Baccarat
Card Game

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CIS-5

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43358

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Introduction

"Gambling: The sure way of getting nothing for something."

-Wilson Mizner

Baccarat is a card game which originated in mid 19th century France. Also termed Punto Banco, it is a casino game which requires no technical skills. It's frequently found in high-stakes casinos in which players bet large sums. Though I've never played in real life, the game has always interested me and seemed a perfect fit for this project with its reliance on chance and the complexity of the rules.

How the Card Game Works

Objective

Bet on either banker or player hand for which comes closest to totaling 9, in addition to betting on appearance of pairs or ties.

Rules of the Game

Cards are ranked with Face cards and 10s counting as 0 points. All other cards have their correspondingly designated point values. Bets are placed on banker hand winning, player hand winning, or a tie between the two. The payout of the player hand winning is 1:1, banker hand winning is 1:0.95, and an 8:1 payout for ties. Any hand exceeding 10 points receives a 10 point subtraction, and a third card is drawn if the first two total less than 5 points.

My Approach to the Game

Translating Game Play Rules to Programming Language

The game is primarily reliant on chance, as 6-8 decks are used, therefore, counting cards would not be beneficial. As a result, this made the game easier to code and drawn cards did not need to be accounted for in the same manner. In coding Baccarat, I used the rand function to generate numbers between 1 and 14, translate face card values to a representative string from their original integers, and pair them with a randomized suit

generated and translated from integers 1-4. After this, I used mathematics and conditional statements to determine if a third card is to be drawn for both player and banker hands. After the cards and winners have been determined, the initial bets input by the user (or taken from an external file), are calculated based on the results of the match and payouts are determined. I chose to have the player begin with $1000 as a starting sum and records are kept of the player/house winnings and the rounds played. Averages and other game statistics are calculated and output to the console along with records of names, scores (in end $), and rounds played (stored in single/2d arrays) entered into an output file for future referencing. A final function that I created allows the user to search for scores and select that they be sorted by both high scores in descending order and name in alphabetical order.

Similarities to the Card Game

The game I coded for is similar to the card game in almost all respects other than minor differences that could potentially affect the statistics if played long-term.

Differences from the Card Game

The major differences between my game and Baccarat in real life are that because 6-8 decks are used, likelihood of drawn cards being drawn a second time will slightly decrease. This should be nearly negligible, but my program randomizes cards without any alterations based on those previously drawn, which could potentially impact results. Additionally, players do not start with a default sum of $1000 and high scores are not kept by casinos. Other than these small differences, the games are nearly identical.

The Logic of it All

Flowchart

My flowchart is multiple pages, so I'll break it up into smaller pieces with pseudocode accompanying each section.

Opening comments

Bring in system libraries

Set function prototypes

Enter main

Declare all variables, initiating some now and others later

Open file to input data

Open file to output data

Set variables to initial values

Output greeting

Input name to be identified by

Run prnt() function to output personalized greeting

Enter into do-while loop

Randomize cards using rndCrd() function

Enter into for loop iterating through randomization of suit values (1-4)

Enter into for loop iterating through translation of suit values into suit names

Run prnt() function for output of player and house info

Output directions to input bets

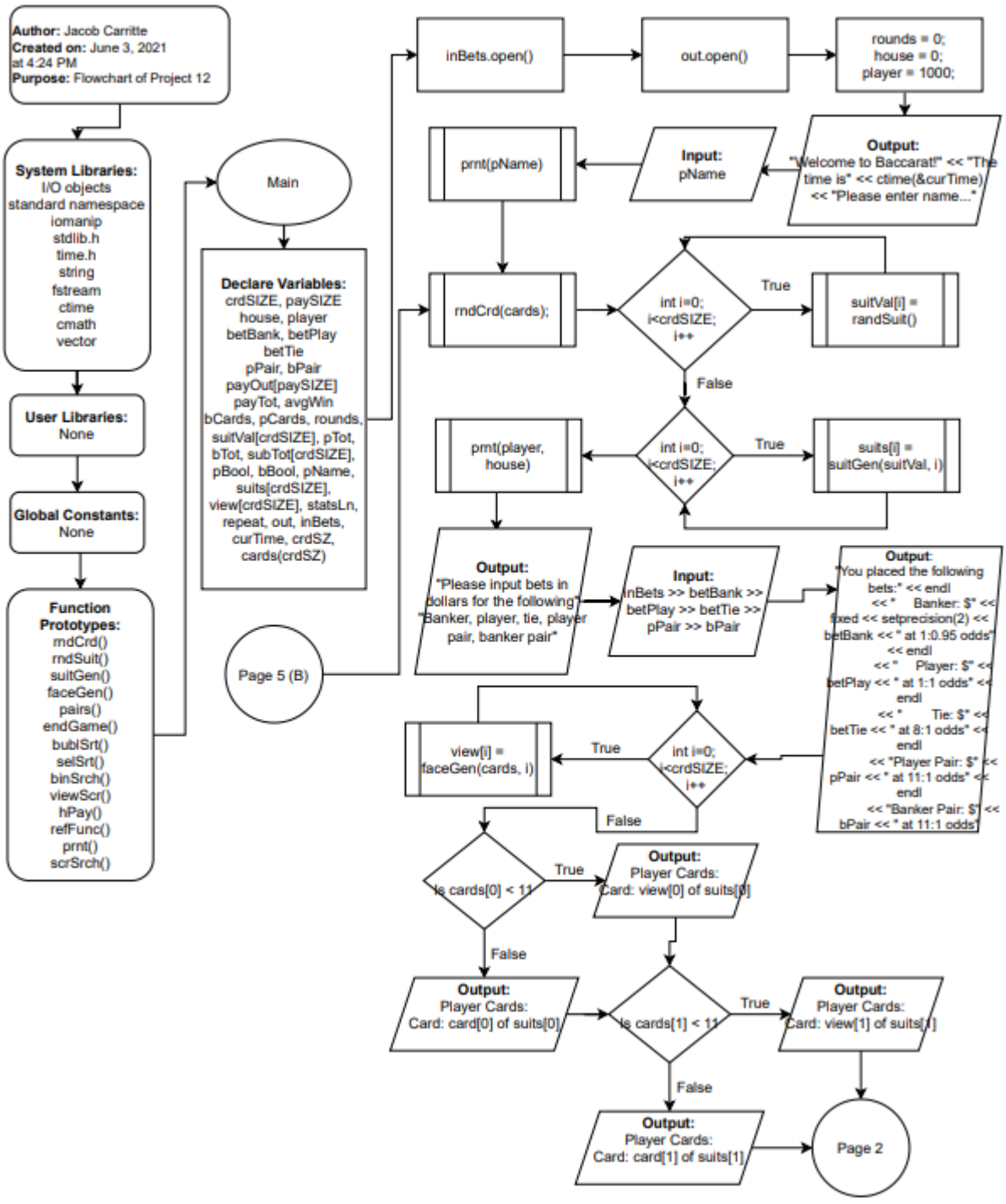
Input bets

Output user-entered bet values

Enter into for loop iterating through card integers to generate strings for face cards

**If cards[0] is less than 11 output card and suit or else output string for generated face card name and suit*

*Repeat above process beginning at * for cards[1]*



**If cards[0] >= 10 set subTot[0] = cards[0] or else subTot[0] = 0*

Repeat the above step for cards[1] and card[4]

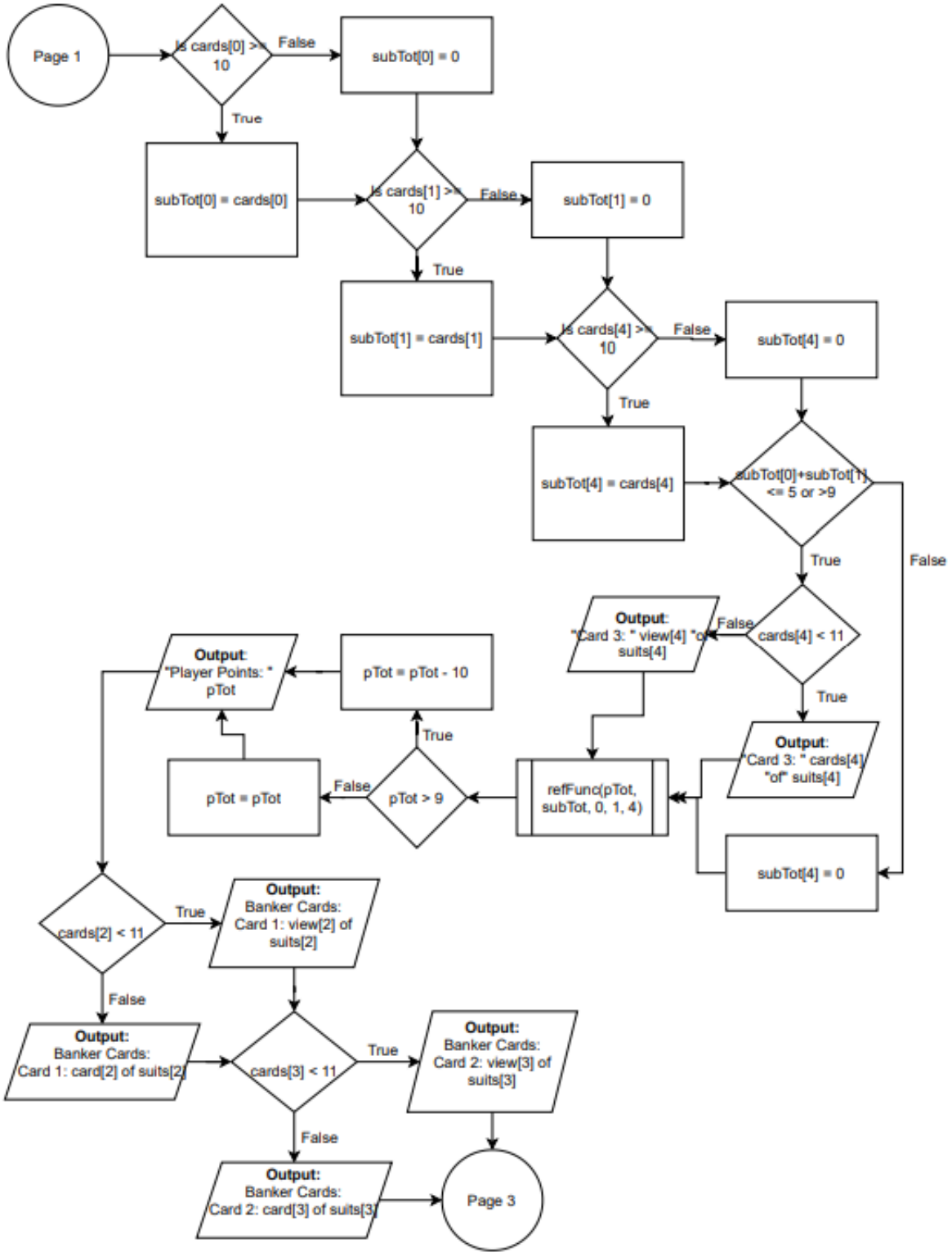
If subTot[0] + subTot[1] is less than 5 or greater than 9, check if cards[4] is less than 11 and output proper number or face card or else set subTot[4] equal to 0 if false

