

Royal Flush:

4

Straight Flush:

40-4=36

Four of a Kind: 11856

Case 0:  $\binom{13}{1} * \binom{4}{4} * 48 = 624$

Case 1:  $\binom{13}{1} * \binom{4}{1} * \binom{3}{2} * 48 = 7488$

Case 2:  $\binom{13}{1} * \binom{4}{2} * 48 = 3744$

Full House: 24960

Case 0:  $\binom{13}{1} * \binom{4}{3} * 12 * \binom{4}{2} = 3744$

Case 1(Subcase1):  $\binom{13}{1} * \binom{4}{2} * \binom{2}{1} * 12 * \binom{4}{2} = 11232$

Case 1(Subcase2):  $\binom{13}{1} * \binom{4}{3} * 12 * \binom{4}{1} = 2496$

Case 2:  $\binom{13}{1} * \binom{4}{2} * \binom{2}{1} * 12 * \binom{4}{1} = 7488$

Flush: 19980

Case 0:  $\binom{4}{1} * \binom{13}{5} - 40 = 5108$

Case 1:  $\binom{13}{1} * \binom{4}{1} * \binom{12}{3} * 1 = 11440$

Case 2:  $\binom{4}{1} * \binom{13}{2} * \binom{11}{1} = 3432$

Straight:

Case 0:  $10 \cdot 4^5 - 40 = 10200$

Three of a Kind: 219648

Case 0:  $\binom{13}{1} \cdot \binom{4}{3} \cdot \binom{12}{2} \cdot 4 \cdot 4 = 54912$

Case 1:  $\binom{13}{1} \cdot \binom{4}{2} \cdot \binom{2}{1} \cdot \binom{12}{2} \cdot 4 \cdot 4 = 164736$

Case 2: Not possible

Two Pair: 243672

Case 0:  $\binom{13}{2} \cdot \binom{4}{2} \cdot \binom{4}{2} \cdot 44 = 123552$

Case 1:  $\binom{13}{2} \cdot \binom{4}{1} \cdot \binom{4}{2} \cdot 44 = 82368$

Case 2:  $\binom{13}{2} \cdot \binom{4}{1} \cdot \binom{3}{1} \cdot 44 = 41184$

One Pair: 1818960

Case 0:  $\binom{13}{1} \cdot \binom{4}{2} \cdot \binom{12}{3} \cdot 4 \cdot 4 \cdot 4 = 1098240$

Case 1:  $\binom{13}{1} \cdot \binom{4}{1} \cdot \binom{12}{3} \cdot 4 \cdot 4 \cdot 4 - \binom{13}{1} \cdot \binom{4}{1} \cdot \binom{12}{3} [\text{Flush with one pair}] = 720720$

Case 2: Not Possible

Five of a Kind: 208

Case 0: Not Possible

Case 1:  $\binom{13}{1} \cdot \binom{4}{1} \cdot \binom{3}{3} = 52$

Case 2:  $\binom{13}{1} \cdot \binom{4}{2} \cdot \binom{2}{1} = 156$