

Games of Chance

The background of the slide is a vibrant collage of various gambling-related items. In the upper right, several playing cards are fanned out, including an Ace of Spades and a King of Hearts. Below the cards, a roulette wheel is partially visible, showing its numbered pockets and a small ball. In the center, there are several roulette chips in red, green, and yellow. To the left, a stack of dominoes is visible. In the bottom right corner, a row of black dominoes is shown, some standing upright and others falling. The overall theme is games of chance.

Roulette

Uniform probability spaces

Probability of outcomes and events

Several games of chance

Roulette

Dominoes

Poker

Backgammon

Roulette

A close-up, slightly blurred photograph of a roulette wheel in a casino. The wheel is made of wood and metal, with numbers 1 through 36 arranged in a circular pattern. The numbers are colored red and black, with green for the 0 and 00. A small yellow ball is visible on the wheel. In the background, a croupier in a red shirt is visible, along with other players and the green felt of the roulette table.

Game

Probabilities

Profit

Practice

Uniform spaces

Selection with replacement

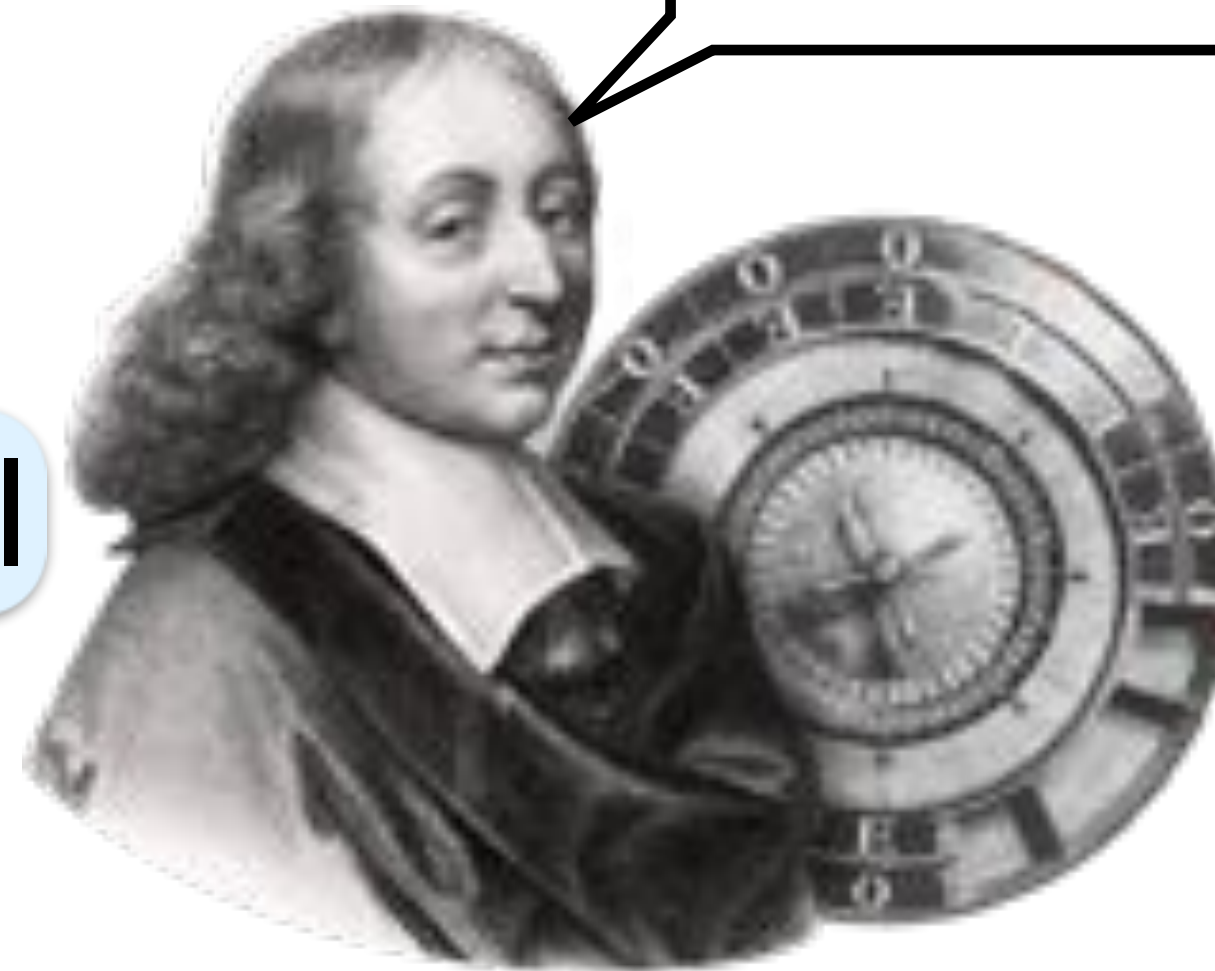
Basics

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



		0		
1to18	1 st 12	1	2	3
EVEN		4	5	6
		7	8	
	2 nd 12	10	11	12
		13	14	15
		16	17	18
	3 rd 12	19	20	21
		22	23	24
		25	26	27
ODD	19to36	28	29	30
		31	32	33
		34	35	36
		2:1	2:1	2:1

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

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

$$|\Omega| = 37$$

Equiprobable $\textcircled{\text{U}}$

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



“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

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

| Odd |

| Red |

| Black |

| 1 to 18 |

| 19 to 36 |

18

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

| 1 to 12 |

...

| ()₃ = 0 |

12

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

0		
1 to 18 EVEN	1 st 12	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
	2 nd 12	25 26 27 28 29 30 31 32 33 34 35 36
	3 rd 12	2:1 2:1 2:1
1 to 18 ODD	19 to 36	

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

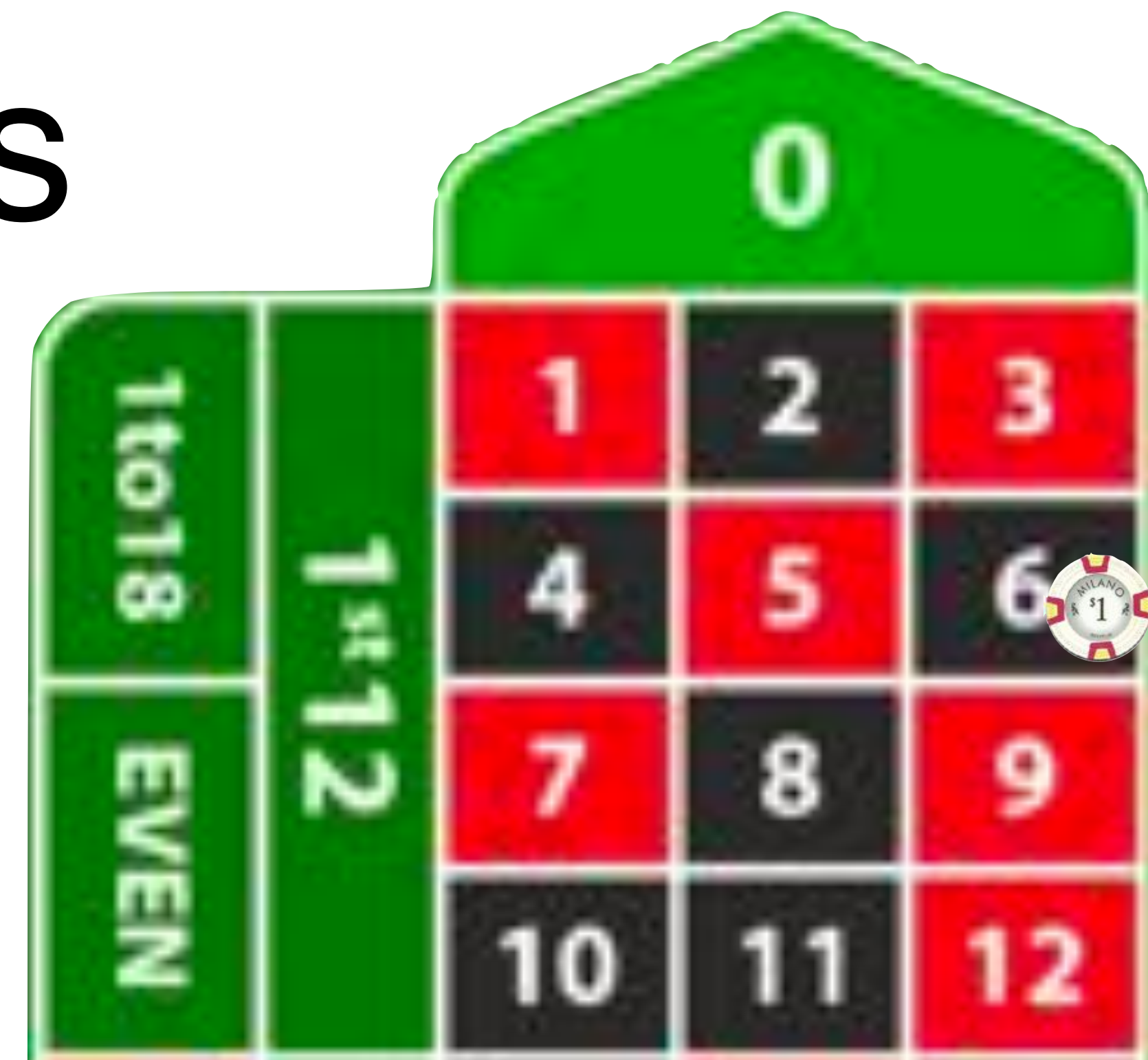
Bet 1 each game total n

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)



