Project 2

Title

Drewbage Cribbage Game V.2

Course

CSC-5

Section

40651

Due Date

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Author

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Drewbage *Cribbage... Distilled.*

Introduction

At the outset of this project, I knew that one of the most difficult games for me to implement with any modicum of success would be a card game. The difficulty, as I saw it, would be in attempting to accurately model the behavior of having cards in one's hand and then using them. That is, to assign cards to a hand from a "deck"—insuring no duplicates could go to any player—and then removing those cards from one's hand to use in gameplay. Even if that was implemented successfully, I still needed to create ways to count the points in a hand, allowing the player to use the hand to their advantage. Despite the difficulty, I desired to impress. In addition, Cribbage holds a special place for me as it's the only card game that my family played during my childhood and still continues to play. It's the game that I would go to my grandmother's house to play before she became ill. Any day that we would travel to her house, we would wait till after dinner and her, my family, and I would play cribbage together.

Game Play and Rules

Drewbage cribbage is two-player cribbage. The Player (user) will be playing against the computer. There is nothing the user needs to do for the computer—it will take care of its own play.

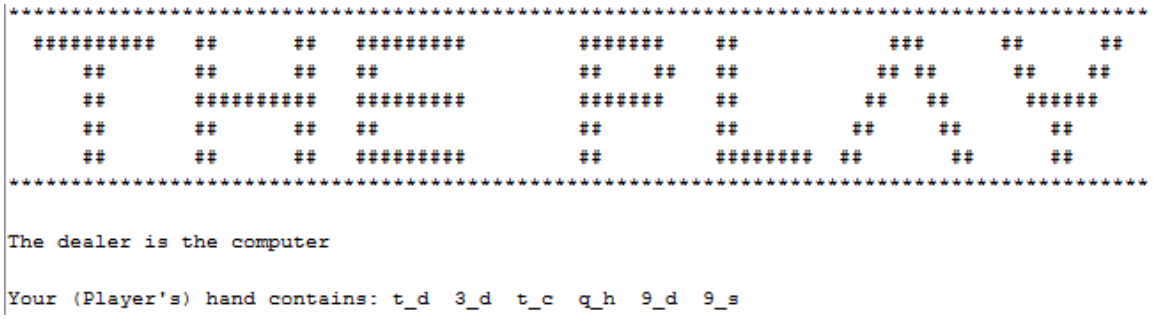
The game starts with a Menu. "Type 1 to Play Game" and pressing any key to quit the program.

```
*********************************************************************************************
  ######    ######    #######   ##          ##   ######       ###       ######     #######
  ##   ##   ##   ##   ##         ##   ##   ##    ##   ##     ## ##     ##    ##    ##
  ##   ##   ######    #######     ##  ##  ##     ######     ##   ##    ##         #######
  ##   ##   ##  ##    ##           ###  ###      ##   ##   ##     ##   ##  ####    ##
  ######    ##   ##   #######       ##  ##       ######   ##       ##   ######     #######
*********************************************************************************************

Menu for Drewbage Cribbage
Type 1 to Play Game
Type anything else to exit
```

Before the game begins, the results of the previous game are displayed above the banner announcing the beginning of "the play".

```
----------------------------
Results of Most Recent Game:
Game has not been played before
----------------------------
```

At the outset of the game, the dealer is determined randomly and both the computer and the Player are dealt six cards. The Player should notice that the dealer is displayed.



The first action the Player will undertake is discarding two cards into the “crib”. The “crib” hand is not used during the pegging portion of the game. However, rest assured that although you as the Player are not using it and will not see its contents for a little while, the crib has been filled properly and contains the cards given to it. As it stands right now, the game that the Player will be playing next is the portion of cribbage called The Play or “pegging”. This occurs after the dealer is announced and two cards from each player have been given to the crib. Any points later derived from the crib will go to the dealer. So, if you’re the dealer you want to maximize your crib points potential. However, if you aren’t the dealer you want to minimize the crib points potential.

At this point, I would like to take the time to detail some of the codes used in the program:

Each card name is composed of three characters; the rank, the “of”, and the suit. For example: a_s equals “ace of spades”. The breakdown is as follows: “a” stands for “ace”, the underscore for “of”, and the “s” for spades.

_ underscore character	“of”
Ranks	
a	Ace
2	two
3	three
4	four
5	five
6	six
7	seven
8	eight
9	nine
t	ten
j	Jack
q	Queen
k	King

Suits	
c	clubs
d	diamonds
h	hearts
s	spades

Now that we have the card codes detailed, let's continue with the game play. Assuming the following:

```
Your (Player's) hand contains: 8_c  6_d  a_h  t_d  6_s  9_s

Please type the name (as displayed) of the TWO cards
you wish to discard into the crib
Card 1: 6_s
```

Let's enter that "6_s" (which is the "six of spades")

```
Please type the name (as displayed) of the TWO cards
you wish to discard into the crib
Card 1: 6_s
Your (Player's) hand now contains: 8_c  6_d  a_h  t_d  9_s
Card 2:
```

And there you have it! The computer accepted the card, put it in the "crib", and removed it from "your" hand. You're going to do the same for the second card and then move on to The Play portion of the cribbage game. At that point, the "Up Card" will be displayed. The Up Card will come into play after The Play portion of the game is finished. The following image gives more information. Note also that the computer put its two cards into the crib, just like you did. Because the computer is the dealer in this particular game (it's assigned randomly) you get to play your card first.

```
The computer has also discarded two cards into the crib.

The starter card is the: 4_c

Your (Player's) hand contains: t_d  t_c  9_d  9_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: t_d
The play count is: 10
The computer plays the: 4_d
The play count is: 14
Your (Player's) hand contains: t_c  9_d  9_s
Please type the name (as displayed) of the card
in your hand you wish to use:
```

Two turns later:

```
Your (Player's) hand contains: t_d  t_c  9_d  9_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: t_d
The play count is: 10
The computer plays the: 4_d
The play count is: 14
Your (Player's) hand contains: t_c  9_d  9_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: 9_d
The play count is: 23
The computer plays the: 2_c
The play count is: 25
Your (Player's) hand contains: t_c  9_s
You have no playable card. You must pass!
The computer plays the: 3_c
The play count is: 28
Your (Player's) hand contains: t_c  9_s
You have no playable card. You must pass!
The computer has chosen to pass!
Last play by the computer. +1000 points for the "GO"!
```

You play the ten of diamonds. The card is removed from your hand. The count is 10. The computer plays the four of diamonds and the count is now 10 + 4 = 14 This then continues until the score reaches as close to 31 as possible without going over 31.

Since you need to start thinking in terms of points, here is the table of values for each card rank:

Rank	Value
Ace	1
two	2
three	3
four	4
five	5
six	6
seven	7
eight	8
nine	9
ten	10
Jack	10
Queen	10
King	10

Before I leave you to play the game for yourself, I would like to go over a few final things:

```
Your (Player's) hand contains: t_d  t_c  9_d  9_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: t_d
The play count is: 10
The computer plays the: 4_d
The play count is: 14
Your (Player's) hand contains: t_c  9_d  9_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: 9_d
The play count is: 23
The computer plays the: 2_c
The play count is: 25
Your (Player's) hand contains: t_c  9_s
You have no playable card. You must pass!
The computer plays the: 3_c
The play count is: 28
Your (Player's) hand contains: t_c  9_s
You have no playable card. You must pass!
The computer has chosen to pass!
Last play by the computer. +1000 points for the "GO"!
```

If you follow the count, you'll notice that at a certain point your hand may only contain a card or cards that will send the count over 31. Don't worry; the program will know that you don't have a playable card in your hand for that given count. In this case it will "pass" for you. That is, you don't have to pass—the computer knows that you can't play your cards with the particular play count.If you still have cards at the end of a particular "round", you will play another round until both you and the computer run out of cards. At that point, the points will be tallied and displayed.

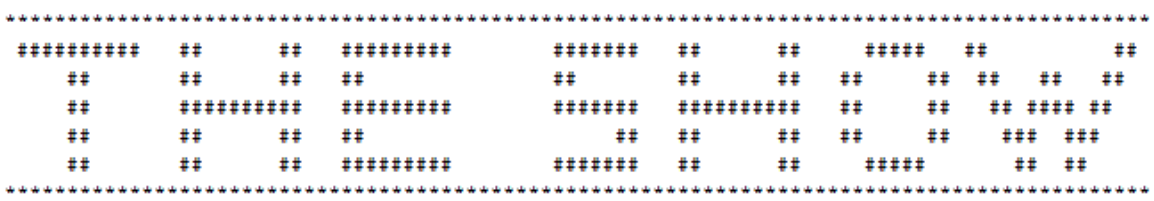
```
New Round Started: Play Count Reset to 0
The computer plays the: t_s
The play count is: 10
Your (Player's) hand contains: 7_h  8_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: 7_h
The play count is: 17
The computer plays the: 9_c
The play count is: 26
Your (Player's) hand contains: 8_s
You have no playable card. You must pass!
The computer is out if cards and must pass!
Last play by the computer. +1000 points for the "GO"!
```

```
New Round Started: Play Count Reset to 0
Your (Player's) hand contains: 8_s
Please type the name (as displayed) of the card
in your hand you wish to use:
Card: 8_s
The play count is: 8
The computer is out if cards and must pass!
You have no playable card. You must pass!
Last play by Player. +1000 points for the "GO"!
-----------------------------------------
The total points are: Player: 2000      Computer: 1000
```

Finally, the following is the scoring breakdown for The Play. It's non-traditional, but so is Drewbage.

Make the play count equal to 15	2000 points
Make the play count equal to 31	4000 points
Last player in a game that ends at < 31 What's known as a "GO"	1000 points

After The Play is finished, the next portion of the game is The Show. This portion is decidedly less involved from a player's point-of-view, but it is the result of your decisions earlier in the game. Specifically, how many points your receive is based on what you kept in your hand after discarding to the crib, what the up card is, and whether you are the dealer and get to add the crib score to your points total.



The following is the scoring breakdown for The Show. Once again, it's non-traditional.

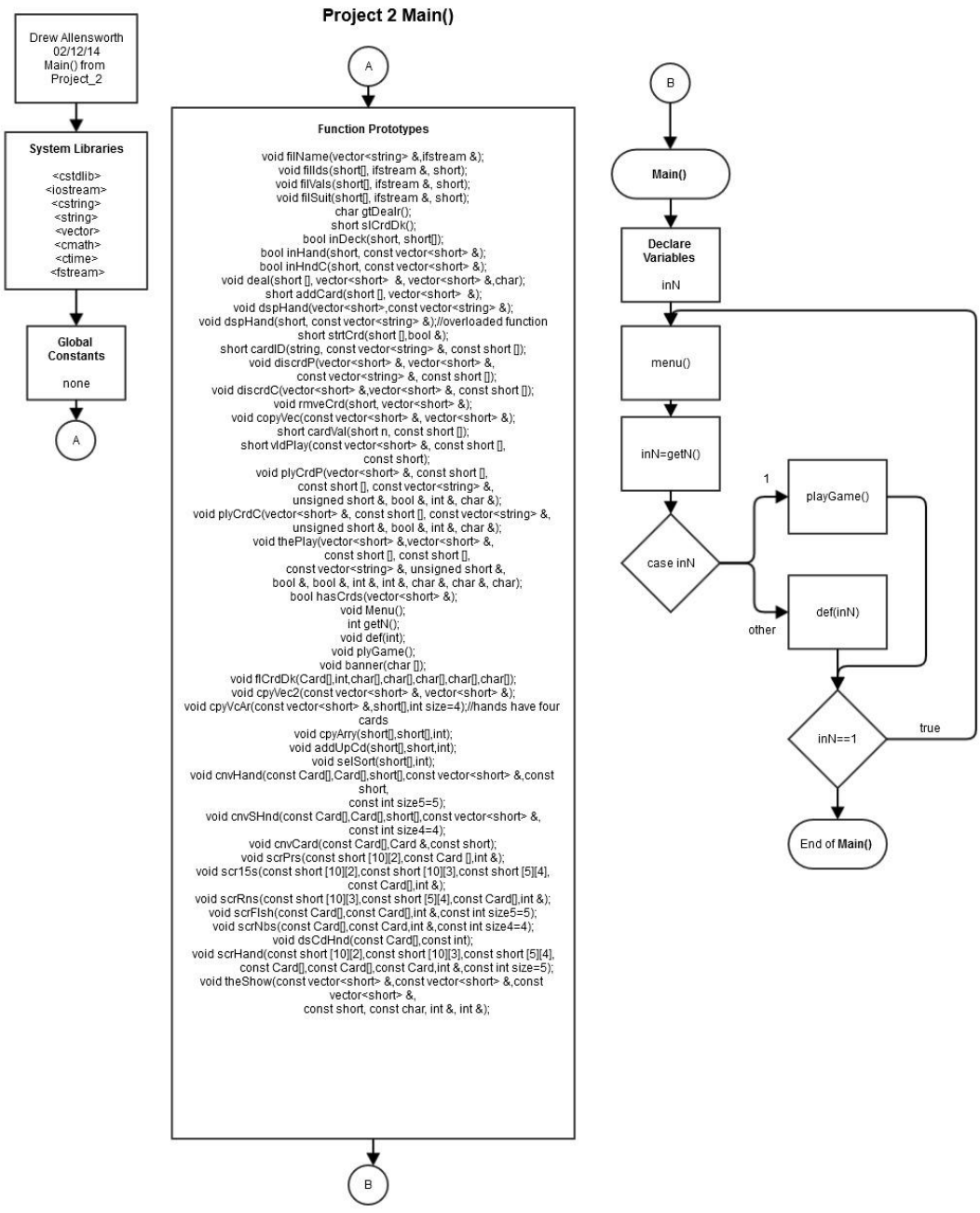
A pair of any two cards	2000 points
Any combination of cards equal to 15	2000 points
Any run of three or more cards	1000 points for each card
A flush (same suit) of all five cards	5000 points
A flush of all four cards in one's hand not including the Up Card	4000 points
Having a Jack in one's hand when the Up Card is a Jack ("nibs")	1000 points + a bonus of 20% of the points total

Below is an image of all three hands being scored and the crib hand's points being added to the dealer. The Points below the hand scores reflects the scores from the hand being added to the points from The Play.

