

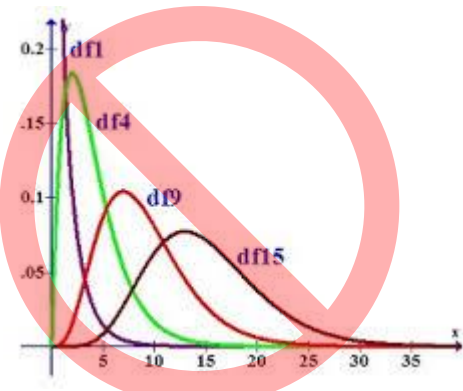
# Probability & Bridge

NKy Summer Getaway Sectional

August 12, 2017

# Goals

- Practical bridge advice
- Improve how we think at the table
- Get better results in tough contracts
- **NOT**: combinatorial mathematics or statistical equations.



$$\binom{N}{n} = \frac{N!}{n!(N-n)!}$$

# Simple Chances

- Flip a coin
- Roll a die
- Take a finesse

# Flip a Coin



- Coin has two sides (2 Total cases)
- One side is up (1 Specific Case): Heads or Tails
- *a priori* probability =  $\text{specific}/\text{TOTAL} = \frac{1}{2} = 50\%$
- Each coin toss is INDEPENDENT of the prior event (Coins have no memories)
- Probability of success for both of 2 independent events is the product of the probability of each:
  - Two coins giving heads (HH):  $\frac{1}{2} \times \frac{1}{2} = 25\%$
  - 3 Coins giving Heads (HHH):  $25\% \times \frac{1}{2} = 12.5\%$  etc...

# Coin Quiz

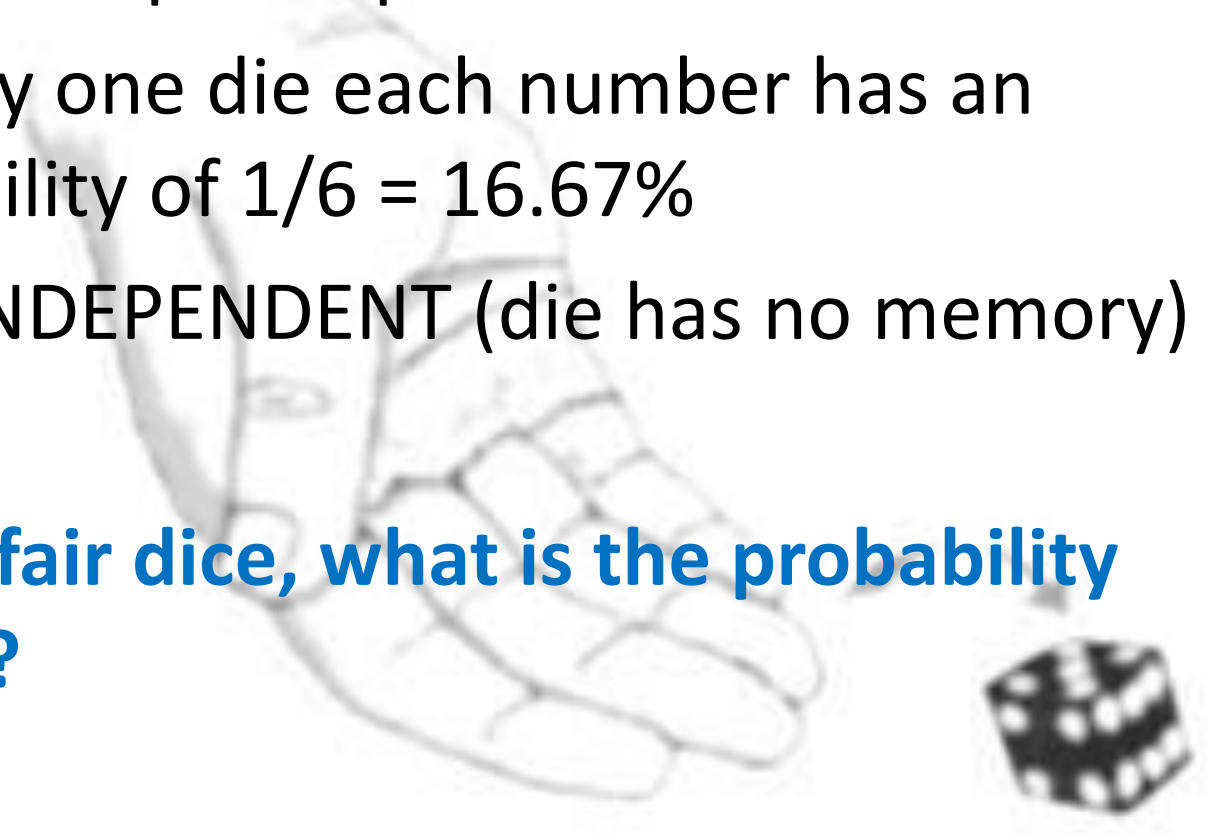
- Which sequence of 10 coin tosses is more likely?

