

Games of Chance

Uniform probability spaces

Probability of outcomes and events

Several games of chance

Roulette

Dominoes

Poker

Backgammon



Roulette

Game

Probabilities

Profit

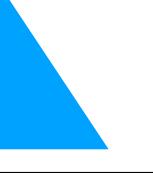
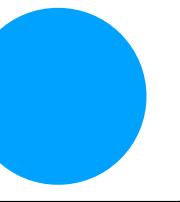
Practice

Uniform spaces

Selection with replacement



Basics

First  .. now 

France

17th century

Blaise Pascal



Wheel

Integers from 1 to 36

and 0

Spin wheel and a ball

Bet on where ball will land

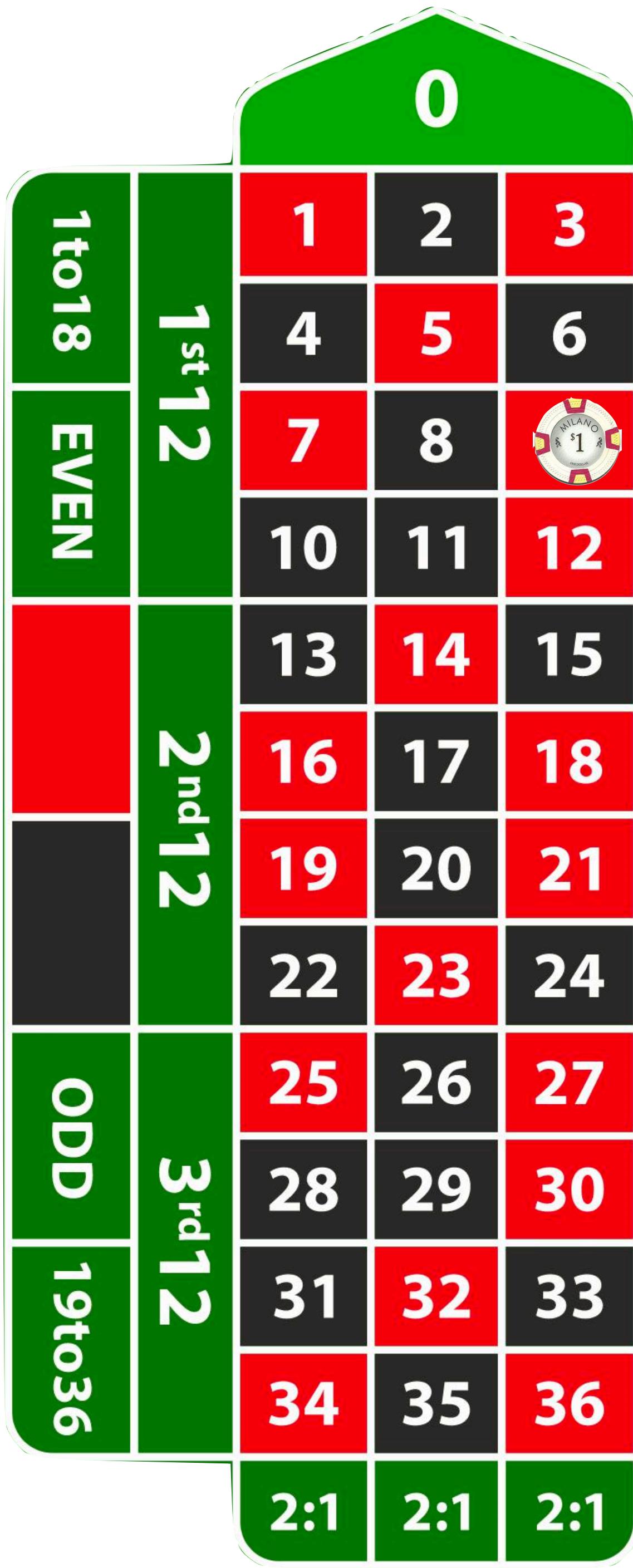
French
European

American



Russian





Bets