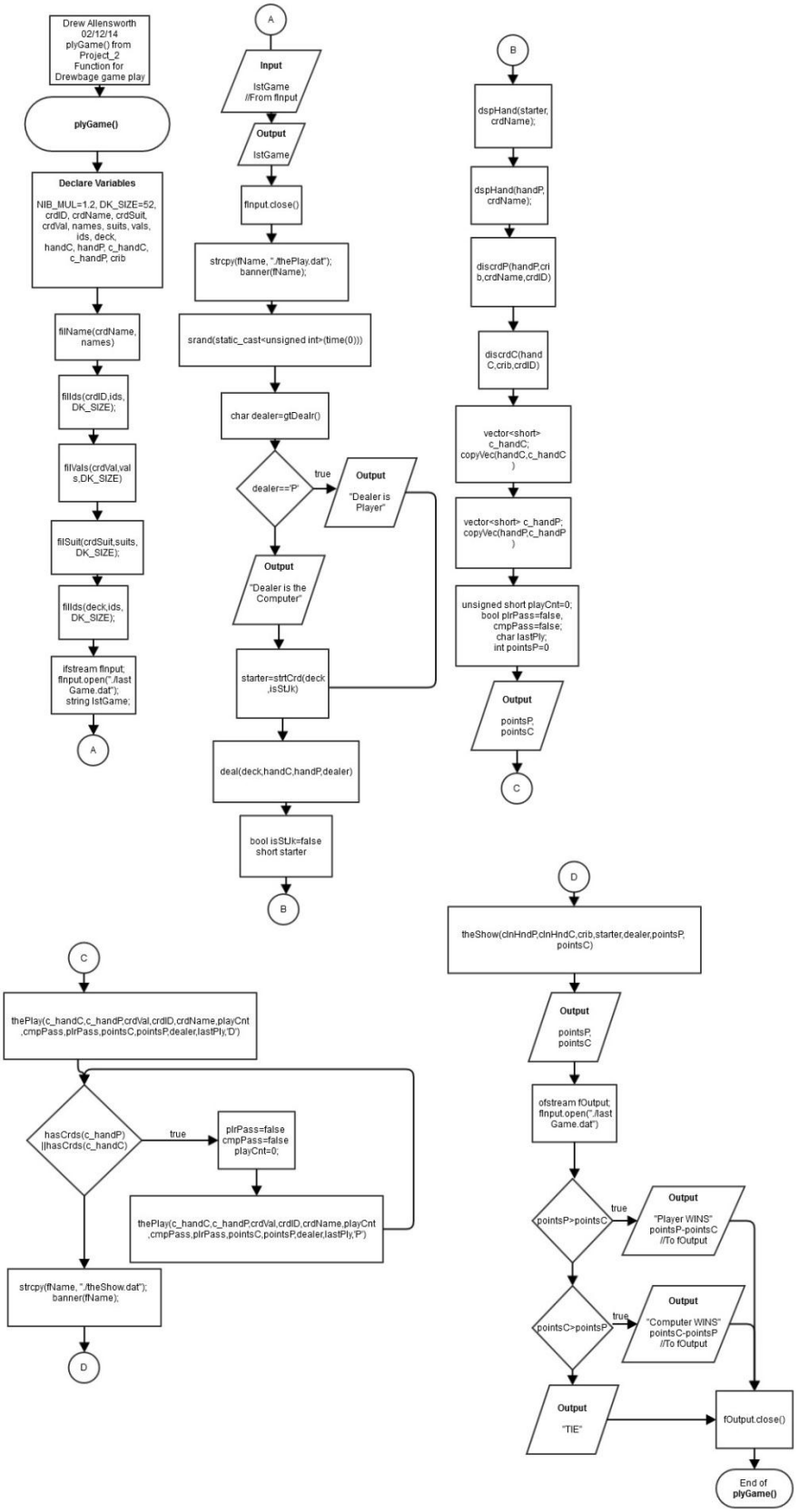
```
Up Card: 2_h
----------------------------------------
Dealer is the Player
----------------------
Computer's Hand Score:
Hand with Up Card: 2_h  6_d  9_c  t_s  j_s
6_d + 9_c = 15: +2000 points
9_c & t_s & j_s = Run of three: +3000 points
Points: 6000

Player's Hand Score:
Hand with Up Card: 2_h  4_h  7_h  8_s  t_d
7_h + 8_s = 15: +2000 points
Points: 4000

Crib Score:
Hand with Up Card: 2_h  6_c  7_d  j_d  q_h
2_h + 6_c + 7_d = 15: +2000 points
Points: 2000
Total points for the Player
with crib score added: 6000
-----------------------------------------------
The total points are: Player: 6000      Computer: 6000
We Have a TIE!!!
```

You can see from the above image that in this game both the Player and the computer finished the game in a tie. This result will be saved and displayed the next time the game is played.

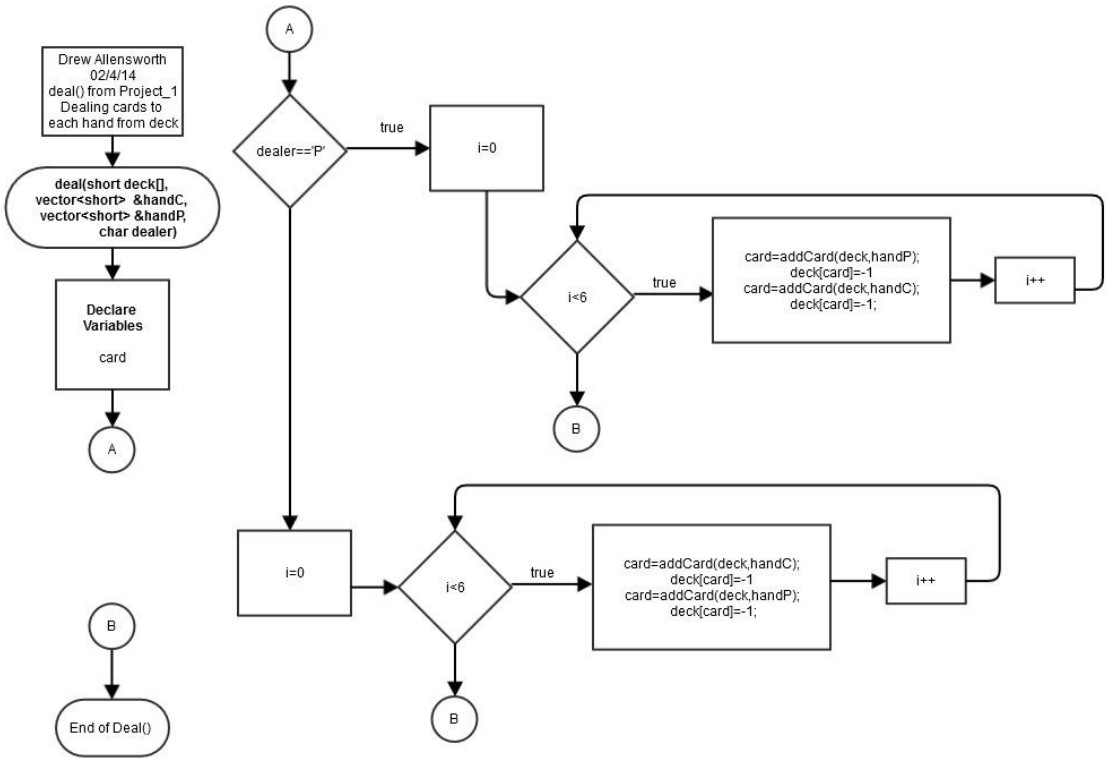
Flowcharts


Project 2 Main()
Drew Allensworth
02/12/14
Main() from
Project_2
System Libraries
<cstdlib>
<iostream>
<cstring>
<string>
<vector>
<cmath>
<ctime>
<fstream>
Global
Constants
none
A
A
Function Prototypes
void filName(vector<string> &,ifstream &);
void fillds(short[], ifstream &, short);
void filVals(short[], ifstream &, short);
void filSuit(short[], ifstream &, short);
char gtDealr();
short slCrdDk();
bool inDeck(short, short[]);
bool inHand(short, const vector<short> &);
bool inHndC(short, const vector<short> &);
void deal(short [], vector<short> &, vector<short> &,char);
short addCard(short [], vector<short> &);
void dspHand(vector<short>,const vector<string> &);
void dspHand(short, const vector<string> &);//overloaded function
short strtCrd(short [],bool &);
short cardID(string, const vector<string> &, const short []);
void discrdP(vector<short> &, vector<short> &,
const vector<string> &, const short []);
void discrdC(vector<short> &,vector<short> &, const short []);
void rmveCrd(short, vector<short> &);
void copyVec(const vector<short> &, vector<short> &);
short cardVal(short n, const short []);
short vldPlay(const vector<short> &, const short [],
const short);
void plyCrdP(vector<short> &, const short [],
const short [], const vector<string> &,
unsigned short &, bool &, int &, char &);
void plyCrdC(vector<short> &, const short [], const vector<string> &,
unsigned short &, bool &, int &, char &);
void thePlay(vector<short> &,vector<short> &,
const short [], const short [],
const vector<string> &, unsigned short &,
bool &, bool &, int &, int &, char &, char &, char);
bool hasCrds(vector<short> &);
void Menu();
int getN();
void def(int);
void plyGame();
void banner(char []);
void flCrdDk(Card[],int,char[],char[],char[],char[],char[]);
void cpyVec2(const vector<short> &, vector<short> &);
void cpyVcAr(const vector<short> &,short[],int size=4);//hands have four
cards
void cpyArry(short[],short[],int);
void addUpCd(short[],short,int);
void selSort(short[],int);
void cnvHand(const Card[],Card[],short[],const vector<short> &,const
short,
const int size5=5);
void cnvSHnd(const Card[],Card[],short[],const vector<short> &,
const int size4=4);
void cnvCard(const Card[],Card &,const short);
void scrPrs(const short [10][2],const Card [],int &);
void scr15s(const short [10][2],const short [10][3],const short [5][4],
const Card[],int &);
void scrRns(const short [10][3],const short [5][4],const Card[],int &);
void scrFlsh(const Card[],const Card[],int &,const int size5=5);
void scrNbs(const Card[],const Card,int &,const int size4=4);
void dsCdHnd(const Card[],const int);
void scrHand(const short [10][2],const short [10][3],const short [5][4],
const Card[],const Card[],const Card,int &,const int size=5);
void theShow(const vector<short> &,const vector<short> &,const
vector<short> &,
const short, const char, int &, int &);
B
B
Main()
Declare
Variables
inN
menu()
inN=getN()
case inN
1
playGame()
other
def(inN)
inN==1
true
End of Main()

