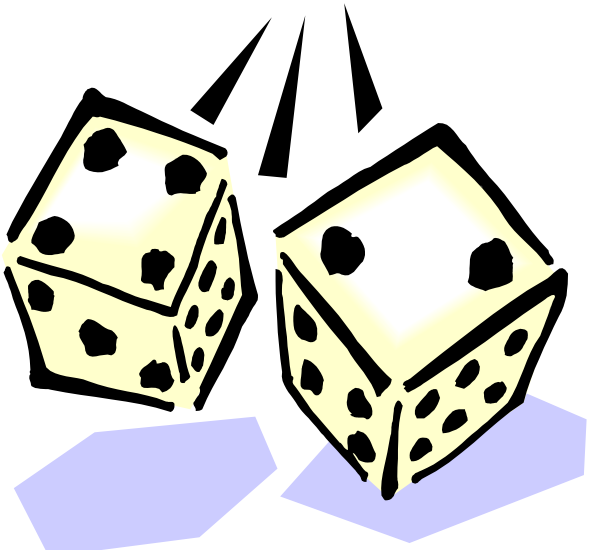
Game of Chuck-a-Luck



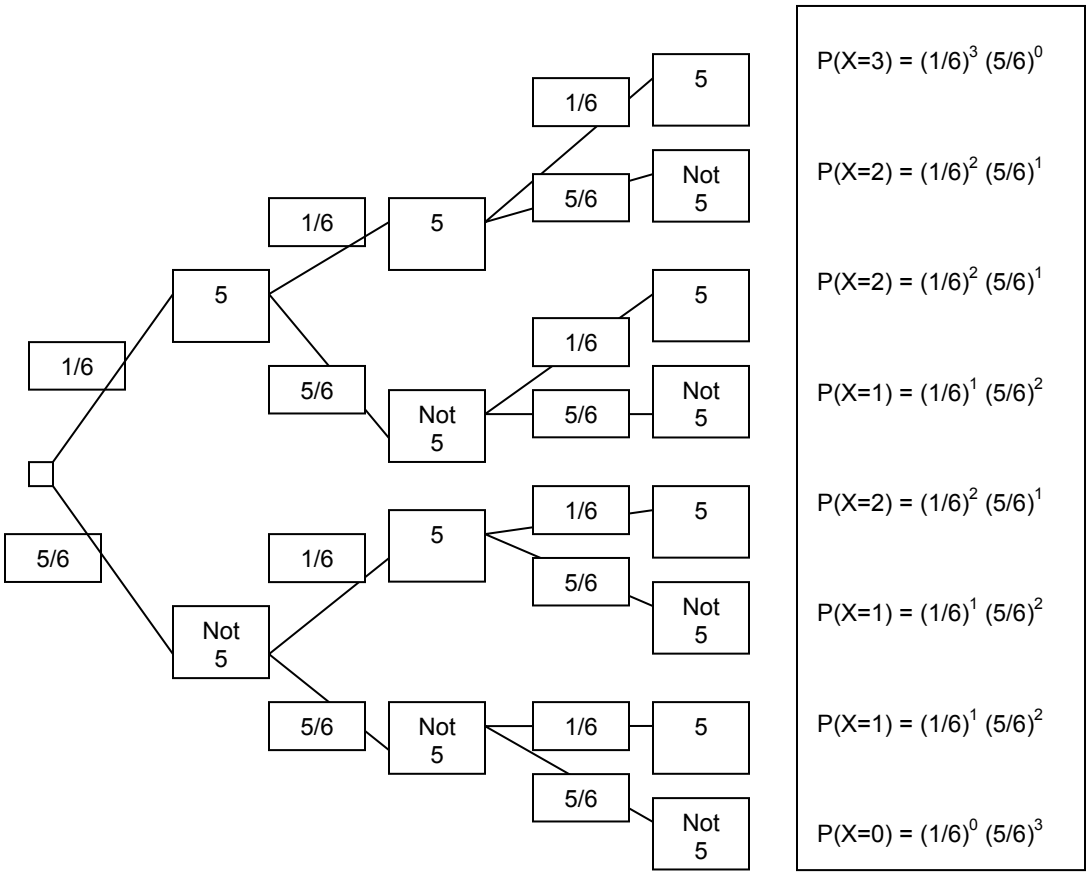
In the game of Chuck-a-Luck three fair dice are rolled. You as the "bettor" are allowed to bet $1 on the occurrence of one of the integers 1, 2, 3, 4, 5, or 6. Suppose you bet on the occurrence of a "5". Then if any 5's occur on the 3 dice, you get your $1 bet back. In addition, if one 5 occurs (on the 3 dice) you win $1, if two 5's occur you win $2, and if three 5's occur you win $3. If no 5's occur you lose your dollar.

1. In the long run, what amount of money would you expect to be paid (or lose) for one bet in the Chuck-a-Luck Game?

2. If you played 100 games, how much money would you expect to win (or lose)? Why?

3. Is the Chuck-a-Luck Game fair?

Tree Diagram of Chuck-a-Luck Game



P(X=3) = 1/216 P(X=2) = 15/216 P(X=1) = 75/216 P(X=0) = 125/216

E(X) = -\$1 (125/216) + \$1 (75/216) + \$2 (15/216) + \$3 (1/126) = -\$(17/216) ≈ -\$0.08

On average, you should expect to lose approximately \$0.08 each time you play a round of the game. In approximately 100 games, one should expect to lose \$8.

Although the first statement does not make much sense, it does provide us with information that allows us to make predictions about what will happen in the long run.