Automating the Simulation Process

In previous activities and assignments, you have learned how to set up a model to run a simulation experiment using TinkerPlots™. In these simulations, you ran many trials from which you collected a particular outcome (e.g., the number of heads when flipping a coin 10 times). You also learned how to create a case table to collect the results from each trial into, and how to plot those results.

In this activity, you are going to be introduced to the Collect function in TinkerPlots™. This will automate the collecting of trial results in a simulation. It will also make carrying out several trials easier.

Modeling Coin Flips

Recall in the previous activity you modeled flipping a coin 10 times. Suppose you wanted to simulate 100 more trials of 10 flips In TinkerPlots™.

- Set up a model to simulate tossing a single coin 10 times.
- After you have set up the model, click the Run button.

Automating the Collection of Trial Results

Rather than having you record the number of heads that occurred in the 10 flips, we will automate this using TinkerPlots™. The general process for having TinkerPlots™ record and collect the trial results is: (1) plot the outcomes from the trial, and (2) collect the numerical result you are using to summarize the trial.

- Plot the 10 outcomes from the trial. Fully separate the outcomes and stack them vertically.
- Highlight the plot of the trial outcomes and click on the Case Counts (N) button in the upper plot toolbar. This should display a count of the number of heads and tails in the trial.

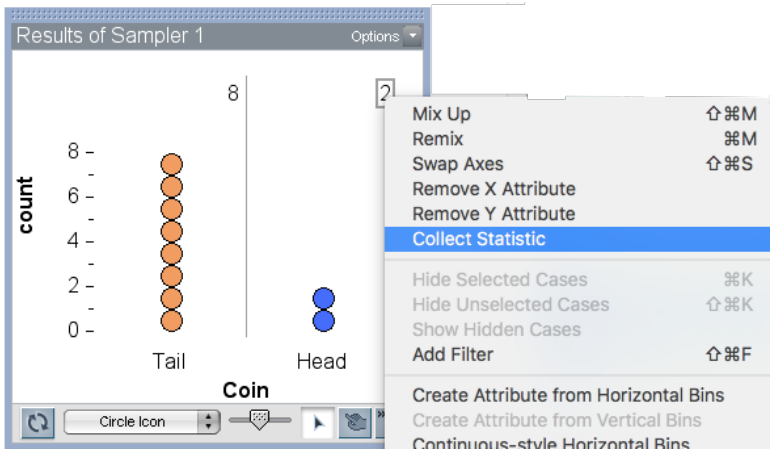
> Note that Case Counts (N) and Case Counts (%) will count the number of cases **within each section of a plot**. If there are not multiple sections (no bin lines), the number of total cases in the plot will be displayed. This is why we need to fully separate the cases when we plot them.

Collecting the Results from Many Trials

You can also use TinkerPlots™ to automatically collect the summarized result from the trial into a case table.

- Use TinkerPlots™ to automatically collect the result from your simulated trial into a case table (see instructions below and figure on next page).

> **Collecting the Results from a Trial**
> - Right-click the summary result in your plot.
> - Select Collect Statistic.



It is important that you right-click on the *actual value of the result* in the plot since you want TinkerPlots™ to collect the value. For example, in the plot displayed above, you would right-click on the value *2* to collect the number of heads.

The result is then collected in a new case table. This case table, which is called *History of Results*, has a single row with the collected result, in this case two, displayed in a new attribute. The window next to the Collect button indicates the number of results that were collected, in this case one result was collected. This value can be changed to add the results of additional trials into the case table. In this case, the result collected from each trial is stored in a row of the *History of Results* case table.

- Change the value in the *History of Results* case table to *99* to add the results from an additional 99 trials of the simulation (see figure below).
- Click the Collect button.

Change the value to 99 in the History of Results table.

Use the data you collected from the 100 trials of the simulation to answer each of the following questions.

1. Record the result from the 87th trial.

2. Plot the results from your 100 simulated trials. Don't forget to fully separate the case icons, and vertically stack them.

3. Based on the plot of the simulation results, what was a typical number of heads from 10 flips? Explain how you decided this from the plot.

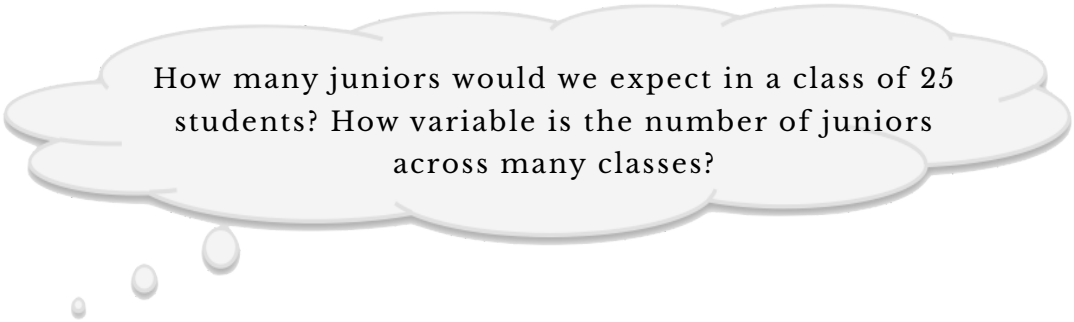
4. Based on the plot of the simulation results, how variable are the results? What are the smallest and largest number of heads that you observed? What is the range of values where most of results lie?

5. Based on the plot of the simulation results, would two heads out of 10 flips be a likely or unlikely result? Explain.

6. Based on the plot of the simulation results, would seven heads out of 10 flips be a likely or unlikely result? Explain.

Number of Juniors

Set up a sampler to generate data for 25 students from a population of students, where 40% of the population are freshmen, 30% are sophomores, 15% are juniors, and 15% are seniors.



- Open a new document in TinkerPlots™.
- Set up the model of sampling students.
- Carry out a single trial of the simulation.
- Plot the 25 outcomes from the simulated trial.
- Stack and separate the cases into groups.
- Use Case Counts (N) to summarize the number of cases in each group.
- Collect the number of juniors from the trial into a *History of Results* case table.
- Carry out an additional 99 trials.
- Plot the results from your 100 simulated trials.

Use the plot of the results from your 100 simulated trials to answer each of the following questions.

7. Sketch a plot of the results. Be sure to label the axis.

8. Based on the plot of the simulation results, what was a typical number of juniors in a class of 25 students? Explain how you decided this from the plot.

9. Based on the plot of the simulation results, how variable are the results? What are the smallest and largest number of juniors that you observed? What is the range of values where most of results lie?

10. Based on the plot of the simulation results, would 10 juniors in a class be a likely or unlikely result? Explain.

Generating Cat Lengths

Set up a sampler to randomly generate 40 female cat lengths (see previous activity). Use TinkerPlots™ to carry out 100 trials of a simulation to determine how much the **average female cat length** varies across samples. After plotting the 100 averages, answer the following questions:

11. Based on the plot of the simulation results, what was a typical average female cat length? Explain how you decided this from the plot.

12. Based on the plot of the simulation results, how variable are the results? What are the smallest and largest mean values that you observed? What is the range of values where most of results lie?

13. Based on the plot of the simulation results, would an average of 17 inches be a likely or unlikely result? Explain.