CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Thomas T. Wooding

Project Number
J1227

Project Title
Is the Roll of a Die Fair?

Abstract

Objectives/Goals
The purpose of this experiment is to determine if the shape of a die affects the fairness of the roll.

Methods/Materials
1.I will roll each polyhedral dice 25 times per side.
A)Tetrahedron # 4 sided die will be rolled 100 times
B)Cube # 6 sided die will be rolled 150 times
C)Octahedron # 8 sided die will be rolled 200 times
D)Decahedron # 10 sided die will be rolled 250 times
E)Dodecahedron # 12 sided die will be rolled 300 times
F)Icosahedron # 20 sided die will be rolled 500 times
2.I will then make a non-isohedral pentahedral out of cardboard.
3.I will roll the non-isohedral die 25 times per side.
A)Pentahedral # 5 sided die will be rolled 125 times
4.All dice will be rolled under the same conditions.
5.I will then analyze and compare the results.

Results
For all the die, except for the non-isohedral pentahedron, the die landed within 10% of the expected value for each face. The expected value was the total number of rolls divided by the number of faces.

Conclusions/Discussion
My hypothesis was correct. The tetrahedron, cube, octahedron, decahedron, dodecahedron and the icosahedrons are fair dice. The experiment proved that each die would land on each face within 10% of the expected value. The research also showed this to be true based on Euler#s Equation. The non-isohedral pentahedron is not a fair die because the faces are not identical. Because the faces have different shapes and surface areas, the die landed on the large triangular faces more frequently than on the smaller rectangular ones. The biggest problem I had in this experiment was finding a non- isohedral die. In fact I couldn#t, so I had to make one. If I were to do this experiment I would like to use a bigger selection of dice.

Summary Statement
Does the shape of a die affect its fairness?

Help Received
N/A