

**CS 135 – Computer Science I**  
**Spring 2016**  
**Chapter 9 Programming Assignment (pa09)**  
**100 points**  
**Due by 9:00, 2016-04-30**

*Problem description*

Write a program that shuffles and deals a hand of cards from a full deck. The deck of cards is represented by a vector of 52 elements. Each element in the vector is a structure for one card, as shown below. (Updated to resemble the syntax shown in your book. However, you may still use the `typedef` approach shown in the original assignment.)

```
struct Card {  
    string suit;    ///< Clubs, Diamonds, Hearts, Spades  
    int     value;  ///< Ace, Deuce, 3..10, Jack, Queen, King  
};  
  
typedef vector<Card> Deck;  
  
typedef Deck Hand;
```

Write the following:

1. A function that initializes a new Deck of Cards. All values should be in order by suit. (Hint: Use nested loops to initialize each new Card before being added to the Deck.)
2. A function that neatly prints a Deck of Cards.
3. A function that randomly shuffles a Deck of Cards. (Hint: Generate a random number in the range 0..51 and exchange the current card with the card in the random position.)
4. A function that deals a Hand of 5 Cards. As each card is dealt, it should be removed from the Deck.
5. A driver program that initializes a new Deck of Cards, shuffles them, then deals and prints a Hand.

*Challenge version (up to 15 points extra credit)*

In addition to the functions above, implement functions to accomplish each of the following:

- a. Determine whether the Hand contains a pair. (2)
- b. Determine whether the Hand contains two pairs. (2)
- c. Determine whether the Hand contains three of a kind (e.g. three Jacks). (2)
- d. Determine whether the Hand contains four of a kind (e.g. four Aces). (2)
- e. Determine whether the Hand contains a flush (i.e. all five cards of the same suit). (2)
- f. Determine whether the Hand contains a straight (i.e. five cards of consecutive face values). (2)
- g. The driver program should evaluate the Hand dealt in step 4 and report the *best* kind of hand. For example, four Aces could be reported as a pair, two pairs, or three of a kind, but the best hand is four of a kind. (3)

*Submission*

Name your source code file `pa09.cpp` and use the `turnin` command to submit your solution.