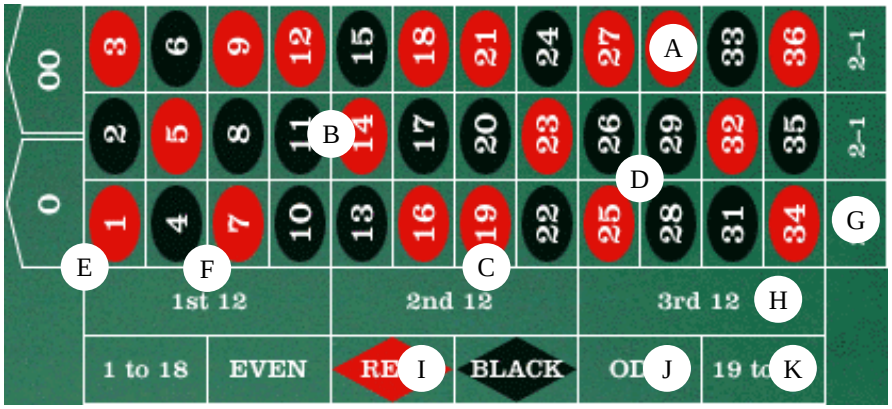
Example: American Roulette

American Roulette Wheel

- In American Roulette the wheel consist of 38 identical slots, numbered from 0, 00, 1 through 36.
- Zero and double zero are both green pockets, while the remaining 36 are split evenly between red and black.
- On the standard roulette wheel the numbers are not distributed in increasing series or randomly.
- On the contrary, the numbers are ordered to achieve a certain mathematical balance between high and low, red and black and even and odd.
- Numbers face the outside of the wheel.

American Roulette Table Layout and Payoffs



Roulette Inside Bets

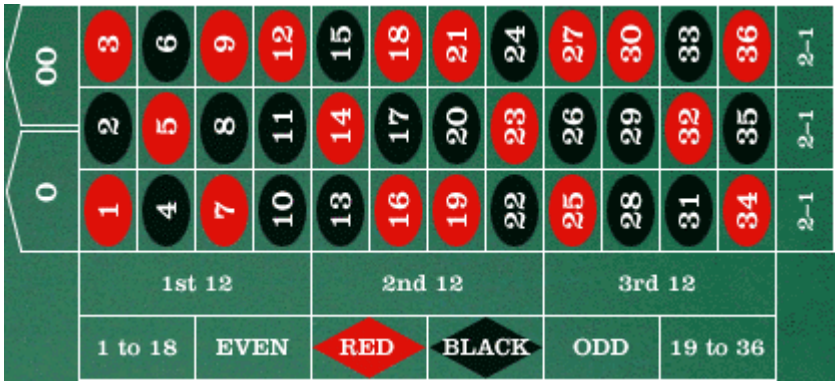
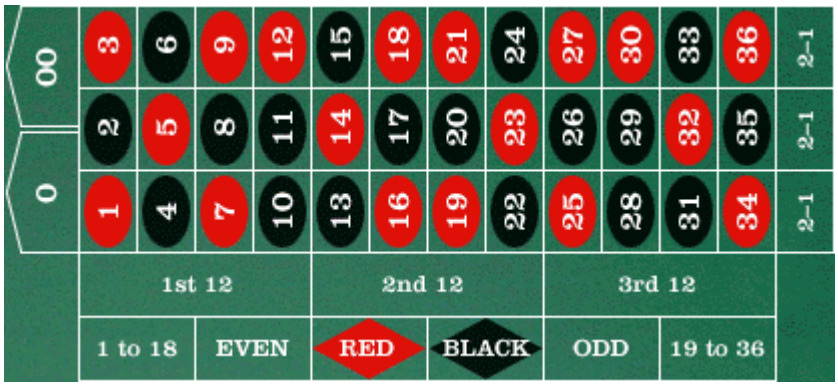
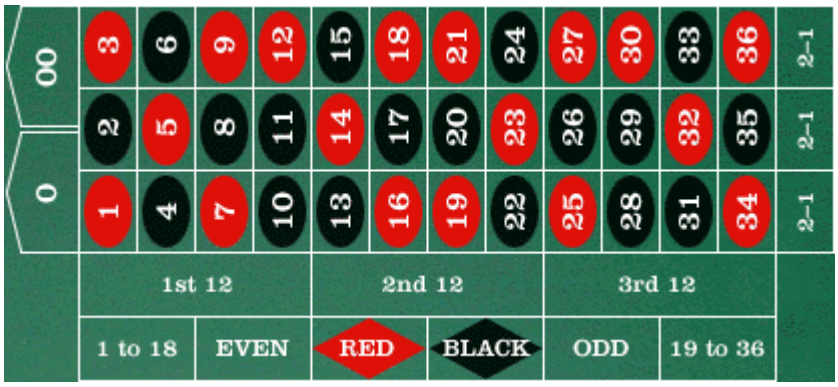
Wager	*Example*	*Bet on*	*Payoff*	*Probability*
Straight up	A	30	35:1	1/38
Split Bet	B	11 or 14	17:1	2/38
Street Bet	C	19, 20, 21	11:1	3/38
Corner	D	25, 26, 28, 29	8:1	4/38
Five Numbers	E	0, 00, 1, 2, 3	6:1	5/38
Line Bet	F	4, 5, 6, 7, 8, 9	5:1	6/38

