Probability & Bridge

NKy Summer Getaway Sectional

August 12, 2017

Steve Moese K082411

Goals

- Practical bridge advice
- Improve how we think at the table
- Get better results in tough contracts

- **NOT**: combinatorial mathematics or statistical equations.
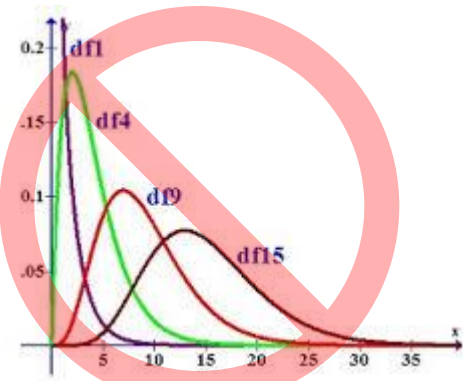
$$\binom{N}{n} = \frac{N!}{n!(N-n)!}$$

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 = ½ = 50%

- Each coin toss is INDEPENDENT of the prior event (Coins have no memories)

- Probability of success for 2 independent events is the product of the probability of each:
  - Two coins giving heads (HH): ½ X ½ = 25%
 - 3 Coins giving Heads (HHH): 25% X ½ = 12.5% etc…

Coin Quiz

- Which sequence of 10 coin tosses is more likely?
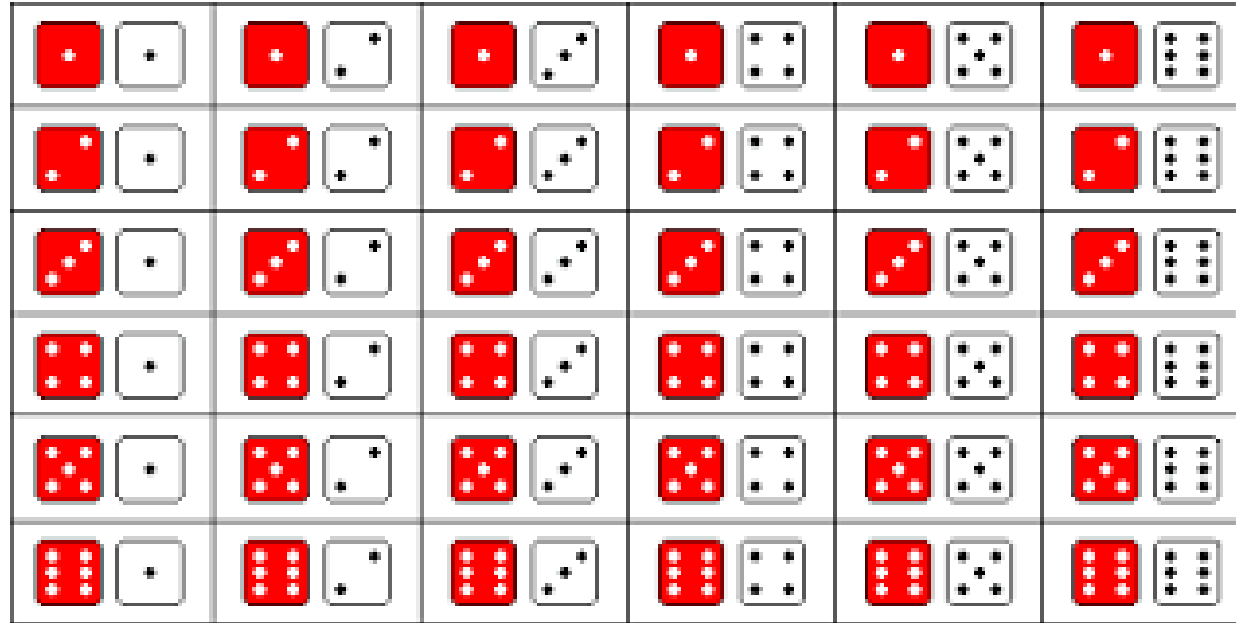
Sequence A: HHHHHHHHHH   0.0977%

