Probability Bridge

June 13, 2017

1 Suits In Hand

The probability distribution of the suits in one player's hand (order not important).

$$P(a, b, c, d) = \frac{4!}{repeat} \cdot \frac{\binom{13}{a}\binom{13}{b}\binom{13}{c}\binom{13}{d}}{\binom{52}{13}}.$$

Prob. distribution with more than 1% chance.

$$P(4, 4, 3, 2) = 0.2155117565$$
$$P(5, 3, 3, 2) = 0.1551684647$$
$$P(5, 4, 3, 1) = 0.1293070539$$
$$P(5, 4, 2, 2) = 0.1057966804$$
$$P(4, 3, 3, 3) = 0.1053613032$$
$$P(6, 3, 2, 2) = 0.05642489625$$
$$P(6, 4, 2, 1) = 0.04702074686$$
$$P(6, 3, 3, 1) = 0.03448188103$$
$$P(5, 5, 2, 1) = 0.03173900413$$
$$P(4, 4, 4, 1) = 0.02993218840$$
$$P(7, 3, 2, 1) = 0.01880829875$$
$$P(6, 4, 3, 0) = 0.01326226194$$
$$P(5, 4, 4, 0) = 0.01243337057.$$

2 Cards in Opp. Hands

Formula:

$$P(a, b) = \frac{\binom{13}{a}\binom{13}{b}}{\sum_{i+j=N}\binom{13}{i}\binom{13}{j}},$$

where N is the total number of cards of my opponents.

The prob. distribution of my opp.'s cards when my partner and I have 7 cards (again order not important):

$$P(6,0) = 0.01490683230$$
$$P(5,1) = 0.1453416149$$
$$P(4,2) = 0.4844720497$$
$$P(3,3) = 0.3552795032$$

The prob. distribution of my opp.'s cards when my partner and I have 8 cards (again order not important):

$$P(5,0) = 0.03913043478$$
$$P(4,1) = 0.2826086958$$
$$P(3,2) = 0.6782608698$$

The prob. distribution of my opp.'s cards when my partner and I have 9 cards (again order not important):

$$P(4,0) = 0.09565217395$$
$$P(3,1) = 0.4973913042$$
$$P(2,2) = 0.4069565213$$

The prob. distribution of my opp.'s cards when my partner and I have 10 cards (again order not important):

$$P(3,0) = 0.22$$
$$P(2,1) = 0.78.$$

Remark. All of the results have been verified by the simulation. It is very likely that these probabilities are correct. Some of the famous but old Bridge books incorrectly gave out the probability. For example if your team has 8 cards in a suit, the chance that the opp. will split 3 and 2 is only 0.6782608698, not 0.8 as claimed.