Sequence A: HHHHHHHHHH 0.0977%

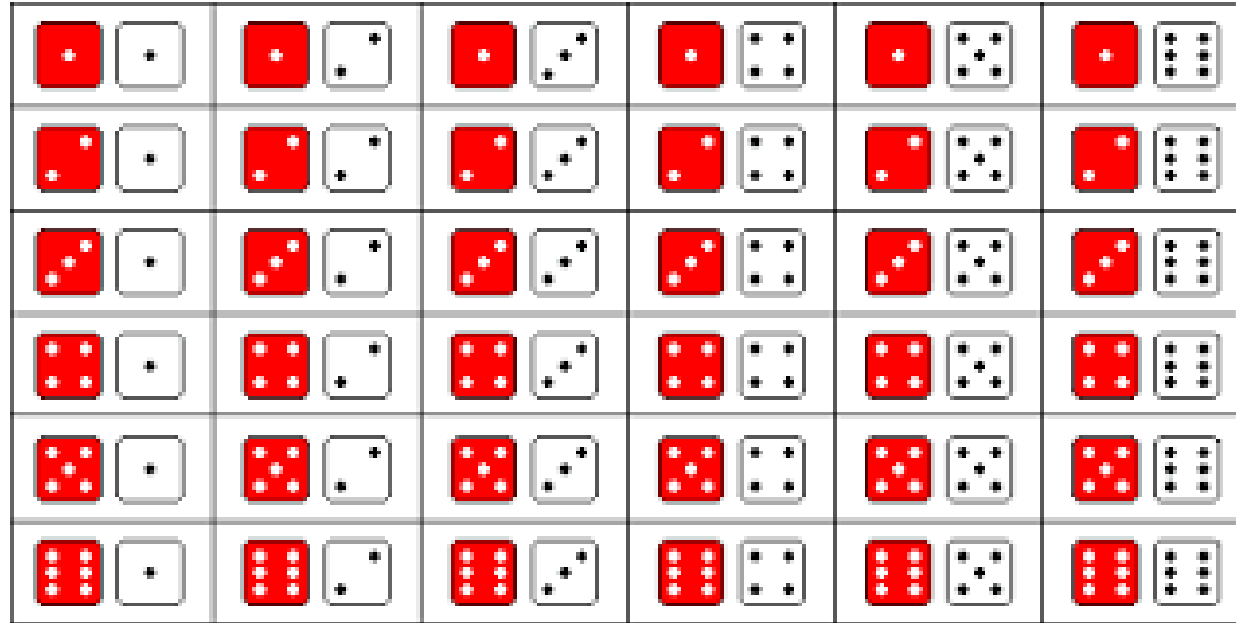
Sequence B: THTTHTHHHT 0.0977%

# Rolling a Die

- A standard die has 6 sides – 6 Total cases
- One side shows up – 1 Specific Case.
- The roll of any one die each number has an equal probability of  $1/6 = 16.67\%$
- Each role is INDEPENDENT (die has no memory)
- **Q: With two fair dice, what is the probability of rolling a 7?**



# Rolling a 7



- Outcome table (6x6=36 Total Cases) →
- Frequency Table:

#	2	3	4	5	6	7	8	9	10	11	12	Tot
Cases	1	2	3	4	5	6	5	4	3	2	1	26
%	3.84	7.69	11.54	15.38	19.23	26.09	19.23	15.38	11.54	7.69	3.84	100

Rolling a 7 is 26.09%

Craps (2 or 12) is 7.69%, the SUM of 2% and 12% (3.84 + 3.84).

