CS 101 – Problem Solving & Programming I
Program 4
Algorithm Due Thursday, Sep 20
Program Due Sunday, Sep 23

Poker is a popular card game. There are many variations, with wildly different rules regarding how many cards are dealt face-up or face-down, when betting takes place, and so on. We're going to start with something simpler. This program will simulate a shuffled deck of cards, deal hands to each of 5 simulated players, and then print the hands and report who won, and what rank the winning hand was.

If you're not familiar with poker, you may want to review the basics of the game, at the end of this document.

Specification: Your program will simulate a card game among five people. Include a function that returns a list or tuple representing a shuffled deck of cards. For the rank of each suit, use a single-character code: 2-9 for numbered cards, T for the 10, J for the Jack, Q for the Queen, K for the King, and A for the Ace. Thus the rank is a single character. For the suit, use the first letter of each suit: S for spades, H for hearts, C for clubs, D for diamonds. Thus, each card can be represented by a 2-character string. For this program, you should represent the card as a string with the rank, then the suit.

Your program will then deal 5 cards to each player. Finally, it will display each player's hand, announce which player wins the hand, and the value of the winning player's hand.

Allow the user to play as many hands as desired. Each hand should begin with a freshly shuffled deck.

Extra credit. For 10 points extra credit, add two jokers (value 'JJ') to your deck. Jokers are *wild*, meaning they can take on any rank or suit necessary to fill out a hand. For example, if you have four spades and a club, you have nothing; four spades and a joker would count as a flush. Cards with values of 4-5-6-7-Q are nothing; 4-5-6-7-JJ count as a straight. Note that this pushes up the complexity of evaluating hands substantially. Make sure you have a working program that's ready to turn in before tackling this.

Development notes:

- This program has several parts. Don't put it off!
- The random module has a function called shuffle() that will be useful. It takes a list as its parameter and shuffles it in place (that is, it does not return anything).
- Generating an unshuffled deck can be done with nested loops.
- You will probably want to write several functions that take a hand as their parameter and return a boolean value based on whether or not the hand has certain properties. For example, one function could report whether a hand contains a flush, and another report whether a hand contains a straight.
- A hand should probably be a tuple rather than a list, so there's less chance of a misbehaving function mangling the hand.
- Since we're not doing any sort of calculation with the card values, we can use single-character strings even for the numeric values—the string '2' rather than the integer 2, and so on.
- This program does not allow draws or wild cards (unless you're going for the extra credit).
- Output should be neatly formatted, but there isn't a specific layout you have to use.
- As usual, develop the program in stages. Start by writing a program that produces a shuffled

deck. Then modify the program to deal 5 hands of 5 cards each. Then add a function that can check if a hand is of a particular type. Etc...

Here's a transcript of a session with the finished program:

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>>>
Enter names of players, separated by whitespace: Alfred Bob Charlie David Eddie
Alfred: ('5H', '3D', '6H', '7S', '2H')
Bob: ('9S', 'QD', 'QH', '3C', 'QC')
Charlie: ('AH', '2D', 'TC', '5D', '8C')
David: ('JD', '4S', '3S', 'QS', 'JC')
Eddie: ('6C', 'JH', 'TD', 'AC', '9C')
Winning this hand:
Bob has three of a kind

Another hand [Y/N]? y
Alfred: ('9H', '4H', '9D', 'AH', 'TC')
Bob: ('3D', 'AS', '6S', 'QC', '8H')
Charlie: ('2S', '6D', 'KD', '5H', '7H')
David: ('QS', '4C', 'JD', '5C', '4D')
Eddie: ('8S', '5S', '9C', 'TH', '7S')
Winning this hand:
Alfred has one pair
David has one pair

Another hand [Y/N]? y
Alfred: ('7C', '4D', '2C', 'KC', 'TD')
Bob: ('TH', 'TS', '5H', 'JD', 'JH')
Charlie: ('2H', '7H', 'AH', 'QD', '8S')
David: ('JS', '6S', '2D', '3S', 'KH')
Eddie: ('AS', '4S', 'TC', 'QS', '3C')
Winning this hand:
Bob has two pair

Another hand [Y/N]? y
Alfred: ('8D', '8H', '7D', 'TD', '7S')
Bob: ('4C', 'TS', 'TH', '2H', '7H')
Charlie: ('5C', '5D', 'QS', '5S', '4D')
David: ('AH', '2S', 'KS', 'JD', '3S')
Eddie: ('9S', '2D', '8S', 'JC', '2C')
Winning this hand:
Charlie has three of a kind

Another hand [Y/N]? y
Alfred: ('6D', '9C', 'QC', '7S', 'AD')
Bob: ('6S', 'AH', '9H', 'TH', '4H')
Charlie: ('3D', '4C', '8D', '3H', '5H')
David: ('2D', 'QS', '2C', 'AS', '9D')
Eddie: ('KD', '5D', 'TC', 'KH', 'AC')
Winning this hand:
Charlie has one pair
David has one pair
Eddie has one pair

Another hand [Y/N]? y
Alfred: ('TD', 'KD', '5D', 'AC', 'KH')
Bob: ('4S', 'JH', '7D', '4C', '6C')
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Charlie: ('AD', 'TC', 'JS', '5H', '4D')
David: ('QH', '7S', '8H', '8C', '6H')
Eddie: ('4H', 'KC', 'QD', '7C', '7H')
Winning this hand:
Alfred has one pair
Bob has one pair
David has one pair
Eddie has one pair

Another hand [Y/N]? n
>>>
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The Basics of Poker

Poker is a card game for 2 or more players. It uses a standard 52 card deck, consisting of 4 suits (Spades, Hearts, Clubs, Diamonds) with 13 cards each: Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10 (abbreviated 'T' here), Jack, Queen, King. The Ace can be considered the smallest card (below the 2) or the highest (above the King).

After the deck is shuffled, each player is dealt 5 cards. (This is the simplest variant. There are many, many variations, which we're not going to get into here.) This program is going to disregard the betting portion of the game, which is a major part of the actual game. After all betting has completed, the hands are compared and the highest hand wins. The value of a hand is based on the likelihood of being dealt that hand. In valuing a hand, the order the cards are dealt doesn't matter. Some hands require that all cards be the same suit, but there is no ranking of the suits themselves. If it is possible to value a hand more than one way, always choose the highest value possible for that hand.

Note that while there are ways of breaking ties between poker hands of the same rank, you don't need to worry about them for this assignment. (At a poker table, a straight with a King as the highest card beats a straight with a 10 as the highest card. For this assignment, they're both straights, and they tie. A pair of Aces beats a pair of threes. Again, for this program, they're both 'one pair' and are tied.)

The ranking of hands, from highest to lowest:

- Royal Flush. A-K-Q-J-T, all the same suit.
- Straight Flush. Both a straight and a flush; that is, the 5 cards are all the same suit and can be arranged in sequence, with no gaps in the sequence.
- Four of a Kind. 4 of the 5 cards have the same rank. The fifth card can be anything.
- Full House. Three cards of one rank, and a pair of a different rank.
- Flush. All 5 cards are the same suit.
- Straight. The 5 cards form an unbroken sequence. The Ace can count low (A-2-3-4-5) or high (A-K-Q-J-T). It is not possible to go 'around the corner;' 3-2-A-K-Q is NOT a straight.
- Three of a kind. Three of the 5 cards have the same rank. The other two cards are not a pair.
- Two pair. Two cards of the same rank, and another two cards of a different rank.
- One pair. Two of the cards have the same rank, no other combination possible.
- No pair.