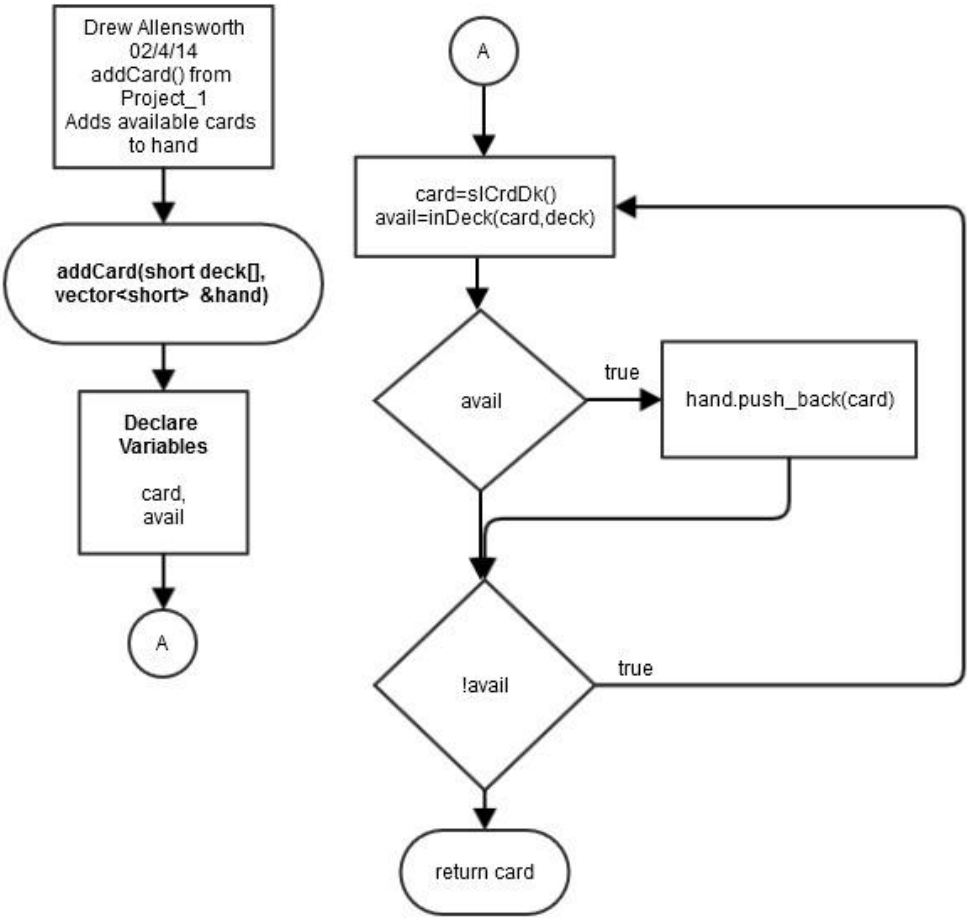
Project 2 plyGame()



void deal()


Drew Allensworth
02/4/14
deal() from Project_1
Dealing cards to each hand from deck
deal(short deck[], vector<short> &handC, vector<short> &handP, char dealer)
Declare Variables
card
A
B
End of Deal()
A
dealer=='P'
true
i=0
i<6
true
card=addCard(deck,handP);
deck[card]=-1
card=addCard(deck,handC);
deck[card]=-1;
i++
B
i=0
i<6
true
card=addCard(deck,handC);
deck[card]=-1
card=addCard(deck,handP);
deck[card]=-1;
i++
B

short addCard()



Pseudocode

Version 1

Four parallel arrays* *Example:*

Sub pos.	Sub 0	Sub 1	Sub 2	Sub 3	Sub 4	Sub 5
crdID	0	1	2	3	4	5
crdName	“a_c”	“a_d”	“a_h”	“a_s”	“2_c”	“2_d”
crdSuit	1	2	3	4	1	2
crdVal	1	1	1	1	2	2

*crdName must be a vector to hold strings

Pseudocode

~~1) Display splash graphics~~

2) Display menu
   a) 1. Play game
   b) ~~2. Help~~
   c) ~~3. High Scores~~
   d) Any other key to Quit
3) Get menu choice
4) (Assuming case == “Play Game”)
   a) Initialize and fill the card arrays and vector for card ID, Values, Suits, and Names
   b) Initialize playerPoints=0, computerPoints=0
   c) Have the computer randomly determine who gets dealt first and who gets “nibs”. Store the outcome dealer.
      i) Alert the player
   d) Deal the player and the computer six cards each
      i) Start with a “deck” of 52 unique cards
         (1) If dealer is for the player
            (a) Loop for six times
               (i) Randomly pick a card ID for the player
                  1. Insure that card hasn’t been chosen
               (ii) Assign that card ID to the player’s “hand”
               (iii) Remove the possibility of that card being picked again
               (iv) Pick a card ID for the computer
                  1. Insure that card hasn’t been chosen
               (v) Assign that card ID to the computer’s “hand”
               (vi) Remove the possibility of that card being picked again
            (b) End loop
         (2) Else dealer is for the computer
            (a) Loop for six times
               (i) Pick a card ID for the computer

1. Insure that card hasn't been chosen

(ii) Assign that card ID to the computer's "hand"

(iii) Remove the possibility of that card being picked again

(iv) Randomly pick a card ID for the player

1. Insure that card hasn't been chosen

(v) Assign that card ID to the player's "hand"

(vi) Remove the possibility of that card being picked again

(b) End loop

e) For each card in the player's "hand", display ~~a graphic of the card and~~ the card's name, i.e. ace_S or queen_H (ace of spades and queen of hearts respectively)

i) ~~Using the card name and files that separately store each card's graphic~~

ii) Display the card name which the player will use to reference the card ~~next to the image~~

f) Randomly select a card ID as the starter card from the "deck" and store the selection

i) Remove the possibility of that card being picked again

ii) Display ~~a graphic of the card and~~ the card's name

iii) If the card is a Jack

(1) Give two points to either the player or computer based on dealer

(2) Alert the player of who got the points

g) Have the player discard two cards

i) Loop two times

(1) Show Player's "hand"

(2) Ask player to type a card name to discard

(3) Use the card name input to find the number ID

(a) Loop –If card does not exist, alert player and get card name again

(b) Loop –If card is not in player's "hand", alert player and get card name again

(4) Assign card ID to crib "hand"

(5) Remove the ID from the player's "hand"

ii) End loop

h) Have the computer discard two cards

i) Loop two times

(1) Randomly select a card to discard using the sub values

(a) Loop –If card ID is not valid, select another sub value

(2) Assign card ID to crib "hand"

(3) Remove the ID from the computer's "hand"

ii) End loop

i) Start The Play

i) Make a copy of the Player's "hand"

ii) Make a copy of the computer's "hand"

iii) Initialize unsigned short playCnt=0 as the variable to hold the count for the gameplay

iv) Initialize bool computerPass=false, playerPass=false

v) Declare char lastPlay//valid values are ‘p’ for player and ‘c’ for computer
   (1) If dealer is for the player—start with the computer
      (a) Loop do {
         (i) Have the computer select a card from “hand” to use using the sub values
            1. Validate: Loop –Start at sub 0. If card ID <0, move to next sub value < vector.size()
            2. Validate: Loop –if playCnt + the card selection > 31, move to next sub value < vector.size()
            3. Validate: If no card meets these criteria , display that the computer has passed and return computerPass=true to allow player to select a card
         (ii) If computerPass=false
            1. Display the card name of computer’s selection
            2. Remove the selected card from the computer’s “hand”
            3. Set playCnt = playCnt + crdVal
               a. If playCnt == 15 then give the computer 2 points
               b. If playCnt == 31 then give the computer 2 points
            4. Set lastPlay=’c’
            5. Display playCnt
         (iii) Let the Player select a card
            1. Display Player’s “hand”
         (iv) Ask player to type a card name to use
            1. Use the card name input to find the number ID
               a. Validate: Loop –If card does not exist, alert player and get card name again
               b. Validate: Loop –If card is not in player’s “hand”, alert player and get card name again
               c. Validate: Loop –if playCnt + the card selection > 31, alert player and get card name again
            2. If player types ‘P’, set playerPass=true
         (v) If playerPass=false
            1. Remove the selected card from the Player’s “hand”
            2. Set playCnt = playCnt + crdVal
               a. If playCnt == 15 then give the Player 2 points
               b. If playCnt == 31 then give the Player 2 points
            3. Set lastPlay=’p’
            4. Display playCnt
            5. Display Player’s “hand”
      (b) } while(playCnt<31&&(playerPass==false||computerPass==false)
   (2) If dealer is for the computer—start with the player
      (a) Loop do {

(i) Display Player's "hand"
(ii) Display playCnt
(iii) Ask player to type a card name to use
    1. Use the card name input to find the number ID
        a. Validate: Loop –If card does not exist, alert player and get card name again
        b. Validate: Loop –If card is not in player's "hand", alert player and get card name again
        c. Validate: Loop –if playCnt + the card selection > 31, alert player and get card name again
    2. If player types 'P', set playerPass=true
(iv) If playerPass=false
    1. Remove the selected card from the Player's "hand"
    2. Set playCnt = total + crdVal
        a. If playCnt == 15 then give the Player 2 points
        b. If playCnt == 31 then give the Player 2 points
    3. Set lastPlay='p'
    4. Display playCnt
    5. Display Player's "hand"
(v) Let the computer select a card
(vi) Have the computer select a card to use using the sub values
    1. Validate: Loop –Start at sub 0. If card ID <0, move to next sub value < vector.size()
    2. Validate: Loop –if playCnt + the card selection > 31, move to next sub value < vector.size()
    3. Validate: If no card meets these criteria , display that the computer has passed and return computerPass=true to allow player to select a card
(vii) If computerPass=false
    1. Display the card name of computer's selection
    2. Remove the selected card from the computer's "hand"
    3. Set playCnt = playCnt + crdVal
        a. If playCnt == 15 then give the computer 2 points
        b. If playCnt == 31 then give the computer 2 points
    4. Set lastPlay='c'
    5. Display playCnt

(b) } while(playCnt<31&&(playerPass==false||computerPass==false)

(3) If(playerPass==true && computerPass==true)
    (a) If lastPlay=='p' then give the player one point
    (b) Else give the computer one point

(4) While ((Player still has cards) ||(computer still has cards)){

(a) This time, instead of choosing who goes first based on dealer, it's based on the value in lastPlay.
(b) Reset computerPass = False and playerPass = False
(c) Start "The Play" above
(d) }

vi) Output scores for both the computer and the player
(1) If there is a nibs bonus, apply it to the dealer

vii) Calculate winner
(1) If playerPoints>computerPoints then Player wins
(2) Else computer wins

j) ~~Get a player's name or handle~~

k) ~~Store name in a file with the score~~

~~5) End of case "Play Game"~~

~~6) (Assuming case == "Help")~~

a) ~~Use an outputfile object to output help text~~

~~7) (Assuming case == "High scores")~~

a) ~~Use an outputfile object to output all scores in the scores file~~

Version 2 Additions

Pseudocode

1. Create card structure
    a. Int ID
    b. Int Rank
    c. Int Suit
    d. String Name
    e. Int Val
2. Create and initialize the "sets" of possible card combinations for scoring
3. Create an array with 52 card structure elements
4. Fill the crdDeck array element members from files
5. Using "hands" passed from plyGame()
    a. Create copies to use for the program
6. Make copies of the copied hands and sort them in ascending order
7. For each hand, take the sorted hand and loop through the array filling an array of card structure elements based on the ids in the sorted hand.
8. Create copies of both the player's hand, the computer's hand, and the crib with the up card added.
9. Based on dealer, start with either Player first or computer
    a. Score hands for pairs
    b. Score hands for 15s

        i. Sets of two
        ii. Sets of three
        iii. Sets of four
        iv. Sets of five
    c. Score hands for runs
        i. Start with runs of five—if found stop.
        ii. Then Four—if found stop.
        iii. Then Three
    d. Score hands for flush
        i. Score the hand for a flush with the up card
            1. If even one card suit is different, no flush
        ii. Score the hand for a flush without the up card
            1. If even one card suit is different, no flush
    e. Score hands for nibs
        i. Use hands with the card structure that don't contain the up card
        ii. If the up card is a Jack and the hand contains a jack—Add nibs points
10. Score the crib with the same methods as above.
    a. Assign points to dealer
11. Output scores for both the computer and the player
    a. If there is a nibs bonus, apply it to the dealer
12. Calculate winner
    a. If playerPoints>computerPoints then Player wins
    b. Else computer wins
13. Store winner in a file with the score
14. End of case "Play Game"