Run refFunc() function to calculate total for player

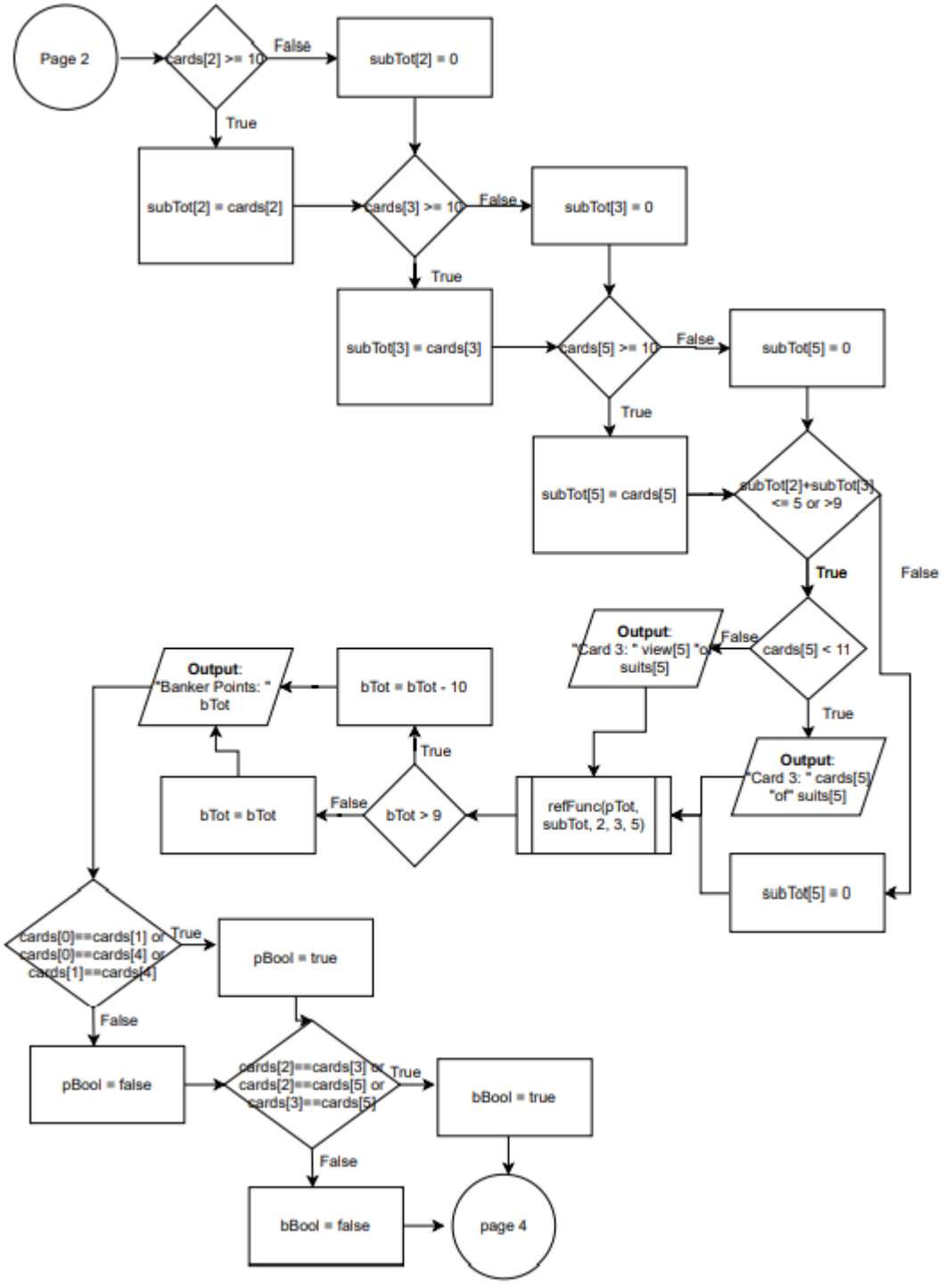
If player total is greater than 9 subract 10 or else leave as is

Output player points

*Repeat process beginning at last * for cards[2], cards[3], and cards[5], respectively calculating banker totals and output results (process continues onto next page)*



Check for pair within player and banker hands and set Booleans accordingly



Check if player total is greater than bank total and set values of payOut array accordingly

Check if player hand has pairs and add winnings if true or else subtract player bets

Check if bank hand has pairs and add winnings if true or else subtract corresponding bets

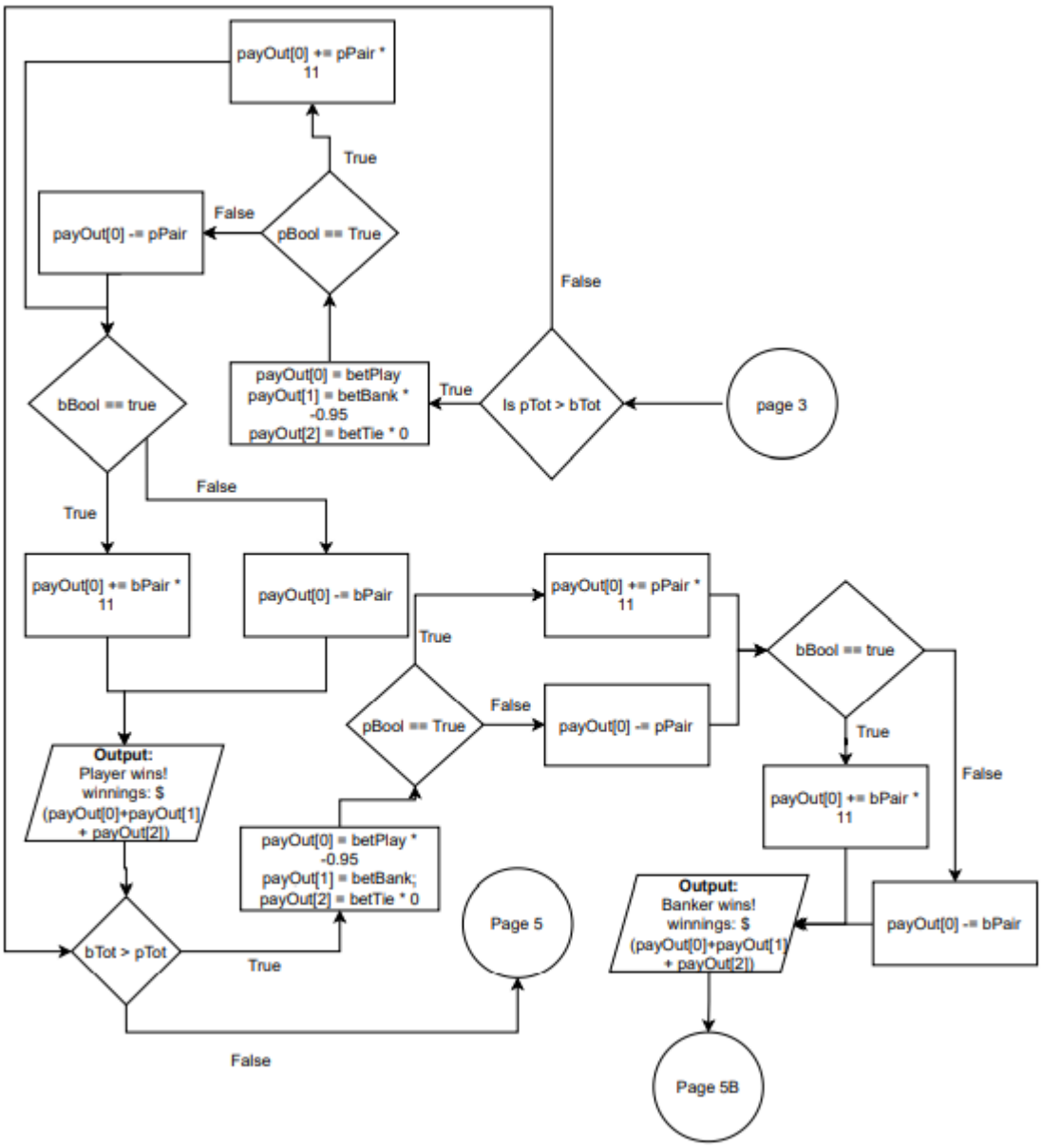
Output winner and money won

If false, check if banker total is greater than player total and set values of payOut array accordingly

Check if player hand has pairs and add winnings if true or else subtract player bets

Check if bank hand has pairs and add winnings if true or else subtract corresponding bets

Output winner and money won



If false, check if banker total is equal to player total and set values of payOut array accordingly

Check if player hand has pairs and add winnings if true or else subtract player bets

Check if bank hand has pairs and add winnings if true or else subtract corresponding bets

Output tie notification and money won

Run hPay function to calculate new player and house money totals and output

Ask player if they would like to play again and check user input

If appropriate user input (y, Y, or n, N), increment number of rounds played and repeat do-while loop if y or Y

If invalid input, reprompt

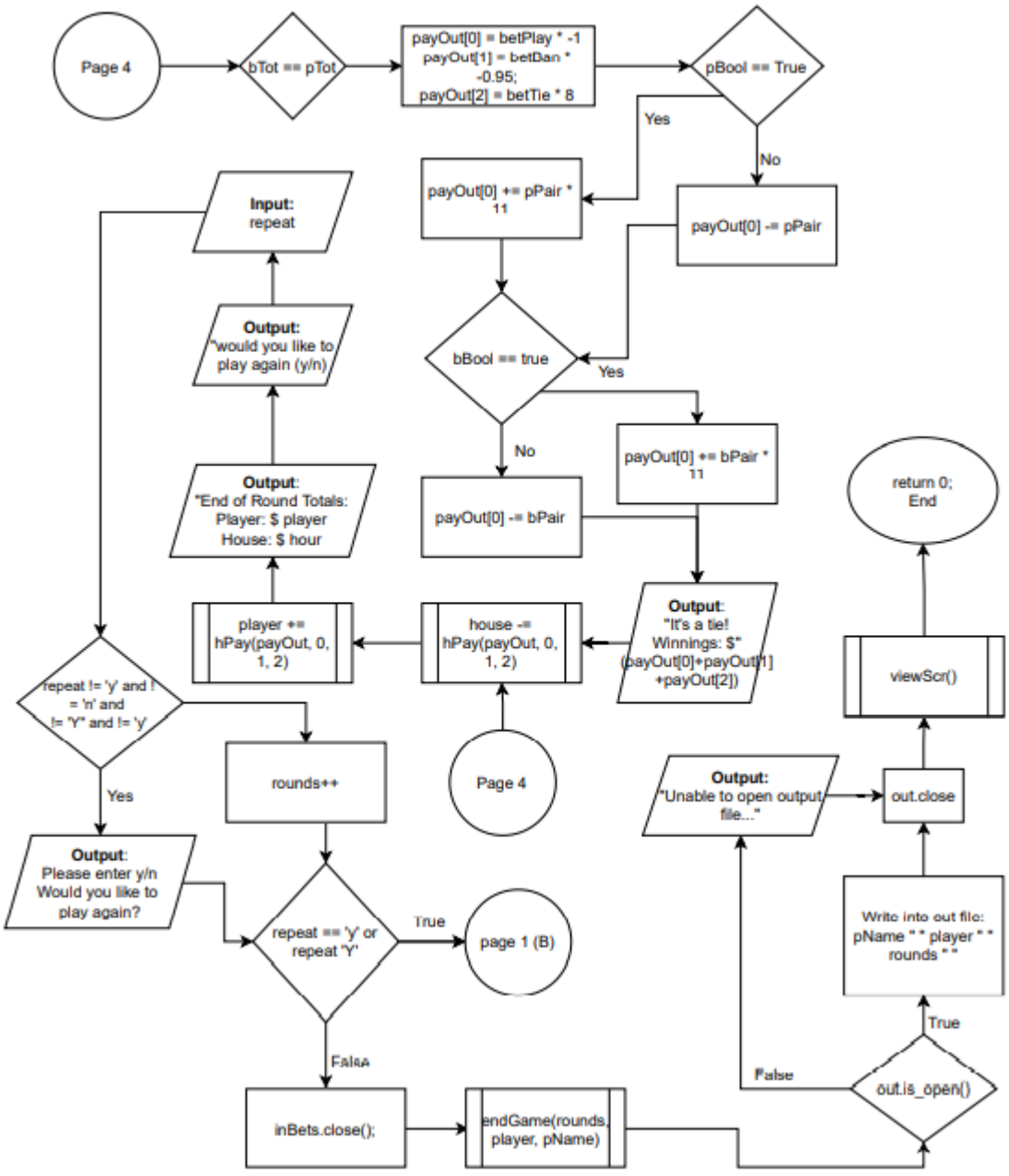
If user enters n or N, close input file and run endGame() function to output game info

Check if output file is open and write in Name, end $, and number of rounds played if true or else state that file cannot be opened

Close output file

Run viewScr() function to check high scores, sort, and perform binary search

End main



Enter viewScr function

Declare variables and set values of some

Output prompt to view high scores

User input response

If invalid input prompt to reenter y/n

Accept secondary input from user

Or else, if appropriate input and yes, open input file

Run for loop iterating to size of array and perform getline() function to take in names, scores, and rounds from file

Run selSrt() function for selection sort in descending order of high scores

Iterate through, outputting names and scores

Output title and description then iterate through outputting names, scores, and rounds

Run a binary search for scores through the function scrSrch()

Prompt user to enter y/n to determine whether to sort scores alphabetically

Accept user input

Check if valid

If invalid reprompt

If valid and yes, run bublSrt() function to perform a bubble sort based on ASCII value of first letter