Roulette Outside Bets

Wager	*Example*	*Bet on*	*Payoff*	*Probability*
Column	G	Set of column numbers	2:1	12/38
Dozen	H	25 through 36	2:1	12/38
Red or Black	I	Red numbers	1:1	18/38
Even or Odd	J	Odd numbers	1:1	18/38
Low or High	K	19 through 36	1:1	18/38

Let's play three rounds of Roulette:

Suppose you have 20 one dollar chips.

Round	Place bets on the Roulette Table	Record your winnings
1		
2		
3		

Optimal Target Hitting Strategy:

Suppose you have $80 to bet and you would like to hit the target of $100. Suppose we focus on the Red or Black bet.

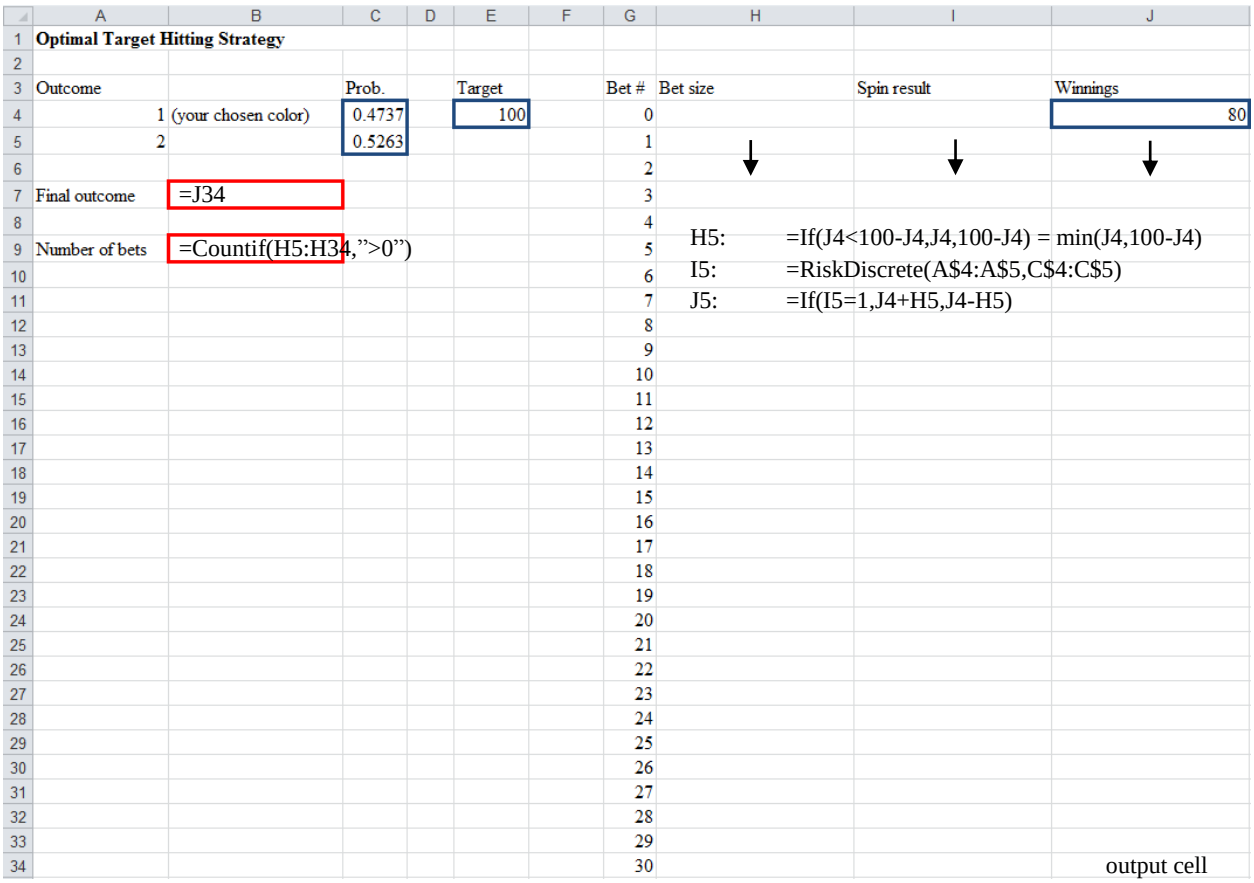
	A	B	C	D	E	F	G	H	I	J
1	**Optimal Target Hitting Strategy**									
2										
3	Outcome		Prob.		Target		Bet #	Bet size	Spin result	Winnings
4	1	(your chosen color)	0.4737		100		0			80
5	2		0.5263				1	20	2	60
6							2	40	2	20
7	Final outcome	100					3	20	1	40
8							4	40	1	80
9	Number of bets	6					5	20	2	60
10							6	40	1	100
11							7	0	2	100
12							8	0	2	100
13							9	0	1	100
14							10	0	1	100
15							11	0	2	100
16							12	0	2	100
17							13	0	2	100
18							14	0	2	100
19							15	0	1	100
20							16	0	2	100
21							17	0	1	100
22							18	0	1	100
23							19	0	1	100
24							20	0	1	100
25							21	0	2	100
26							22	0	1	100
27							23	0	2	100
28							24	0	1	100
29							25	0	2	100
30							26	0	2	100
31							27	0	2	100