For independent events, **A and B** is the **product**  $P_A \times P_B$ , while **A or B** is the **sum**  $P_A + P_B$

# When is a finesse like a coin flip?

- When we lack INFORMATION!!! (*a priori*)
- 2 Cases: Win or lose finesse
- Just like coin: Heads or Tails
- Therefore Finesse is 50%, ***lacking other information***



# Bridge Hands – BIG NUMBERS

- **635,013,559,600** - # of ways to deal 13 cards.
- **53,644,737,765,488,792,839,237,440,000** - the number of possible ways to deal all 52 cards, 13 at a time.
- Odds of 4 players being dealt all 13 cards in one suit:  
**1 in 2,235,197,406,895,366,368,301,559,999**

# Which Hand is More Likely?

♠ AKQJ1098765432

♠ AK32

♥ K984

♦ Q10

♣ J107

# The Trap?

What I gave you:

♠ AK32

♥ K984

♦ Q10

♣ J107

What you saw:

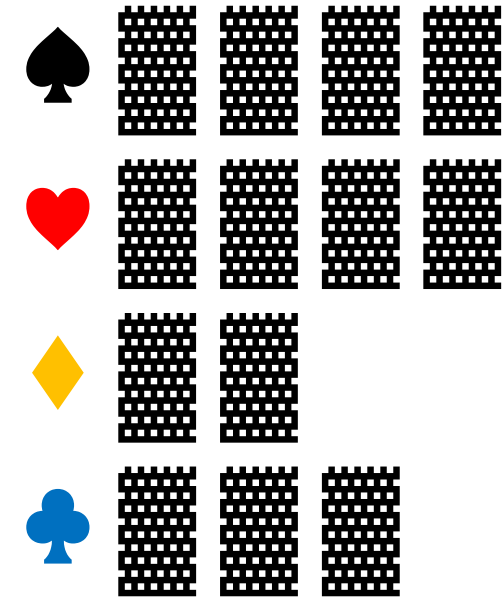
♠ AKxx

♥ Kxxx

♦ Q10

♣ J10x

What you assumed:



# SUIT SPLITS

- # of specific cases / # Total Cases (approximately)
- # Total Cases =  $2^m$  (where  $m$ =# missing cards)
- Study 2 – 7 missing cards (4 – 128 Tot. Cases)

Split	0	1	2	3	
Suit Split Missing:	7	0.5	7	30.5	62
	6	1.5	14.5	48	36
	5	4	28	68	
	4	10	50	40	
	3	22	78		
	2	48	52		

# DROP Missing Honors

	%	H	Hx	Hxx	TOT
Honor Drop Missing:	8	0.4	4	18	22.4
	7	1	9	27	37
	6	2.4	16	36	54.4
	5	6	27	41	74
	4	12	41	37	90
	3	26	52	22	100
	2	52	48		100

# Suit Combinations

- How to play suits – **wrong** when done alone – **right** when done in the **context of whole hand**.
- Know **# tricks needed**.
- **Vacant Spaces** 13 each, reduced by **information**.

## *a priori* Suit Combinations

1. **K3** opposite **6710QA** Do you finesse for the 10? Why/Not?
2. **AJ975** -- **K1086** - You play the K. LHO plays the 2 RHO the 3. You play the 6 to dummy. LHO plays the 4. **Finesse or drop?**
3. **AQ97** opposite **K108** - You play the 10 to the Q and the 7 to the K, RHO playing 2,4. LHO playing 3, 5. Now you continue the 8 and LHO plays the 6. **Finesse or drop?**
4. **AJ1074** opposite **52** (need 3 tricks)
5. **AKQ74** opposite **52** (need 4 tricks; Need 5 tricks)  
**NO SIDE ENTRIES.**

# Suit Combination 1

- **K3** opposite **6710QA** Do you finesse for the 10? Why/Not?
  - Absent information the finesse is worth 50%.
  - If we are looking for the J, then we can win when the J is singleton, doubleton or Jxx in either hand.
  - Combining those chances results in  $2.4 + 16 + 36 = 54.4\%$  so cashing tops is better.

What Information would make you change your play?