Function Descriptions and Comments

Version 1

void filName(vector<string> crdName, ifstream &names)	Parameters: vector<string> crdName is an empty vector from plyGame(); ifstream &names is a files with string names Uses names file to fill the crdName vector
void filIds(short []crdID, ifstream &ids,const short DK_SIZE)	Parameters: empty short array sized to DK_SIZE, ifstream object connected to a file of short ints; const short DK_SIZE is the size of the array Uses the referenced file to fill the crdID array with values
void filVals(short []crdVal, ifstream &vals,const short DK_SIZE)	Parameters: empty short array sized to DK_SIZE, ifstream object connected to a file of short ints; const short DK_SIZE is the size of the array Uses the referenced file to fill the crdVal array with values
void filSuit(short []crdSuit, ifstream &suits,const short DK_SIZE)	Parameters: empty short array sized to DK_SIZE, ifstream object connected to a file of short ints; const short DK_SIZE is the size of the array Uses the referenced file to fill the crdSuit array with values
void plyGame()	Main function for gameplay
char GtDealr()	Uses rand() to generate a character which will decide who gets dealt first—the computer or the Player. 'C' for Comp; 'P' for Player. The one who gets dealt first also gets "nibs". This information will be outputted as a message. Output: A char with 'P' for player and 'C' for computer
void deal(short deck[], vector<short> &handC, vector<short> &handP ,char dealer)	Parameters: deck[],vector<short> &handC, vector<short> &handP, and dealer from plyGame(). Uses and changes the deck array, the computer's hand vector, and the player's hand vector using addCard(). Char dealer contains 'P' for player or 'C' for computer. Either starts dealing to the computer or Player based on the value of dealer. Copies the value to a hand, and then changes it in the deck to -1 to indicate that it was used. Loops for six cards to each player.

short addCard(short deck[], vector<short> &)	Parameters: deck[] from plyGame(); vector<short> is an empty vector Uses and the deck array. Changes the computer's hand vector, and the player's hand vector. Uses SlCrdDk() for array sub number to select. Uses inDeck() to determine if card is available. Output: card ID between 0-51
short SlCrdDk()	Uses rand() to select a number between 0 and 51, that value is returned as a short. The number is used for an array sub number
bool inDeck(short cardSub, const short[])	Parameters: cardSub is a short between 0-51 and the short[] is the deck array from plyGame(). Uses cardSub to determine if the card is available for selection or has already been selected Output: boolean, true if card is available; otherwise false
bool inHand(short id, const vector<short> &)	Parameters: cardSub is a short between 0-51 and the vector is a "hand" with card ID's Uses id to search through the vector to determine if the card is available for selection Output: boolean, true if card is available; otherwise false
bool inHndC(short sub, const vector<short> &hand)	Parameters: sub is a short between 0-51 and the vector is the computer's hand from plyGame(). Uses sub to determine if the card is available for selection or has already been selected. Used for computer's hand only. Output: boolean, true if card is available; otherwise false
short cardID(string, const vector<string> &crdName, const short crdID[], const short DK_SIZE)	Parameters: string is a card name; const string crdName[] from plyGame(); const short crdID[] from plyGame(); const short DK_SIZE for looping through array First validates that the string name is a string in the array. If yes, it returns the card ID value in the corresponding sub position of crdID[]. If no, returns -1 to indicate that the card name does not exist Output: short card ID between 0-51 or if invalid card name -1

void dspHand(vector<short> handP , vector<string> crdName)	Parameters: vector handP is the player's hand containing card ID's; vector<string> crdName from plyGame() is a vector containing string names for cards. Uses the values from the handP vector to look up values in the crdName[] array and displays each card ID which is > 0
short strtCrd(short deck[],bool &isStJak)	Parameters: uses deck[] from plyGame() which holds available card values; uses reference to boolean isStJak from plyGame(). Uses SlCrdDk() to get a random value. Validates that the corresponding card is available using inDeck(). Assigns a value of -1 in the deck to indicate that it was used. Checks if the card equals values for Jacks, if so isStJak=True, else false. Output: Returns a short containing a card ID
void dspHand(short, vector<string> crdName)	Parameters: the short is a card ID from 0-51; vector<string> crdName from plyGame() is a vector containing string names for cards. !OVERLOADED FUNCTION! Uses the short to display the name for the card ID.
void rmveCrd(short, const vector<short> &)	Parameters: the short is a card ID 0-51; vector<short> is any vector being used as a hand with card values Searches through the vector for the card ID and changes it to -1, effectively removing the card from the hand.
void discrdP(vector<short> &handP,vector<short> &crib, const vector<string> crdName , const short cardID[])	Parameters: vector<short> &handP is Player's hand from plyGame(); vector<short> &crib from plyGame();const vector<string> crdName from plyGame() used for dspHand() and cardID(); const short cardID[] from plyGame() used for cardID() Loops twice. Displays Player's hand using dspHand(). Gets a card name from Player, validates and gets card ID from cardID(). Validates that card is in Player's hand using inHand(). Assigns card ID to vector<short> &crib. Changes card ID to -1 in Player's hand using rmveCrd().

void discrdC(vector<short> &handC,vector<short> &crib, const cardID[])	Parameters: vector<short> &handC is computer's hand from plyGame(); vector<short> &crib is crib hand from plyGame(); const cardID[] is card ID's from plyGame() Loops twice. Randomly selects a card to discard to crib hand. Uses rand()%6 to select a value 0-5 to use as a sub number. Validates that sub number has a valid card ID using inHand(). Assigns card ID to vector<short> &crib. Changes card ID to -1 in computer's hand.
void copyVec(vector<short> &, vector<short> &)	Parameters: two vectors of the same datatype Takes the values in the first vector and copies them to the second vector.
short cardVal(short, const short crdVal[])	Parameters: a short int card ID from 0-51; crdVal[] is the array of card values from plyGame() Uses the card ID to determine the card's value Output: a short with the value 1-10
void plyCrdC(vector<short> &c_handC, const short crdVal[], const vector<string> &crdName, unsigned short &playCnt, bool &cmpPass, int &pointsC, char &lastPly)	Parameters: vector<short> &c_handC is a copy of the computer's hand from plyGame(); const crdVal[] is an array of card values from plyGame() for cardVal(); const vector<string> crdName[] is an vector of card names for dspHand() from plyGame(); unsigned short &playCnt has value 0-31 from plyGame(); bool &cmpPass initialized to false from plyGame(); int &pointsC is points total from plyGame(); char &lastPly holds 'C' or 'P' from plyGame() Used to have the computer play a card from its "hand". Loops through the hand looking for a card ID >=0. Uses cardVal() to get the card's value. Checks if card's value plus playCnt > 31. Returns cmpPass=True if loop ends without selecting a card. If cmpPass=False—displays card using dspHand(), assigns -1 to card ID in hand, calculates playCnt, and sets lastPly = 'C'. Displays playCnt.

void plyCrdP(vector<short> &c_handP, const short crdID[], const short crdVal[], const vector<string> &crdName, unsigned short &playCnt, bool &plrPass, int &pointsP, char &lastPly)	Parameters: vector<short> &c_handP is a copy of the Player's hand from plyGame(); const short crdID[] is an array of card id's for cardID() from plyGame(); const crdVal[] is an array of card values from plyGame() for cardVal();const vector<string> crdName is a vector of card names for dspHand() from plyGame(); unsigned short &playCnt has value 0-31 from plyGame(); bool &plrPass initialized to false from plyGame(); int &pointsP is points total from plyGame(); char &lastPly holds 'C' or 'P' from plyGame() Used to have Player play a card from their hand. Displays Player's hand using dspHand(). Gets a card name from Player, validates and gets card ID from cardID(). Validates that card is in Player's hand using inHand().Uses cardVal() to get the card's value. Checks if card's value plus playCnt > 31. Sets plrPass=True if Player enters "P". If plrPass=False—assigns -1 to card ID in hand, calculates playCnt, and sets lastPly = 'C'. Displays playCnt. Displays card using dspHand().
short vldPlay(const vector<short> &hand, const short crdVal[],const short playCnt)	Parameters: vector<short> hand is a hand containing values -1 through 51; const crdVal[] is an array of card values from plyGame(); unsigned short &playCnt has value 0-31 from plyGame() Determines if there is a playable card in a particular hand given the current playCnt. Output: The card ID of the first playable card in the hand, else -1 if no playable cards are found
bool hasCrds(vector<short>)	Parameters: Uses a short int vector Checks each value in the vector to see if any one value is >=0 meaning there is a valid card left to play Output: returns true if there are one or more cards left, else returns false

void thePlay((vector<short> &c_handC,vector<short> &c_handP,const short crdVal[], const short crdID[], const vector<string> &crdName, unsigned short &playCnt, bool &cmpPass, bool &plrPass, int &pointsC, int &pointsP, char &dealer, char &lastPly, char option)	Parameters: vector<short> &c_handP is a copy of the Player's hand from plyGame();vector<short> &c_handC is a copy of the computer's hand from plyGame(); const short crdID[] is an array of card id's for cardID() from plyGame(); const crdVal[] is an array of card values from plyGame() for cardVal();const vector<string> crdName is a vector of card names for dspHand() from plyGame(); unsigned short &playCnt has value 0-31 from plyGame(); bool &plrPass initialized to false from plyGame();int &pointsC is computer's points total from plyGame(); int &pointsP is player's points total from plyGame(); char &lastPly holds 'C' or 'P' from plyGame(); option controls which variable controls the execution order thePlay() executes plyCrdC() and plyCrdP() using looping constructs. The order of execution is based on either char dealer or char lastPly using char option to determine which variable will be used. Checks if either the player or computer has "passed" and keeps track of the playCnt. Adds "GO" scoring functionality based on lastPly.

Version 2 Additions

void theShow(const vector<short> &vecHndP,const vector<short> &vecHndC, const vector<short> &vecCrib,const short starter, const char dealer, int &pointsP, int &pointsC)	Parameters: const vector<short> &vecHndP is the player's hand vector from plyGame; const vector<short> &vecHndC is the computer's hand vector from plyGame();const vector<short> &vecCrib is the crib vector from plyGame(); const short starter is the up card from plyGame; const char dealer from plyGame; int &pointsP is player's points from plyGame; int &pointsC is computer's points from plyGame Takes the various hands, dealer, up card, and points from plyGame() and uses them to generate the scores for each hand. It changes the points totals of both computer and player to reflect the hand scores.

void scrHand(const short combi2[10][2],const short combi3[10][3],const short combi4[5][4], const Card lngHnd[],const Card shrtHnd[], const Card cdUpCrd,int & points, const int size)	Parameters: const short combi2[10][2] 2D array containing card combinations from theShow(); const short combi3[10][3] 2D array containing card combinations from theShow(); const short combi4[5][4] 2D array containing card combinations from theShow(); const Card lngHnd[] is an array of card structures from theShow() with the up card included; const Card shrtHnd[]is an array of card structures from theShow() without the up card; const Card cdUpCrd is the Up card from theShow(); int & points from theShow(); const int size is a defaulted parameter set to 5 scrHand() is a function acting as a container for a set of function calls for scoring a single hand. It calls dsCdHnd() to display hand, scrPrs() to score pairs, scr15s() to score 15s, scrFlsh() to score flushes, scrNbs to score nibs, and scrRns to score runs.
void dsCdHnd(const Card hand[],const int size)	Parameters: const Card hand[] is an array of card structures; const int size is the size of the array Iterates through the card structure array displaying the name member of each card
void scrRns(const short combi3[10][3],const short combi4[5][4],const Card hand[],int &points)	Parameters: const short combi3[10][3] 2D array containing card combinations from theShow(); const short combi4[5][4] 2D array containing card combinations from theShow(); const Card hand[] is an array of card structures from theShow() with the up card included; int &points are from theShow() Looks for runs (i.e. 1,2,3,4,5) in the hand starting with the largest runs and then looking for the smaller if larger runs are not found. Uses the card combination arrays to search all possible card combinations for runs. Adds points when any run is found.

