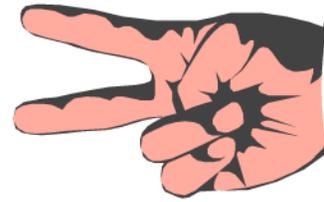
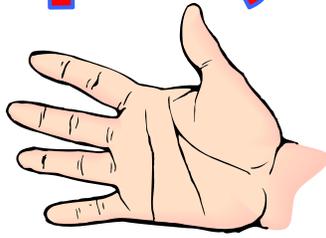
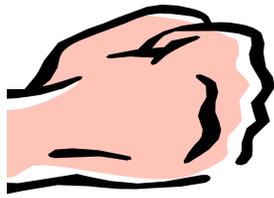


# Rock, Paper, Scissors



This is an old game that you probably played as a kid. Do you remember? Each player, on the count of three, makes their hand into:

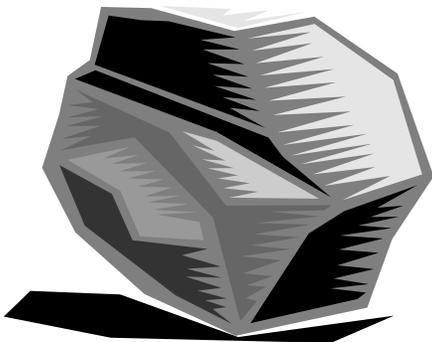
- **Scissors -- two fingers extended**
- **Paper -- palm flat down**
- **Rock -- make a fist**

Scissors cuts (beats) Paper, Paper wraps (beats) Rock and Rock breaks (beats) Scissors. If two players form the same symbol, then that game is drawn. Is this a fair game? If you played that game 100 times, what outcomes would you expect? If you played the game several hundred times, what outcomes would you expect?

We could get in small groups, play the game, and carefully record each outcome. I am sure you would agree, that would be tedious and could take hours. Once you understand how spreadsheets work, however, we can quickly set up a mathematical simulation that will play the games for us and accurately keep track of the results.

Here's how our simple spreadsheet will work:

- Each of two players will be assigned a column in our spreadsheet (Ann, A; Bob, D).
- Column A and D use a random number generator to create the whole numbers 1, 2, and 3.
- Column B and D use an IF statement to "convert" each of these numbers to a player's hand symbol (3=scissors, 2=paper, 1=rock).
- Column G will use algebraic statements to determine who wins each game.
- Columns I and J are used to convert wins into 1's and losses into 0's. This will allow us to use the SUM Function to total the number of games each player wins.
- Cells K6 and L6 will total the number of games each player wins.
- The "Fill" feature will allow us to quickly and easily play and record the outcomes of any number of games we choose to play.



Column	Heading
A1 & B1	Ann
C1	"Blank"
D1 & E1	Bob
F1	"Blank"
G1	Winner
H1	"Blank"
I1	"Blank"
J1	"Blank"
K1	Games Ann Won
L1	Games Bob Won
M1	Draws

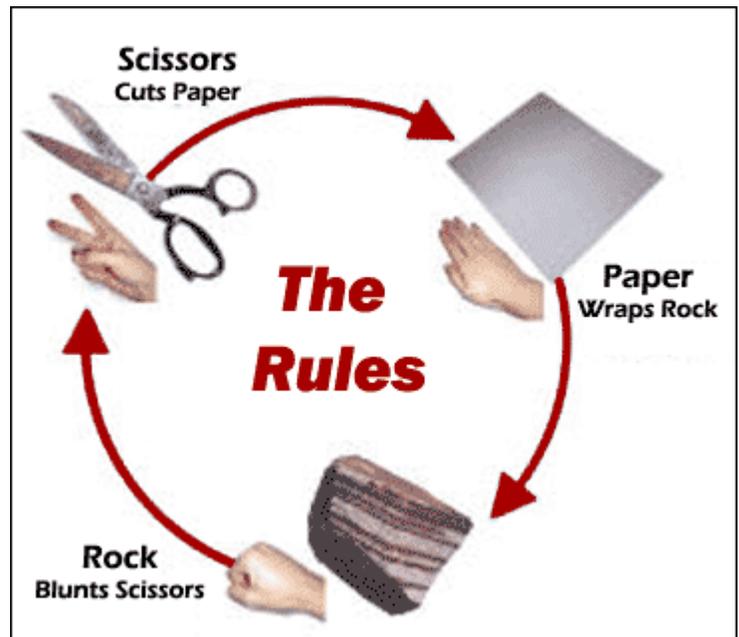
	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		1 rock		2 paper		Bob			0	1	73	56	66
3		1 rock		3 scissors		Ann			1	0			
4		2 paper		3 scissors		Bob			0	1			
5		3 scissors		3 scissors		draw			0	0			
6		1 rock		2 paper		Bob			0	1			
7		3 scissors		3 scissors		draw			0	0			
8		3 scissors		1 rock		Bob			0	1			
9		2 paper		2 paper		draw			0	0			
10		1 rock		3 scissors		Ann			1	0			
11		3 scissors		3 scissors		draw			0	0			
12		2 paper		3 scissors		Bob			0	1			
13		2 paper		1 rock		Ann			1	0			
14		3 scissors		2 paper		Ann			1	0			
15		2 paper		3 scissors		Bob			0	1			
16		3 scissors		3 scissors		draw			0	0			
17		2 paper		2 paper		draw			0	0			
18		2 paper		2 paper		draw			0	0			
19		2 paper		3 scissors		Bob			0	1			
20		2 paper		1 rock		Ann			1	0			
21		1 rock		3 scissors		Ann			1	0			
22		3 scissors		3 scissors		draw			0	0			

### Functions

A2	=IF(RAND() $<$ 1/3,3,IF(RAND() $>$ 2/3,1,2))
B2	=IF(A2=3,"scissors",IF(A2=2,"paper",IF(A2=1,"rock")))
C2	"Blank"
D2	=IF(RAND() $<$ 1/3,3,IF(RAND() $>$ 2/3,1,2))
E2	=IF(D2=3,"scissors",IF(D2=2,"paper",IF(D2=1,"rock")))
F2	"Blank"
G2	=IF(A2-D2=1,"Ann",IF(A2-D2=-1,"Bob",IF(A2-D2=2,"Bob",IF(A2-D2=-2,"Ann","draw"))))
H2	"Blank"
I2	=IF(G2="Ann",1,0)
J2	=IF(G2="Bob",1,0)
K2	=SUM(I2:I196)
L2	=SUM(J2:J196)
M2	=COUNT(A2:A196)-K2-L2

You can quickly complete this project by copying-and-pasting the formulas and functions (which are all placed in ROW 6). If you have never worked with this type of computer logic before -- it can be confusing to look at.

Once you have your headings in place (ROW 1) and the above formulas in the correct column in ROW 2, use the **F9** to recalculate your game and verify it works. The results should immediately update.



We can finish the project quickly then by filling COLUMNS A-J down to row 196. To recalculate your sheet and verify the game works and the outcomes are fairly equally distributed, hit the F9 key.