



# The Theory

Me they are organized therefore:

- Before you story little of Theory in order to help you to fix some basic ideas
- Then I examine some traditional figures (like the search of the Woman with 9 carts in the suit that give to the title it to the Section of the Situated one) with the eyes of Declaring
- some considerations from the part of the Defender Follow
- statistics finishes itself with the application to the declaration, is understanding it with more questions that answers.

I would want that the things that you will read you can be useful in the practical one. Of against many of the calculations that we will make they will be unattainable to the table because of their complexity of is thinkable that you can carry with you your portable computer. Then every a lot we will stop and compress in pills the acquired information, if you will succeed to remember these pills and to apply them correctly my scope is caught up (and creed also yours).

Good reading.

## Modality of distribution of the Cards

As they are arranged the cards depend exclusively on the way in which they come stirred.

If we suppose to use the manual distribution a serious problem exists of which holding account. We say that as soon as you have ended to play a hand in which all the players put tidily the cards if after every played and to before taken the forward a Spades has intavolato on which all they have answered. To the end player collects the 4 pile collecting into a pile them and, we suppose, redistributes without to stir. The 4 cards of Spades of before played of the previous hand will occupy places 13, 26, 39 and 52 of the recomposed bunch and will come respective delivered to the players 1<sup>^</sup>, 2<sup>^</sup>, 3<sup>^</sup> and 4<sup>^</sup> of hand.

One before immediate consequence of a how much illustrated and that a division of the suit of Spades is IMPOSSIBLE with a pole 11<sup>^</sup> or more, other consequence and that if memory the 4 cards of before taken of the previous hand when I discover who has 3 of these cards is in a position to stable where it is the 4<sup>?</sup>.

Hour we consider that of these pile it orders some to you ve are various in the bunch for the distribution and that we have the bad habit to stir little only separating in part quatrains produced in the previous hands one. It achieves some that the manual distribution stretches to favor the regular distributions to damage of the others.

The problem was sure famous, the better solution that I can supply to you and to stir separately every single pile of 13 cards and then to increase considerable the number of the mix. An other

good system and that one to scatter the cards on the table and mix, this method must be particularly effective if it comes used in the casinos of all the world.

With the advent of the computer it has been thought to have resolved every problem; you then concur me to tell to you as the hands ones with the computer are produced.

Every PC has a predetermined sequence of numbers called PSEUDOCASUALITA' (the term "Pseudo" depends just on "Predeterminazione"), and in order to fix the ideas we will say that there are all the Numbers comprised between 0 and 1 that we have to more the 8 figures decimates them. An express calculation us door to conclude that we have 100 million different numbers.

Moreover there are of "Gates" of income to this sequence of numbers, in order to always fix the ideas we say that there are 100 numbers between 2 cancels and therefore a million cancel. Also it cancels are numbered from 1 to a million, this time in consecutive way.

A high way to see the thing, and that better adapted to the truth, and to imagine one enormous pearl necklace with a every Node 100 pearls. After which we can number the pearls in Pseudocasuale way (I repeat "" Predetermined "Pseudo" because) from 1 to the 100 million and nodes in consecutive way from 1 to a million.

Well, this is that of which arranges the Programmer when a program must write that kinds of the hands ones. The used way more than to proceed is to decide (and soon we will see what happens taking one sure decision) a node of income and therefore with a dictated algorithm the own fantasy to use the numbers written on pearls in order to assign one card not previously used in the hands one. Completed the hands one it is proceeded in analogous way with the successive hands one until exhausting the number of hands demands.

A present function in every computer concurs of "randomize" the income node, that is deciding in "Accidental" way the first pearl with which beginning the generation. To many it has seemed a good thing to use the hour of start (hour, minute and second) for this function, that is to use one of the 86,400 second of one day in order to choose "Accidentally" the node.

Remembered when we have read, or we have lived same we in first person, that they came generates 2 IDENTICAL tournament to you and little lacked us that say to the miracle? Simply account had not been kept that many Directors prepare hands the half hour before the tournament that he begins to the 17,30; that is in around tightened of hours 17,00. The probability that chose the same node of the previous tournament was incredibly high, other that miracle!