Output title and description

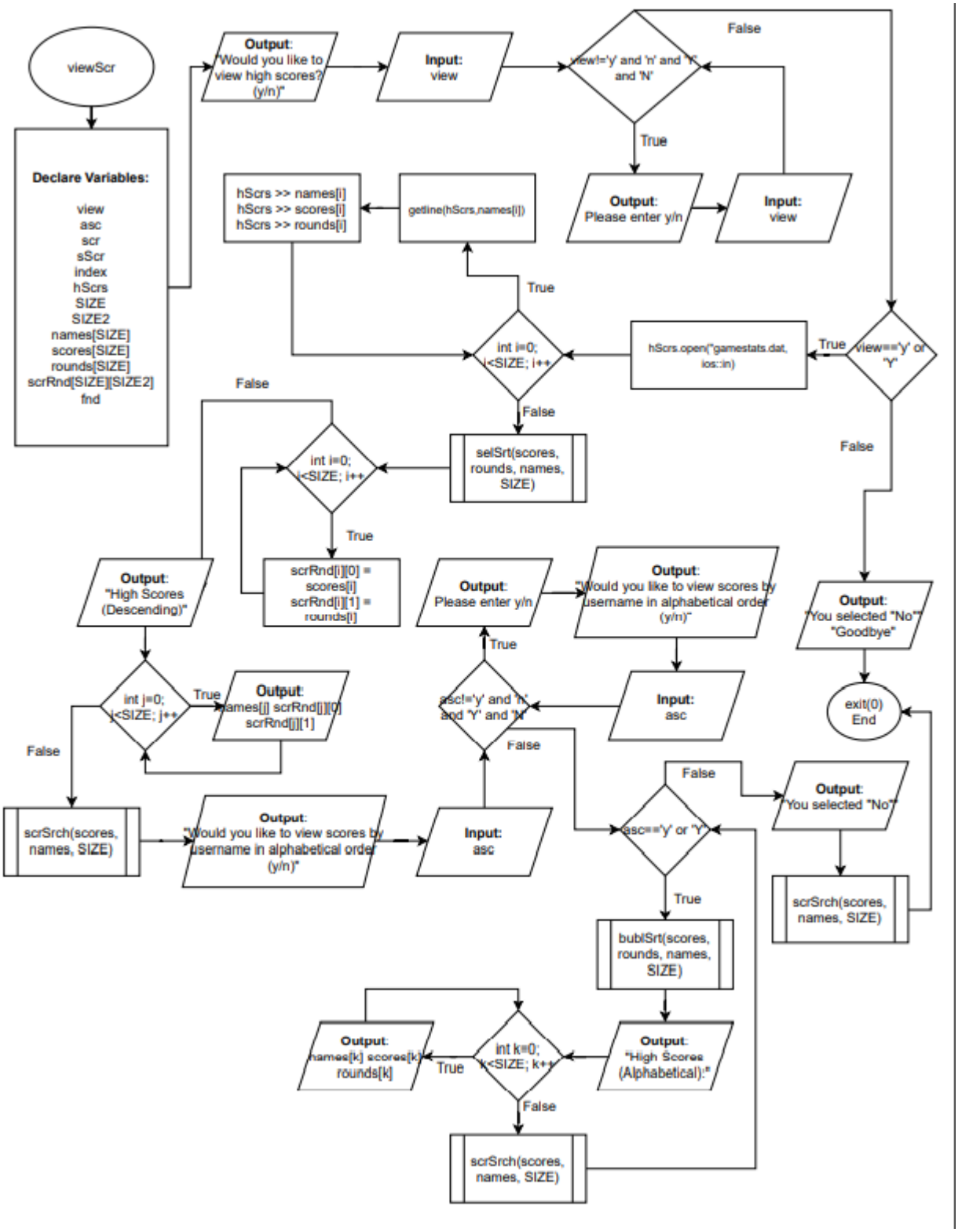
Iterate through and output names, scores, and rounds in new order

Run binary search based on scores

If user input invalid, output that user selected no and run score search function

Output goodbye and end function

If false, output alert and end function


viewScr
Declare Variables:
view
asc
scr
sScr
index
hScrs
SIZE
SIZE2
names[SIZE]
scores[SIZE]
rounds[SIZE]
scrRnd[SIZE][SIZE2]
fnd
Output: "Would you like to view high scores? (y/n)"
Input: view
view!='y' and 'n' and 'Y' and 'N'
False
True
Output: Please enter y/n
Input: view
hScrs >> names[i]
hScrs >> scores[i]
hScrs >> rounds[i]
getline(hScrs,names[i])
True
int i=0; i<SIZE; i++
hScrs.open("gamestats.dat, ios::in)
True
view=='y' or 'Y'
False
False
selSrt(scores, rounds, names, SIZE)
int i=0; i<SIZE; i++
False
True
scrRnd[i][0] = scores[i]
scrRnd[i][1] = rounds[i]
Output: "High Scores (Descending)"
int j=0; j<SIZE; j++
True
Output: names[j] scrRnd[j][0] scrRnd[j][1]
False
scrSrch(scores, names, SIZE)
Output: "Would you like to view scores by username in alphabetical order (y/n)"
Input: asc
Output: Please enter y/n
asc!='y' and 'n' and 'Y' and 'N'
True
False
Output: "Would you like to view scores by username in alphabetical order (y/n)"
Input: asc
asc=='y' or 'Y'
False
True
Output: "You selected "No""
scrSrch(scores, names, SIZE)
Output: "You selected "No""
"Goodbye"
exit(0)
End
bublSrt(scores, rounds, names, SIZE)
Output: "High Scores (Alphabetical):"
int k=0; k<SIZE; k++
True
Output: names[k] scores[k] rounds[k]
False
scrSrch(scores, names, SIZE)

Enter rndCrd function

Declare variables

Iterate through based on size of vector and if true randomize card values

End function when false

Enter rndSuit function

Declare variables

Set variable as randomly generated number between 1 and 4

Return number

End function

Enter faceGen function

Declare variables

If card value is 11 or greater, enter switch statement

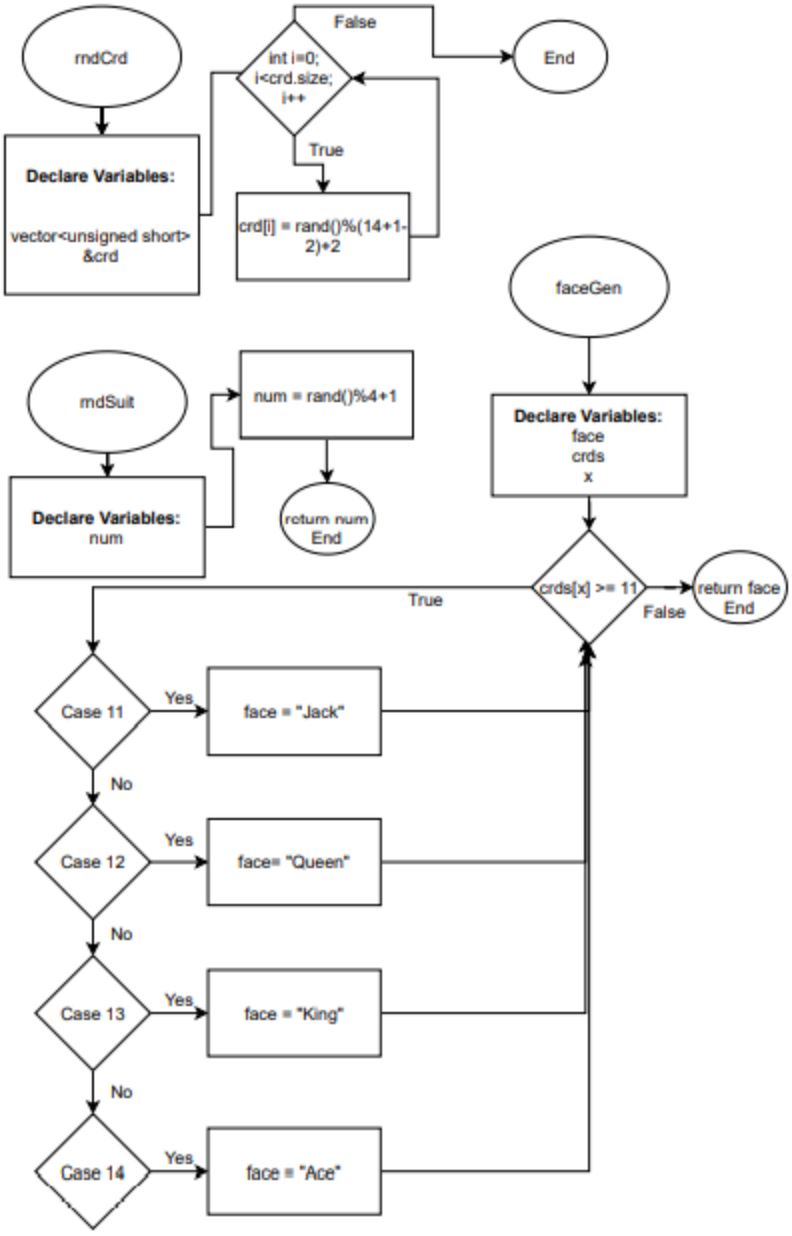
If 11, set variable as "Jack"

If 12, set variable as "Queen"

If 13, set variable as "King"

If 14, set variable as "Ace"

If false, return variable and end function



Enter suitGen function

Declare variables

Enter switch statement

For index value 1, set suit to "Hearts"

For 2, set suit to "Clubs"

For 3, set suit to "Diamonds"

For 4, set suit to "Spades"

Return suit and end function

Enter endgame function

Declare variables

Output goodbye message

Enter for loop, iterating based on number of rounds and output X for each if statement is true

If false, calculate average winnings and output the average profit per game

End function

Enter bublSrt function

Declare variables

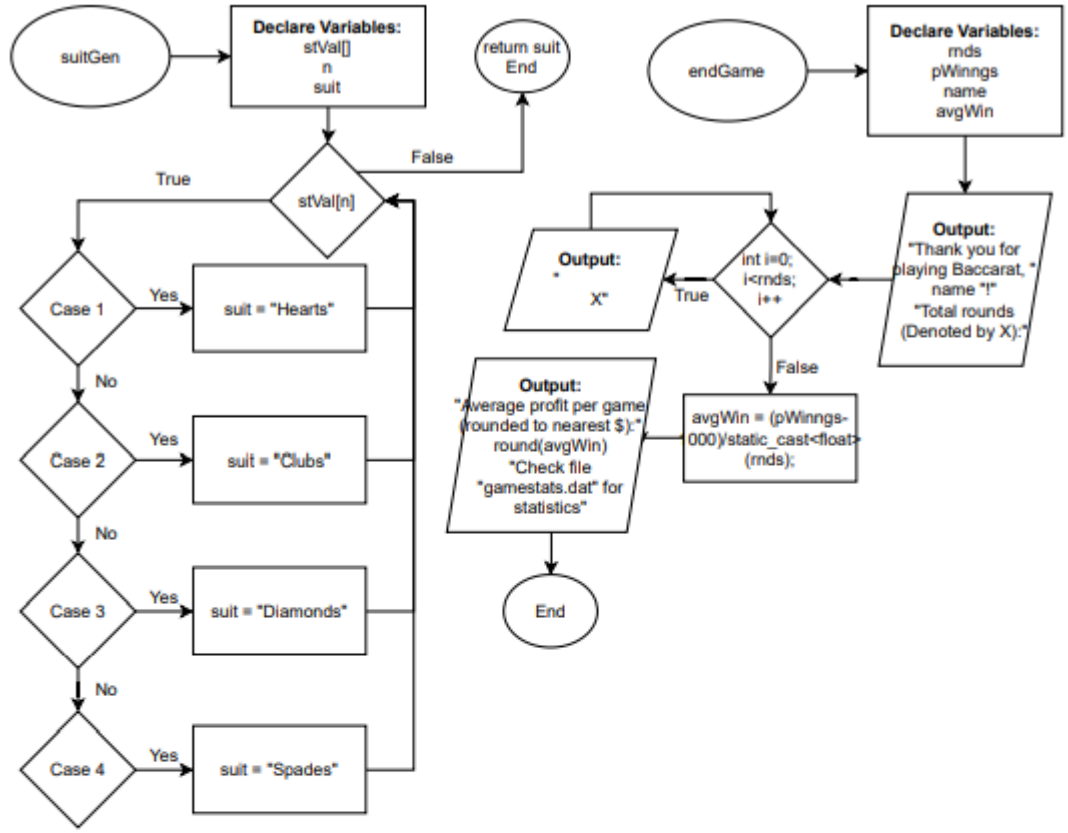
Enter for loop iterating through based on size of array-1