- Count of the hand → split known
- # Tricks needed from this suit
- Avoid having DANGER HAND on lead
- Can ruff out the suit



# Suit Combination 2

- **AJ975 -- 6810K** - You play the K. LHO plays the 2 RHO the 3. You play the 6 to dummy. LHO plays the 4. Finesse or drop?
  - Any 2-2 break is 40% while any 3-1 break is 50%.
  - 2-2 has 6 cases. 3-1 has 8. So the specific case for 3-1 is less likely (absent additional information).
  - The Qxx w/ LHO is 6.21%. The Qx with RHO is 6.78%.
  - The ratio  $6.78/13 = 52.2\%$ .
  - Vacant spaces says LHO has 11 while RHO has 12 before declarer's choice.  $12/23 = 52.2\%$  the Q is with RHO.

What Information would make you change your play?

# Suit Combination 3

- **AQ97** opposite **810K** - You play the 10 to the Q and the 7 to the K, RHO playing 2,4. LHO playing 3, 5. Now you continue the 8 and LHO plays the 6. Finesse or drop?

- You have seen 3 insignificant cards from LHO and 2 from RHO.
- That leaves 10 spaces for LHO and 11 for RHO.
- Therefore the probability that the J is with LHO is  $11/(10+11) = 52.4\%$ . **DROP**

What Information would make you change your play?

# Suit Combination 4

- **AJ1074** opposite **52** – **Goal: 3 tricks**
  - We are missing the **KQ9863**
  - From the chart, 3-3 happens 36% of the time and 4-2 happens 48% of the time.
  - Missing 6 cards there are  $2^6 = 64$  total cases.
  - 6 cards taken 3 at a time counts to 20
  - 6 cards take 2 (or four) at a time counts to 30
- Any 3-3 means we win 3 tricks. Any 1-5 or 0-6 and we fail. Ignore these.
- 4-2/2-4 is where we can gain advantage. A finesse helps only when KQ63 – 89 is the distribution (One Case), and Hx-Hxxx (4 Cases).
- Playing small to the A and SMALL from length works for the 8 cases where Hxxx – Hx / Hx – Hxxx plus the 2 cases KQ-9863 or 9863-KQ. 10 Cases
- Ace then small is better *a priori* than the 1<sup>st</sup> round finesse.

What Information would make you change your play?

# Suit Combination 5

- **AKQ74** opposite **52** (need 4 tricks; Need 5 tricks)
- Needing 5 tricks, we play top down, for a 36% chance (3-3 split).
- Needing 4 tricks we can do better. If we duck the first trick we will get 4 tricks if the suit splits 3-3 (36%) or 4-2/2-4 (48%). This improves our chances to 84%. Much better than playing the suit top down (remember we have no outside entry).

What Information would make you change your play?

# Suit Split Probability

Richard Pavlicek

Bridge Site:

<http://www.rpbridge.net/>

Case: Missing 6 cards including the Q

Best way to answer the question "WHY??"

Now the fun starts!

#	A	B	C	D	West	East	Ways	Ratio	Percent	
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Qxxxxx	—	1	24	0.75	
2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Qxxxx	x	5	195	6.06	
3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Qxxx	xx	10	520	16.15	
4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Qxx	xxx	10	572	17.76	
5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Qx	xxxx	5	260	8.07	
6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Q	xxxxx	1	39	1.21	
7	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	xxxxx	Q	1	39	1.21	
8	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	xxxx	Qx	5	260	8.07	
9	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	xxx	Qxx	10	572	17.76	
10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	xx	Qxxx	10	520	16.15	
11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	x	Qxxxx	5	195	6.06	
12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	—	Qxxxxx	1	24	0.75	
Goal to win							<b>Totals</b>	64	3220	100.00
<b>A</b>	Q, Qx, Qxx onside						3	16	871	27.05
<b>B</b>	Ruff the 4th Club						3	16	739	22.95
<b>C</b>	Play off 3 rounds of Clubs						6	32	1742	54.10
<b>D</b>	Q drops in 2 rounds						4	12	598	18.57

# Combining Chances

- **♠AJ1097 opposite 543**

- What is the probability you can score 4 tricks?

- p Both ♠ A&K are onside: 24%
- p Honors are split 52%
- p Both honors are on your right 24%

P Success = 24% + 52% = 76%

- We Need: Finesse in Suit A, and if that fails a 3-3 break in suit B.

