



## Introduction

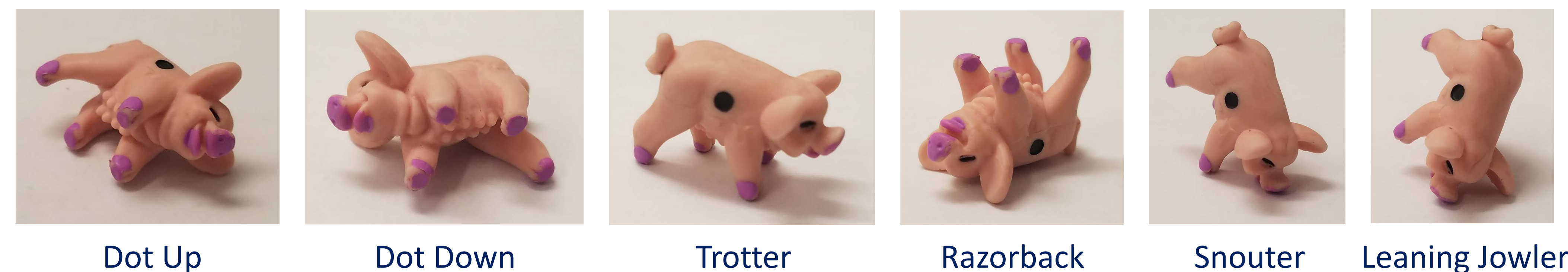
- Game of Pig is frequently used to introduce fundamental concepts in statistics, mathematics, and computer science
- We present an extension of the Game of Pig originally presented by Hancock et. al (2010)
- Originally developed as a workshop activity to encourage participation in STEM for 6<sup>th</sup>-8<sup>th</sup> grade girls
- Activity is helpful to illustrate several concepts:
  - probability
  - probability and sampling distributions
  - simulation
  - informal inference

