Provide *complete* and *legible* solutions to each of the following problems on separate stapled sheets of paper.

A standard poker deck of 52 cards has four *suits*, (symbols C, H, S, and D) and thirteen *ranks* (symbols A, 2, 3, 4, 5, 6, 7, 8, 9, T, J, Q, and K). Every card in the deck has both a rank and a suit.[1]

A *poker hand* is any set of 5 cards from the standard poker deck. There are some special hands in poker, and these have values (i.e. some are better, some are worse). From best to worst, the hands are given names as follows:

(a) A *royal flush* is a hand T, J, Q, K, A all of the same suit.

(b) A *royal straight* is a hand T, J, Q, K, A not all in the same suit.

(c) A *straight flush* is a hand of five cards in sequence, all in the same suit.

(d) A *four of a kind* is a hand with four cards of the same rank.

(e) A *full house* is a hand with a three cards of one rank and two cards of a different rank.

(f) A *flush* is a hand with any five cards in the same suit.

(g) A *straight* is a hand with five cards in sequence.

(h) A *three of a kind* is a hand with three cards of the same rank.

(i) A *two pair* is a hand with two different pairs.

(j) A *pair* is a hand with two cards of the same rank.

(k) A *high card hand* is a hand which fails all of the above.

1. How many poker hands are there?

2. How many royal flushes are there?

3. How many royal straights are there?

4. How many four of a kinds are there?

5. How many three of a kinds are there?

6. How many pairs are there?

7. How many full houses are there?

8. How many two pairs are there?

9. How many straight flushes are there?

10. How many flushes are there?

11. How many straights are there?

12. How many high card hands are there?

---

[1]If we really wanted to, we could think of the deck of cards as the set $\{A, 2, 3, 4, 5, 6, 7, 8, 9, T, J, Q, K\} \times \{C, H, S, D\}$.