This we have learned it, analogous episodes would not have to be more taken place. Moreover hour is had ambles better Pseudocasuali to you and is in a position to generating some thousand of billions of hands different rendering null the probability to meet the same hands of a previous tournament.

Why "only" some thousand of hands billions of if all the hands ones are 50 billions of billions of billions? The limitation has had to the necklace, for how much large one it is the number of pearls this unavoidably are get exhausted and comes the moment in which the generation of the hands it leaves again from the first pearl used with hands the same result that resumes the generation of the identical ones.

In order to understand to full load what this means is necessary to make one transposition. The number of the hands ones is so large that we could associate it to the number of smallest drips some

than water of a great Italian lake, says the Lake of Garda on whose rivers I have had the pleasure to pass some month.

Of against the number of the give birth hands ones with the better today program it can calmly be associated to the contained number of drips of it of water in one small basin.

This wants to say that also the best one of the programs is not in a position to generating nearly the totality of the hands ones, therefore like nearly the totality of the water it is remained in the lake and is not ended in the small basin.

A beautiful difference, creed not still picked to flood from the greater part of the attache's to the jobs.

For some aspects we have fallen from the frying pan to the live coal. We have but earned a meaningful result, the give birth hands ones are in perfect agreement with the theoretical probabilities of the distributions. Moreover they are so many that we do not have no possibility to play them all.

Pills

- the traditional manual distribution produces distributions more balanced than how much theoretically attended. In order to try to obviate to the disadvantage the times of the distribution extended and. however attend hands more balanced than previewed how much from the Theory.
- the generation of hands through computer produces to distributions the line with the theoretical waits. At the moment it is in a position to generating only one small fraction of all the possible hands ones, but the thing does not have worry excessive draft also always of an enormous number in a position to is made us to play for thousand of generations.

## **How many are?**

And therefore to the end you have distributed hands.

Before that you collect your cards I inform to you that been in order to receive one between  $6,35 \times 10^{11}$  possible Hands. Perhaps you do not have familiarity with this way to write the numbers, no fear and simply a compact way in order to indicate a number of 12 figures (the number place like apex + 1) that it begins with 635, therefore (if only remembered that a billion is written with 9 Zero) has approximately 635 billions of possibility.

The water molecules are little visible, propose you to use the most visible (but cumbersomer) biglie than glass from 1 centimeter of diameter. If we suppose of having biglia for a every possible hand suitable container it is a cube with 85 meters of chine that could be constructed over a soccer field.

Naturally everyone of the others members your table has identical possibilities,.. in this moment.

Hour your 4 cards that we will suppose to be Spades and 3 in everyone of other suits watched.

There are things that hour your companion cannot more possess: one 11?, your Honours or your small cards, etc. Like saying that the possibilities of its hand have been eroded and have become  $8,12 \times 10^9$  (little more than 8 billions). A suitable container for this number of biglie is a cube with 20 meters of chine that we will construct over a field from tennis.

Important: the reduction is of the same type independently from your cards, that is had had one 13? of Spades this not modification in some way the count.

It comes down the dead man, hour you know 26 cards. Sure waited for you that the number of the possible hands for the adversary to your left is diminished, in effects it is therefore and it has become  $1,04 \times 10^7$ , little more than ten million than biglie that are within a cube of 2 meters of chine that we will construct over a table from Ping-Pong.

Finally we will suppose that facades a incorrectness and you watch the cards to your adversary of left, how many are the possible hands for your adversary of right? Exactly one, one single biglia by put in pocket.

We are you leave yourself from a sure number of possibility for the generic hand of a Player, we have acquired of the information (our hand) and have been forced to reduce in meaningful way the possibilities for the others. Then we have seen also the dead man and we have reduced still the possibilities for any hand of the Adversaries. This is the torture of this job, the possibilities (and consequently the probability and the frequency) changes continuously as information on the cards, the distributions, the divisions are acquired, etc or as I love to say "Are a continuous one to become".

We cannot close the argument without to consider others 2 numbers: the possibilities for one brace and that one for the hands ones. The first value is  $5,16 \times 10^{21}$ , many biglie to fill up a cube with 100 kilometers of chine that could be constructed over one small Italian region; the second  $10^{28}$  are worth  $5,36 \times 10^{28}$ , have biglie to fill up the Earth enough if it were quarry to its inside

### Distribuzioni e Ripartizioni

An illustrious scientist of the '600, Isaac Newton, realize for first a compact able mathematical formula to calculate the distribution of a number ended of objects taken to groups.