32							28	0	1	100
33							29	0	2	100
34							30	0	2	100

Strategy:

- Bet the difference between 100 and your balance (what you have) if you have enough money.
- If your balance is not enough to get you to 100, then bet all you have.

The idea is to hit the target as soon as possible.

Specify the @Risk Model in Excel:



	A	B	C	D	E	F	G	H	I	J
1	**Optimal Target Hitting Strategy**									
2										
3	Outcome		Prob.		Target		Bet #	Bet size	Spin result	Winnings
4	1	(your chosen color)	0.4737		100		0			80
5	2		0.5263				1			
6							2			
7	Final outcome	=J34					3			
8							4			
9	Number of bets	=Countif(H5:H34,">0")					5	H5:	=If(J4<100-J4,J4,100-J4) = min(J4,100-J4)	
10							6	I5:	=RiskDiscrete(A$4:A$5,C$4:C$5)	
11							7	J5:	=If(I5=1,J4+H5,J4-H5)	
12							8			
13							9			
14							10			
15							11			
16							12			
17							13			
18							14			
19							15			
20							16			
21							17			
22							18			
23							19			
24							20			
25							21			
26							22			
27							23			
28							24			
29							25			
30							26			
31							27			
32							28			
33							29			
34							30			output cell

What's the probability of hitting the target?

Detailed Statistics: Target (Value) = 0 → Target (%) = 22.55%
Prob(Final Winning = 0) = Prob(Final Winning <= 0) = 22.55%
Prob(Final Winning = 100) = 1 – Prob(Final Winning = 0) = 1 – 22.55% = 77.45%