What is the probability we make our contract?

- 50% Finesse wins + 50% Finesse loses X (36% 3-3 split) = 68%
- $P_{1\text{-success}} + P_{1\text{-fail}} (P_{2\text{-Success}})$
- Notice that independent plays (NOT finesses) chances ADD.
- Requiring 2 or more finesses multiplies fractions.

# Analyze 1<sup>st</sup> – Plan 2<sup>nd</sup>

## The Whole Bridge Hand

- Use **ALL** your information – Bidding & Play
- **Start** with a flexible picture of **declarer/opponent**
- Count hand **winners and losers** (“off the top”) and **SLOW LOSERS**
- Count **entries**
- Count **stoppers** in threat suits.
- Count **HCP** - Your total and their total
- **Combine your chances** – Source of Tricks/Trick Packets
- Avoid the **DANGER HAND**. Assume perfect defense.
- **Modify plan** as you learn - Show-outs are **GOLD**

## Use All Information

### Common Inferences

- Opening bids show 12 HCP + and 5+ Cards in a Major.
- 1 NT is typically 15-17.
- Weak 2 for 7-8 HCP and 6 cards
- a 3-bid less (~6) and 6-7 cards

An **INFERENCE** is what we judge

**INFORMATION** is what we see and know. (Show outs are INFORMATION)

# Tips

## Combining Chances (Mutually Exclusive events)

- Plan for failure – Stay ALIVE.
- Find chances that create options
- Cash winners in your long side suit (drop honors)
- Finesse long suits into safe hands when necessary.
- Avoid finesses completely if possible
- Leave short suits (no extra chances) until the end.

## Steve's Tips:

- Always choose the plan with the best probability
- Find a good plan? **LOOK AGAIN. FIND A BETTER ONE**
- When faced with equal choices, choose the option that allows you to **STAY ALIVE** longest (Take more chances)
- **Any Chance** is better than NO Chance
- **NEVER** take a **PRACTICE FINESSE.**



# A Simple Hand?

Contract: 4♠, Opponents pass throughout

♠ QJ432	N	♠ 1098
♥ AK2	W E	♥ 1064
♦ Q3	S	♦ AK65
♣ J456	Lead ♥3	♣ KQ2

**Analysis:**

**Winners:** 5 **Losers:** 3 Fast, 1 Slow

**Entries:** W3 and E2

**Stoppers:** ♥2,

**Source of Tricks:** ♠(3), ♣(2)

# Improving Your Plan

Contract 6♥, no opposing bidding

♠ AQ	N	♠ 98
♥ AKJ72	W E	♥ Q10654
♦ AQ	S	♦ J65
♣ J456	Lead ♥3	♣ AK10

## ANAYLSIS:

Winners: 9 Losers: 0 Fast, 3 Slow

Entries: W5 and E3

Stoppers: 1♠ 1♦ 2♣

Source of Tricks: ♣ (3); ♦ (2)

Plan 6♥

# Improving your plan 1

♠ AQ	N	♠ 98
♥ AKJ72	W E	♥ Q10654
♦ AQ	S	♦ J65
♣ J456	Lead ♥3	♣ AK10

A Novice (or *finesse-aholic*)

- sees 3 finesses, draw trumps in 2-4 rounds and begin.
- 3 Finesses here are independent (different suits, different players) so the odds of all 3 are  $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$  or 12.5 %.
- They need only 2 of the 3 finesses. How do you calculate the probability? Think: 2 winning finesses is the same case as one losing finesse or **50%**.

# Improving your plan 2

♠ AQ	N		♠ 98
♥ AKJ72	W	E	♥ Q10654
♦ AQ	S		♦ J65
♣ J456	Lead ♥ 3		♣ AK10

## Intermediate Player:

- After pulling trumps if the ♣ finesse works and they split 3-3, they can pitch a losing ♠ on the long ♣,

Combining chances that way means:

- 50% ♣ finesse x 36% 3-3- split = 18%
- 50% ♦ Finesse x 82% remaining = 41% or
- TOTAL CHANCE: **59%**

a useful improvement.

