Application Exercise: Random Babies[1]

Consider a hospital that is so disorganized that it can't keep track of which family a baby came from. Instead of trying to fix this problem, the nurses randomly choose which home will get each baby. We will consider how often the hospital guesses correctly. For a simulated example of this, go to http://www.rossmanchance.com/applets/randomBabies/RandomBabies.html.

Using the applet:

- Click **Randomize**. This will start an animation of a stork bringing babies to St. Elizabeth Hospital, and from there to 4 homes.

- Below the hospital the number of matches is shown for this simulation. This is also shown next to the houses with rain (no match) or sun (match).

- Below are two histograms, the one on the left showing the frequencies of how many matches were made in each simulation, and the one on the right plotting the average number of matches made in the simulations.

- Click on one of the bars in the histogram on the left. This will show the relative frequency of that many matches in the histogram on the right. Click the box above that says **Show Theoretical**. This will show a red horizontal line on the histogram on the right which shows the long-run probability of getting the chosen outcome from the previous step.

- In the box next to **Number of trials**, enter the number 9. This will run 9 more simulations and add the results to the histograms below. Click on the various bars of the histogram on the left to see how results compare with the long-run probabilities.

Answer the following questions based on this applet.

1. In the box next to **Number of babies**, enter the number 3. What are the possible number of matches for this situation?

2. Is it possible to have 2 matches when there are 3 babies? Why or why not?

3. List all possible combinations of how babies 1, 2, and 3 will go to house 1, house 2, or house 3.

4. Since babies are randomly assigned to each home, what is the probability of each of the above possible outcomes? (*Hint: there are six possible outcomes.*)

5. What is the probability that no babies are sent to the correct home?

6. What is the probability that only one baby is correctly matched with its home?

7. What is the probability that all 3 babies are sent to the correct homes?

8. Click **Reset**. In the box next to **Number of babies**, enter 4. In the box next to **Number of trials**, enter 250. What happens to the average of each number of matches compared to their long-run probabilities?

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