The cards of one hands answer perfectly to requirement and are therefore calculable with precision distributions and divisions (the divisions are the distributions in which the cards have been definite), the obtained values have been infinite times brought back in books and reviews of every kind. This way to proceed is called "a priori", meaning with that the fact that we execute the calculations "BEFORE" of having one whichever additional information.

The formula would say to you little and serve to nothing.

We make instead a reasoning that it is equivalent and much profit, we suppose that come down the dead man you have 11 cards in the suit of Spades lacking Ace and King. How they can be distributed to the 2 residual cards (the rest of the suit) between your Adversaries?

A table will help us to answer:

Distr.	Numero	Distr.	%Dis.	Div.	Numero	Div.	%Div.	Rip.	Numero	Rip.	%Rip.
1-1		338	52%	1/1	169+169=338		52%	A/K	13 x 13	=169	26%
								K/A	13 x 13	=169	26%
2-0	156+156=312		48%	2/0		156	24%	AK/-	13x12 x 1=156		24%
				0/2		156	24%	-/AK	1 x 13x12=156		24%
Total		650			Total	650			Total	650	

Graphical notation: with the hyphen "-" we separate "generic" distributions in which it is not define which Player has the greater number of cards; when we will say distributions we will refer to these; with the bar "/" we separate "specific" distributions in which the Player with the greater number of cards is define, in order to make reference these we will say divisions. As an example distribution 2-0 does not evidence who has 2 cards, while division 2/0 indicates that the Player with the 2 cards is that one to our left (for convention West inasmuch as we will place ourselves in South). Obviously X-X is equivalent to X/X and therefore 1-1 is like 1/1, 2-2 like 2/2, etc.

The calculations of the table are made from right towards left.

Some considerations

- the divisions are  $2^R$  (where R=number cards of the Rest), in this case  $2^2=4$ ;
- the divisions are R+1, in this case  $2+1=3$ ;
- the distributions are the half of the divisions rounded off for excess, in this case 3 divided 2 = 1,5 and rounding off we obtain 2.
- the probability of a division (or division or distribution) is simply the relationship between the number of the divisions (or divisions or distributions) and the number of all the divisions (or divisions or distributions);
- All the divisions of a specific distribution, in which it is define which Player has the greater number of cards, have the same probability to take place themselves. Of it follows that the divisions of a X-X (that it is always equivalent to X/X) have the same probability to take place itself, analogous for one X/Y (X cards in the West), but not for generic distribution X-Y in which we do not know which Player has X cards. Between little lines you will know because;
- Here it is looked at little, but the number of the divisions depends from as the several cards in the division can be arranged. As an example the 2/1 from place to 3 divisions that look at define the cards well that we will suppose to be Ace, King and Woman: AK/Q, AQ/K, KQ/A;
- the probability to take place itself of a distribution, a division or a division does not depend from as the cards in the suit between died hand are distributed and. That the Spades is uniforms 5 and 6, 8 and 3 or 11 and 0 NOT such modification value. For some aspects this information is superfluous, but there is who anchor thinks that to forehead of single or empty between died hand and they increase the single or empty possibilities of in the hands of the Adversaries; this is not true, the only important thing is the number total of the cards of the rest and the eventual information notes of division of the other suits in the hands of the Adversaries.
- there is an other way to express the previous concept: after that you have seen the cards of the dead man you can always imagine that the hidden cards have been mix and distributed in that moment. Hour is comprised well that the distribution of the cards between died hand and is not important on the distributions of the hidden hands.

Hour we clear well in order because we have used and multiplied values like 13 and 12.

Examinee division A/K the Ace of Spades has 13 places in which placing itself in the hand of the West (because 13 are the cards of the West), while the King has 13 places in the hand of East. After all there are 13x13 that is 169 possible dispositions of the cards in the 2 hands.

Examinee division AK/- the Ace has 13 places to disposition, while to the King 12 remain some "single" inasmuch as a place has been occupied from the Ace. There is a single possible case for no card in East from which  $13 \times 12 \times 1 = 156$ .

