Genetic Drift Simulation Lab

Name: _____ Date: _____ Period: _____

Standard 8c. Students know the effects of genetic drift on the diversity of organisms in a population.

Objectives: Students will

- Identify that random events are a driving force of evolution
- Summarize how genetic drift affects diversity in a population
- Compare the effect of genetic drift on two different population sizes

Pre-Lab Questions

1. Roll the die and see what you get. Record the number. ____
2. Roll the die four more times and record the numbers. ____ ____ ____ ____
3. How does this show "randomness"?

Problem

Are driftworms affected by random events that cause genetic drift to occur? How does the size of the population relate to the effects of genetic drift?

Hypothesis

Write a hypothesis to answer the problem question:

If the worm population is small, then genetic drift will have **more/less** of an effect because

_____

_____

Procedure

Part 1: Internet Simulation at http://www.biology.arizona.edu/evolution/act/drift/manual.html

1. Your teacher will run the genetic drift simulation at the above website for a population of 10 worms. Record the results in the following table. The trial will run 10 times.
2. At a **population of 10**, what is the mean number of generations until an allele becomes fixed?

Data Table:

Trial #	Generation at which allele becomes fixed	Trial #	Generation at which allele becomes fixed
1		6	
2		7	
3		8	
4		9	
5		10	

What is the average number of generations to allele fixation? _____

Part II: Student Simulation.

You will now run a simulation with the parent population size cut in half from 10 to 5. Write a second hypothesis predicting how this will affect the number of generations it will take for allele fixation.

If the parent worm population is cut in half, then allele fixation will happen **faster/slower** because

_____

_____

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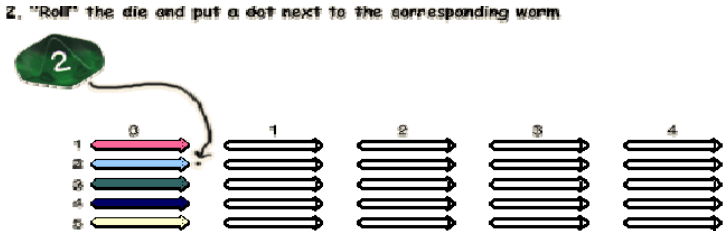
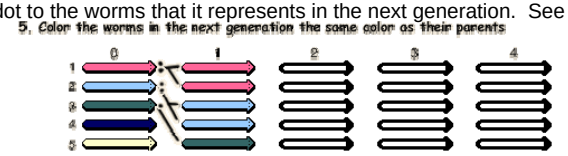
3. Find the Generations of Driftworms worksheet and get 5 different colored pencils.
4. Color each worm in the population 0 a different color.
5. Using the die, roll it once and make a dot next to the worm color that was rolled 1, 2, 3, 4, or 5. (You will not use the 6.) See the diagram below.



6. Do this five times so that you will have a total of five dots next to your generation 0 worms.
7. Draw a line from each dot to the worms that it represents in the next generation. See the diagram below.



8. Next color the generation 1 of worms the same color as their parent from generation 0.
9. Continue steps 3-6 until all the worms in a generation are the same color.
10. How many generations passed before the allele became fixed in your population? _____
11. Your teacher will collect data from 10 random students once everyone has finished. Copy the class results in the following chart:
12. At a **population of 5**, what is the mean number of generations until an allele becomes fixed?
13. **Data Table for class results:**

Trial #	Generation at which allele becomes fixed	Trial #	Generation at which allele becomes fixed
1		6	
2		7	
3		8	
4		9	
5		10	

14. What is the average number of generations to allele fixation? _____

Analysis and Conclusions:

1. When the parent population was 5, how did your results compare to the class average? Explain why they were similar or not?

Name(s): _____

Generations of Driftworms

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2. Refer to your data tables for the following:
   What was the average number of generations for allele fixation:

   For a parent population of 10? _____

   For a parent population of 5? _____
   Which parent population size reached allele fixation faster?
   Why do you think this happens?

3. What is the relationship between population size and the number of generations it takes for an allele to become fixed? Complete the following:

   As the parent population size **increases**, the number of generations it takes for allele fixation

   _____.
   As the parent population size **decreases**, the number of generations it takes for allele fixation

   _____.

4. Why is there is no point in adding more generations after all the worms are one color (when an allele has become fixed)?

5. Why is genetic drift negative for a population of species at risk for natural disasters?

6. Write a summary analyzing how genetic drift affects biological diversity (biodiversity)? Why does it have this effect? Write at least four sentences and use at least four words from the following bank in writing your summary. Underline these words in your summary.

Allele Frequency	Gene Pool		Small Population		Large Population
Biodiversity	Random	Survival	Species	Environment	Change