CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
J1210

Project Title
Step Right Up! Carnival Game Probability

Abstract

Objectives/Goals
My objective was to find the real chance of winning a prize at a carnival dice game, and what the operator needs to charge to make a profit. In my hypothesis I stated that I think there is at least a 3 in 6 chance of winning. For the operator to make a profit, he should charge at least $2.00 due to the costs of the prizes.

Methods/Materials
I learned probability by solving practice problems so I would have no problem solving my main problem. Then I designed my number tree that would help me with my figuring. I looked for the branches that had one, two, and three of a number 1-6 to find my probabilities. Then I needed to find the expected value, the amount of money on average that it costs the operator per player.

Results
When my teacher said the results I came up with were wrong, I tried to figure out her point of view but I kept getting my same answer. I realized there might be two ways to look at this problem: the player#s point of view or the operator#s point of view. Players point of view: I learned that the number choice does not affect the probability of winning a certain prize. Operator's point of view: you would include the probability of the player choosing a number as well as the probability of the dice showing that number. The answers that I originally got were correct and if the probabilities are the same, the expected value would not change.

Conclusions/Discussion
I found that my hypothesis was completely incorrect. If the real probability of winning was 3/6,or ½ then the game would be fair but it is not. The probability of winning is actually closer to 1/3 (25/72). Carnival game operators want you to think that a game is fair like I did, so that you will play. If you knew that the probability of winning a game was only about 1/3, most likely you would not waste your money. I also incorrectly thought that the operator would have to charge at least $2.00 to make a profit because of the cost of the prizes. Now I realize what a huge profit carnival game operators make if they only lose on average 60 cents per player (this varies for different games) but charge up to $2.00 for each person to play. That is an enormous profit of 70%. Now I see carnival games as a gambling device directed at children. Another thing I learned from this is that some probability problems are tricky. There may be several ways of going about solving a problem.

Summary Statement
The probability of winning a prize at a carnival game.

Help Received
My Sister helped in checking work.