void cnvCard(const Card crdDeck[],Card &card,const short id)	Parameters: const Card crdDeck[] is an array of card structure with information on all cards from theShow(); Card &card is a card structure; const short id is a short with a value between 0-51 cnvCard()takes a card Id and fills a card structure element with the proper values for that specific ID.
void scrNbs(const Card shrtHnd[],const Card cdUpCrd,int &points,const int size4)	Parameters: const Card shrtHnd[] is an array of card structures without the Up Card from theShow(); const Card cdUpCrd is the Up Card from theShow(); int &points is from theShow(); const int size4 is a defaulted parameter = 4 scrNbs() first checks if the Up Card is a Jack. If so, it adds points for each jack in the hand.
void scrFlsh(const Card hand[],const Card shrtHnd[],int &points, const int size5)	Parameters: const Card hand[]is an array of card structures from theShow() with the up card included; const Card shrtHnd[]is an array of card structures without the Up Card from theShow(); int &points from theShow(); const int size5 is a defaulted parameter = 5 scrFlsh() first checks if all five cards have the same suit (a flush) and if so adds points. If only four cards are the same suit it checks if the hand without the up card has a flush of all four cards. If so, it adds points.
void scr15s(const short combi2[10][2],const short combi3[10][3],const short combi4[5][4], const Card hand[],int &points)	Parameters: const short combi2[10][2] 2D array containing card combinations from theShow(); const short combi3[10][3] 2D array containing card combinations from theShow(); const short combi4[5][4] 2D array containing card combinations from theShow(); const Card hand[] is an array of card structures from theShow() with the up card included; int &points is from theShow() scr15s() uses the three 2D card combination arrays to check for all possible unique combinations of cards whose values add up to 15. Points are added for each combination making 15.

void scrPrs(const short combi[10][2],const Card hand[],int &points)	Parameters: const short combi[10][2] 2D array containing card combinations from theShow(); const Card hand[] is an array of card structures from theShow() with the up card included; int &points is from theShow() scrPrs() uses the card combination array to iterate through all possible pair combinations searching through the hand for a pair of cards with the same rank.
void cnvSHnd(const Card crdDeck[],Card crdSHnd[],short arHnd[],const vector<short> &vcHnd,const int size4)	Parameters: const Card crdDeck[] is an array of card structure with information on all cards from theShow(); Card crdSHnd[]is an array of card structures without the Up Card from theShow(); short arHnd[] is an array of card IDs from theShow(); const vector<short> &vcHnd is a vector of card IDs that can be traced to plyGame(); const int size4 is a defaulted parameter = 4 cnvSHnd()creates a "Small" 4 card hand without the up card from the vcHnd vector using cpyVcAr() to convert the hand to an array, cpyArry to copy the array for sorting, selSort() to sort the hand, and then crdDeck[] for card member values.
void cnvHand(const Card crdDeck[],Card crdHand[],short arHnd[], const vector<short> &vcHnd,const short upCard,const int size5)	Parameters: const Card crdDeck[] is an array of card structure with information on all cards from theShow(); Card crdHand[]is an array of card structures with the Up Card from theShow(); short arHnd[] is an array of card IDs from theShow(); const vector<short> &vcHnd is a vector of card IDs that can be traced to plyGame();const Card cdUpCrd is the Up Card from theShow(); const int size5 is a defaulted parameter = 5 cnvSHnd()creates a five card hand with the up card added from the vcHnd vector using cpyVcAr() to convert the hand to an array, addUpCd() to append the Up Card ID to the array, cpyArry to copy the array for sorting, selSort() to sort the hand, and then crdDeck[] for card member values.

void cpyArry(short a[],short b[],const int size)	Parameters: Two arrays of short ints and the size of the arrays Simply copies the contents of short a[] to short b[] up to the size of the arrays.
void selSort(short a[], const int size)	Parameters: a[] is an array of short integers; const int size is the size of the array selSort() is a selection sort function that accepts an array of shorts and sorts the array in ascending order.
void addUpCd(short hand[],short upCard,const int size){	Parameters: short hand[] is an array of short ints holding card IDs; short upCard is the card ID of the Up Card; const int size is the size of the array addUpCd() appends the card ID of the Up Card to the end of the array of card IDs.
void cpyVcAr(const vector<short> &vcHnd, short aHnd[],const int size)	Parameters: const vector<short> &vcHnd is a vector of card IDs as short ints; short aHnd[] is an array of short ints; const int size is the size of the array cpyVcAr() copies the contents of the vector into the array up to the size of the array.
void banner(char fName[])	Parameters: char fName[] is a character array holding a filename for an input stream object banner() uses the fName[] to open a file and read in and output seven lines (or rows) of characters
void flCrdDk(Card crdDeck[],const int size,char fnIds[],char fnRanks[],char fnSuits[],char fnNames[],char fnVals[])	Parameters: Card crdDeck[] is an array of card structure elements; const int size is the size of the array; char fnIds[] is a character array with the filename for the card IDs; char fnRanks[]is a character array with the filename for the card ranks; char fnSuits[]is a character array with the filename for the card suits; char fnNames[]is a character array with the filename for the card names; char fnVals[]is a character array with the filename for the card numerical values flCrdDk() opens file streams and simultaneously fills all the members for each card structure in the array up to the size of the array

Major Variables and Objects

Version 1

Major Variables and Objects			
Function Location	**Type**	**Name**	**Description**
plyGame()	short array	crdID	An array to hold all of the card id's 0-51; card ID == sub number
plyGame()	string vector	crdName	An array to hold all of the card names
plyGame()	short array	crdSuit	An array to hold the suit for each card
plyGame()	short array	crdVal	An array to hold the numerical value for each card
plyGame()	ifstream	names	Input stream object to stream card names from file
plyGame()	ifstream	suits	Input stream object to stream card suits from file
plyGame()	ifstream	vals	Input stream object to stream numerical card values from file
plyGame()	ifstream	ids	Input stream object to stream card ID's from file
plyGame()	character	dealer	'C' for computer, 'P' for Player. For determining who is dealer
plyGame()	short array	deck	Copy of crdID[] used to hold available card values for the "deck"
plyGame()	short vector	handC	Used to hold card values for the computer's hand; MAX size == 6
plyGame()	short vector	handP	Used to hold card values for the Player's hand; MAX size == 6
plyGame()	short vector	c_handC	Copy of handC used to hold card values for the computer's hand
plyGame()	short vector	c_handP	Copy of handP used to hold card values for the Player's hand
plyGame()	short vector	crib	Used to hold card values for the crib; MAX size == 4
plyGame()	const short	DK_SIZE	Holds the size of the Deck arrays == 52
plyGame()	integer	pointsC	Holds the computer's point total;
plyGame()	integer	pointsP	Holds the Player's point total;
plyGame()	short	starter	Holds the starting card's ID number
plyGame()	bool	isStJak	Holds whether the starting card is a Jack. True if a Jack.
plyGame()	const float	NIB_MUL	The nibs multiplier == 1.2; Used as a bonus
plyGame()	unsigned short	playCnt	Holds the count for The Play; values 0-31
plyGame()	bool	cmpPass	Initialized to false; indicates if computer has "passed" during play

plyGame()	bool	plrPass	Initialized to false; indicates if Player has “passed” during play
plyGame()	character	lastPly	‘C’ for computer, ‘P’ for Player. For determining who played last

Version 2 Additions

Major Variables and Objects			
Function Location	**Type**	**Name**	**Description**
plyGame()	char array[25]	fName	An array of size 25 to hold the characters of a filename.
plyGame()	ifstream	fInput	An input stream object to read in data from a file
plyGame()	string	lstGame	Holds the results of the last played game
plyGame()	ofstream	fOutput	An output stream object to write data to a file
theShow()	const int	DK_SIZE	The size of a deck
theShow()	const int	HND_SZ5	The size of a hand
theShow()	const int	HND_SZ4	The size of a crib and a hand w/o the up card
theShow()	const int	COLS_2	Constant to hold the column size for 2D array
theShow()	const int	COLS_3	Constant to hold the column size for 2D array
theShow()	const int	COLS_4	Constant to hold the column size for 2D array
theShow()	const int	ROWS_10	Constant to hold the row size for 2D array
theShow()	const int	ROWS_5	Constant to hold the row size for 2D array
theShow()	int	pointsK	Holds the points total for the crib hand
theShow()	Card array	handP	Player’s hand with up card
theShow()	Card array	handC	Computer’s hand with up card
theShow()	Card array	crib	Crib hand with up card
theShow()	Card array	sHndP	Player’s hand without up card
theShow()	Card array	sHndC	Computer’s hand without up card
theShow()	Card array	sCrb	Crib hand without up card
theShow()	short array	arHandP	Holds the sorted card ids for player's hand
theShow()	short array	arHandC	Holds the sorted card ids for computer's hand
theShow()	short array	arCrib	Holds the sorted card ids for crib hand
theShow()	short array	arSHndP	Holds the sorted card ids for player's hand w/o Up Card
theShow()	short array	arSHndC	Holds the sorted card ids for computer's hand w/o Up Card
theShow()	short array	arSCrib	Holds the sorted card ids for crib hand w/o Up Card
theShow()	char array	fnIds	Holds filename for card IDs
theShow()	char array	fnRanks	Holds filename for card ranks
theShow()	char array	fnSuits	Holds filename for card suits
theShow()	char array	fnNames	Holds filename for card names
theShow()	char array	fnVals	Holds filename for card vals