# Improving your plan 3

♠ AQ	N	♠ 98
♥ AKJ72	W     E	♥ Q10654
♦ AQ	S	♦ J65
♣ J456	Lead ♥ 3	♣ AK10



## Expert Player:

- Cash the ♣ AK
= 18% +
- % Time North has 0, 1, 2 ♣
= 26% (NOT Q, Qx)
- ♦ Finesse (50% x 56%)
= 28%
- TOTAL
72+%

- **Look deeper!** Treat the hand as “one of 2 finesses”: Finesse ♣. If win, cash ♣ tops. If no ♣Q, finesse ♦. If lose, long ♠ goes away on 3<sup>rd</sup> ♦. Likewise if ♣ finesse loses, we need only the ♦ finesse to win (Pitch the losing ♠ on the ♣) - a **75%** play.

# Bonus Problem

6♠, No opposition bids. What is the likelihood of success?

Trumps split 2-1

♠ QJ432

♥ AK

♦ KJ3

♣ AJ4

N

W

E

S

Lead ♥ 3

♠ AK987

♥ 64

♦ A65

♣ K102

Which finesse do you take first? Second? Why?

**ANSWER:** Take **NO** Finesses. Draw 2 rounds of Trump and 2 rounds of ♥. Then play off ♦AKJ in that order. No matter who wins they have to either give you a free ♣ finesse or a ruff sluff – either way we lose only 1 ♦ trick.

**PROBABILITY OF SUCCESS: 100%**

# See the Ending...

♠ QJ432	N	♠ AK987
♥ AK	W E	♥ 64
♦ KJ3	S	♦ A65
♣ AJ4	Lead ♥ 3	♣ K102

Either N or S must lead and give us the rest of the tricks. You play like an expert!

**ANSWER:** Take **NO** Finesses. Draw 3 rounds of Trump and 2 rounds of ♥. Then play off ♦ AKJ in that order. No matter who wins they have to either give you a free ♣ finesse or a ruff sluff – either way we lose only 1 ♦ trick.

**PROBABILITY OF SUCCESS: 100%**

# Other Uses for “p”

- When to bid Game, Small Slam, and Grand Slam
  - The likelihood of success must match or exceed breakeven
  - Breakeven – what you win equals what you lose.



# Game, Slam & Grand Odds

	Games		Small Slam		Grand Slam			
Type	V	NV	V	NV	V	NV	V	NV
Score+	620	420	1430	980	2210	1510	2210	1510
Score-	-100	-50	-100	-50	-100	-50	-100	-50
Not Bid	170	170	680	480	1460	1010	710	510
<b>Win</b>	<b>+450</b>	<b>+250</b>	<b>750</b>	<b>500</b>	<b>750</b>	<b>500</b>	<b>1500</b>	<b>1000</b>
<b>Lose</b>	<b>-240</b>	<b>-190</b>	<b>750</b>	<b>500</b>	<b>1530</b>	<b>1030</b>	<b>-780</b>	<b>-530</b>
<b>IMPs W</b>	<b>10</b>	<b>6</b>	<b>13</b>	<b>11</b>	<b>13</b>	<b>11</b>	<b>17</b>	<b>14</b>
<b>IMPs L</b>	<b>-6</b>	<b>-5</b>	<b>-13</b>	<b>-11</b>	<b>-17</b>	<b>-14</b>	<b>-13</b>	<b>-11</b>
Break Even	38%	45%	50%	50%	57%	56%	43%*	44%*

**\*If opponents bid game, then bidding a Grand Slam is Poor.** With 12 tricks, a slam gains +11NV & +13V IMPS, the grand loses -11NV Imps and -13V, swinging -22NV & -26V Imps. Avoid grand slams when they only bid game. Need 14 tricks.

# Useful *a priori* %:

	<u>%</u>
• Have FUN playing BRIDGE	100
• Need 1 of 2 finesses (same hand)	76
• Missing cards split 3-2	68
• Missing cards split 4-3	62
• Q drops in 3 rounds when holding 7 cards	54.4
• Pure finesse	50
• Need 2 finesses of 3 available	50
• Q drops in 3 rounds when holding 6 cards	37
• Suit splits 3-3	36
• Need 3 finesses of 4 available.	31
• Need 2 finesse of 2 available	25
• Need finesse & 3-3 split	18
• Need 3 finesses	12.5

# References

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See you at the tables!

**THANK YOU FOR YOUR KIND  
ATTENTION!**