**Date** _____


# Helper or Hinderer?

## (Inferential Statistics)

*Activity modified and used with permission of A. Rossman, B. Chance, and J. Holcomb.*

**Group Member Names:** _____

## Part One – Introduction

**Sociology Study from the Yale Infant Cognition Center:**
View the video about Helper or Hinderer at https://www.youtube.com/watch?v=anCaGBsBOxM

1. If 16 infants participated in this study, how many do **you** think chose the helper toy? Why? What factors do you think might be at play when the infants make their choice?

2. What are some possible **hypotheses** we could make for this situation regarding infants and their choice of a toy?

3. If infants really do **NOT** have a preference for the helper or the hinderer toy, what would be the most likely outcome (number of infants choosing the helper toy) when this study is conducted on 16 infants?

4. Still assuming that infants show **NO** preference between the helper and hinderer, what kind of results (for number of infants choosing the helper toy) would **NOT** surprise you when this study is conducted on 16 infants? How far off your guess from number 3 could you go and it still be "okay?"

5. The researchers actually found that _____ of the 16 infants in the study selected the helper toy. If it is REALLY the case that infants show **NO** preference between the helper and hinderer toy, do you find the researchers' results surprising? Why or why not?

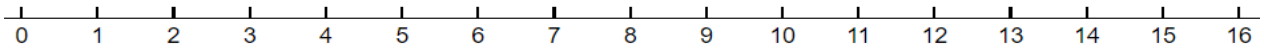
## Part Two - Exploration

- A key question is, "How surprising is the observed result under the assumption that infants have **NO** real preference for the helper toy or the hinderer toy?"
- We will call this assumption of no real preference the ***null hypothesis***.
- Let's simulate this situation using coin flips. If children truly have no preference, they will have a 50/50 chance of picking the helper toy.

1. Flip a coin 16 times. If getting **heads** represents that the child chose the **helper** toy, count how many of your 16 hypothetical infants chose the helper toy and place in the blank on the left. (Count the total number of heads from your 16 coin flips.) Repeat this process 3 more times and write the number of heads for each round of 16 in the blanks below.

   _____ _____ _____ _____

2. Combine your results with your classmates. Do this by producing a **dot plot** (of the number of infants who choose the helper toy) on the board, where you contribute 4 dots corresponding to your 4 simulations from number 1 above. Copy the class dotplot from the board here below.




Dot Plot: **Number of Heads from 16 coin flips**

3. Does it seem like the results actually obtained by these researchers (see number 5 on Part One) would be surprising under the null hypothesis that infants do **NOT** have a genuine preference for either toy? Explain.

4. Now, we will use technology to simulate completing this experiment many, many times (100, 500, 1000 times) under the assumption that the null hypothesis is true – that infants show no preference of choice over the Helper or Hinderer toy. Based on this simulation, how surprising are the actual results of this study? (Refer back to Part One, number 5). Explain your reasoning.

## Part Three – Analysis and Conclusions

There is **variability** between what we *expected* to happen, assuming the null hypothesis is true (8 infants choosing helper toy), and the *actual* results. The question is, "Can the *random process of choosing* explain this variability, or is there *another explanation* for this variability?" Many statisticians say that the field of statistics is primarily about explaining variability. This is what we are attempting to do in this investigation, and we will continue to explore these ideas throughout this course.

**TERMINOLOGY:**

- The ***probability*** of an event is the long-run proportion of times the event happens when its random process is repeated indefinitely. It has to do with the *likelihood* that an event occurs.

- The ***p-value*** is the probability that randomness would produce data as (or more) extreme as an actual study, assuming the null hypothesis to be true.
    - A small *p*-value indicates that the observed data would be surprising to occur by randomness alone, if the null hypothesis were true.
    - Having results with a small *p*-value is said to be ***statistically significant***,
        - The results did not occur by chance/randomness alone.
        - It provides evidence against the null hypothesis.

1. Based on our simulations from Part Two, what conclusion should the researchers draw? Justify your conclusions and use the above terminology in your justification.

2. If the actual study had instead found that 9 of the 16 infants chose the Helper toy, then what decision should the researchers make based on this result? Justify your conclusions, and use the above terminology in your justification.