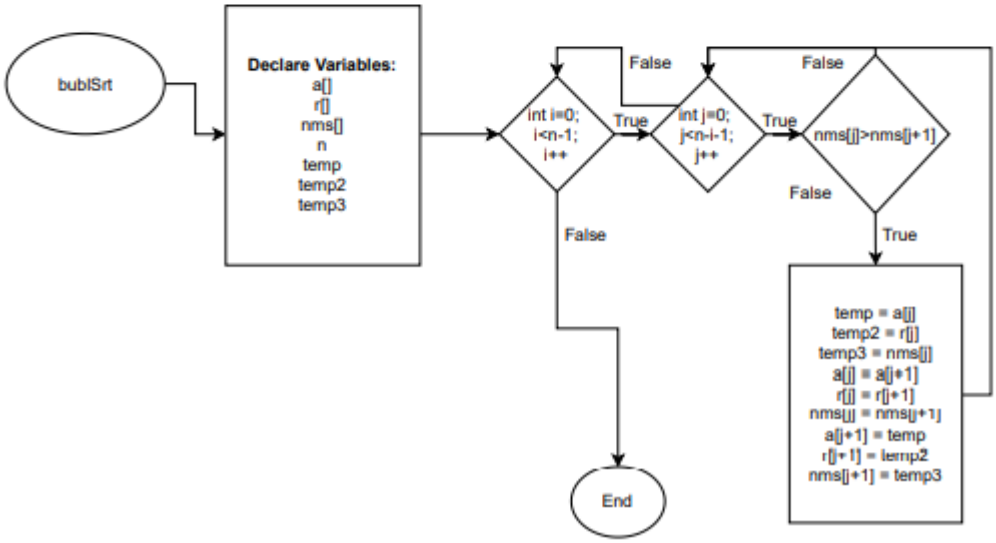
If true, enter secondary for loop iterating through based on index value of size – first index value – 1

If true compare nms[j] to nms[j+1]

If greater, swap values around to render condition false

End function





Enter selSrt function

Declare variables

Enter for loop and iterate based upon statement of index < size of array – 1

If true, iterate through second for loop with j=i+1 and statement for j<size of array

If true compare array[j] to array[i]

If a[j] is greater

Swap index values of three ways for each array

If false, end function

Enter binSrch function

Declare variables

Enter for loop and compare i to size of arrays

If true, set Boolean to true and index = I and output money at time of completion and index position

Run exit function and end function

If false, return found and end function

Enter hPay function

Declare variables

Set variable equal to total of all elements of pay array added together and return variable

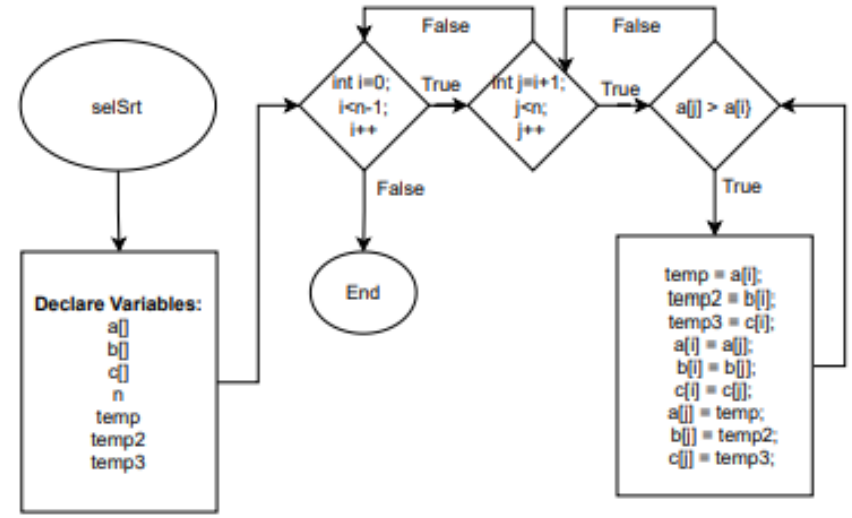
End function

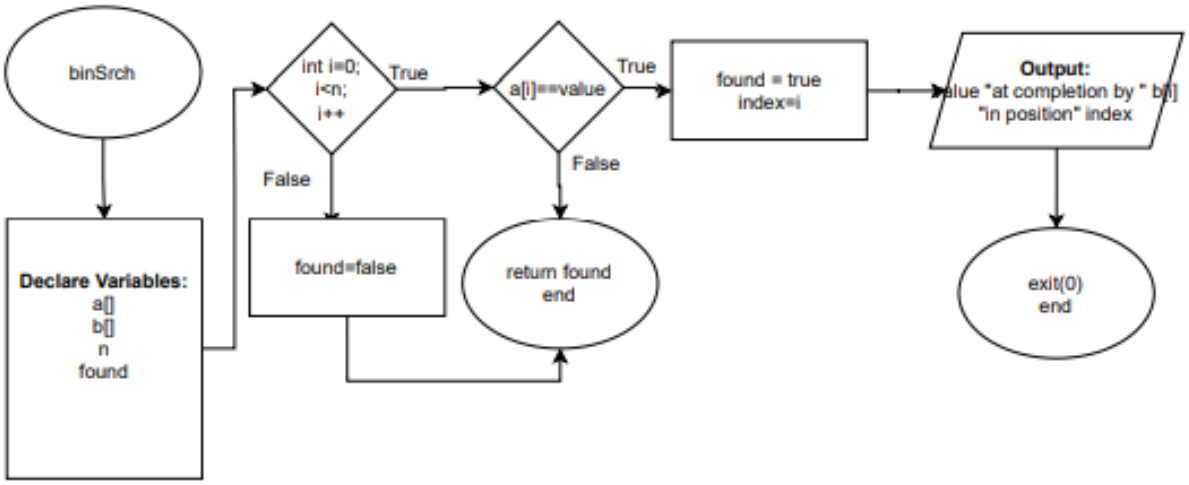
Enter refFunc

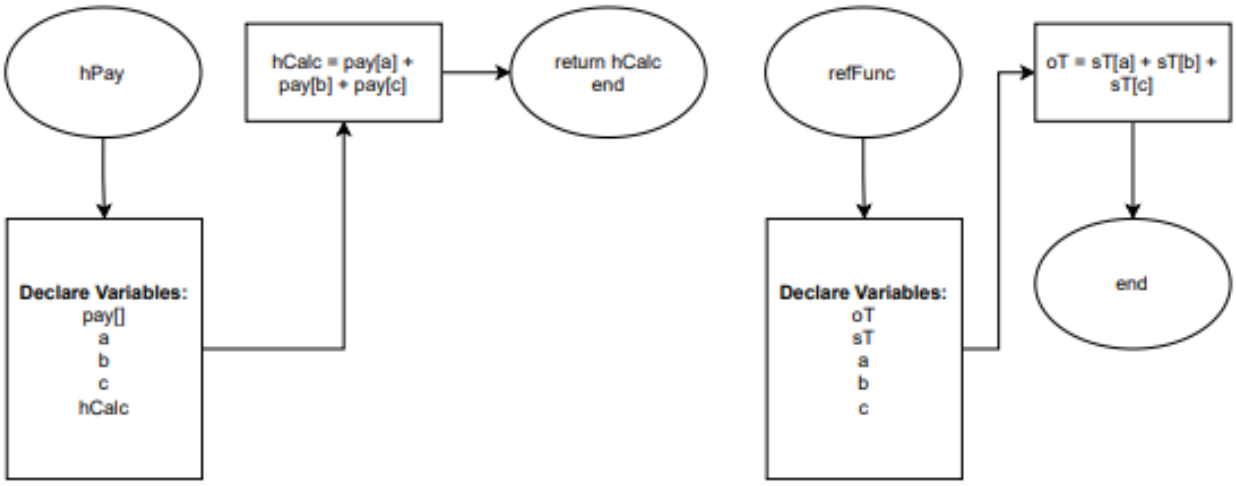
Declare variables

Add up subtotals and set equal to reference variable

End function


selSrt
Declare Variables:
a[]
b[]
c[]
n
temp
temp2
temp3
int i=0;
i<n-1;
i++
True
False
End
int j=i+1;
j<n;
j++
True
False
a[j] > a[i]
True
temp = a[i];
temp2 = b[i];
temp3 = c[i];
a[i] = a[j];
b[i] = b[j];
c[i] = c[j];
a[j] = temp;
b[j] = temp2;
c[j] = temp3;


binSrch
Declare Variables:
a[]
b[]
n
found
int i=0;
i<n;
i++
True
False
found=false
a[i]==value
True
False
return found
end
found = true
index=i
Output:
"in position" index
exit(0)
end


hPay
Declare Variables:
pay[]
a
b
c
hCalc
hCalc = pay[a] +
pay[b] + pay[c]
return hCalc
end
refFunc
Declare Variables:
oT
sT
a
b
c
oT = sT[a] + sT[b] +
sT[c]
end

Enter prnt function

Declare variables with default string if string argument

Output player money and house money if float argument

Output player greeting if string argument

End function

Enter scrSrch function

Declare variables

Output prompt asking if player wants to run search

Accept user input

If invalid input, reprompt and reaccept input

If valid and yes, output prompt to enter score to search for

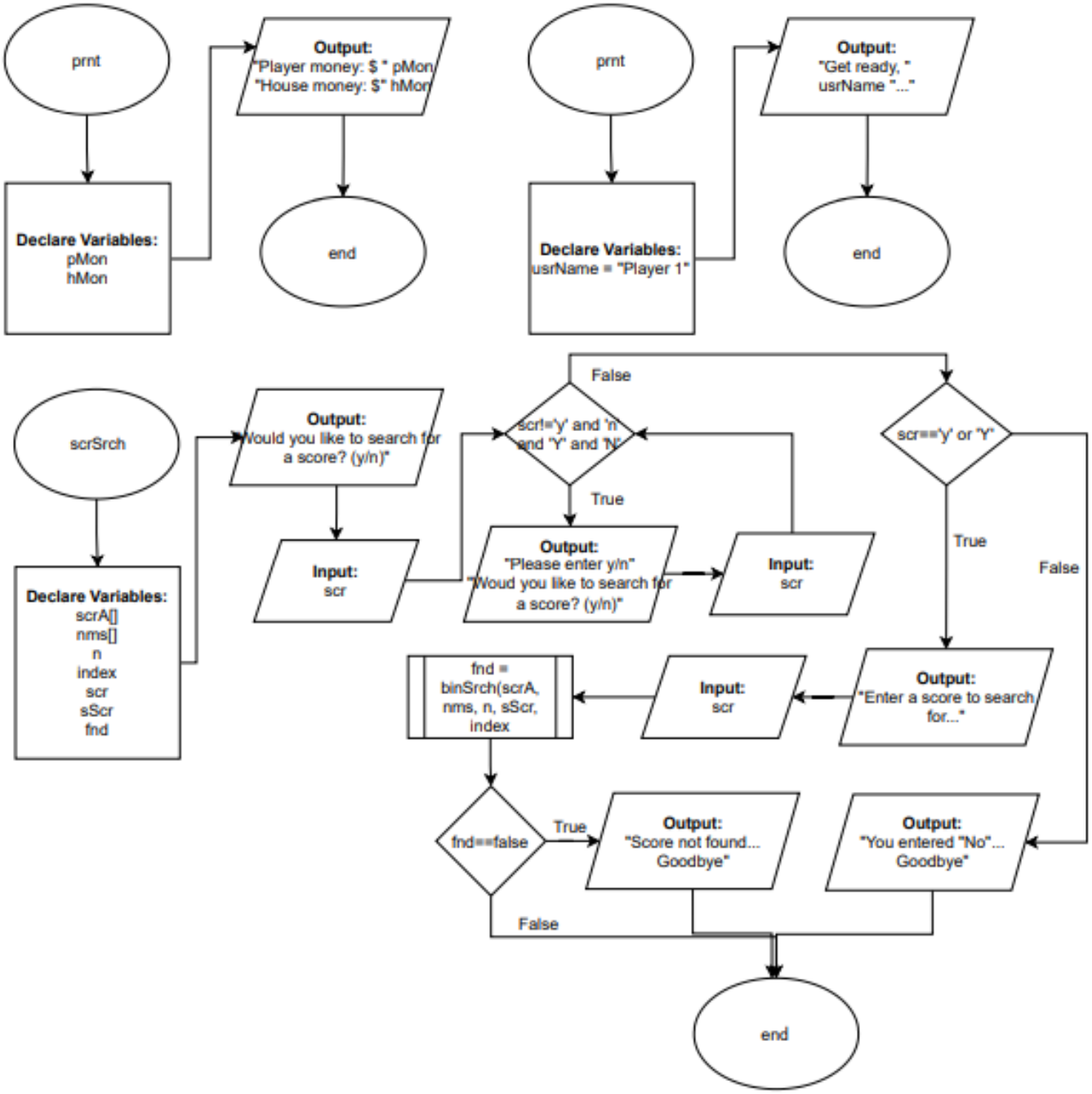
Accept user input

Run binary search function and set equal to Boolean variable

If variable is true, output that the score is not found

If false, end function

If 'n' or 'N' (y or Y is false), output "You entered "No"" and end function


prnt
Output:
"Player money: $ " pMon
"House money: $" hMon
Declare Variables:
pMon
hMon
end
prnt
Output:
"Get ready, "
usrName "..."
Declare Variables:
usrName = "Player 1"
end
scrSrch
Output:
Would you like to search for a score? (y/n)"
Declare Variables:
scrA[]
nms[]
n
index
scr
sScr
fnd
Input:
scr
False
scr!='y' and 'n' and 'Y' and 'N'
True
Output:
"Please enter y/n"
"Woud you like to search for a score? (y/n)"
Input:
scr
scr=='y' or 'Y'
True
False
Output:
"Enter a score to search for..."
Input:
scr
fnd = binSrch(scrA, nms, n, sScr, index
fnd==false
True
Output:
"Score not found... Goodbye"
Output:
"You entered "No"... Goodbye"
False
end