Concepts Used

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Program Listing

```
/*
 * File:   main.cpp
 * Author: Drew Allensworth
 *
 * Created on February 8, 2014, 4:05 PM
 * Purpose: Program for CSC-5 Project 2
 *      Drewbage cribbage game. It's two-hand cribbage,
 *      1 player against the computer.
 *
 */

//System Libraries
#include <cstdlib>
#include <iostream>
#include <string>
#include <cstring>
#include <vector>
#include <cmath>//for rand()
#include <ctime>//for srand()
#include <fstream>//for reading/writing files
using namespace std;

//Structure Declarations not in User Defined Libraries
struct Card{//Declare Card Structure
```

```
    short id;//Card id number
    short rank;//Rank of card. From ace to king using numbers
    short suit;//Suit of card. From clubs to spades using numbers
    string name;//Name of card. Ex: a_s (ace of spades)
    short val;//Count value of card. 1 to 10
};
//Global Constants

//Function Prototypes
void filName(vector<string> &,ifstream &);
void filIds(short[], ifstream &, short);
void filVals(short[], ifstream &, short);
void filSuit(short[], ifstream &, short);
char gtDealr();
short slCrdDk();
bool inDeck(short, short[]);
bool inHand(short, const vector<short> &);
bool inHndC(short, const vector<short> &);
void deal(short [], vector<short>  &, vector<short> &,char);
short addCard(short [], vector<short>  &);
void dspHand(vector<short>,const vector<string> &);
void dspHand(short, const vector<string> &);//overloaded function
short strtCrd(short [],bool &);
short cardID(string, const vector<string> &, const short []);
void discrdP(vector<short> &, vector<short> &,
```

```
        const vector<string> &, const short []);
void discrdC(vector<short> &,vector<short> &, const short []);
void rmveCrd(short, vector<short> &);
void copyVec(const vector<short> &, vector<short> &);
short cardVal(short n, const short []);
short vldPlay(const vector<short> &, const short [],
        const short);
void plyCrdP(vector<short> &, const short [],
        const short [], const vector<string> &,
        unsigned short &, bool &, int &, char &);
void plyCrdC(vector<short> &, const short [], const vector<string> &,
        unsigned short &, bool &, int &, char &);
void thePlay(vector<short> &,vector<short> &,
        const short [], const short [],
        const vector<string> &, unsigned short &,
        bool &, bool &, int &, int &, char &, char &, char);
bool hasCrds(vector<short> &);

void Menu();
int getN();
void def(int);
void plyGame();
//Function Prototypes-Version 2 additions
void banner(char []);
void flCrdDk(Card[],int,char[],char[],char[],char[],char[]);
```

```
void cpyVec2(const vector<short> &, vector<short> &);
void cpyVcAr(const vector<short> &,short[],int size=4);//hands have four cards
void cpyArry(short[],short[],int);
void addUpCd(short[],short,int);
void selSort(short[],int);
void cnvHand(const Card[],Card[],short[],const vector<short> &,const short,
        const int size5=5);
void cnvSHnd(const Card[],Card[],short[],const vector<short> &,
        const int size4=4);
void cnvCard(const Card[],Card &,const short);
void scrPrs(const short [10][2],const Card [],int &);
void scr15s(const short [10][2],const short [10][3],const short [5][4],
        const Card[],int &);
void scrRns(const short [10][3],const short [5][4],const Card[],int &);
void scrFlsh(const Card[],const Card[],int &,const int size5=5);
void scrNbs(const Card[],const Card,int &,const int size4=4);
void dsCdHnd(const Card[],const int);
void scrHand(const short [10][2],const short [10][3],const short [5][4],
        const Card[],const Card[],const Card,int &,const int size=5);
void theShow(const vector<short> &,const vector<short> &,const vector<short> &,
        const short, const char, int &, int &);



//Execution Begins Here!!!
int main(int argv,char *argc[]){
```

```
   int inN;
   do{
      Menu();
      inN=getN();
      switch(inN){
      case 1:    plyGame();break;
      default:   def(inN);}//More options go here!!!
   }while(inN==1);//<- don't forget to change this!!!
   return 0;
}

void Menu(){
   char fName[25]="./Title.dat";
   banner(fName);
   cout<<endl;
   cout<<"Menu for Drewbage Cribbage"<<endl;
   cout<<"Type 1 to Play Game"<<endl;
//    cout<<"Type 2 for Help"<<endl;
//    cout<<"Type 3 for High Scores"<<endl;
   cout<<"Type anything else to exit \n"<<endl;
}

int getN(){
      int inN;
      cin>>inN;
```

```
    return inN;
}

void def(int inN){
    cout<<"You typed "<<inN<<" to exit the program"<<endl;
}

void plyGame(){
  //Declare Variables
  const float NIB_MUL=1.2;//Multiplier for nibs bonus
  const short DK_SIZE=52;//Holds the size of the Deck arrays == 56
  short crdID[DK_SIZE];//All of the card id's 0-51; card ID == sub number
  short crdVal[DK_SIZE];//An array to hold the numerical value for each card
  short crdSuit[DK_SIZE];//An array to hold the suit for each card
  vector<string> crdName;//An array to hold all of the card names
  short deck[DK_SIZE];//An array to hold the "deck" cards for gameplay
  vector<short> handC;//Vector for computer's hand
  vector<short> handP;//Vector for player's hand
  vector<short> crib;//Vector for the crib
  //file stream objects to fill arrays and vector
  ifstream names;
  ifstream ids;
  ifstream vals;
  ifstream suits;
  //fill the arrays and vectors
```

```
filName(crdName,names);
filIds(crdID,ids,DK_SIZE);
filVals(crdVal,vals,DK_SIZE);
filSuit(crdSuit,suits,DK_SIZE);
//fills the deck
filIds(deck,ids,DK_SIZE);
//seeds the random number generator
srand(static_cast<unsigned int>(time(0)));
//Display Results of last game
cout<<"----------------------------"<<endl;
cout<<"Results of Most Recent Game:"<<endl;
ifstream fInput;
fInput.open("./lastGame.dat");
string lstGame;
getline(fInput,lstGame);
(lstGame.length()>0)? cout<<lstGame<<endl:
   cout<<"Game has not been played before"<<endl;
fInput.close();
cout<<"----------------------------"<<endl;
//Game Header
char fName[25]="./thePlay.dat";
banner(fName);
cout<<endl;
//choose the dealer
char dealer=gtDealr();
```

```
dealer=='P'?cout<<"The dealer is Player":
   cout<<"The dealer is the computer";
cout<<endl;
//deal the cards
deal(deck,handC,handP,dealer);

//select starting card
bool isStJk=false;//initialized to false, true if starting card is a Jack
short starter;//variable containing the starting card ID
starter=strtCrd(deck,isStJk);//sets both starter and isStJk
cout<<endl;
//display the player's hand
cout<<"Your (Player's) hand contains: ";
dspHand(handP,crdName);
cout<<endl;
//Begins the discard process
discrdP(handP,crib,crdName,crdID);//discard for Player
discrdC(handC,crib,crdID);//discard for Computer
cout<<"The computer has also discarded two cards into the crib."
      <<endl<<endl;
//display the starter card
cout<<"The starter card is the: ";
dspHand(starter,crdName);
cout<<endl<<endl;
//Make copies of the hands to use for The Play
```

```
vector<short> c_handC;//Vector for copy of computer's hand
copyVec(handC,c_handC);//Fully copy handC to c_handC
vector<short> c_handP;//Vector for copy of player's hand
copyVec(handP,c_handP);//Fully copy handP to c_handP
//Variables for The Play
unsigned short playCnt=0;//holds count for The Play. Values 0-31
bool plrPass=false,//Indicates if Player has “passed” during play
    cmpPass=false;//Indicates if computer has “passed” during play
char lastPly;//‘C’ = computer, ‘P’ = Player. For determining who played last
int pointsP=0,//holds total point for the player
   pointsC=0;//holds total points for the computer
//'D' means run The Play using lastPly rather than dealer
thePlay(c_handC,c_handP,crdVal,crdID,crdName,playCnt,
        cmpPass,plrPass,pointsC,pointsP,dealer,lastPly,'D');
//Continue game if cards remain after the first
while(hasCrds(c_handP)||hasCrds(c_handC)){
   //reset variables for new game
   plrPass=false;
   cmpPass=false;
   playCnt=0;
   cout<<endl<<"New Round Started: Play Count Reset to 0"<<endl;
   //'P' means run The Play using lastPly rather than dealer
   thePlay(c_handC,c_handP,crdVal,crdID,crdName,playCnt,
        cmpPass,plrPass,pointsC,pointsP,dealer,lastPly,'P');
}
```

```
//Header for The Play results
cout<<"-----------------------------------------\n"
   <<"The total points are: Player: "<<pointsP<<"\tComputer: "
      <<pointsC<<endl;
//Header for The Show
strcpy(fName,"./theShow.dat");
banner(fName);
cout<<endl;
//Clean the hands of negative values for theShow
vector<short> clnHndC;//Vector for copy of computer's hand
cpyVec2(handC,clnHndC);//Fully copy handC to clnHandC
vector<short> clnHndP;//Vector for copy of player's hand
cpyVec2(handP,clnHndP);//Fully copy handP to clnHandP
//Start The Show--score the hands
theShow(clnHndP,clnHndC,crib,starter,dealer,pointsP,pointsC);
//Header for final score results
cout<<"-----------------------------------------\n"
   <<"The total points are: Player: "<<pointsP<<"\tComputer: "
      <<pointsC<<endl;
//determine who wins and output results to a file
ofstream fOutput;
fOutput.open("./lastGame.dat");
if(pointsP>pointsC){
   cout<<"Player WINS!!!";
   fOutput<<"Player won by "<<(pointsP-pointsC)<<" points!"<<endl;
```

```
    }else if(pointsC>pointsP){
        cout<<"Computer WINS!!!";
        fOutput<<"Computer won by "<<(pointsC-pointsP)<<" points!"<<endl;
    }else{
        cout<<"We Have a TIE!!!";
        fOutput<<"The Computer and Player tied!"<<endl;
    }
    fOutput.close();
    cout<<endl<<endl;
}



bool hasCrds(vector<short> &hand){
    for(int i=0;i<hand.size();i++){
        //if any sub has a valid card ID return true
        if(hand[i]>=0)return true;
    }
    return false;//else return false
}

void thePlay(vector<short> &c_handC,vector<short> &c_handP,
             const short crdVal[], const short crdID[],
             const vector<string> &crdName, unsigned short &playCnt,
             bool &cmpPass, bool &plrPass,
             int &pointsC, int &pointsP, char &dealer,
```

```
          char &lastPly, char option){
char dlFrst;//allows one to set the program to run based on either
          //either dealer or lastPly depending on the option
if(option=='D'){
   dlFrst=dealer;
}else dlFrst=lastPly;
//Start The Play
if(dlFrst=='P'){
   do{
     plyCrdC(c_handC,crdVal,crdName,playCnt,cmpPass,
          pointsC,lastPly);
     if(playCnt==31)break;//get out of the loop if 31
     if(plrPass==true&&cmpPass==true)break;//if both players pass
     plyCrdP(c_handP,crdID,crdVal,crdName,playCnt,plrPass,
          pointsP,lastPly);
   }while(playCnt<31&&(plrPass==false||cmpPass==false));
}else{//dealer=='C'
   do{
     plyCrdP(c_handP,crdID,crdVal,crdName,playCnt,plrPass,
          pointsP,lastPly);
     if(playCnt==31)break;
     if(plrPass==true&&cmpPass==true)break;
     plyCrdC(c_handC,crdVal,crdName,playCnt,cmpPass,
          pointsC,lastPly);
   }while(playCnt<31&&(plrPass==false||cmpPass==false));
```

```
    }
    if(plrPass==true&&cmpPass==true){
        playCnt=0;//reset the game count
        if(lastPly=='P'){
            pointsP+=1000;
            cout<<"Last play by Player. +1000 points for the \"GO\"!"<<endl;
        }else{//lastPly=='C'
            pointsC+=1000;
            cout<<"Last play by the computer. +1000 points for the \"GO\"!"
                <<endl;

        }
    }
}



short vldPlay(const vector<short> &hand, const short crdVal[],
              const short playCnt){
    short val,id;
    for(int i=0;i<hand.size();i++){
        if(hand[i]>=0){
            id=hand[i];
            val=cardVal(id,crdVal);
            if(playCnt+val<=31){
                return hand[i];//return value of first card that's a valid play
```

```
        }
      }
   }
   return -1;//if no card in the hand is a valid play, return -1
}

void plyCrdC(vector<short> &c_handC, const short crdVal[],
             const vector<string> &name, unsigned short &playCnt,
             bool &cmpPass, int &pointsC, char &lastPly){
   if(hasCrds(c_handC)){//checks if hand has cards
      //gets the first valid playable card and return the ID
      //If there is no playable card in the deck, returns -1
      short card=vldPlay(c_handC,crdVal,playCnt);
      //perform operations if there is a playable card
      if(card>=0){
         short val=cardVal(card,crdVal);//gets the value of the card
         playCnt+=val;//adds the value to the play count
         //Show the Player the card the computer chose
         cout<<"The computer plays the: ";
         dspHand(card,name);
         cout<<endl<<"The play count is: "<<playCnt<<endl;
         if(playCnt==15){//assigns points if count == 15||31
            pointsC+=2000;
            cout<<"The computer scores 2000 points! It's total points are: "
                <<pointsC<<endl;
```

```
        }else if(playCnt==31){
            pointsC+=4000;
            cout<<"The computer scores 4000 points! It's total points are: "
                <<pointsC<<endl;
        }else;//assigns no points
        lastPly='C';//sets the computer as the most recent player
