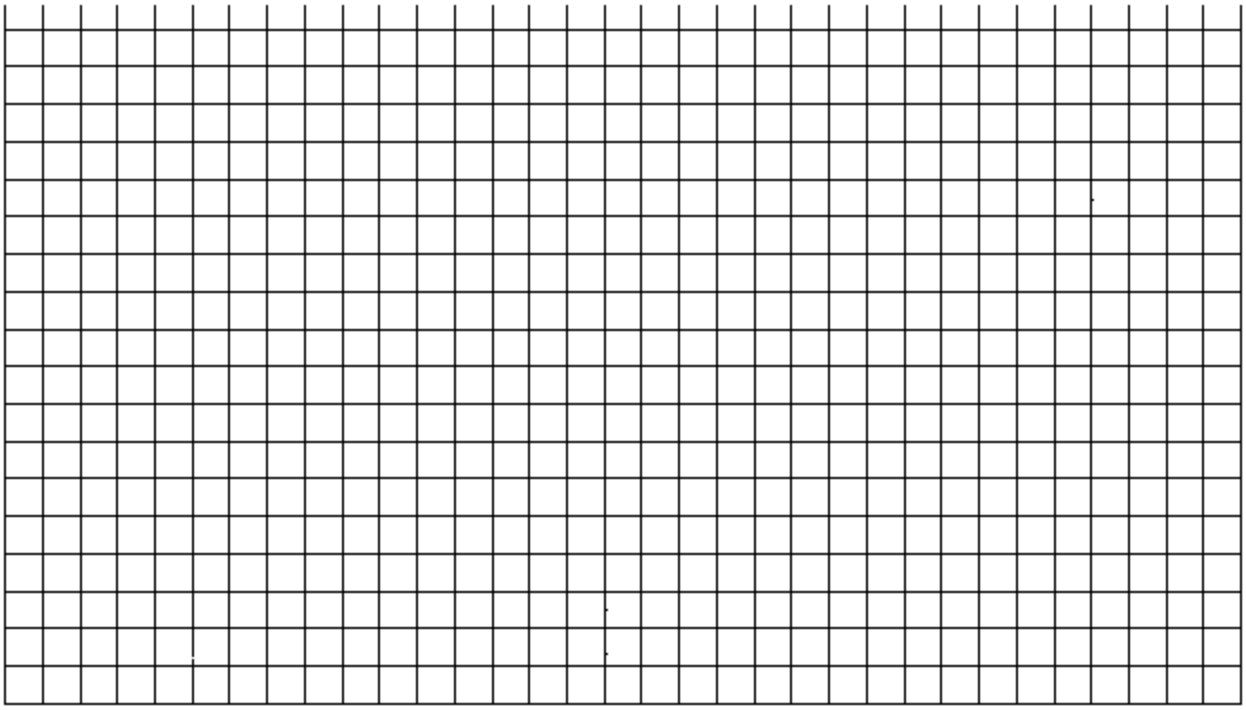
Example: If 5 of the 10 bears are happy, then 10 out of 20 alleles would be happy alleles. Therefore the q^2 number would be 0.5. You must then determine the q number by taking the square of 0.5.

2. Eat three happy bears. (If you do not have three happy bears, then eat the difference in sad bears.) You will use the remaining bears to produce offspring during breeding season. Each remaining bear bear will produce one new bear.

3. Repeat this process for four generations of bears and construct a data table to show how many of happy and sad bears are in the population for each generation. Data should reflect the **frequency** of each type of bear.

Generation	p^2 (sad)	2pq (sad)	q^2 (happy)	p	q
1 (initial)					
2					
3					
4					

4. Using your data, construct a graph that will show what happens to the bear population over time. Use percentages of happy and sad bears for each generation. Changes in frequencies should be shown on the same graph.



Analysis

Prepare a short summary of what you observed in this activity that addresses the following:

- What is happening to the genotype and allele frequencies in the population of Teddy Grahams?
- What would you expect to happen if you continued the selection process for additional generations?
- How would the frequencies change if you were to now select for the sad bears?
- Why doesn't the recessive allele disappear from the population? How is it protected?