Games of Chance Roulette

Uniform probability spaces

Probability of outcomes and events

Several games of chance

- Roulette
- Dominoes
- Poker
- Backgammon

Roulette

Game

Probabilities

Profit

Practice

Uniform spaces

Selection with replacement

Basics

France

17th century

Blaise Pascal

Little wheel

More later

Wheel

Integers from 1 to 36

and 0

Spin wheel and a ball

Bet on where ball will lands

French
European

American

Russian

Bets

Place 1 token bet

Bet	Return
Number	36
Red, Black Even, Odd Low, High	2
1-12, 13-24, 25-36 $( )_3=0$, $( )_3=1$, $( )_3=2$	3

Probabilities

Individual outcomes

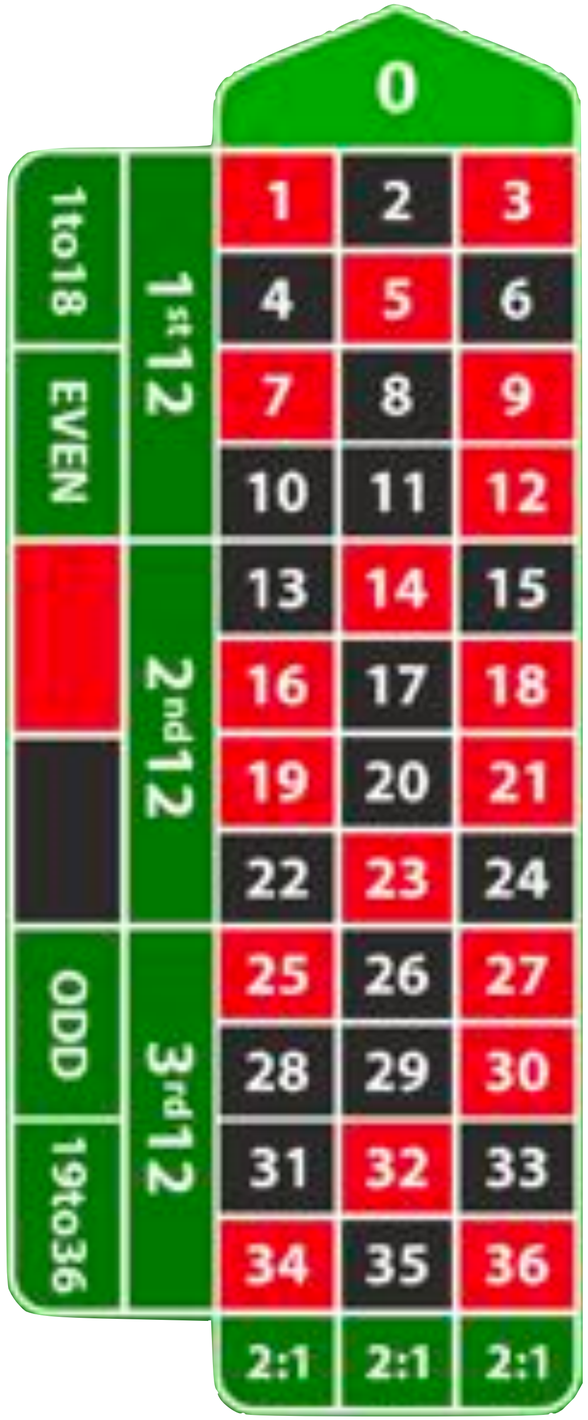
$\Omega = \{ 0, 1, 2, \ldots, 36 \}$

$|\Omega| = 37$

Equiprobable ⓤ

$P(0) = P(1) = \ldots = P(36) = \frac{1}{|\Omega|} = \frac{1}{37}$

“Should be” 1/36
but 1/37
because of 0



Events

Even = { 2, 4,…, 36 } | Even | 18

“Should be” half, but slightly smaller because of 0

U

$$P(\text{Even}) = \frac{|Even|}{|\Omega|} = \frac{18}{37}$$

| Odd | | Red | | Black | | 1 to 18 | | 19 to 36 | 18

P(…) = 18 / 37

| 1 to 12 | … | ( )3 = 0 | 12

P(…) = 12 / 37

Win or Lose?

How much can you expect to make on Roulette?