Place 1 token bet



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



Probabilities

Individual outcomes

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

$$|\Omega| = 37$$

Equiprobable

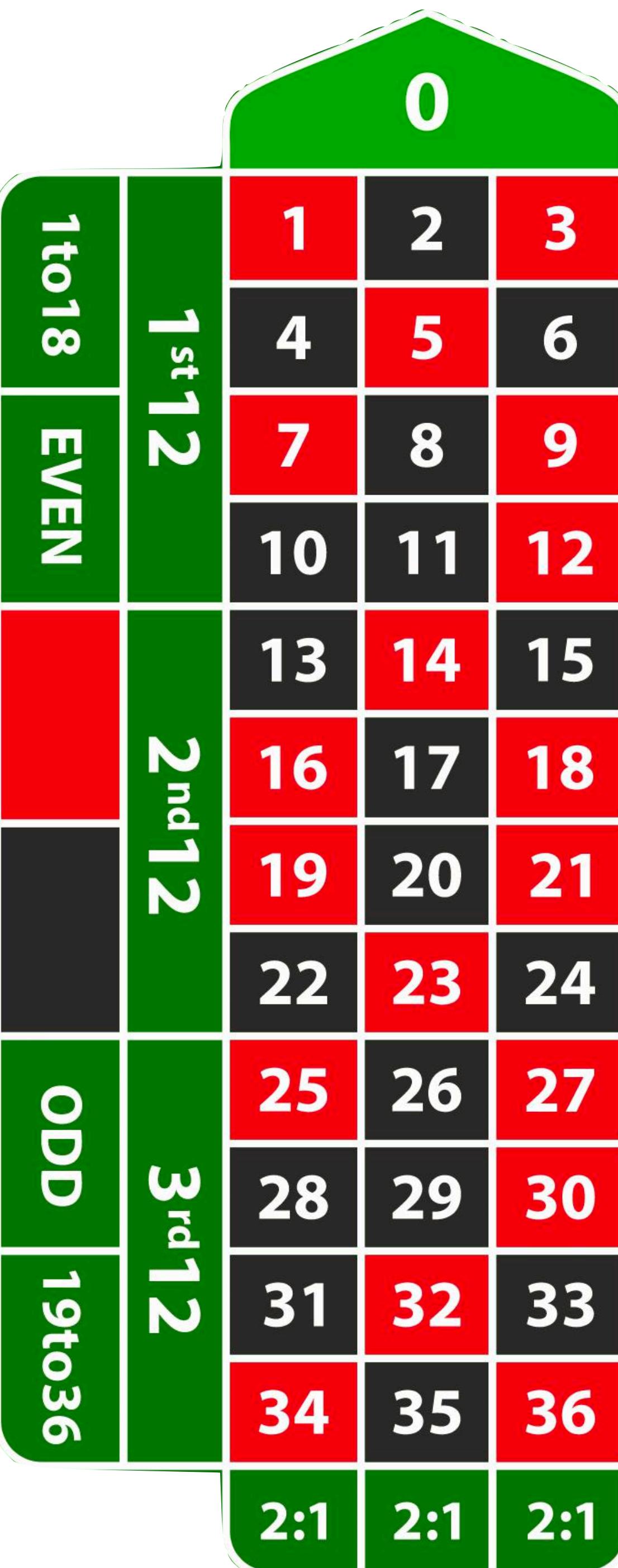
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$$P(0) = P(1) = \dots = P(36) = \frac{1}{|\Omega|} = \frac{1}{37}$$



“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

$$P(\dots) = 18 / 37$$

| 1 to 12 |

...

| ()_3 = 0 |

12

$$P(\dots) = 12 / 37$$

Win or Lose?

How much can you expect to make on Roulette?