## Set-up for the Activity

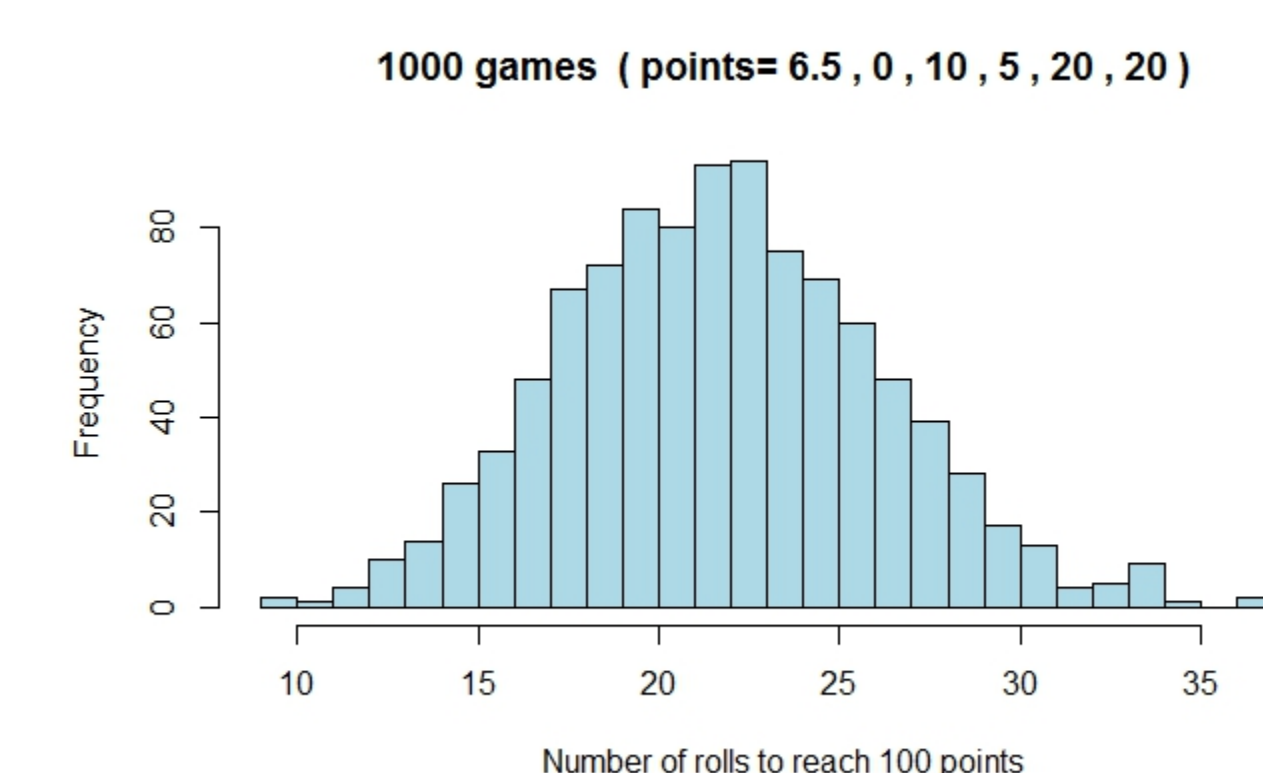
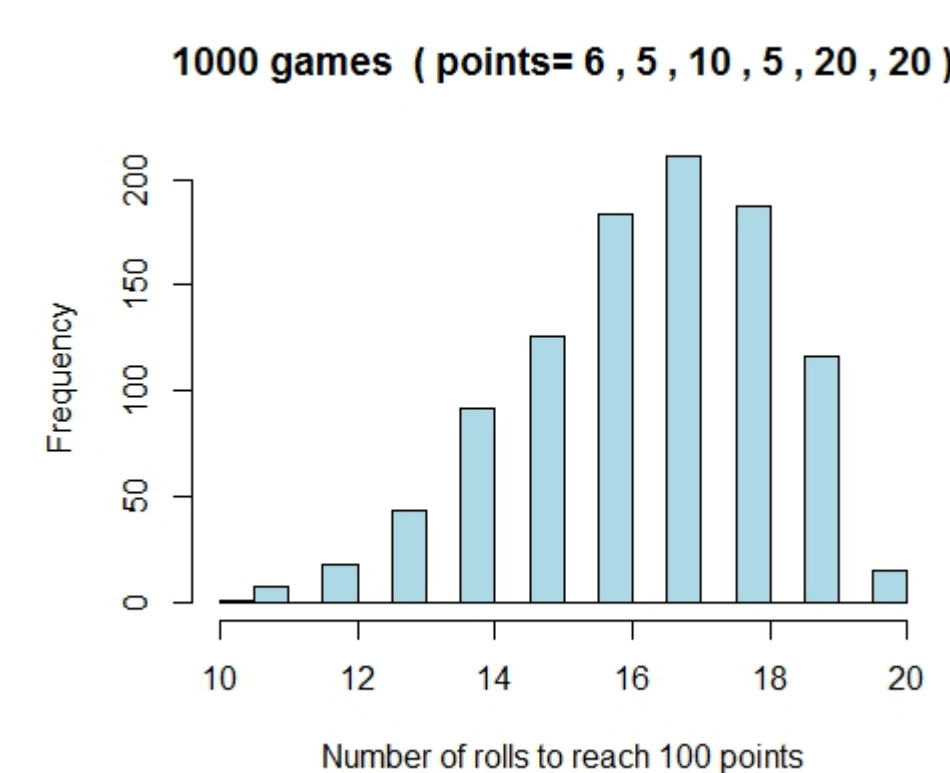
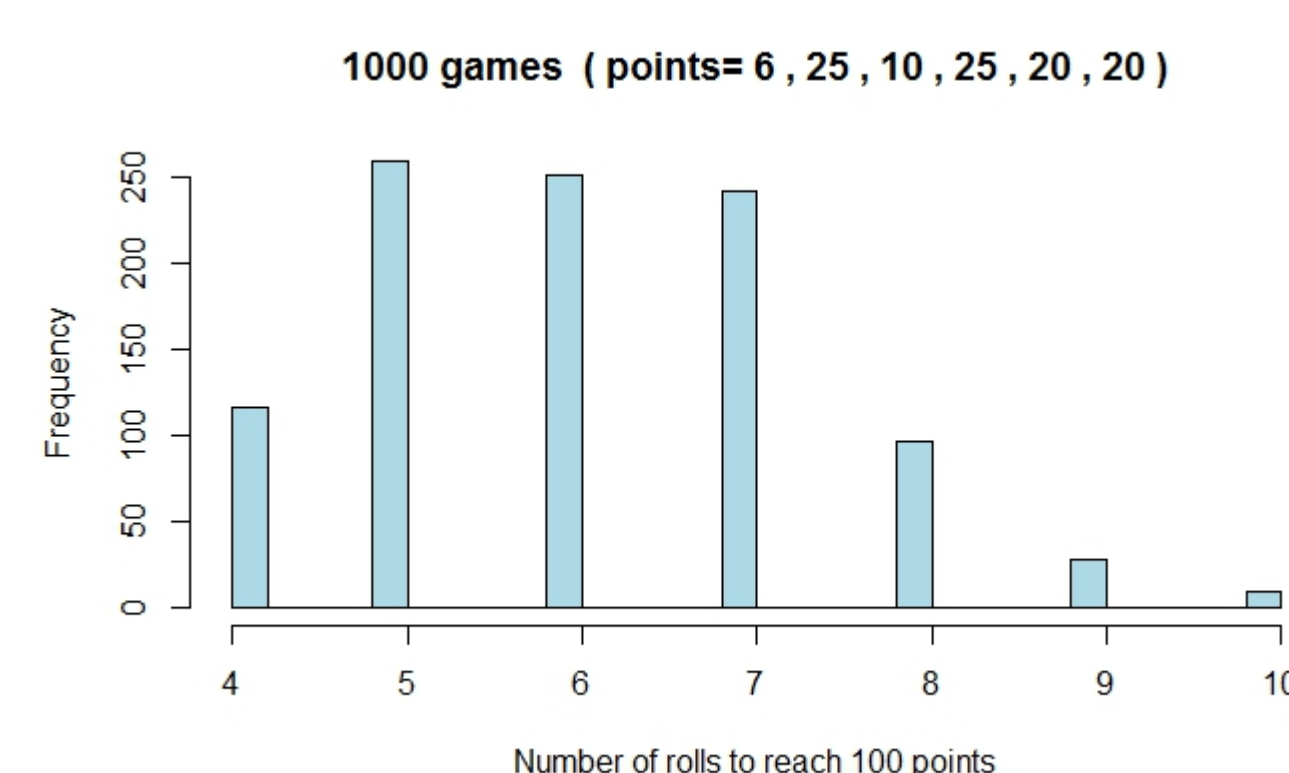
- Students work in groups of two to four
- **Activity motivation:** Porker Brothers has developed a game where players roll a pig-shaped die and earn points depending on how the die lands. The first player to 100 points wins—how should we assign points?

