

# Monte Carlo Modeling

Dice games for probability and  
statistics



# Overview

- Dice experiment
- Data collected on successes and sample sizes
- Linear Regression analysis
- Convert data to proportions
- Law of Large Numbers
- Estimate standard deviations from multiple samples of the same size
- Central Limit Theorem (using power regression)

# The Students

- Course: MAT 223: Fundamentals Concepts of Mathematics III (Probability and Statistics for Teachers)
- 10 students in the class
- Meets MWF for 70 minutes (4 credit hour course)
- Elementary Education majors take three math courses in Maryland
- Formed groups of 3-4 students each to conduct activity
- Spread over 4 class periods
- Follow-up with an Excel/computer component

# Highlights

- Students selected from different size gaming dice: groups chose decahedral, octahedral and icosahedral.
- Students selected their own successes so proportions could vary between groups.
- Previous exposure to scatterplots, but activity included finding lines from data points, and calculating a best-fit line from calculator.
- Students used random number generators to simulate even larger data sets.
- Explored topics from upcoming chapters: Law of Large Numbers, and Central Limit Theorem.

# Highlights

- Each group had their own strategies for counting and randomizing dice.
- One of the groups made a game of it, trying to “beat” each other with more successes.
- Used paper box lids to keep dice from going all over the place.
- Gave students a chance to discuss concepts with each other.
- Will use data gathered from data collection as the course discusses probability, binomial distributions and central limit theorem in upcoming chapters.

# Assessment

- Activity itself will be assessed directly.
- Data collected was also analyzed with Excel graphing tools and trendlines.
- Outside of class activities asked students to explore correlation and regression lines on PhET and with Desmos.
- Follow-up quiz on scatterplots and regression after formal introduction of topic in textbook after the completion of the activity.
- Assessed ability to find and interpret regression line and correlation.

# Reflections

- Modified activity on the fly to include TI-83/84's Random Binomial generator for largest sample sizes. Will probably include this modification in revisions before using it again. Primarily for time considerations.
- Activity could probably be broken up into smaller parts.
- Student survey conducted in two stages. Additional changes may be adopted from feedback.
- Included activity in a Learning Outcomes Assessment project for professional development activity at AACCC.

# Student Survey Responses



Follow-up