Constructs & Concepts Utilized

iostream Library

Name	Frequency	Description	Location
static_cast	1	Statically cast as a different variable	Line 494
cout	51	Output Data	Throughout
cin	11	Input Data	Throughout
getline()	1	Reads string data	Line 377

iomanip Library

Name	Frequency	Description	Location
setw()	7	Set width of output	Throughout
setprecision()	2	Set number of decimal places/Format floating-point values for output	Lines 574 and 161
fixed	2	Sets floatfield format flag for strings to fixed point notation	Lines 574 and 161

stdlib.h Library

Name	Frequency	Description	Location
rand()	13	Generates random number	Throughout
srand()	1	Initializes random number generator	Line 81

time.h/ctime Library

Name	Frequency	Description	Location
time()	1	Get current time (for random number generation)	Line 81

string Library

Name	Frequency	Description	Location
string	27	Loads string type availability (unnecessary with current version) – declare variable	Throughout
getline()	Previously mentioned	Previously mentioned	Previously mentioned

fstream Library

Name	Frequency	Description	Location
out.open()	2	Opens file for manipulation	Line 120 and 121
out.close()	2	Closes file	Line 343 and 332

cmath Library

Name	Frequency	Description	Location
round()	1	Returns integer value of nearest whole number	Line 495

vector Library

Name	Frequency	Description	Location
vector<>	6	Sequence container type representing arrays that can change in size	Throughout

Data Types:

Data Types	Frequency	Location
unsigned short	21	Throughout
bool	16	Throughout
string	24	Throughout
const int	11	Throughout
float	16	Throughout
char	4	Throughout
time_t	1	Line 111
vector	3	Line 113, 425, 438

Conditional Statements:

Conditional Statement	Frequency	Starting Location
if	1	Line 440
if/else	15	Line 176, 182, 195, 196, 215, 221, 233, 234, 263, 269, 281, 287, 336, 374, 403
if/else if	1	Line 259
switch	2	Line 441, 465
Ternary operator	10	Line 190-192, 211, 228-230, 249, 253, 256

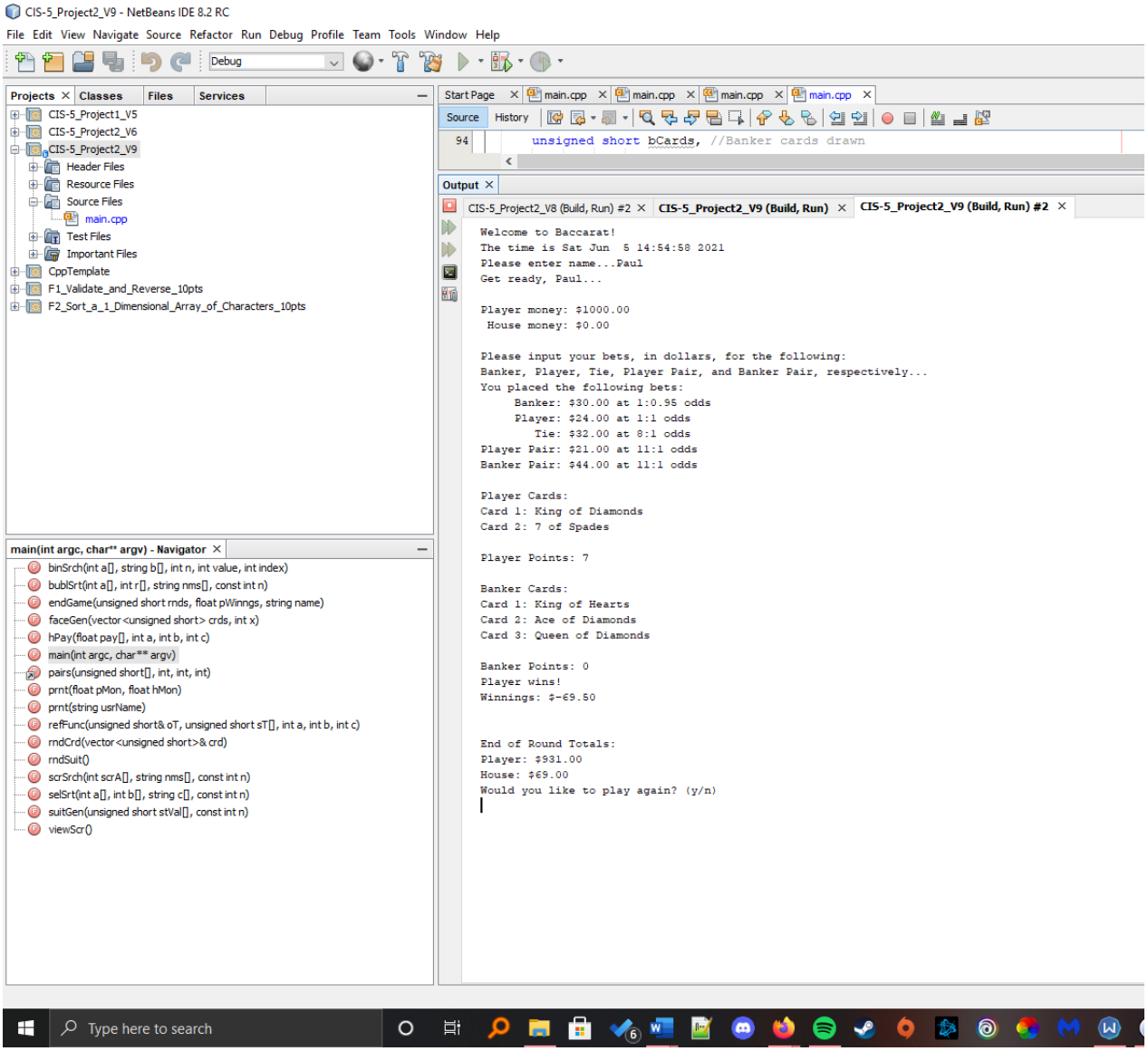
Loops:

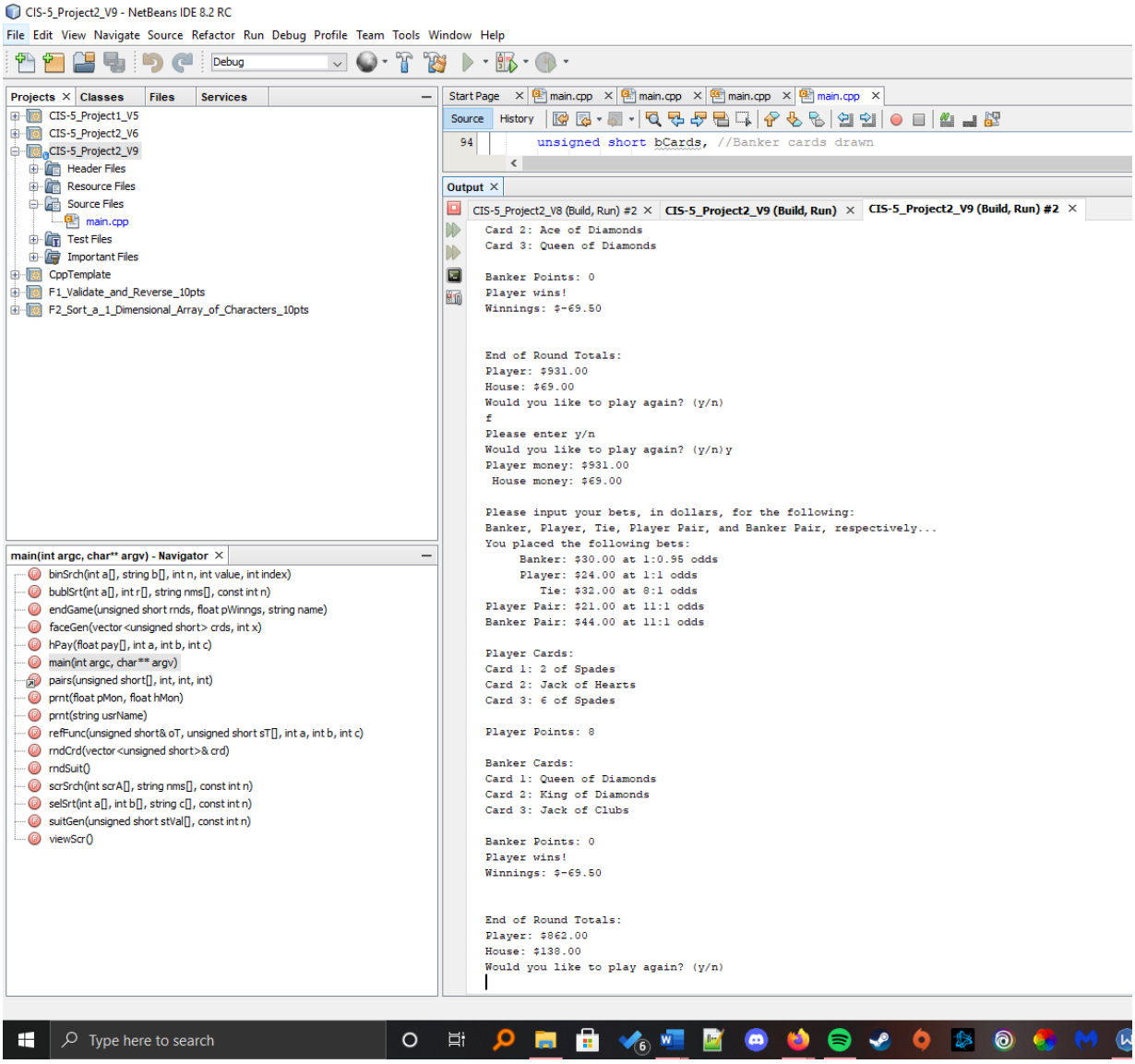
Loops	Frequency	Starting Location
for	14	Line 139, 143, 172, 376, 385, 390, 406, 426, 290, 504, 505, 526, 525, 545