One game

Random

Many games

More predictable

Expected profit or loss

Simplicity

Each bet \$1

Evaluate 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

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

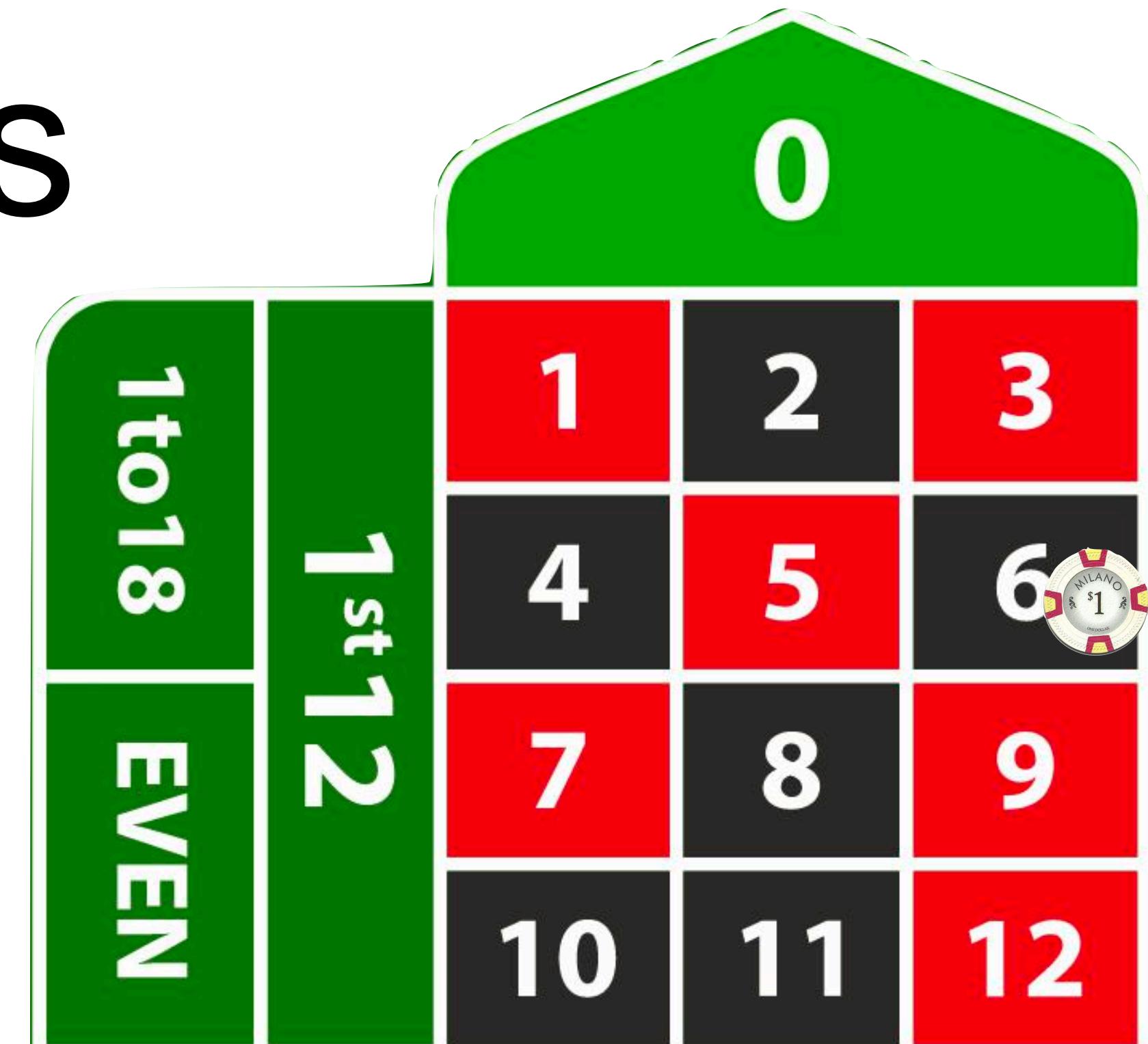
$-\frac{1}{37}n$

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

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

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

House edge

$\approx 2.7\%$

Again

Later

Why same

How different

Now

High or low

vs. other games

Absolute

0	1	2	3
1	2	3	4
4	5	6	7
7	8	9	10
10	11	12	13
13	14	15	16
16	17	18	19
19	20	21	

1to18 1st12 EVEN 2nd12

House Edge in other Games

Game	Edge (%)	σ	Later
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	0.99~5.76	
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	

Single 0 Double 0

On your own

2.7% - Low or High?



Las Vegas



Macau

THE WEEK

How did Americans manage to lose \$119 billion gambling last year?