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?**
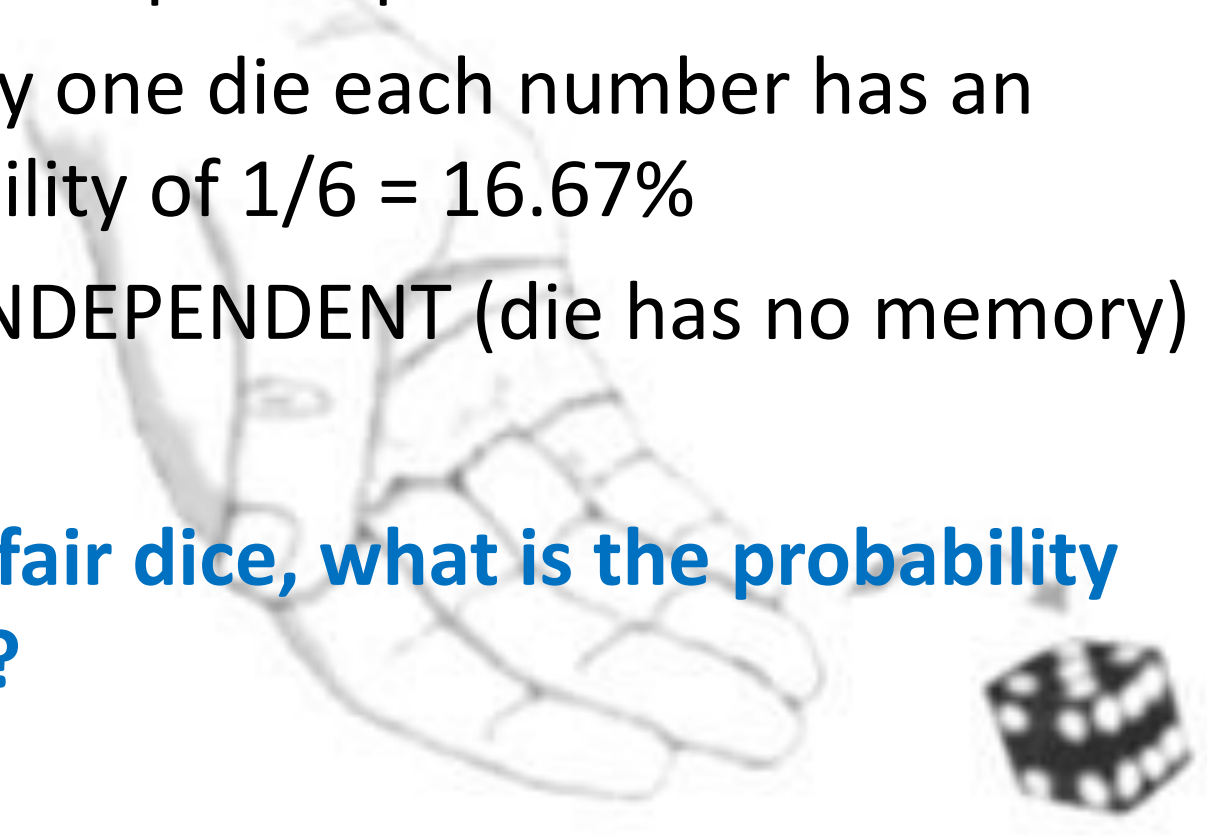
Rolling a 7

- 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!!!
- 2 Cases: Win or lose
- 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
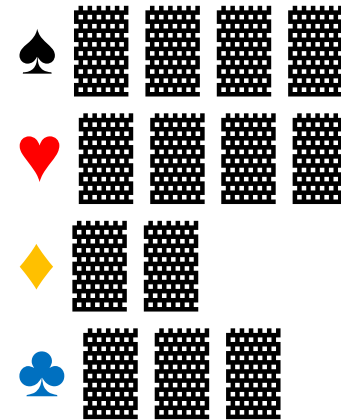
♣ J107

The Trap?

What I gave you:	What you saw:	What you assumed:
♠ AK32	♠ AKxx	♠ ▦▦▦▦
♥ K984	♥ Kxxx	♥ ▦▦▦▦
♦ Q10	♦ Q10	♦ ▦▦
♣ J107	♣ J10x	♣ ▦▦▦

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
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		

(leftmost column label: Suit Split Missing:)

DROP Missing Honors

%	H	Hx	Hxx	TOT
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

Honor Drop Missing:

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**.

Suit Combinations

1. **K3** opposite **6710QA** Do you finesse for the 10? Why/Not?