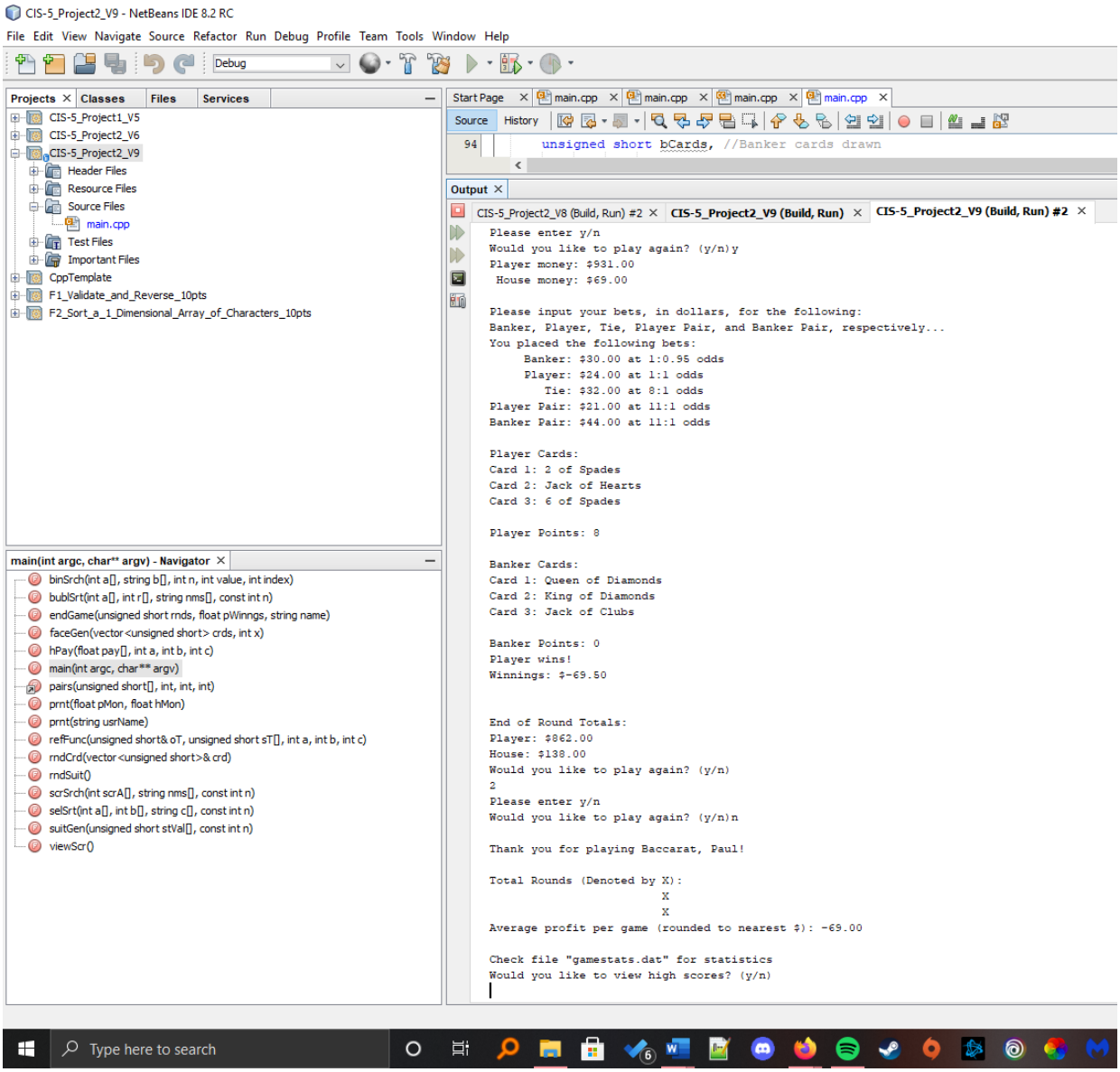
while	4	Line 323, 369, 398, 585
do-while	1	Line 136

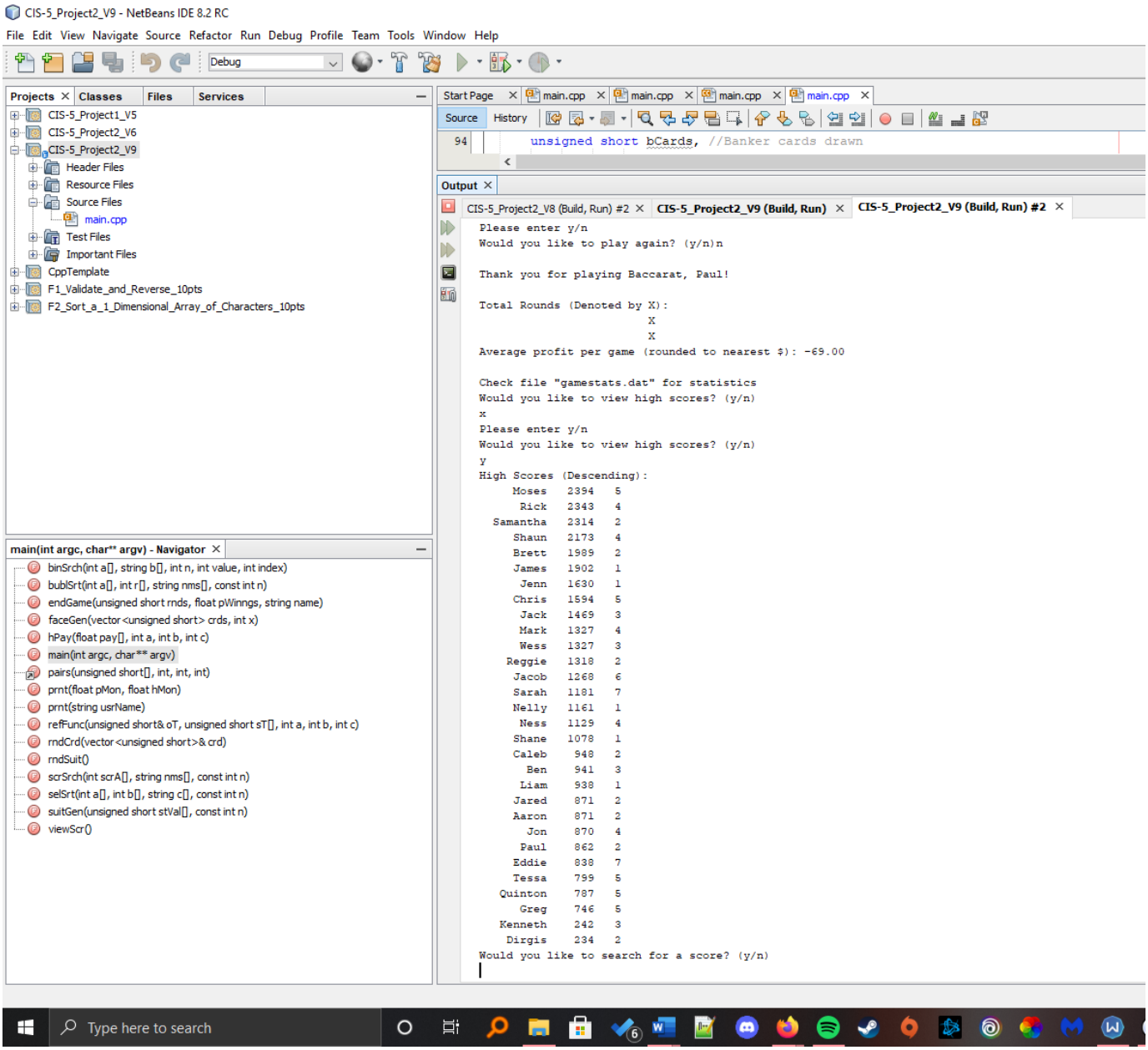
Proof of a Working Product

In the event that my program encounters errors and does not function once turned in to Dr. Lehr, I have provided screenshots as proof that the program did work.




CIS-5_Project2_V9 - NetBeans IDE 8.2 RC
File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
Debug
Projects Classes Files Services
CIS-5_Project1_V5
CIS-5_Project2_V6
CIS-5_Project2_V9
Header Files
Resource Files
Source Files
main.cpp
Test Files
Important Files
CppTemplate
F1_Validate_and_Reverse_10pts
F2_Sort_a_1_Dimensional_Array_of_Characters_10pts
main(int argc, char** argv) - Navigator
binSrch(int a[], string b[], int n, int value, int index)
bublSrt(int a[], int r[], string nms[], const int n)
endGame(unsigned short rnds, float pWinngs, string name)
faceGen(vector <unsigned short> crds, int x)
hPay(float pay[], int a, int b, int c)
main(int argc, char** argv)
pairs(unsigned short[], int, int, int)
prnt(float pMon, float hMon)
prnt(string usrName)
reffunc(unsigned short& oT, unsigned short sT[], int a, int b, int c)
rndCrd(vector <unsigned short>& crd)
rndSuit()
scrSrch(int scrA[], string nms[], const int n)
selSrt(int a[], int b[], string c[], const int n)
suitGen(unsigned short stVal[], const int n)
viewScr()
Start Page main.cpp main.cpp main.cpp main.cpp
Source History
94 unsigned short bCards, //Banker cards drawn
Output
CIS-5_Project2_V8 (Build, Run) #2
CIS-5_Project2_V9 (Build, Run)
CIS-5_Project2_V9 (Build, Run) #2
Card 2: Ace of Diamonds
Card 3: Queen of Diamonds
Banker Points: 0
Player wins!
Winnings: $-69.50
End of Round Totals:
Player: $931.00
House: $69.00
Would you like to play again? (y/n)
f
Please enter y/n
Would you like to play again? (y/n)y
Player money: $931.00
House money: $69.00
Please input your bets, in dollars, for the following:
Banker, Player, Tie, Player Pair, and Banker Pair, respectively...
You placed the following bets:
Banker: $30.00 at 1:0.95 odds
Player: $24.00 at 1:1 odds
Tie: $32.00 at 8:1 odds
Player Pair: $21.00 at 11:1 odds
Banker Pair: $44.00 at 11:1 odds
Player Cards:
Card 1: 2 of Spades
Card 2: Jack of Hearts
Card 3: 6 of Spades
Player Points: 8
Banker Cards:
Card 1: Queen of Diamonds
Card 2: King of Diamonds
Card 3: Jack of Clubs
Banker Points: 0
Player wins!
Winnings: $-69.50
End of Round Totals:
Player: $862.00
House: $138.00
Would you like to play again? (y/n)
Type here to search


CIS-5_Project2_V9 - NetBeans IDE 8.2 RC
File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
Debug
Projects
Classes
Files
Services
CIS-5_Project1_V5
CIS-5_Project2_V6
CIS-5_Project2_V9
Header Files
Resource Files
Source Files
main.cpp
Test Files
Important Files
CppTemplate
F1_Validate_and_Reverse_10pts
F2_Sort_a_1_Dimensional_Array_of_Characters_10pts
main(int argc, char** argv) - Navigator
binSrch(int a[], string b[], int n, int value, int index)
bublSrt(int a[], int r[], string nms[], const int n)
endGame(unsigned short rnds, float pWinngs, string name)
faceGen(vector <unsigned short> crds, int x)
hPay(float pay[], int a, int b, int c)
main(int argc, char** argv)
pairs(unsigned short[], int, int, int)
prnt(float pMon, float hMon)
prnt(string usrName)
refFunc(unsigned short& oT, unsigned short sT[], int a, int b, int c)
rndCrd(vector <unsigned short>& crd)
rndSuit()
scrSrch(int scrA[], string nms[], const int n)
selSrt(int a[], int b[], string c[], const int n)
suitGen(unsigned short stVal[], const int n)
viewScr()
Start Page
main.cpp
main.cpp
main.cpp
main.cpp
Source
History
94 unsigned short bCards, //Banker cards drawn
Output
CIS-5_Project2_V8 (Build, Run) #2
CIS-5_Project2_V9 (Build, Run)
CIS-5_Project2_V9 (Build, Run) #2
Please enter y/n
Would you like to play again? (y/n)y
Player money: $931.00
House money: $69.00
Please input your bets, in dollars, for the following:
Banker, Player, Tie, Player Pair, and Banker Pair, respectively...
You placed the following bets:
Banker: $30.00 at 1:0.95 odds
Player: $24.00 at 1:1 odds
Tie: $32.00 at 8:1 odds
Player Pair: $21.00 at 11:1 odds
Banker Pair: $44.00 at 11:1 odds
Player Cards:
Card 1: 2 of Spades
Card 2: Jack of Hearts
Card 3: 6 of Spades
Player Points: 8
Banker Cards:
Card 1: Queen of Diamonds
Card 2: King of Diamonds
Card 3: Jack of Clubs
Banker Points: 0
Player wins!
Winnings: $-69.50
End of Round Totals:
Player: $862.00
House: $138.00
Would you like to play again? (y/n)
2
Please enter y/n
Would you like to play again? (y/n)n
Thank you for playing Baccarat, Paul!
Total Rounds (Denoted by X):
X
X
Average profit per game (rounded to nearest $): -69.00
Check file "gamestats.dat" for statistics
Would you like to view high scores? (y/n)
Type here to search


