MATH 1300, Mathematical Explorations

Is it worth it?

Assignments

1. How much would you be willing to pay to play a game in which you roll a die and win $100 if you roll a 1? ($1? $10? $20?) What if it was a 12-sided die (numbered 1-12)? What if it was a 20-sided die? Justify your answers.

2. Let us consider an American-style roulette wheel. (We'll simplify the rules a bit to make it easier for us.) A roulette wheel has 38 slots, with two numbered 0 and 36 numbered 1-36; the 0s are green, while all of the other numbers are red or black. The wheel is spun, and a ball is rolled in the other direction around the wheel. Eventually the ball stops in one of the slots. You may gamble on the number of the slot (1-36) (payout: 35 to 1), whether the slot is red or black (payout:1 to 1), or whether the number is even or odd (payout: 1 to 1). Note that it is impossible to win if the ball lands on 0. Here, payout is how much you win relative to your bet, so if you bet $1 on "black" you get $2 back: $1 for your stake back, and $1 payout. The payout on getting a number correct is 36 times your original bet. Explain why, in the long run, the house always wins.

3. There have been many betting systems developed for roulette, most of which rely on the "gambler's fallacy." Explain the gambler's fallacy in your own words. Describe an example of the gambler's fallacy outside of gambling. (Expected length: 2 paragraphs.)

4. Consider the famous Monty Hall problem. You are on a game show in which there are three doors. Behind one door there is a car, and behind the others there are goats (i.e. things you do not want). You choose a door but do not yet open it. The host then opens another door and shows you that there is a goat behind it; he gives you the option to switch which door you want to pick. Should you switch? Justify your answer. (Expected length: 1 paragraph.)

Follow-on activities

Reasoning about Probability

Monty Hall