        rmveCrd(card,c_handC);//removes the card from the hand
      }else{
        cmpPass=true;
        cout<<"The computer has chosen to pass!"<<endl;
      }
    }else{//if hand does not have any cards
      cmpPass=true;
      cout<<"The computer is out if cards and must pass!"<<endl;
    }
}

void plyCrdP(vector<short> &c_handP, const short id[],
             const short crdVal[], const vector<string> &name,
             unsigned short &playCnt, bool &plrPass,
             int &pointsP, char &lastPly){
    if(hasCrds(c_handP)){
      cout<<"Your (Player's) hand contains: ";
        dspHand(c_handP,name);//displays the Player's hand for review
      //gets the first valid playable card and return the ID
```

```
//If there is no playable card in the deck, returns -1
short card=vldPlay(c_handP,crdVal,playCnt);
//perform operations if there is a playable card
if(card>=0){
   cout<<"Please type the name (as displayed) of the card\n"
           <<"in your hand you wish to use: "<<endl;
   string crdName;//to hold the user's input
   short crdID;//to hold the looked up cardID
   short val;//to hold the card value
   bool avail;//holds whether the card is found in the Player's hand
   char pass='A';//holds 'P' to pass if user cannot play a card
   do{
      cout<<"Card: ";
      cin>>crdName;
      crdID=cardID(crdName,name,id);//checks if the card name has a card ID
      while(crdID<0){//while card name is invalid
         cout<<"That is not a valid card name\n"
               <<"please enter a card name from your hand: ";
         cout<<"Card: ";
         cin>>crdName;
         crdID=cardID(crdName,name,id);
      }
      avail=inHand(crdID,c_handP);//checks if card ID is in plyrs hand
      while(!avail||crdID<0){//while card ID is not in player's hand
         cout<<"You do not have that card in your hand\n"
```

```
            <<"please enter a card name from your hand: ";
      cout<<"Card: ";
      cin>>crdName;
      crdID=cardID(crdName,name,id);
      if(cardID>=0){
         avail=inHand(crdID,c_handP);
      }
   }
   val=cardVal(crdID,crdVal);
   if((playCnt+val)>31){
      //checks hand for a playable card
      short card=vldPlay(c_handP,crdVal,playCnt);
      cout<<"Your card selection added to the current points "
            <<"total\n is greater than 31."<<endl;
      if(card>=0){//if there is a playable card in the hand
      cout<<"You have at least one playable card in your hand.\n"
            <<"Please select another card."<<endl;
      }else{
         pass='P';//have the program pass for the player
               //if no playable cards are in their hand
         cout<<"You have no playable card. You must pass!!!"
               <<endl;
         plrPass=true;
      }
```

```
        }
    }while(pass!='P'&&(playCnt+val)>31);
    if(pass!='P'&&avail&&(playCnt+val)<=31){//defensive programming
        playCnt = playCnt + val;//add card value to playCnt
        rmveCrd(crdID,c_handP);//remove card from Player's hand
        lastPly='P';//Player is now the most recent one to play
        if(playCnt==15){//assigns points if count == 15||31
            pointsP+=2000;
            cout<<"You score 2000 points! Your total point are: "
                <<pointsP<<endl;
        }else if(playCnt==31){
            pointsP+=4000;
            cout<<"You score 4000 points! Your total point are: "
                <<pointsP<<endl;
        }else;//assigns no points


    }
//      else cout<<"You have no playable card. You must pass!!!"<<endl;
//      cout<<"Your (Player's) hand now contains: ";
//      dspHand(c_handP,name);//displays the Player's hand for review
    cout<<"The play count is: "<<playCnt<<endl;
  }else{
    plrPass=true;
    cout<<"You have no playable card. You must pass!"<<endl;
```

```
        }
    }else{//if hand does not have any cards
        plrPass=true;
        cout<<"You have no playable card. You must pass!"<<endl;
    }
}

short cardVal(short n, const short vals[]){
    return vals[n];
}

void cpyVec2(const vector<short> &a, vector<short> &b){
    for(int i=0;i<a.size();i++){
        if(a[i]>=0)b.push_back(a[i]);//only copy non-negative values
    }
}

void copyVec(const vector<short> &a, vector<short> &b){
    for(int i=0;i<a.size();i++){
        b.push_back(a[i]);
    }
}

void discrdC(vector<short> &handC,vector<short> &crib, const short id[]){
    short sub, card;
```

```
   bool avail;
   for(int i=0;i<2;i++){
      do{
         sub=rand()%6;//assigns a random number for vector sub from 0-5
         avail=inHndC(sub,handC);//true if card is available
         if(avail){
            card=handC[sub];//assigns value in handC at sub number to card
            crib.push_back(card);//puts that card ID into the crib
            handC[sub]=-1;//removes the ID from the computer's hand
         }
      }while(!avail);//loop again if card is not in deck
   }
}

void discrdP(vector<short> &handP, vector<short> &crib,
             const vector<string> &name, const short id[]){
   cout<<"Please type the name (as displayed) of the TWO cards\n"
          <<"you wish to discard into the crib"<<endl;
   string crdName;//to hold the user's input
   short crdID;//to hold the looked up cardID
   bool avail;//holds whether the card is found in the Player's hand
   for(int i=0;i<2;i++){
      cout<<"Card "<<i+1<<": ";
      cin>>crdName;
      crdID=cardID(crdName,name,id);//checks if the card name has a card ID
```

```
while(crdID<0){//while card name is invalid
   cout<<"That is not a valid card name\n"
         <<"please enter a card name from your hand: ";
   cout<<"Card "<<i+1<<": ";
   cin>>crdName;
   crdID=cardID(crdName,name,id);
}
avail=inHand(crdID,handP);//checks if card ID is in players hand
while(!avail||crdID<0){//while card ID is not in player's hand
   cout<<"You do not have that card in your hand\n"
         <<"please enter a card name from your hand: ";
   cout<<"Card "<<i+1<<": ";
   cin>>crdName;
   crdID=cardID(crdName,name,id);
   if(cardID>=0){
      avail=inHand(crdID,handP);
   }
}
if(avail){//defensive programming
   crib.push_back(crdID);//push card into crib vector
   rmveCrd(crdID,handP);//remove card from Player's hand
}else cout<<"ERROR: From dscrdP. This message should not be seen"
      <<endl;
cout<<"Your (Player's) hand now contains: ";
dspHand(handP,name);//displays the Player's hand for review
```

```
    }
}

void rmveCrd(short id, vector<short> &hand){
    for(int i=0;i<hand.size();i++){
        if(hand[i]==id){
            hand[i]=-1;
            break;
        }
    }
}

short cardID(string str, const vector<string> &name, const short id[]){
    for(int i=0;i<name.size();i++){
        if(name[i]==str){
            return id[i];
        }
    }
    return -1;
}

short strtCrd(short deck[],bool &isStJak){
    short card;
    bool avail;
    do{
```

```
        card=slCrdDk();//assigns a random number from 0-51
        avail=inDeck(card,deck);//true if card is available
        if(avail){
           if(card>=40&&card<=43){//if card ID is equal to any suit Jack
             isStJak=true;
           }
           deck[card]=-1;//remove card from deck
           return card;
        }
     }while(!avail);//loop again if card is not in deck
}

void dspHand(short n, const vector<string> &name){
     cout<<name[n];
}

void dspHand(vector<short> hand, const vector<string> &crdName){
     for(int i=0;i<hand.size();i++){
        //if the card ID for a given hand sub number is valid
        //then output the corresponding name for that ID number
        if(hand[i]>=0)cout<<crdName[hand[i]]<<"  ";
     }
     cout<<endl;
}
```

```
void deal(short deck[], vector<short>  &handC, vector<short> &handP,
            char dealer){
   short card;
   if(dealer=='P'){//deal Player first
      for(int i=0;i<6;i++){//assign six cards
         card=addCard(deck,handP);//for Player
         deck[card]=-1;//remove card from deck
         card=addCard(deck,handC);//for computer
         deck[card]=-1;//remove card from deck
         }
   }else{//dealer=='C'//deal computer first
      for(int i=0;i<6;i++){//assign six cards
         card=addCard(deck,handC);//for computer
         deck[card]=-1;//remove card from deck
         card=addCard(deck,handP);//for Player
         deck[card]=-1;//remove card from deck
      }
   }
}

short addCard(short deck[], vector<short>  &hand){
   short card;
   bool avail;
   do{
      card=slCrdDk();//assigns a random number from 0-51
```

```
        avail=inDeck(card,deck);//true if card is available
        if(avail){
            hand.push_back(card);
        }
    }while(!avail);//loop again if card is not in deck
    return card;
}

bool inHand(short id, const vector<short> &hand){
    for(int i=0;i<hand.size();i++){
        if(hand[i]==id){
            return true;
        }
    }
    return false;
}

bool inHndC(short sub, const vector<short> &hand){
    if (hand[sub]<0){
        return false;
    }else return true;
}

bool inDeck(short sub, short deck[]){
    if (deck[sub]<0){
```

```
        return false;
    }else return true;
}

short slCrdDk(){
    return rand()%52;
}

char gtDealr(){
    short n=rand()%2;
    if(n==0){
        return 'C';
    }else return 'P';
}

void filName(vector<string> &crdName,ifstream &names){
    names.open("names.txt", ios::in);
    string tmp;
    int cnt=0;
    while(cnt<52){
        names>>tmp;
        crdName.push_back(tmp);
        cnt++;
    }
    names.close();
```

```
}

void fillds(short array[], ifstream &ids, const short MAX){
   ids.open("ids.txt", ios::in);
   short tmp;
   for(int cnt=0;cnt<MAX;cnt++){
      ids>>tmp;
      array[cnt]=tmp;
   }
   ids.close();
}

void filVals(short array[], ifstream &vals, const short MAX){
   vals.open("vals.txt", ios::in);
   short tmp;
   for(int cnt=0;cnt<MAX;cnt++){
      vals>>tmp;
      array[cnt]=tmp;
   }
   vals.close();
}

void filSuit(short array[], ifstream &suits, const short MAX){
   suits.open("suits.txt", ios::in);
   short tmp;
```

```
   for(int cnt=0;cnt<MAX;cnt++){
      suits>>tmp;
      array[cnt]=tmp;
   }
   suits.close();
}

//Start of Version 2 Functions
void theShow(const vector<short> &vecHndP,const vector<short> &vecHndC,
             const vector<short> &vecCrib,const short starter,
             const char dealer, int &pointsP, int &pointsC){
   //Declare constant variables
   const int DK_SIZE=52;//The size of the deck
   const int HND_SZ5=5;//The size of a hand
   const int HND_SZ4=4;//The size if the crib hand
   const int COLS_2=2;//Constant to hold the column size for 2D array
   const int COLS_3=3;//Constant to hold the column size for 2D array
   const int COLS_4=4;//Constant to hold the column size for 2D array
   const int ROWS_10=10;//Constant to hold the row size for 2D array
   const int ROWS_5=5;//Constant to hold the row size for 2D array
   //Declare constant arrays
   const short sets_2[ROWS_10][COLS_2]={{0,1},{0,2},//2D array to hold all
                        {0,3},{0,4},//possible combinations of two cards.
                        {1,2},{1,3},//Used for scoring hands
                        {1,4},{2,3},
```

```
                    {2,4},{3,4}};


    const short sets_3[ROWS_10][COLS_3]={{0,1,2},{0,1,3},//2D array to hold all
{0,2,3},{1,2,3},
                    {0,1,4},{0,2,4},//possible card combinations of
                    {1,2,4},{0,3,4},//three cards. Used for scoring
                    {1,3,4},{2,3,4},//hands
                    {0,2,3},{1,2,3}};
    const short sets_4[ROWS_5][COLS_4]={{0,1,2,3},
                       {0,1,2,4},
                       {0,1,3,4},
                       {0,2,3,4},
                       {1,2,3,4}};
    //Declare Variables
    short upCard=starter;//sets Up Card
    int pointsK=0;//K for "kitty" or, if you prefer "krib"
    //Declare arrays
    Card crdDeck[DK_SIZE];
    Card handP[HND_SZ5];//hand with up card
    Card handC[HND_SZ5];//hand with up card
    Card crib[HND_SZ5];//hand with up card
    Card sHndP[HND_SZ4];//hand without up card
    Card sHndC[HND_SZ4];//hand without up card
    Card sCrb[HND_SZ4];//hand without up card
    short arHandP[HND_SZ5];//Holds the sorted card ids for player's hand
    short arHandC[HND_SZ5];//Holds the sorted card ids for computer's hand
```

```
short arCrib[HND_SZ5];//Holds the sorted card ids for crib
short arSHndP[HND_SZ4];//sorted card ids for player's hand without up card
short arSHndC[HND_SZ4];//sorted card ids for computer's hand w/o up card
short arSCrb[HND_SZ4];//sorted card ids for crib without up card
//Character arrays for holding filenames
char fnIds[]="./ids.txt";
char fnRanks[]="./ranks.txt";
char fnSuits[]="./suits.txt";
char fnNames[]="./names.txt";
char fnVals[]="./vals.txt";
//Fill the crdDeck array
flCrdDk(crdDeck,DK_SIZE,fnIds,fnRanks,fnSuits,fnNames,fnVals);
//Convert hands with up card
cnvHand(crdDeck,handP,arHandP,vecHndP,upCard);
cnvHand(crdDeck,handC,arHandC,vecHndC,upCard);
cnvHand(crdDeck,crib,arCrib,vecCrib,upCard);
//convert hands without up card