0		
1 to 18	1 to 12	<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> <div>12</div>



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

$\approx 2.7\%$

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	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

Later

Single 0

Double 0

On your own

Low or High



THE WEEK

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



Why Gamble?

Not a good way to make \$

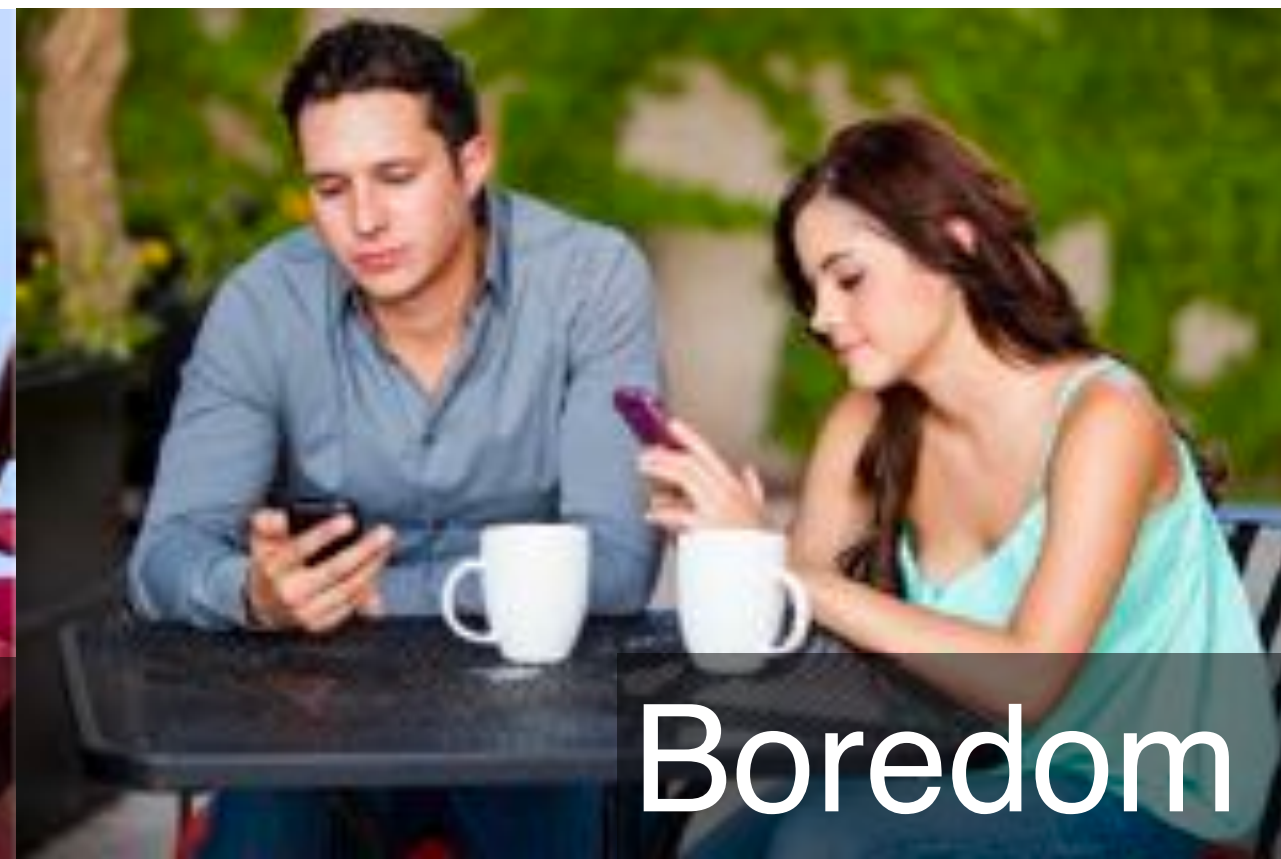
Why gamble



Make a killing



Thrill



Boredom



Glamour



Free drinks



Good food



Shows



Tell Stories

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

