5-CARD POKER HANDS

A SINGLE PAIR

This the hand with the pattern AABCD, where A, B, C and D are from the distinct "kinds" of cards: aces, twos, threes, tens, jacks, queens, and kings (there are 13 kinds, and four of each kind, in the standard 52 card deck). The number of such hands is (13-choose-1)*(4-choose-2)*(12-choose-3)*[(4-choose-1)]^3. If all hands are equally likely, the probability of a single pair is obtained by dividing by (52-choose-5). This probability is 0.422569.

TWO PAIR

This hand has the pattern AABBC where A, B, and C are from distinct kinds. The number of such hands is (13-choose-2)(4-choose-2)(4-choose-2)(11-choose-1)(4-choose-1). After dividing by (52-choose-5), the probability is 0.047539.

A TRIPLE

This hand has the pattern AAABC where A, B, and C are from distinct kinds. The number of such hands is (13-choose-1)(4-choose-3)(12-choose-2)[4-choose-1]^2. The probability is 0.021128.

A FULL HOUSE

This hand has the pattern AAABB where A and B are from distinct kinds. The number of such hands is (13-choose-1)(4-choose-3)(12-choose-1)(4-choose-2). The probability is 0.001441.

FOUR OF A KIND

This hand has the pattern AAAAB where A and B are from distinct kinds. The number of such hands is (13-choose-1)(4-choose-4)(12-choose-1)(4-choose-1). The probability is 0.000240.

A STRAIGHT

This is five cards in a sequence (e.g., 4,5,6,7,8), with aces allowed to be either 1 or 13 (low or high) and with the cards allowed to be of the same suit (e.g., all hearts) or from some different suits. The number of such hands is 10*[4-choose-1]^5. The probability is 0.003940. IF YOU MEAN TO EXCLUDE STRAIGHT FLUSHES AND ROYAL FLUSHES (SEE BELOW), the number of such hands is 10*[4-choose-1]^5 - 36 - 4 = 10200, with probability 0.00392465

A FLUSH

Here all 5 cards are from the same suit (they may also be a straight). The number of such hands is (4-choose-1)* (13-choose-5). The probability is approximately 0.00198079. IF YOU MEAN TO EXCLUDE STRAIGHT FLUSHES, SUBTRACT 4*10 (SEE THE NEXT TYPE OF HAND): the number of hands would then be (4-choose-1)*(13-choose-5)-4*10, with probability approximately 0.0019654.

A STRAIGHT FLUSH

All 5 cards are from the same suit and they form a straight (they may also be a royal flush). The number of such hands is 4*10, and the probability is 0.0000153908. IF YOU MEAN TO EXCLUDE ROYAL FLUSHES, SUBTRACT 4 (SEE THE NEXT TYPE OF HAND): the number of hands would then be 4*10-4 = 36, with probability approximately 0.0000138517.

A ROYAL FLUSH

This consists of the ten, jack, queen, king, and ace of one suit. There are four such hands. The probability is 0.00000153908.

NONE OF THE ABOVE

We have to choose 5 distinct kinds (13-choose-5) but exclude any straights (subtract 10). We can have any pattern of suits except the 4 patterns where all 5 cards have the same suit: 4^5-4. The total number of such hands is [(13-choose-5)-10]* (4^5-4). The probability is 0.501177.

Hand	Probability	Number of Hands
Single Pair	0.422569	1098240
Two Pair	0.047539	123552
Triple	0.0211285	54912
Full House	0.00144058	3744
Four of a Kind	0.000240096	624
Straight (excluding Straight Flush and Royal Flush)	0.00392465	10200
Flush (but not a Straight)	0.0019654	5108
Straight Flush (but not Royal)	0.0000138517	36
Royal Flush	0.00000153908	4
None of the Above	0.501177	1302540
Sum over except this list	0.999999616	2598960