**Math in Literature—Using Jumanji to Study Theoretical vs. Experimental Probability**

**Learning Objectives: 4.NF.1, 4.NF.2**

* Students will develop predictions based on what they currently know about probability.
* Students will conduct an experiment in probability to test their predictions or hypothesis.
* Students will break down independent events and list possible outcomes.
* Students will be able to determine theoretical probability by comparing possible outcomes for one result to the total of all possible outcomes.
* Students will develop conclusions about probability based on their experiments.
* Students will be able to differentiate between theoretical and experimental probability.

**Procedure: (Day One)**

1. Teacher will read Jumanji to the class.
2. Teacher will connect Judy’s experience of having to roll a 12 to reach Jumanji to dice rolling probabilities in mathematics.
3. Teacher will build on knowledge of probability by asking about the probability of rolling a 6 on one die.
4. Teacher will extend and have students predict by asking: If there is a 1 out of 6 chance you will roll a six on one die, what do you predict is the probability of rolling a 12 with two dice? (Students will be given time to write down their predictions and reasoning as well as to share with classmates.)
5. Teacher will discuss whether or not 12 is a probably a common or uncommon outcome. (When students come to the conclusion that 12 is an uncommon outcome, teacher will pose the next question.)
6. Teacher will ask, “If 12 is an uncommon outcome, what sum of a pair of dice do you predict is most commonly rolled?”
7. Teacher will model an expanded response and give students an opportunity to write down their predictions.
8. Teacher will guide students in setting up a chart to conduct their experiment and pass out a pair of dice to each student/pair of students (materials permitting).
9. Students will roll pair of dice and record the sum of their dice until one sum has been reached a total of 10 times.
10. Students will record which sum was rolled most often and they will decide whether that supports or does not support their prediction.

**(Day Two):**

1. Students will be asked to review their findings from the previous day’s work.
2. Each student will place a sticker on chart paper to indicate which sum was produced most often in their experiment.
3. Teacher will bring discussion back to rolling a 6 sided die and why there is a 1 out of 6 chance that you will roll any given number. She will lead the discussion into the fact that there are 6 possible outcomes for the rolls.
4. How many possible outcomes are there for two dice? How do we know? How can we figure this out quickly without writing down every possible combination?
5. What are the possible combinations to get any of those totals?
6. Students will create a final chart listing possible combinations.
7. Teacher will monitor student work and then create a class chart on the board through discussion and collection of results.
8. Teacher will count up total possible outcomes (36), and the possible ways you can get each outcome to create fractions. Ask class, “What do you notice about this chart?” Do you think a chart would look similar for even more dice? Why?”
9. Teacher will introduce mini-project: Pass out rubric. This is where we will lay out our experiment and our findings for others to view. This is my example. What is good about it? What could be better?

If time permits, present In the Balance extras.

Over the week: Think about how you want to present your project. Bring any extra materials you may want to include on your poster (decorative).

**Day Three:**

1. Students will use the majority of their class time creating and completing their visual representations of their experiment findings.
2. Students who finish early will be encouraged to complete Brain Benders (Logic Puzzles, In the Balance Practice).
3. Students will be reminded to check their rubrics and self-evaluate before turning in their final product.