One game

Random

Many games

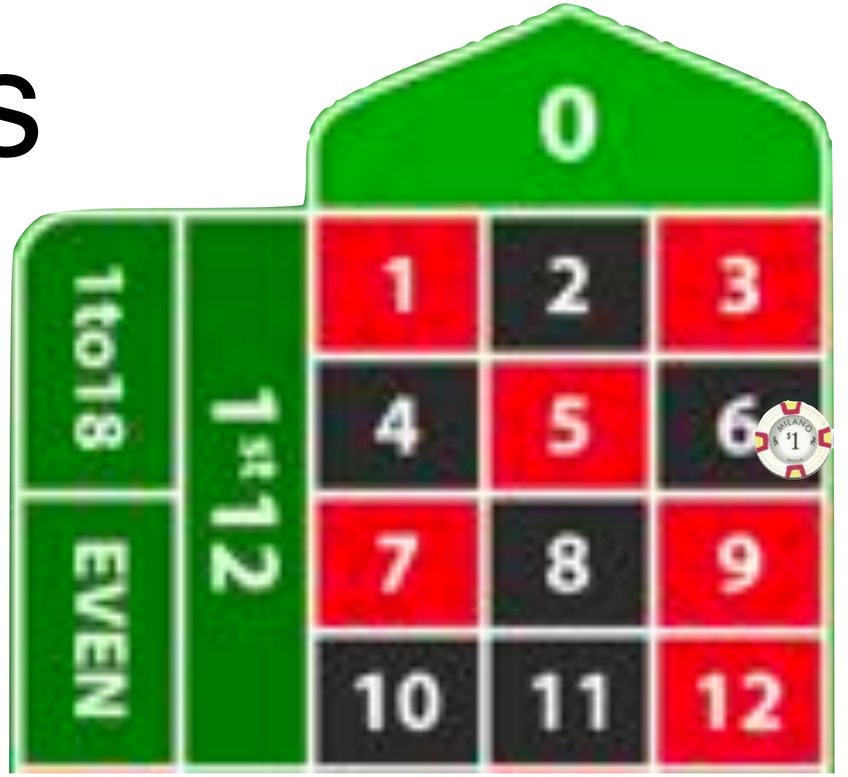
Expected profit or loss

Simplicity

Each bet $1

Two bet types

Single-Number Bets



Always bet on single number **6**

games n large

Bet 1 each game total n

Get correct $\approx \frac{n}{37}$ games 36 each Total $\frac{36}{37}n$

Gain $n - \frac{36}{37}n$ $-\frac{1}{37}n$

Lose ¢2.7 per $ bet 2.7%

House edge (advantage)

Bet Red

Always bet Red

games n large

Bet 1 each game total n

Get correct $\frac{18}{37}n$ games 2 each Total $\frac{36}{37}n$

Gain $n - \frac{36}{37}n$ $-\frac{1}{37}n$

House edge ≈ 2.7% Again

Later Why same How different

Now High or low vs. other games Absolute

House Edge

Game	Edge (%)	σ
Pai Gow Poker	1.46–2.70	0.75
Baccarat	1.06–1.24	0.93–0.95
Craps	1.36–16.67	0.99–5.09
Roulette	2.70	5.26
Blackjack	0.28–2.27	1.14–1.32
Sic Bo	2.78–33.33	1–2.42
Caribbean Stud	2.36–5.22	2.24–2.75
Video Poker	0.46–1.40	4.42–8.08
Slots	2–15	8–10
Keno	25–29	1.94–41.06

Later

Single 0

Double 0

On your own

Low or High

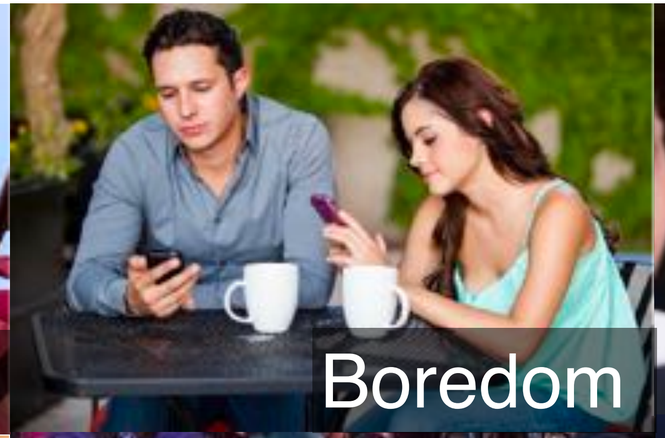
Las Vegas

Macau

Why Gamble?

Not a good way to make $

Why gamble



Not all is for $

Why travel?

movies?

Perhaps not even $

Roulette

Game

Probabilities

Profit

Lose 2.7% per game

Practice

Uniform spaces

Selection with replacement

Dominoes