

Statistics Project—Testing for Loaded Dice

The Question: How can we decide if a pair of dice is “fair” or “crooked”? If each face of a die is equally likely to end face up then we say the die is “fair”. Otherwise we say the die is “crooked”. Imagine that you are the pit boss for the dice table at a Las Vegas casino and the shooter has rolled 6-1 seven straight times—do you think he has slipped a pair of loaded dice onto your table?

Basic Test: Roll the dice n times and then make a judgment that the dice are “fair” or “crooked”. Also specify a confidence level for your assessment.

Simplifying Assumption: The primary concern for our casino employers is the possibility of “Ace-Six Flats” (A6Fs) being introduced into the game. A6Fs have a higher probability of a one or a six ending face down. Thus we can consider this in the light of the binomial distribution with events $\{1,6\}$ and $\{2,3,4,5\}$. See text chapters 13 and 20 for details.

Getting Started: You will want to understand the following: how to compute confidence levels, how to estimate population proportions, and how to test hypothesis. Make up several fake sets of test data and do the hypothesis testing with these data sets. From those results estimate how many trials you will want to do

First Meeting: Prior to the meeting do the “Getting Started” exercise. Meet with your instructor and explain the mock hypothesis testing that you did. Explain your project in terms of what hypothesis you will be testing for, how you will establish a confidence level, type I and type II error rates, a source of dice for testing, and what could go wrong. Write a summary of this meeting and turn it in to the instructor.

Experimental Protocol: Based on the decisions from the First Meeting make up an experiment protocol and data collection strategy. Review this protocol with your instructor (second project meeting).

Conduct Tests and Compute Statistics: Your team should end up with a table of test results and a table of statistics based on the test results.

Third Meeting: Present your results. If there are problems with the testing procedures resolve them and run the tests again. Discuss what conclusions are justified. Discuss every section of the project report and what should be there.

Write Project Report Draft: Use the guidance from the Third Meeting to write your draft report.

Fourth Meeting: Present your draft report to the instructor. Use your instructor’s critique to write the final report.

Write the Project Report.

Additional Project Guidelines:

Due Dates

[Report Format](#)

[Report Writing Cautions.](#)