I have need of your attention: I have as soon as introduced the important concept of the "Free Places" according to which a card has many possibilities to place in the hand of a determined Player how many is the free places of these. For the moment we limit ourselves to observe, as it would make messier De the Palisse, than the free places are those not occupied from other cards.

Which are the occupied places are simpler to tell: they are those places that are necessary to use in order to insert the cards of one famous distribution.

If, as an example, we have ascertained, from the declaration or a sure number of turns it plays to you, than a lateral suit, than in order to fix the ideas we will suppose to be the Hearts, is divided 5/2 (5 in the West) then the table before goes count as it follows:

Distr.	Numero	Distr.	%Dis.	Div.	Numero	Div.	%Div.	Rip.	Numero	Rip.	%Rip.
1-1		176	51,4%	1/1	88+	88=176	51,4%	A/K	8 x 11	= 88	25,7%
								K/A	8 x 11	= 88	25,7%
2-0	56+110=166		48,6%	2/0		56	16,4%	AK/-	8x7 x 1	= 56	16,4%
				0/2		110	32,2%	-/AK	1 x 11x10=110		32,2%
Total	342				Total	342			Total	342	

The new table holds account of the division of the Hearts, in practical is one table a posteriori of the acquired information.

If we confront this with the previous one differences and similitude emerge:

- the probabilities of distributions (the 2-0 and the 1-1) are not changed in meaningful way;
- it is not truer, like preannounced, than the divisions of generic distributions (the 2-0 in this case) have the same probability to take place itself;
- It remains true that is equal the probabilities of relative divisions to same division (the 1/1 in this case);
- more probable E' 2 times to find Ace and King to right that not on the left.

In our good hand the information fall to crowds: our cards, the declarations, the played cards, etc. This makes that we always find ourselves "AFTER" many acquired information, that of which would have truly need is of tables "a posteriori" like that one as soon as found.

To part the difficulty to calculate them, what that it can be made only through a program the computer realistically, you have idea of how many numbers we would have to hold to mind? It is not just possible.

To this point it is necessary to give a short signal on the divisions (I repeat, the X/Y and the Y/X are distinguished) and relative divisions of the rests in the more common cases. Before we will see the calculation a priori and then we will see as this changes in function of the free places assuming a lateral suit divided 5/2 (fifth in the West).

### 3 card of rest

Divisioni		Ripartizioni		
Ovest	Est			
xxx	-	13x12x11 x 1 x 1	= 1.716/15.600=11%	1 x 11%
xx	x	13x12 x 13 x 3	= 6.084/15.600=39%	3 x 13%
x	xx	13 x 13x12 x 3	= 6.084/15.600=39%	3 x 13%

-	xxx	1 x 13x12x11 x 1	= 1.716/15.600=11%	1 x 11 %
		Total	15.600	

Like previously multiple approval for 3 in the cases xx/x and x/xx because there are 3 possibilities for the single card. The relative divisions (to define all the cards) obtain dividend for 3 simply.

Some considerations

- distribution 3-0 is introduced in 22% of the cases. From place to 2 divisions (3/0 and 0/3) any which are introduced in 11% of the cases
- distribution 2-1 is introduced in 78% of the cases. From place to 2 divisions (2/1 and 1/2) any which present in 39% of the cases.

Divisioni (suit lateral 5/2)		Ripartizioni		
Ovest	Est			
xxx	-	8x7x6 x 1 x 1	= 336/5.778= 5,82%	1 x 5,82%
xx	x	8x7 x 11 x 3	=1.848/5.778=31,98%	3 x 10,66%
x	xx	8 x 11x10 x 3	=2.604/5.778=45,07%	3 x 15,02%
-	xxx	1 x 11x10x9 x 1	= 990/5.778=17,13%	1 x 17,13%
		Total	5.778	

Some considerations

- distribution 3-0 is introduced in 23% approximately of the cases, is changed little regarding before. From place to 2 divisions: the 3/0 that are introduced approximately in 6% of the the 0/3 cases and that presence approximately in 17% of the cases like saying that he is 3 times more probable.
- distribution 2-1 is introduced in 77% approximately of the cases, also here one little meaningful variation. From place to 2 divisions: the 2/1 that it is introduced approximately in 32% of the cases and 1/2 that is introduced approximately in 45% of the cases like saying that it is once and average the most probable one.
- they have grown, in meaningful way, the probabilities of the divisions that contain a greater number of cards in the hand with more free places. As we will see from here in ahead this conditions strongly the choices between 2 or more lines than game.