## Description of the Activity

- Explain the different ways the pig die could land:



- Guide students through the activity using a series of questions:
  - 1) What are important considerations in determining how many points to assign to each position?
    - Develops students' understanding of the use of probability to make decisions and how expected values influence decisions
  - 2) Collecting whatever information you need, assign points to each of the six types of landing.
    - Introduces students to data collection, the law of large numbers, and constructing empirical probability distributions
  - 3) Play the game using the points you assigned to each position in question 2. How many rolls did it take for a person to reach 100 points? Based on the considerations you used to assign points, do you think that your point assignment is reasonable? Why or why not?
    - Allows students to think about how point assignment impacts game length and variability in game length
  - 4) How many turns to you think it would typically take for someone to win the game? Do you think the game we played took more or less rounds than usual?
    - Exposes students to the use of computer simulation to obtain empirical sampling distributions that are then used to make informal inferences



## Reflections

- Hands-on activity is helpful for fostering conceptual understanding
- Students were highly engaged throughout the activity
- Students like seeing how the simulated sampling distributions change based on point assignments
- Activity provides many opportunities to formally and informally introduce fundamental statistical concepts

## Extensions

- **Introductory statistics:** Derive empirical probability distributions, construct empirical sampling distributions
- **Probability and mathematical statistics:** Calculate expected values and standard deviations
- **Statistical computing:** Write code for simulation
- Can also consider rolling more than one die