CIS-5_Project2_V9 - NetBeans IDE 8.2 RC
File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
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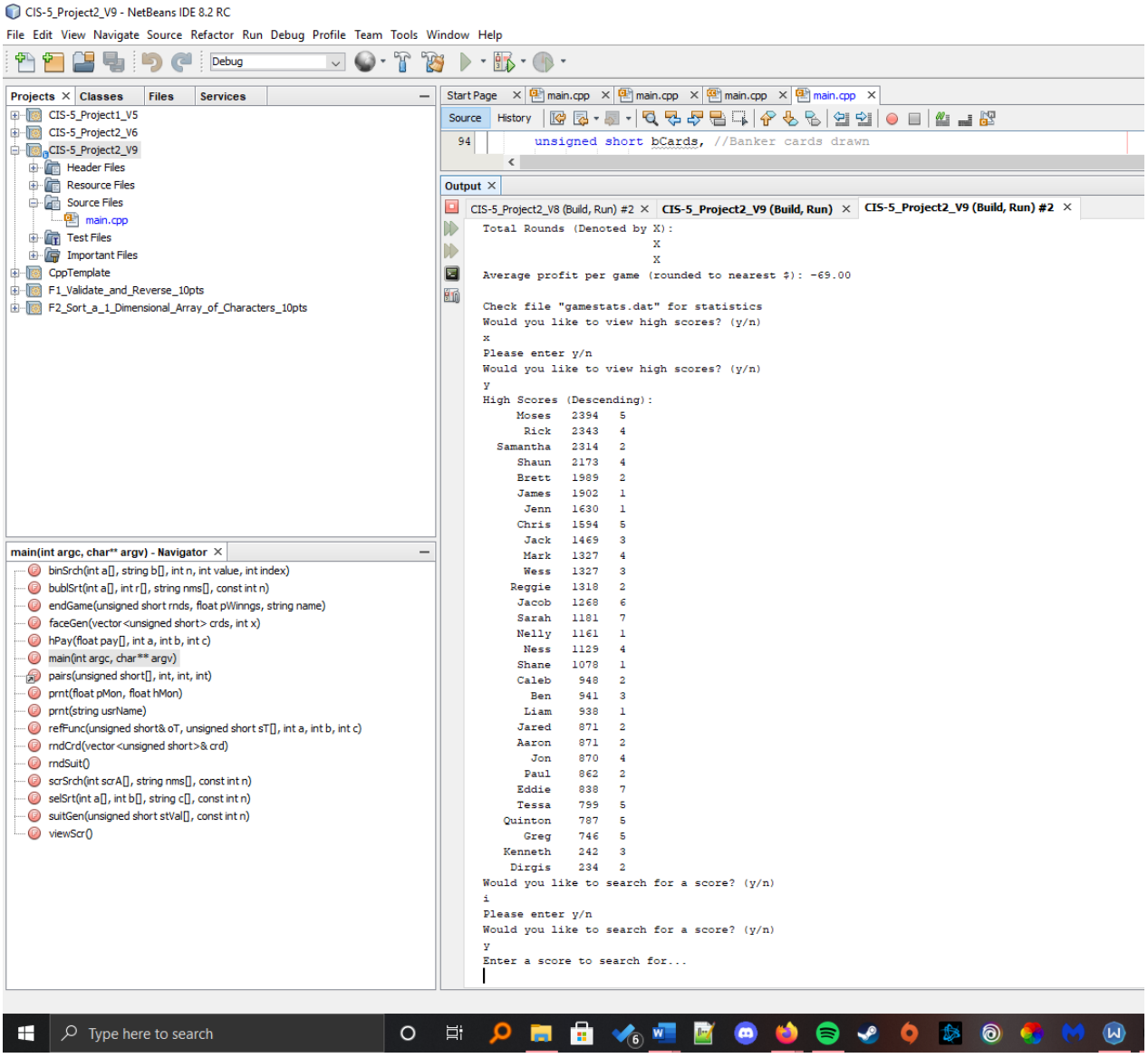
CIS-5_Project2_V9 (Build, Run) #2
Please enter y/n
Would you like to play again? (y/n)n
Thank you for playing Baccarat, Paul!
Total Rounds (Denoted by X):
X
X
Average profit per game (rounded to nearest $): -69.00
Check file "gamestats.dat" for statistics
Would you like to view high scores? (y/n)
x
Please enter y/n
Would you like to view high scores? (y/n)
y
High Scores (Descending):
Moses 2394 5
Rick 2343 4
Samantha 2314 2
Shaun 2173 4
Brett 1989 2
James 1902 1
Jenn 1630 1
Chris 1594 5
Jack 1469 3
Mark 1327 4
Wess 1327 3
Reggie 1318 2
Jacob 1268 6
Sarah 1181 7
Nelly 1161 1
Ness 1129 4
Shane 1078 1
Caleb 948 2
Ben 941 3
Liam 938 1
Jared 871 2
Aaron 871 2
Jon 870 4
Paul 862 2
Eddie 838 7
Tessa 799 5
Quinton 787 5
Greg 746 5
Kenneth 242 3
Dirgis 234 2
Would you like to search for a score? (y/n)
Type here to search


CIS-5_Project2_V9 - NetBeans IDE 8.2 RC
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faceGen(vector<unsigned short> crds, int x)
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main(int argc, char** argv)
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94
unsigned short bCards, //Banker cards drawn
Output
CIS-5_Project2_V8 (Build, Run) #2
CIS-5_Project2_V9 (Build, Run)
CIS-5_Project2_V9 (Build, Run) #2
Total Rounds (Denoted by X):
X
X
Average profit per game (rounded to nearest $): -69.00
Check file "gamestats.dat" for statistics
Would you like to view high scores? (y/n)
x
Please enter y/n
Would you like to view high scores? (y/n)
y
High Scores (Descending):
Moses 2394 5
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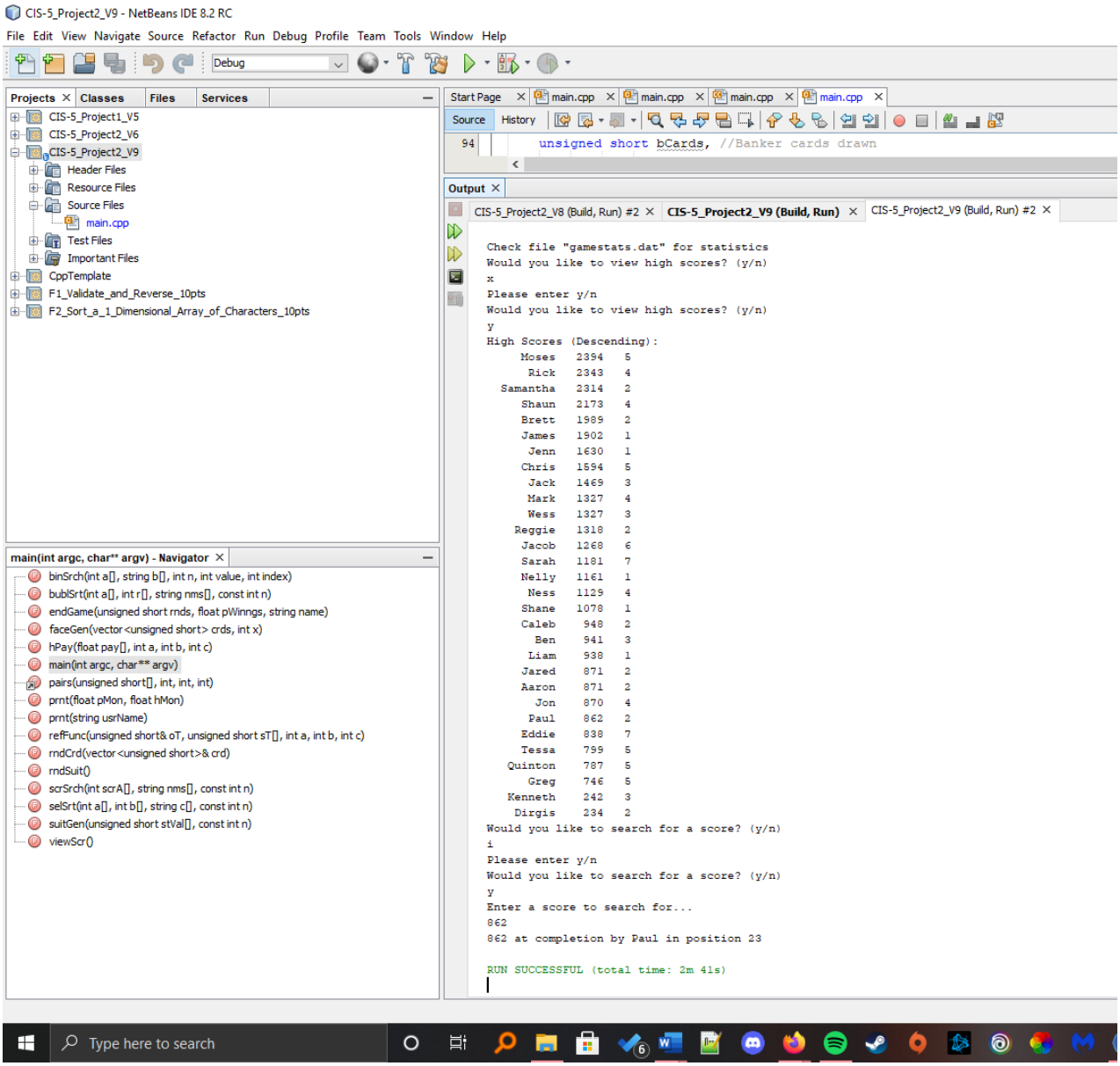
Aaron 871 2
Jon 870 4
Paul 862 2
Eddie 838 7
Tessa 799 5
Quinton 787 5
Greg 746 5
Kenneth 242 3
Dirgis 234 2
Would you like to search for a score? (y/n)
i
Please enter y/n
Would you like to search for a score? (y/n)
y
Enter a score to search for...
Type here to search



References

1. Dr. Lehr's Lectures & Lab
2. Starting Out with C++: From Control Structures through Objects" – Gaddiss, Tony. 8th Edition (Textbook)
3. www.geeksforgeeks.org
4. www.w3schools.com
5. www.programiz.com
   (Websites used for additional information on multidimensional arrays and vector syntax)