The tables that follow are most annoying. I have had to insert them in order to demonstrate that I know to make of account, but you are not obligates to read them to you.

#### 4 card of rest

Divisioni		Ripartizioni		
Ovest	Est			
xxxx	-	13x12x11x10 x 1 x 1	= 17.160/358.800= 4,78%	1 x 4,78%
xxx	x	13x12x11 x 13 x 4	= 89.232/358.800=24,87%	4 x 6,22%
xx	xx	13x12 x 13x12 x 6	=146.016/358.800=40,70%	6 x 6,78%
x	xxx	13 x 13x12x11 x 4	= 89.232/358.800=24,87%	4 x 6,22 %
-	xxxx	1 x 13x12x11x10 x1	= 17.160/358.800= 4,78%	1 x 4,78%
		Total	358.800	

Divisioni (suit lateral 5/2)		Ripartizioni		
Ovest	Est			
xxxx	-	8x7x6x5 x 1 x 1	= 1.680/93.024= 1,80%	1 x 1,80%
xxx	x	8x7x6 x 11 x 4	= 14.784/93.024=15,89%	4 x 3,97%
xx	xx	8x7 x 11x10 x 6	= 36.960/93.024=39,73%	6 x 6,62%

x	xxx	8 x 11x10x9 x 4	= 31.680/93.024=34,05%	4 x 8,51 %
-	xxxx	1 x 11x10x9x8 x 1	= 7.920/93.024= 8,51%	1 x 8,51%
		Total	93.024	

### 5 cards of rest

Divisioni		Ripartizioni		
Ovest	Est			
xxxxx	-	13x12x11x10x9 x 1 x 1	= 154.440/7.893.600= 1,96%	1 x 1,96%
xxxx	x	13x12x11x10 x 13 x 5	=1.115.400/7.893.600=14,13%	5 x 2,83%
xxx	xx	13x12x11 x 13x12 x 10	=2.676.960/7.893.600=33,91%	10 x 3,39%
xx	xxx	13x12 x 13x12x11 x 10	=2.676.960/7.893.600=33,91%	10 x 3,39%
x	xxxx	13 x 13x12x11x10 x 5	=1.115.400/7.893.600=14,13%	5 x 2,83%
-	xxxxx	1 x 13x12x11x10x9 x 1	= 154.440/7.893.600= 1,96%	1 x 1,96%
		Total	7.893.600	

Divisioni (suit lateral 5/2)		Ripartizioni		
Ovest	Est			
xxxxx	-	8x7x6x5x4 x 1 x 1	= 6.720/1.395.360= 0,48%	1 x 0,48%
xxxx	x	8x7x6x5 x 11 x 5	= 92.400/1.395.360= 6,62%	5 x 1,32%
xxx	xx	8x7x6 x 11x10 x 10	= 369.600/1.395.360=26,49%	10 x 2,65%
xx	xxx	8x7 x 11x10x9 x 10	= 554.400/1.395.360=39,73%	10 x 3,97%
x	xxxx	8 x 11x10x9x8 x 5	= 316.800/1.395.360=22,70%	5 x 4,54%
-	xxxxx	1 x 11x10x9x8x7 x 1	= 55.440/1.395.360= 3,97%	1 x 3,97%
		Total	1.395.360	

### 6 cards of rest

Divisioni		Ripartizioni		
Ovest	Est			
xxxxxx	-	13x12x11x10x9x8 x 1 x 1	= 1.235.520/165.765.800= 0,74%	1 x 0,74%
xxxxx	x	13x12x11x10x9 x 13 x 6	= 12.046.320/165.765.800= 7,27%	6 x 1,21%
xxxx	xx	13x12x11x10 x 13x12 x 15	= 40.154.400/165.765.800=24,22%	15 x 1,61%
xxx	xxx	13x12x11 x 13x12x11 x 20	= 58.893.320/165.765.800=35,53%	20 x 1,78%
xx	xxxx	13x12 x 13x12x11x10 x 15	= 40.154.400/165.765.800=24,22%	15 x 1,61%
x	xxxxx	13 x 13x12x11x10x9 x 6	= 12.046.320/165.765.800= 7,27%	6 x 1,21%
-	xxxxxx	1 x 13x12x11x10x9x8 x 1	= 1.235.520/165.765.800= 0,74%	1 x 0,74%
		Total	165.765.800	

