Mathematical Modeling: Hardy-Weinberg

How can mathematical models be used to investigate the relationship between allele frequencies in populations of organisms and evolutionary change?

Name: _____ Date: _____ Class/period: _____

Dataset ID: _____

https://biologylabbench.com/lab02

How to use this guide

Check off each numbered step as you work in the online simulation. Follow your teacher's assigned sections and repeat counts. This guide explains the workflow; enter your measurements and responses in the lab or your assigned worksheet.

Use Data for tables and editable calculations, Graph for plots, and Scene for the simulation. Some controls are under More options. Write predictions before running an experiment and scroll below the simulation for response boxes.

Overview

- ☐ 1. Read the driving question and your teacher's assignment. Note which sections, optional extensions, and number of trials your teacher wants you to complete.
- ☐ 2. Sign in with your name and class period. Copy your Dataset ID onto this guide. Keep using the same dataset for the investigation; classmates may have different numbers.

Background

- ☐ 1. Read the background explanations, diagrams, and vocabulary. Review the reference formulas you will need and identify the variables you will measure.

Pre-lab

- ☐ 1. Complete the pre-lab questions and any practice activities. Use Check answer, read the feedback, and revise your reasoning before starting the investigation.

Card model

- ☐ 1. Write your prediction, then Mate one generation. Use Run 5 generations and inspect how allele frequencies change.
- ☐ 2. Choose another case and repeat. Record the case, settings, and allele frequencies, then compare the cases in the response box.

Build the model

- ☐ 1. Write your prediction and examine the spreadsheet model. Recalculate at least three times and Record this run after each recalculation with 16 zygotes.
- ☐ 2. Change the number of zygotes to 100, then 1000; record runs at each size. Compare sampling variation and answer the questions below the model.

Many generations

- ☐ 1. Predict what will happen, then Run model with drift only. Compare populations of N = 10, 100, and 1000, using Record result for each run.
- ☐ 2. Turn on one additional force such as selection, mutation, or migration and run again. Record the starting conditions and final allele frequencies; answer the questions and complete the chi-square practice if assigned.

Design

- ☐ 1. Write your question and hypothesis. Choose one independent variable and its levels; keep other settings constant.
- ☐ 2. Run experiment and use the chart and Data table to compare outcomes. Describe the variation, results, and whether the evidence supports your hypothesis.

Analyze

- [ ] 1. Answer every assigned analysis question using your own recorded data. Include numbers, units, and comparisons from the appropriate Data and Graph panels.
- [ ] 2. Complete the requested calculations or statistical comparisons. Show your method and explain what the result means biologically. Write the claim, evidence, and reasoning response if shown.

Reflect

- [ ] 1. Compare your original predictions with your results. Explain any disagreement, limitations of the simulation, and one way to improve the investigation.
- [ ] 2. Complete the assigned reflection/evaluation questions and AP-style response if shown. Use your own data where requested. Rate your confidence if you wish; ask your teacher about any unfinished or unclear work.

Submit

- [ ] 1. Review the completion checklist and Preview my report. Check your name, period, Dataset ID, calculations, units, graphs, and written responses.
- [ ] 2. Download .docx or use Save as PDF as directed by your teacher. Open the downloaded file and check that it contains your work, then upload or hand it in where your teacher specifies. Downloading alone does not submit it.
- [ ] 3. Save a progress file using Move your work to another computer if you need a backup or will change devices. Keep recordings separately if assigned; a report cannot restore editable progress.

Teacher instructions / notes