Poker hand consists of 5 cards selected from a deck of 52 cards.

- How many different poker hands are there?
  $C(52,5) = 2598960$ hands \(\{1,2,3,4,5\} = \{5,3,4,2,1\}\)

- How many different poker hands consist entirely of aces and kings?
  Number of aces + kings = 8; \(C(8,5) = 56\) hands.

- How many different poker hands consist entirely of clubs?
  \# of clubs = 13, \(C(13,5) = 1287\) hands.

- How many consist of 3 aces and 2 kings?
  \(C(4,3).C(4,2) = 4.6 = 24\)

- How many different poker hands consist entirely of red cards?
  \# red cards = 26; \(C(26,5) = 65780\) hands.

- How many combinations have cards from exactly 2 suits?
  a) Consider one from the 1st suit, then there are \(C(4,1) = 4\), and left 4 for the other suit then there are \(C(3,1) = 3\). Therefore there are \(4.C(13,1) \cdot 3C(13,4) = 111540\) ways.
  b) Consider 2 from the 1st suit, then there are \(C(4,1) = 4\), and left 3 for the other suit then there are \(C(3,1) = 3\). Therefore there are \(4.C(13,2) \cdot 3C(13,3) = 267696\) ways.
  c) Total = \(111540 + 267696 = 379236\) ways

- How many ways all the cards from the same suit?
  Select a suit, there are \(C(4,1) = 4\) ways to do this. For each selection of a suit there are \(C(13,5) = 1287\).
  Final = \(4 \cdot C(13,5) = 5148\) ways.

- How many ways 3 from one suit and 2 from another?
  Select 3 from one suit = \(C(13,2) = 78\) ways.
  Select 2 from the same suit, there are \(C(4,2) = 6\) ways.
  The other suit is \(C(3,1) = 3\) (since 3 suits left to choose from). First 3 from 1 suit there are \(4.C(13,5) = 286\) ways, and 2 from another \(3C(13,2) = 78\).
  Total = \(4 \cdot C(13,3) \cdot 3C(13,2) = 22308\) ways.

- How many ways 2 aces, 2 cards of another denomination, and 1 card of a 3rd denomination.
  - For 2 aces = \(C(4,2) = 6\)
  - 2 cards of another denomination are \(C(4,2) = 6\) ways, there are 12 ways for the 2nd denomination.
    Therefore, there are \(12.(6) = 72\) ways
  - 3rd denomination the are 11 ways, 1 card \(\Rightarrow 11.C(4,1) = 44\)
    The outcomes: \(6.(72).(44) = 19008\) hands.

- How many hands are in 2 cards of 1 denomination, 2 cards of another different denomination, and 1 card of a 3rd denomination.
  Select 2 cards of 1 denomination = \(C(13,2) = 78\) ways.
  Select 2 of one denomination, there are \(C(4,2) = 6\)
  Then select 2 of the other = \(C(4,2) = 6\)
  Select the 3rd denomination, there are \(11.C(4,1) = 44\)
  # of poker hands = \(78.6.6.44 = 123552\) hands.