Divisioni (suit lateral 5/2)		Ripartizioni		
Ovest	Est			
xxxxxx	-	8x7x6x5x4x3 x 1 x 1	= 20.160/19.535.040= 0,10%	1 x 0,10%
xxxxx	x	8x7x6x5x4 x 11 x 6	= 443.520/19.535.040= 2,27%	6 x 0,38%
xxxx	xx	8x7x6x5 x 11x10 x 15	= 2.772.000/19.535.040=14,19%	15 x 0,95%
xxx	xxx	8x7x6 x 11x10x9 x 20	= 6.652.800/19.535.040=34,06%	20 x 1,70%
xx	xxxx	8x7 x 11x10x9x8 x 15	= 6.652.800/19.535.040=34,06%	15 x 2,27%
x	xxxxx	8 x 11x10x9x8x7 x 6	= 2.661.120/19.535.040=13,62%	6 x 2,27%
-	xxxxxx	1 x 11x10x9x8x7x6 x 1	= 332.640/19.535.040= 1,70%	1 x 1,70%
		Total	19.535.040	

I have inserted the count complete, but the programs enclose to you will allow to obtain you the same values without no difficulty. Indeed you will be able to find them for every number of rest cards and for every information of lateral suits.

### Some considerations (a priori)

- If the number of the cards of the rest is uneven (3, 5, etc.) the 2 more probable divisions are those with minor the number of cards of difference (2/1, 1/2, 3/2, 2/3 etc).
- If the number of the cards of the rest is equal (4, 6, etc.) the more probable division is that one with the same number of cards (2/2, 3/3, etc.); as we have seen previously not are exceptions, this is worth also for the 1/1. The more probable distribution and that one with 2 cards of difference (3-1, 4-2, etc.); it makes exception the 1-1 that he is more probable of 2-0.

### Some considerations (a posteriori of a lateral suit divided 5/2)

- If the number of the cards of the rest is equal then the division with the same number of cards (2/2, 3/3, etc.) meaningful variation of the probability does not endure one to take place itself.
- If cases X/Y and Y/X do not differ, but the generic X-Y is considered the probabilities endures one minimal variation regarding the table to PRIORI..
- If cases X/Y differ and Y/X looks at that it always comes privileged that one with the greater number of cards in the hand of the Player with more free places. - In this forest of numbers there is rising of fixed value in the case that the rests are equal: the distribution with 2 cards of difference (2-0, 3-1, 4-2, etc.) it is always worth approximately 48% and it does not come influenced, if not in minimal measure, from the divisions of lateral suits.

### Pills

- As you will find the rests of the suit that interests to you depends on how many are the cards of the rest and from eventual information on lateral suit in the hands of your Adversaries.
- As you will find the rests of the suit that interests to you does not depend on as the cards between hand are uniforms and died. The fact that you have single or an empty one does not increase the probability who your Adversaries have a single one or an empty one.
- To play on distributions with one card of difference (2-1, 3-2, etc.) succeeding offers high probability of, always advanced, as an example, respect to finesse. - To play on distributions with two cards of difference (2-0, 3-1, etc.) succeeding offers probability of comparable with finesse. It represents rising of fixed number that is worth independently approximately 48% from the number of the cards to from the distribution information.
- To play on distributions with no card of difference (2-2, 3-3, etc.) succeeding offers probability of widely inferior to finesse. It makes exception single distribution 1-1 that, approximately, is worth how much finesse.
- Two symmetrical divisions (3/1 and 1/3, 4/2 and 2/4, etc.) they are equally possible if you have not been able to acquire information distributions on the hands of your adversaries. Vice versa if you are to acquaintance of a greater number of free places in the hand of a specific Adversary increases, in meaningful way, the possibility that the division is taken place that previews the greater number of cards in the hand of these.
- the distribution information that we acquire gradually on the cards of our Adversaries modify the number of the free places. E' possible to use them in order to find, with absolute precision, the tables of division of a suit a posteriori of the distribution information.