2. **AJ975** -- **6810K -** You play the K. LHO plays the 2 RHO the 3. <u>You play the 6 to dummy. LHO plays the 4.</u> **Finesse or drop?**

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 <u>the 8 and LHO plays the 6.</u> **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 RHO on lead
- Can ruff out the suit

Suit Combination 2

- **AJ975** -- **6810K -** You play the K. LHO plays the 2 RHO the 3. <u>You play the 6 to dummy. LHO plays the 4.</u> **Finesse or drop?**
  - Any 2-2 break is 40% while any 3-1 break is 50%.
  - 2-2 has 12 cases. 3-1 has only 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 <u>the 8 and LHO plays the 6</u>. **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%.
  - 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, and playing A then small are equivalent for all Hxxx-Hx/Hx-Hxxx. The finesse gains for all HHxx-xx, 6 cases more than A then x. But loses for the case xxxx-HH, net 5 cases different. **Finesse!**

3 Tricks		Totals	64	16100	100.00
A	2 finesses	43	43	11700	72.67
B	A and then small	38	38	10400	64.60

- Notice if we hold AJ10542 opposite 7, we are missing the same 6 cards but can take only **one** finesse. Now we are better playing A then x instead of finessing for the 16 cases for Hxxx-Hx/Hx-Hxxx.

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).

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	☐	☑	☐	☐	Qxxxxx	—	1	24	0.75
2	☐	☑	☐	☐	Qxxxx	x	5	195	6.06
3	☐	☑	☐	☐	Qxxx	xx	10	520	16.15
4	☑	☐	☑	☐	Qxx	xxx	10	572	17.76
5	☑	☐	☑	☑	Qx	xxxx	5	260	8.07
6	☑	☐	☑	☑	Q	xxxxx	1	39	1.21
7	☐	☐	☑	☑	xxxxx	Q	1	39	1.21
8	☐	☐	☑	☑	xxxx	Qx	5	260	8.07
9	☐	☐	☑	☐	xxx	Qxx	10	572	17.76
10	☐	☐	☐	☐	xx	Qxxx	10	520	16.15
11	☐	☐	☐	☐	x	Qxxxx	5	195	6.06
12	☐	☐	☐	☐	—	Qxxxxx	1	24	0.75
Goal to win						**Totals**	64	3220	100.00
A	Q, Qx, Qxx onside					3	16	871	27.05
B	Ruff the 4th Club					3	16	739	22.95
C	Play off 3 rounds of Clubs					6	32	1742	54.10
D	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%

Analyze 1ˢᵗ – Plan 2ⁿᵈ

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

	N	
♠ AQ		♠ 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 ½ x ½ x ½ 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 ♥ AKJ72 ♦ AQ ♣ J456

N	
W	E
S	
Lead ♥3	

♠ 98 ♥ Q10654 ♦ J65 ♣ AK10

When you find a good plan, look for a better one.

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 3rd ♦. 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	**N**	♠ AK987
♥ AK	**W**　　**E**	♥ 64
♦ KJ3	**S**	♦ A65
♣ AJ4	Lead ♥3	♣ 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...

♠ **QJ4**32   N   ♠ AK**987**

♥ AK   W   E   ♥ 64

♦ KJ3   S   ♦ A65

♣ **AJ4**   Lead ♥3   ♣ **K102**

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

Type	Games		Small Slam		Grand Slam			
	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
Win	**+450**	**+250**	**750**	**500**	**750**	**500**	**1500**	**1000**
Lose	**-240**	**-190**	**750**	**500**	**1530**	**1030**	**-780**	**-530**
IMPs W	**10**	**6**	**13**	**11**	**13**	**11**	**17**	**14**
IMPs L	**-6**	**-5**	**-13**	**-11**	**-17**	**-14**	**-13**	**-11**
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 %:

%

- Chances you'll have fun playing Bridge — 100
- Need 1 of 2 finesses — 75
- 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

1. E Kantar, <u>Take All Your Chances</u> (2009) Masterpoint Press
2. Richard Pavlicek Bridge Site: <u>http://www.rpbridge.net/</u>
3. Suit Play: <u>http://home.planet.nl/~narcis45/suitplay/</u>
4. Andrew Gumperz, "<u>Gambling at Bridge Part V – Grand Slams</u>" <u>http://www.bridgewinners.com</u>

5. H. W. Kelsey & M. l. Glauert, <u>Bridge Odds for Practical Players</u> (1980) Orion Publishing

6. E Rodwell & M Horton, <u>The Rodwell Files, Secrets of a Bridge Champion</u> (2011) Master Point Press

7. Jeff Ruben, <u>Expert Bridge Simplified, Arithmetic Shortcust for Declarer</u>, (2009) Bridge World Books.

INCREASING DIFFICULTY

Steve Moese

See you at the tables!

THANK YOU FOR YOUR KIND ATTENTION!