Why Gamble?

Not a good way to make \$

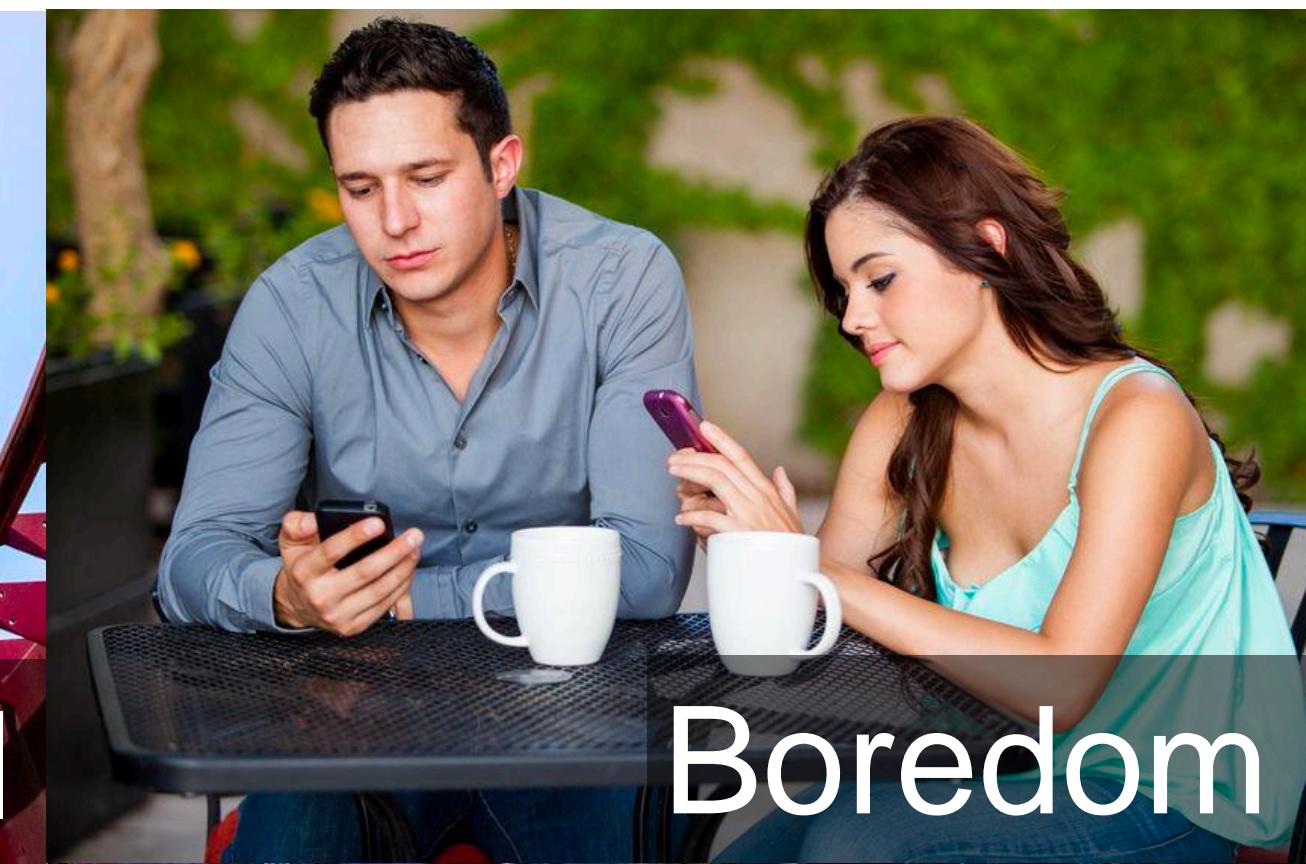
Why gamble



Make a killing



Thrill



Boredom



Glamour



Free drinks



Good food



Shows



Tell Stories

Why?

Travel?

Movies?

Not all is for \$

Perhaps not even \$

Roulette

Game

Probabilities

Profit

Lose 2.7% per game

Practice

Uniform spaces

Selection with replacement



Dominoes

