


Random Babies

Suppose that on one night at a certain hospital, four mothers (named Smith, Jones, Marshall, and Banks) gave birth to baby boys. Suppose the babies names are Sam Smith, Joe Jones, Mark Marshall, and Bobby Banks. Suppose also that, as a very sick joke, the hospital staff decides to return babies to their mothers completely at random. (Totally fiction – no hospital staff we know would even think of doing this!)

The questions we want to investigate are these: How often will at least one mother get the right baby? How often will every mother get the right baby? What is the most likely number of correct matches of baby to mother? On average, how many mothers will get the right baby?

We will use a *simulation* to investigate what happens in the long run.

Write the definition of *simulation here:* ____

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To represent the process of distributing babies to mothers at random, you will shuffle and deal 3x5 cards (representing the babies) to regions on a sheet of paper (representing the mothers).

1. Use the four index cards I'll give you and one piece of your own notebook paper. On each index card, write one of the babies' first names. Divide your sheet of paper into four regions, writing one of the mothers' last names in each region. Shuffle the four index cards well, and deal them out randomly, placing one card face down on each region of your paper. Finally, turn the cards over to reveal which babies were randomly assigned to which mothers. Record how many mothers received their own baby. Jot this number down under "Trial 1" in the table below.

Trial	**1**	**2**	**3**	**4**	**5**
Number of matches					

2. Repeat the random "dealing" of babies to mothers a total of five times, recording in each case how many mothers received the correct babies. Record your counts in the above table.

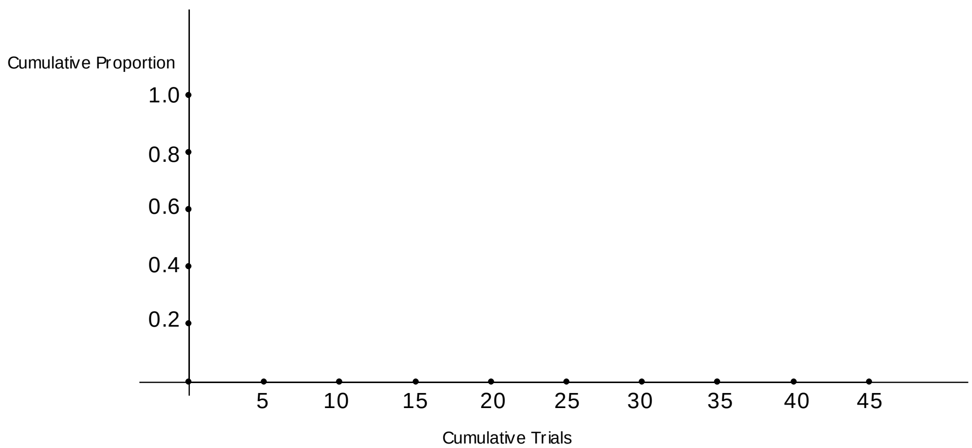
3. Now, you're going to combine your results with all the other students at your table. Each student needs to make a chart in her notes like the one at the top of the next page. Assign one student at your table to be the manager. The manager will ask each student, "How many of your trials resulted in AT LEAST ONE match?" Each student will record these numbers in Column 1 in her chart. Once all nine students have announced their results each student will complete Columns 3 and 4. (Feel free to help each other.) Notice that we are going to keep adding on the number of trials, so that we keep a CUMULATIVE COUNT of the total number of trials and a CUMULATIVE COUNT of then number of trials with at least one match. In the last column, figure out the proportion of trials with at least one match.

Reference

Adapted from Activity 11-1: Random Babies in Rossman and Chance (2012), *Workshop Statistics, 4th ed*. John Wiley & Sons

Student #	Column 1: Number of trials with at least one match	Column 2: Cumulative Number of Trials	Column 3: Cumulative Number of Trials with at Least one Match	Column 4: Cumulative Proportion of Trials with at Least One Match
1		5	(student #1's count)	(column 3 ÷ column 2)
2		10	(student 1's + student 2's count)	
3		15		
4		20		
5		25		
6		30		
7		35		
8		40		
9		45		

4. Construct a graph of the cumulative proportion of trials with at least one match vs. the cumulative number of trials.



5. Does the proportion of trials that result in at least one mother getting the right baby fluctuate more at the beginning or at the end of this process?

6. Does the cumulative proportion (also known as the **cumulative relative frequency)** appear to be "settling down" and approaching one particular value? What do you think that value will be?

Complete the following:

The **probability** of a random event occurring is ____

____

____

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Simulation leads to an **empirical estimate** of the probability, which is ______________________

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