

Stat 19: Fiat Lux, Holdem or Foldem, Probability and Poker

Outline for the day:

1. Addiction.
2. Syllabus, etc.
3. Wasicka/Gold/Binger example.
4. Meaning of probability.
5. Axioms of probability.



For next class,

(i) Learn the rules of Texas Hold'em.

(<https://www.cardplayer.com/rules-of-poker/how-to-play-poker/games/texas-holdem> . There are tons of sites explaining this.)

(ii) Read addiction handout and legality handout at course website <http://www.stat.ucla.edu/~frederic/19/F21> .

Sometime in the next few weeks

(iii) Download R and try it out.

(www.r-project.org)

Wasicka/Gold/Binger Example

Wasicka/Gold/Binger Example, Continued

Gold: 4♠ 3♣. Binger: A♦ 10♦. Wasicka: 8♠ 7♠.
Flop: 10♣ 6♠ 5♠. (Turn: 7♣. River: Q♠.)

Wasicka folded?!? ♠ ♣ ♥ ♦

He had 8♠ 7♠ and the flop was 10♣ 6♠ 5♠.

Worst case scenario: suppose he were up against

9♠ 4♠ and 9♥ 9♦. How could Wasicka win?

88 (3: 8♣8♦, 8♣8♥, 8♦8♥)

77 (3)

44 (3)

[Let “X” = non-49, “Y” = A2378JQK, and “n” = non-★.]

4n Xn (3 x 32)

9♣ 4n (3)

9♣ Yn (24). **Total: 132 out of 903 = 14.62%.**

Meaning of Probability.

Notation: “ $P(A) = 60\%$ ”. A is an *event*.

Not “ $P(60\%)$ ”.

Definition of probability:

Frequentist: If repeated independently under the same conditions millions and millions of times, A would happen 60% of the times.

Bayesian: Subjective feeling about how likely something seems.

$P(A \text{ or } B)$ means $P(A \text{ or } B \text{ or both })$

Mutually exclusive: $P(A \text{ and } B) = 0$.

Independent: $P(A \text{ given } B)$ [written “ $P(A|B)$ ”] = $P(A)$.

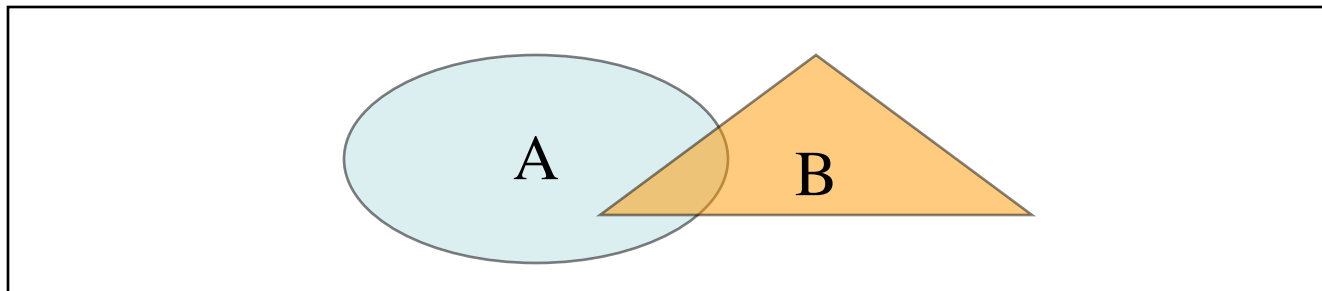
$P(A^c)$ means $P(\text{not } A)$.

2. Axioms (initial assumptions/rules) of probability:

- 1) $P(A) \geq 0$.
- 2) $P(A) + P(A^c) = 1$.
- 3) If A_1, A_2, A_3, \dots are mutually exclusive, then
 $P(A_1 \text{ or } A_2 \text{ or } A_3 \text{ or } \dots) = P(A_1) + P(A_2) + P(A_3) + \dots$

(#3 is sometimes called the *addition rule*)

Probability \Leftrightarrow Area. Measure theory, Venn diagrams



$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B).$$