

Baccarat Chemin de Fer

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We will play the *Chemin de Fer* variant of the *Baccart* card game.

Game rules

We will use *one* deck of cards.

One person will be the **Banker**. One person will be the **Player**.

The Banker will deal the cards. The Player will record the outcomes.

You will play **10** rounds of the game, while recording the cards and the winner. **You will use the results generated by all groups.**

Hand value

The objective of the game is to maximize the value of a hand, which consists initially of two cards, and a third card may be dealt, depending on the outcome.

- Cards Ace to Nine are worth 1 to 9 respectively.
- Ten and face cards are worth 0.
- The value of a hand is equal to the sum of the values of the cards, modulo 10. In other words, only the last digit of the sum is kept.

Setup

1. The Banker shuffles the deck.
2. The Player cuts the deck.

One round of the game

1. Deal one card face **up** to the Player and then to the Banker.
2. Deal a second card face **up** to the Player and the Banker.
3. If either Player or Banker has a hand value of 8 or 9 (called **natural**), compare the hands and declare the winner or a tie.
4. If the Player wishes to **hit**, deal a third card face up to the Player. Otherwise, the Player **stands** (i.e. hand remains the same).
5. If the Banker wishes to hit, deal a third card face up to the Banker. Otherwise, the Banker stands.
6. Compare the hands and declare the winner or a tie.
7. Remove all cards from play to start the next round.

Questions

In deriving the theoretical probability distributions below, you may assume that an infinitely large combined deck is used (i.e. an infinite number of decks are shuffled together).

1. Traditionally, in *Chemin de Fer*, the first two cards for each hand are dealt face down. Explain whether this makes a difference to the outcomes of the game.
2. Typically, in *Chemin de Fer*, six decks or more are mixed together. Explain whether this makes a difference.
3. What are the empirical marginal probabilities of obtaining a final hand value of 9 for the Player and the Banker?
4. Derive the theoretical marginal probability of obtaining a final hand value of 9 for the Player and the Banker.