**Poker Hand Comparison Project**

A Visual Studio C# project has been supplied to act as the template for delivering this project. Unzip the attached zip file. In Visual Studio, open the solution file ‘’*PokerHandExercise.sln*” which contains two projects – the main project and a .Test project (containing unit tests).

The exercise involves implementing the (supplied in the C# project) interface *IPokerHandComparer*. The class ‘*PokerHandComparer’* implements that interface has also been provided but the correct implementation is not in place.

The interface declares one method:

*CompareHands*(PokerHand hand1, PokerHand hand2)

which returns an integer indicating which hand is best.

It should return:

-1 if hand2 beats hand1

0 if hand1 and hand2 are equivalent

1 if hand1 beats hand2

Poker hands consist of 5 cards out of a standard deck of 52 cards. Each card has a suit and a value (in the starting project these are defined in the enums *CardSuit* and *CardValue*).

There is also an enumeration (*PokerHandType*) which lists each of the different types of hand (as listed below) which can be used if needed (it’s not required that you use this enum).

The types and rankings of poker hands can be found here: https://en.wikipedia.org/wiki/List\_of\_poker\_hands

(In addition, a summary of poker hands and their precedence is included below)

Feel free to extend the provided classes as required.

What should not be modified are:

* The interface definition
* The *CardSuit* and *CardValue* enumerations
* The existing tests (additional tests can be added as you see fit)

The provided tests are representative but not exhaustive, and do not represent all the tests we will run against your solution. Note that the tests fail at present – because the solution has not been implemented yet.

We are looking for a solution that is well tested, extensible and maintainable.

**Appendix: Poker hands and their precedence**

It’s worth noting that Ace (A) is generally considered a high card, coming above King (K) in sequence. However, for the purposes of straights, it can be used as a ‘one’ (e.g. A,2,3,4,5). When an A is consider to be a ‘One’ in order to complete a hand the A must always be considered a ‘One’ when comparing that hand. So, the straight A,2,3,4,5 loses against the straight 9,10,J,Q,K. At first glance the first straight, with the Ace, might be interpreted as higher than the second, but since the Ace is being used as a One, the first straight is lower than (loses to) the second.

Hands From best to worst:

* **Straight Flush**: All five cards are the same suit, and they are in a value sequence (with Ace considered either a one (falling below the numeric 2) or a card following the King )

Examples:

* 9,10,J,Q,K of Hearts.
* 3,4,5,6,7 of Diamonds.
* A,2,3,4,5 of Clubs
* 10,J,Q,K,A of Spades

When comparing two flush hands, the one that ends in the higher Value card wins: So 8,9,10,J,Q (same suite) beats 6,7,8,9,10 (same suite) because the Q is higher than the 10.

* **Four of a kind**: 4 of the 5 cards in the hand have the same Value (suit is irrelevant)

Examples:

* 9,9,9,9,any

If two players have 4 of a kind then the hand with the highest value cards (making up the 4) wins. The ‘any’ card will always be irrelevant as no two players can have the same valued 4 cards.

* **Full House**: 3 of the cards have same value, and the other 2 have the same value (suit is irrelevant).

Examples:

* J,J,J,3,3
* A,A,A,9,9

When comparing two Full Houses, the hand with the higher value of the triple card wins (e.g. 5,5,5,Q,Q beats 4,4,4,A,A)

* **Flush**: All 5 cards in the hand have the same Suit (card Values are irrelevant).

When comparing two Flush hands, the hand with the highest Value card wins (so J,7,4,3,2 all Hearts beats 10,9,8,7,3 all Clubs).

If the top two cards in both hands have the same Value, the next highest cards are compared and so on down until one hand or the other wins.

If they match Values exactly for all 5 cards, the hands are equivalent.

* **Straight**: This is a set of 5 cards with Values that make up a sequence. Suit is irrelevant.

Examples:

* 4,5,6,7,8 (any suits)
* 10,J,Q,K,A (any suits)

When two straights are compared the hand with the highest Value card wins. If both have the same highest Value they are equivalent.

* **Three of a kind**: 3 of the cards have the same Value (and the other two differ and can be anything, otherwise it would be a better hand). Suit is irrelevant.

Examples:

* 7,7,7,any,any
* Q,Q,Q,any,any

When two 'three-of-a-kind' hands are compared, the hand with the highest Value 'triple-card' wins.

* **Two-pair**: Two cards have the same Value, and another two cards have the same Value (different to the first pair). Suit is irrelevant.

Examples:

* 4,4,2,2,any
* J,J,6,6,any

When two 'Two pair' hands are compared, the hand with the higher pair wins. If both have the same highest pair, the second pairs are compared and the higher value pair of those wins. If those also match the hand with the higher 5th cards wins. If those also match the hands are equivalent.

* **Pair**: Two of the cards in the hand have the same value. Suit is irrelevant.

Examples:

* 7,7,any,any,any
* 2,2,any,any,any

When two 'Pair' hands are compared the hand with the higher Value pair wins. If those match, each of the other cards in order is compared in order, highest to lowest. If any has a higher ‘x-th’ card then that hand wins.

If all the card's Values match, the hands are equivalent.

* **High Card**: A hand matching none of the above described hands is the lowest on the ladder. When two 'High card' hands are compared the Value of the cards from each hand from highest to lowest are compared and whichever hand has the higher of the 2 cards being compared wins. If the two hands have exactly the same set of 5 card values the hands are equivalent.  
  Examples (assuming the hands are not flushes – i.e. the 5 cards in each hand are not the same suit):
* K,T,5,4,3 beats K,9,8,3,2 – because the T (10) in the first hand beats the corresponding 9 in the second hand
* A,J,6,5,3 beats A,J,6,5,2 (the fifth cards differ, with 3 beating 2)
* J,10,7,6,5 draws with J,10,7,6,5 (each hand would have different suits of the corresponding valued cards)

Note that a hand is always ‘valued’ at its highest quality hand. The hand 5,5,8,8,8 might be recognised as a ‘Pair’ because of the two 5s, or, maybe even Two Pair due to having two fives and two eights. However, the hand also qualifies as a full-house which is higher than Pair or Two-pair, and so that is what it should be identified as.