cnvSHnd(crdDeck,sHndP,arSHndP,vecHndP);
cnvSHnd(crdDeck,sHndC,arSHndC,vecHndC);
cnvSHnd(crdDeck,sCrb,arCrib,vecCrib);
//fill the Up Card's members
Card cdUpCrd;
cnvCard(crdDeck,cdUpCrd,upCard);
//header
cout<<"Up Card: "<<cdUpCrd.name<<endl;
```

```
cout<<"---------------------------------------"<<endl;
//Score hands and output results
if(dealer=='C'){//score hands starting with player if computer is dealer
   cout<<"Dealer is the Computer"<<endl;
   cout<<"----------------------"<<endl;
   cout<<"Player's Hand Score:"<<endl;
   scrHand(sets_2,sets_3,sets_4,handP,sHndP,cdUpCrd,pointsP);
   cout<<endl<<"Computer's Hand Score:"<<endl;
   scrHand(sets_2,sets_3,sets_4,handC,sHndC,cdUpCrd,pointsC);
   cout<<endl<<"Crib Score:"<<endl;
   scrHand(sets_2,sets_3,sets_4,crib,sCrb,cdUpCrd,pointsK);
   //assign crib points to dealer
   pointsC+=pointsK;
   cout<<"Total points for the Computer\n"
         <<"with crib score added: "<<pointsC<<endl;
}else{//score hands starting with Computer if Player is dealer
   cout<<"Dealer is the Player"<<endl;
   cout<<"----------------------"<<endl;
   cout<<"Computer's Hand Score:"<<endl;
   scrHand(sets_2,sets_3,sets_4,handC,sHndC,cdUpCrd,pointsC);
   cout<<endl<<"Player's Hand Score:"<<endl;
   scrHand(sets_2,sets_3,sets_4,handP,sHndP,cdUpCrd,pointsP);
   cout<<endl<<"Crib Score:"<<endl;
   scrHand(sets_2,sets_3,sets_4,crib,sCrb,cdUpCrd,pointsK);
   //assign crib points to dealer
```

```
        pointsP+=pointsK;
        cout<<"Total points for the Player\n"
            <<"with crib score added: "<<pointsP<<endl;
    }
}

void scrHand(const short combi2[10][2],const short combi3[10][3],
             const short combi4[5][4],const Card lngHnd[],
             const Card shrtHnd[],const Card cdUpCrd,int & points,
             const int size){
    //display the hand
    cout<<"Hand with Up Card: ";
    dsCdHnd(lngHnd,size);
    //score pairs
    scrPrs(combi2,lngHnd,points);
    //score 15s
    scr15s(combi2,combi3,combi4,lngHnd,points);
    //score for a flush
    scrFlsh(lngHnd,shrtHnd,points);
    //score nibs
    scrNbs(shrtHnd,cdUpCrd,points);
    //score runs
    scrRns(combi3,combi4,lngHnd,points);
    //output points
    cout<<"Points: "<<points<<endl;
```

```
}

void dsCdHnd(const Card hand[],const int size){
   //displays all the contents of a hand
   for(int i=0;i<size;i++){
      cout<<hand[i].name<<"  ";
   }
   cout<<endl;
}

void scrRns(const short combi3[10][3],const short combi4[5][4],
            const Card hand[],int &points){
   bool rnFound=false;//used as a flag value to skip tests if larger runs
                  //are found
   //tests if all five cards are only one away from the next. The moment one
   //card fails the tests move to the next test
   if((hand[1].rank)-(hand[0].rank)==1){
      if((hand[2].rank)-(hand[1].rank)==1){
         if((hand[3].rank)-(hand[2].rank)==1){
            if((hand[4].rank)-(hand[3].rank)==1){
               //all cards passed the test
               //output the card names and assign +5000 points
               cout<<hand[0].name<<" & "<<hand[1].name<<" & "
                  <<hand[2].name<<" & "<<hand[3].name<<" & "
                  <<hand[4].name<<" = Run of five: +5000 points"
```

```
            <<endl;
            points+=5000;//give points
            rnFound=true;//set that a run of five was found.
                    //Skip all other tests if true
        }
      }
   }
}
if(!rnFound){
   for(int i=0;i<5;i++){//iterate less than the size of the combi4 array
      if((hand[combi4[i][1]].rank)-(hand[combi4[i][0]].rank)==1){
         if((hand[combi4[i][2]].rank)-(hand[combi4[i][1]].rank)==1){
            if((hand[combi4[i][3]].rank)-(hand[combi4[i][2]].rank)==1){
               //all cards passed the test
               //output the card names and assign +4000 points
               cout<<hand[combi4[i][0]].name<<" & "
                  <<hand[combi4[i][1]].name<<" & "
                  <<hand[combi4[i][2]].name<<" & "
                  <<hand[combi4[i][3]].name
                  <<" = Run of four: +4000 points"
                  <<endl;
               points+=4000;//give points
               rnFound=true;//set that a run of five was found.
                       //Skip all other tests if true
            }
```

```
            }
          }
        }
      }
      if(!rnFound){
        for(int i=0;i<10;i++){//iterate less than the size of the combi4 array
          if((hand[combi3[i][1]].rank)-(hand[combi3[i][0]].rank)==1){
            if((hand[combi3[i][2]].rank)-(hand[combi3[i][1]].rank)==1){
              //all cards passed the test
              //output the card names and assign +3000 points
              cout<<hand[combi3[i][0]].name<<" & "
                <<hand[combi3[i][1]].name<<" & "
                <<hand[combi3[i][2]].name
                <<" = Run of three: +3000 points"
                <<endl;
              points+=3000;//give points
              rnFound=true;//set that a run of five was found.
                    //Skip all other tests if true
            }
          }
        }
      }
    }

void cnvCard(const Card crdDeck[],Card &card,const short id){
```

```
   //takes a card Id and fills a card structure element with the proper values
   card.id=crdDeck[id].id;
   card.rank=crdDeck[id].rank;
   card.suit=crdDeck[id].suit;
   card.name=crdDeck[id].name;
   card.val=crdDeck[id].val;
}

void scrNbs(const Card shrtHnd[],const Card cdUpCrd,int &points,
            const int size4){
   if(cdUpCrd.rank==11){
      for(int i=0;i<size4;i++){
         if(shrtHnd[i].rank==cdUpCrd.rank){
            cout<<shrtHnd[i].name<<" makes nibs: +1000 points"
                <<" and +20% of total points!"<<endl;
            points+=1000;
            points=(points*1.2)+0.05;
         }
      }
   }
}

void scrFlsh(const Card hand[],const Card shrtHnd[],int &points,
            const int size5){
   int cnt=0;//count to hold how many card have the same suit
```

```
    for(int i=0;i<size5;i++){
        if(hand[0].suit==hand[i].suit)cnt++;//increments ctr for each match
    }
    if(cnt==5){
        cout<<"Flush of all five cards: +5000 points"<<endl;
        points+=5000;
    }
    //if all the cards in the hand except for the up card are the same suit
    //then +4000 points
    if(cnt==4){
        int nCnt=0;
        for(int i=0;i<4;i++){//4 = go through the hand w/o the up card
        //increments nCtr for each suit match without including up card
        if(shrtHnd[0].suit==shrtHnd[i].suit)nCnt++;
        }
        if(nCnt==4){
        cout<<"Flush of all four hand cards: +4000 points"<<endl;
        points+=4000;
        }
    }
}

void scr15s(const short combi2[10][2],const short combi3[10][3],
            const short combi4[5][4],const Card hand[],int &points){
    //Go through hand looking for combinations of two cards which add to 15
```

```
for(int i=0;i<10;i++){//goes through const combi2 2D array with 10 rows
   //and two columns. Compares ten combinations of two cards.
   //uses values in card combinations array to check hand for 15s
   if((hand[combi2[i][0]].val)+(hand[combi2[i][1]].val)==15){
      //if true, print out names and add 2000 point to points total
      cout<<hand[combi2[i][0]].name<<" + "<<hand[combi2[i][1]].name
           <<" = 15: +2000 points"<<endl;
      points+=2000;
   }
}
//Go through hand looking for combinations of three cards which add to 15
for(int i=0;i<10;i++){//goes through const combi3 2D array with 10 rows
   //and three columns. Compares ten combinations of three cards.
   //uses values in card combinations array to check hand for 15s
   if((hand[combi3[i][0]].val)+(hand[combi3[i][1]].val)+
        (hand[combi3[i][2]].val)==15){
      //if true, print out names and add 2000 point to points total
      cout<<hand[combi3[i][0]].name<<" + "<<hand[combi3[i][1]].name
           <<" + "<<hand[combi3[i][2]].name<<" = 15: +2000 points"
             <<endl;
      points+=2000;
   }
}
//Go through hand looking for combinations of four cards which add to 15
for(int i=0;i<5;i++){//goes through const combi3 2D array with 5 rows
```

```
      //and four columns. Compares five combinations of four cards.
      //uses values in card combinations array to check hand for 15s
      if((hand[combi4[i][0]].val)+(hand[combi4[i][1]].val)+
            (hand[combi4[i][2]].val)+(hand[combi4[i][3]].val)==15){
         //if true, print out names and add 2000 point to points total
         cout<<hand[combi4[i][0]].name<<" + "<<hand[combi4[i][1]].name
               <<" + "<<hand[combi4[i][2]].name<<" + "
               <<hand[combi4[i][3]].name<<" = 15: +2000 points"<<endl;
         points+=2000;
      }
   }
   //Trivial case: checks if all five cards add up to 15. If so, +2000 points
   if((hand[0].val)+(hand[1].val)+(hand[2].val)+(hand[3].val)
         +(hand[4].val)==15){
      //if true, print out names and add 2000 point to points total
      cout<<hand[0].name<<" + "<<hand[1].name<<" + "<<hand[2].name<<" + "
            <<hand[3].name<<" + "<<hand[4].name<<" = 15: +2000 points"
                  <<endl;
   }
}

void scrPrs(const short combi[10][2],const Card hand[],int &points){
   for(int i=0;i<10;i++){//goes through const combi 2D array with 10 rows
      //uses values in card combinations array to check hand for pairs
      if(hand[combi[i][0]].rank==hand[combi[i][1]].rank){
```

```
            cout<<hand[combi[i][0]].name<<" & "<<hand[combi[i][1]].name
                 <<" = A Pair: +2000 points"<<endl;
            points+=2000;
        }
    }
}

//creates a "Small" 4 card hand without the up card
void cnvSHnd(const Card crdDeck[],Card crdSHnd[],short arHnd[],
             const vector<short> &vcHnd,const int size4){
    //Declare variables
    short srtArry[size4];
    //convert hands
    cpyVcAr(vcHnd,arHnd);
    //Copy hand array for sorting
    cpyArry(arHnd,srtArry,size4);
    //Sort the hand copy in ascending order
    selSort(srtArry,size4);
    //Copy and add values to members of card hand
    for(int i=0;i<size4;i++){
        crdSHnd[i].id=crdDeck[srtArry[i]].id;
        crdSHnd[i].rank=crdDeck[srtArry[i]].rank;
        crdSHnd[i].suit=crdDeck[srtArry[i]].suit;
        crdSHnd[i].name=crdDeck[srtArry[i]].name;
        crdSHnd[i].val=crdDeck[srtArry[i]].val;
```

```
    }
}



//creates a five card hand with the up card added
void cnvHand(const Card crdDeck[],Card crdHand[],short arHnd[],
             const vector<short> &vcHnd,const short upCard,const int size5){
    //Declare variables
    short srtArry[size5];
    //convert hands
    cpyVcAr(vcHnd,arHnd);
    //add the Up card
    addUpCd(arHnd,upCard,size5);
    //Copy hand array for sorting
    cpyArry(arHnd,srtArry,size5);
    //Sort the hand copy in ascending order
    selSort(srtArry,size5);
    //Copy and add values to members of card hand
    for(int i=0;i<size5;i++){
        crdHand[i].id=crdDeck[srtArry[i]].id;
        crdHand[i].rank=crdDeck[srtArry[i]].rank;
        crdHand[i].suit=crdDeck[srtArry[i]].suit;
        crdHand[i].name=crdDeck[srtArry[i]].name;
        crdHand[i].val=crdDeck[srtArry[i]].val;
    }
```

```
}

void cpyArry(short a[],short b[],const int size){
   //copies one array to another
   for(int i=0;i<size;i++){
      b[i]=a[i];
   }
}

void selSort(short a[], const int size){
   //A selection sort for an array
   int strtScn, minVal, minIndx;
   for(strtScn=0;strtScn<size-1;strtScn++){
      minIndx=strtScn;
      minVal=a[strtScn];
      for(int i=strtScn+1;i<size;i++){
         if(a[i]<minVal){
            minVal=a[i];
            minIndx=i;
         }
      }
      a[minIndx]=a[strtScn];
      a[strtScn]=minVal;
   }
```

```
}

void addUpCd(short hand[],short upCard,const int size){
   hand[size-1]=upCard;//always add upCard to last position in hand array
}

void cpyVcAr(const vector<short> &vcHnd,short aHnd[],const int size){
   for(int i=0;i<size;i++){
      aHnd[i]=vcHnd[i];//copies value in vector[i] to array[i]
   }
}

void banner(char fName[]){
   //Declare variables
   ifstream input;
   string str;
   //open file
   input.open(fName);
   for(int i=0;i<7;i++){
      getline(input,str,'\n');
      cout<<str<<endl;
   }
   //clean up
   input.close();
}
```

```
void flCrdDk(Card crdDeck[],const int size,char fnIds[],char fnRanks[],
             char fnSuits[],char fnNames[],char fnVals[]){
   ifstream ids;
   ifstream ranks;
   ifstream suits;
   ifstream names;
   ifstream vals;
   //Open the file stream objects using the character arrays for filenames
   ids.open(fnIds, ios::in);
   ranks.open(fnRanks, ios::in);
   suits.open(fnSuits, ios::in);
   names.open(fnNames, ios::in);
   vals.open(fnVals, ios::in);
   //Fill the array
   for(int i=0;i<size;i++){
      ids>>crdDeck[i].id;
      ranks>>crdDeck[i].rank;
      suits>>crdDeck[i].suit;
      names>>crdDeck[i].name;
      vals>>crdDeck[i].val;
   }
   //Clean up
   ids.close();
   ranks.close();
```

```
    suits.close();
    names.close();
    vals.close();
}
```