Baccarat Game Rules. PlayingCardDecks.com. (n.d.). https://playingcarddecks.com/blogs/how-to-play/baccarat-game-rules.

```
/*
 * File:   main.cpp
 * Author: jakec
 * Project 2, Vesion 9: Baccarat
 * Created on June 4, 2021, 3:05 PM
 */
//System Libraries
#include <iostream>    //Input/Output Library
#include <iomanip>     //Use for formatting and setting $ to 10ths place for cents
#include <stdlib.h>    //srand, rand, exit function
#include <time.h>      //time for random number seed purposes
#include <string>      //Displaying cards drawn, etc.
#include <fstream>     //To read and write statistics files
#include <ctime>       //Print out time
#include <cmath>       //Used for rounding to nearest $
#include <vector>      //STL Dynamic Array
using namespace std;   //Library Name-space

//User Libraries

//Global/Universal Constants -- No Global Variables
//Science, Math, Conversions, Higher Dimensioned constants only

//Function Prototypes
unsigned short rndCrd(vector<unsigned short> &); //Function to randomize card #
unsigned short rndSuit(); //Function to randomize suit - # corresponds to suit
```

```
string suitGen(unsigned short [], const int); //Generates suits from corresponding numbers

string faceGen(vector<unsigned short>, int); //Generates face cards as strings from corresponding numbers

bool pairs(unsigned short [],int,int,int); //Determines whether pairs are present and returns true or false

void endGame(unsigned short, float, string); //Outputs average winnings and goodbyes

void bublSrt(int [],int [],string [], const int); //Bubble Sort - repeatedly swaps adjacent elements if misordered

void selSrt(int [],int [],string [],const int); //Selection Sort in ascending order by finding min

bool binSrch(int [], string [], const int, int, int); //Binary search which displays index if found

void viewScr(); //View high scores

float hPay(float [],int,int,int); //Used to calculate new player and house totals

void refFunc(unsigned short &,unsigned short [],int,int,int); //Uses pass by reference to calc bank total points

void prnt(float,float); //Function overloading! Prints player and house money

void prnt(string); //Function overloading! User greeting outputting user input or default

void scrSrch(int [],string [],const int);


//Execution Begins Here
int main(int argc, char** argv) {
   //Set the Random number seed
   srand(time(NULL));
   //Declare variables
   const int crdSIZE = 6;
   const int paySIZE = 3;
   float house, //House Money (Cumulative)
         player, //Player money (Cumulative)
         betBank, //Bet on banker - 1:0.95
         betPlay, //Bet on player - 1:1
         betTie, //Bet on tie between banker + player; 8:1 payout
         pPair, //Bet on pair drawn for player; 11:1 payout
         bPair, //Bet on pair drawn for banker; 11:1 payout
```

```
      payOut[paySIZE], payTot,
      avgWin; //average winnings per round
unsigned short bCards, //Banker cards drawn
               pCards, //Player cards drawn
               rounds, //rounds played (incremented)
               //cards[crdSIZE], //number on cards
               suitVal[crdSIZE], //array of randomly generated numbers corresponding to suits
               pTot, //Player total
               bTot, //Banker total
               subTot[crdSIZE]; //Used for calculating zero values for face cards
bool pBool,  //Player boolean to check if pair
     bBool; //Bank boolean for pair
string pName, //Player name
       suits[crdSIZE], //array of suits corresponding to drawn cards
       view[crdSIZE], //Face Card display stored in array
       statsLn; //Stats line from file
char repeat; //y or n entered by user to indicate repeat
fstream out, //For writing stats in file - output
        inBets; //File for taking in bets
time_t curTime; //Current time
int crdSZ = 6; //Size of array
vector<unsigned short> cards(crdSZ); //Array -number on cards

//Initialize variables
/*GAME PLAYED WITH 6-8 DECKS OF CARDS SO NO NEED TO MANIPULATE
  PROBABILITIES BASED UPON PAST DRAWS*/
rounds = 0;

inBets.open("inputBets.dat", ios::in); //File to take prewritten bets from
out.open("gamestats.dat", ios::app); //Appended file displaying names and scores
```

```
house = 0; //Initial house money
player = 1000; //Initial player money
curTime = time(NULL);

cout << "Welcome to Baccarat!" << endl
     << "The time is " << ctime(&curTime)
     << "Please enter name...";
cin >> pName;
prnt(pName);

//Size of commented out because pointless to include
//cout << "Size of float is " << sizeof(float) << endl;

do {
   rndCrd(cards); //Function to generate random values for cards

   for (int i=0; i<crdSIZE; i++) {
      suitVal[i] = rndSuit(); //Random number generation from 1-4
   } //Preparation to be translated into suit

   for (int i=0; i<crdSIZE; i++) {
      suits[i] = suitGen(suitVal, i); //
   }

   //Process, map inputs to outputs
   //PLACE BETS
   prnt(player, house); //Prints out player and house money
   cout << "Please input your bets, in dollars, for the following: " << endl;
   cout << "Banker, Player, Tie, Player Pair, and Banker Pair, respectively..." << endl;
```

```
/*
Commented out if using file as input...
cin >> betBank >> betPlay >> betTie >> pPair >> bPair;
*/

//Takes bets from file "inputBets.dat"
inBets >> betBank >> betPlay >> betTie >> pPair >> bPair;

cout << "You placed the following bets:" << endl
     << "     Banker: $" << fixed << setprecision(2) << betBank << " at 1:0.95 odds" << endl
     << "     Player: $" << betPlay << " at 1:1 odds" << endl
     << "        Tie: $" << betTie << " at 8:1 odds" << endl
     << "Player Pair: $" << pPair << " at 11:1 odds" << endl
     << "Banker Pair: $" << bPair << " at 11:1 odds" << endl << endl;


//Display your initial conditions as well as outputs.
//DRAW CARDS FOR PLAYER
//DRAW TWO CARDS FOR BANK AND PLAYER: 10's and face cards counted as 0
//FOR TWO DIGIT NUMBERS, DROP OFF FIRST NUMBER
for (int i=0; i<crdSIZE; i++) {
   view[i] = faceGen(cards, i); //function to generate string for corresponding face cards
}
//Output values of cards and suits based on Card #
if (cards[0] < 11) {
   cout << "Player Cards:\n" << "Card 1: " << cards[0] << " of " << suits[0] << endl;
}
else {
   cout << "Player Cards:\n" << "Card 1: " << view[0] << " of " << suits[0] << endl;
}
```

```
if (cards[1] < 11) {
   cout << "Card 2: " << cards[1] << " of " << suits[1] << endl;
}
else {
   cout << "Card 2: " << view[1] << " of " << suits[1] << endl;
}

//Point value calculation using ternary operators in function
cards[0] >= 10 ? subTot[0] = 0: subTot[0] = cards[0];//Calculates subtotal for card 1
cards[1] >= 10 ? subTot[1] = 0: subTot[1] = cards[1];//Calculates subtotal for card 2
cards[4] >= 10 ? subTot[4] = 0: subTot[4] = cards[4];//Calculates subtotal for card 5

//Determine whether to draw 3rd card
if (subTot[0] + subTot[1] <= 5 || subTot[0] + subTot[1] > 9) {
   if (cards[4] < 11) {
      cout << "Card 3: " << cards[4] << " of " << suits[4] << endl << endl;
   }
   else {
      cout << "Card 3: " << view[4] << " of " << suits[4] << endl << endl;
   }
}
else {
   subTot[4] = 0;
   cout << endl;
}

//Calculate player points
refFunc(pTot, subTot, 0, 1, 4); //Uses pass by reference to perform player total calc
//pTot = subTot[0] + subTot[1] + subTot[4];
(pTot > 9) ? (pTot = pTot - 10) : (pTot = pTot); //Check if pts > 9 and truncate
```

```
cout << "Player Points: " << pTot << endl << endl;



if (cards[2] < 11) {
   cout << "Banker Cards:\n" << "Card 1: " << cards[2] << " of " << suits[2] << endl;
}
else {
   cout << "Banker Cards:\n" << "Card 1: " << view[2] << " of " << suits[2] << endl;
}
if (cards[3] < 11) {
   cout << "Card 2: " << cards[3] << " of " << suits[3] << endl;
}
else {
   cout << "Card 2: " << view[3] << " of " << suits[3] << endl;
}
//Point value calculation using ternary operators
cards[2] >= 10 ? subTot[2] = 0: subTot[2] = cards[2];//Calculates subtotal for card 3
cards[3] >= 10 ? subTot[3] = 0: subTot[3] = cards[3];//Calculates subtotal for card 4
cards[5] >= 10 ? subTot[5] = 0: subTot[5] = cards[5];//Calculates subtotal for card 6

//Determine whether to draw 3rd card
if (subTot[2] + subTot[3] <= 5 || subTot[2] + subTot[3] > 9) {
   if (cards[5] < 11) {
      cout << "Card 3: " << cards[5] << " of " << suits[5] << endl << endl;
   }
   else {
      cout << "Card 3: " << view[5] << " of " << suits[5] << endl << endl;
   }
}
else {
```

```
    subTot[4] = 0;
    cout << endl;
}

//Calculate banker points
refFunc(bTot, subTot, 2, 3, 5); //Uses pass by reference to perform bank total calc
//bTot = subTot[2] + subTot[3] + subTot[5];
(bTot > 9) ? (bTot = bTot - 10) : (bTot = bTot); //Check if pts > 9 and truncate
cout << "Banker Points: " << bTot << endl;
//Check if pairs:
//Player:
(cards[0] == cards[1] || cards[0] == cards[4] || cards[1] == cards[4]) ? pBool = true : pBool = false;

//Banker:
(cards[2] == cards[3] || cards[2] == cards[5] || cards[3] == cards[5]) ? bBool = true : bBool = false;

//Winning Calculations
if (pTot > bTot) {
    payOut[0] = betPlay; //Pay for player win
    payOut[1] = betBank * -0.95; //Loss for player win
    payOut[2] = betTie * 0;
    if (pBool == true) {
        payOut[0] += pPair * 11;
    }
    else {
        payOut[0] -= pPair;
    }
    if (bBool == true) {
        payOut[0] += bPair * 11;
    }
```

```
            else {
                payOut[0] -= bPair;
            }
            cout << "Player wins!" << endl << "Winnings: $" << payOut[0] + payOut[1] + payOut[2] << endl
<< endl;
            }
        else if (bTot > pTot) {
            payOut[0] = betPlay * -1;
            payOut[1] = betBank * 0.95;
            payOut[2] = betTie * 0;
            if (pBool == true) {
                payOut[1] += pPair * 11;
            }
            else {
                payOut[1] -= pPair;
            }
            if (bBool == true) {
                payOut[1] += bPair * 11;
            }
            else {
                payOut[1] -= bPair;
            }
            cout << "Banker wins!" << endl << "Winnings: $" << payOut[0] + payOut[1] + payOut[2]  <<
endl;
        }
        else if (bTot == pTot) {
            payOut[0] = betPlay * -1;
            payOut[1] = betBank * -0.95;
            payOut[2] = betTie * 8;
            if (pBool == true) {
                payOut[2] += pPair * 11;
```

```
        }
        else {
            payOut[2] -= pPair;
        }
        if (bBool == true) {
            payOut[2] += bPair * 11;
        }
        else {
            payOut[2] -= bPair;
        }
        cout << "It's a tie!" << endl << "Winnings: $" << payOut[0] + payOut[1] + payOut[2]  << endl;
    }

    //End of round cumulative monetary totals
    house -= hPay(payOut, 0, 1, 2); //Function using pass by value
    player += hPay(payOut, 0, 1, 2);

    cout << endl << "End of Round Totals:" << endl << "Player: $" << player << endl
         << "House: $" << house << endl;

    cout << "Would you like to play again? (y/n)" << endl;
    cin >> repeat;
    while (repeat != 'y' && repeat != 'n' && repeat != 'Y' && repeat != 'N') {
        cout << "Please enter y/n\n"
             << "Would you like to play again? (y/n)";
        cin >> repeat;
    }
    rounds++;
} while (repeat == 'y' || repeat == 'Y'); //Checks condition after running through code
//Only accepts capital or lowercase y to play again
```

```
    inBets.close(); //Close input file

    endGame(rounds, player, pName); //Function for endgame calculations and goodbyes

    if (out.is_open()) {
        out << pName << " " << player << " " << rounds << endl; //Write name and end winnings into file "gamestats.dat"
    }
    else {
        cout << "Unable to open output file...";
    }

    out.close(); //Close output file "gamestats.dat"

    viewScr(); //Display high scores, sort by score, binary search for value

    //Exit stage right
    return 0;
}

void viewScr() {
    char view,//Yes/no - view high scores
         asc, //Yes/no to view in ascending order using bubble sort
         scr; //Yes/no for binary score search
    int sScr, //Score to search for
        index; //Value to return for binary search
    fstream hScrs; //File to be manipulated
    int SIZE = 30; //Array size - alterable depending on number of scores to hold
    int SIZE2 = 2; //2d array 2nd dimension size
```

```
string names[SIZE]; //Names stored in array for sorting
int scores[SIZE]; //Scores stored in array for sorting
int rounds[SIZE]; //Rounds stored in array for sorting
int scrRnd[SIZE][SIZE2]; //2d array
bool fnd; //True or false if score found

   cout << "Would you like to view high scores? (y/n)\n";
   //display scores based on user input or repeat prompt
   cin >> view;
   while (view!= 'y' && view!='n' && view!='Y' && view!='N') {
      cout << "Please enter y/n\n"
           << "Would you like to view high scores? (y/n)\n";
      cin >> view;
   }
   if (view=='y'|| view=='Y') {
      hScrs.open("gamestats.dat", ios::in); //reopen to read in
      for (int i=0; i<SIZE; i++) {
         getline(hScrs, names[i]);
         hScrs >> names[i];
         hScrs >> scores[i];
         hScrs >> rounds[i];
      }

      selSrt(scores, rounds, names, SIZE); //Sorts from high to low - converted to sort trio as linked

      for (int i=0; i<SIZE; i++) { //2d array initialization for accessibility and convenience
         scrRnd[i][0] = scores[i];
         scrRnd[i][1] = rounds[i];
      }
      cout << "High Scores (Descending):" << endl;
```

```
        for (int j=0; j<SIZE; j++) { //Displays names, scores, and rounds, respectively
            cout << setw(10) << names[j] << " " << setw(6) << scrRnd[j][0] << " " << setw(3) << scrRnd[j][1] << endl; //Output using 2d array
            //cout << setw(15) << names[j] << " " << scores[j] << " " << rounds[j] << endl;     Original output using single dimensional array
        }
        scrSrch(scores, names, SIZE);

            cout << "Would you like to view scores by username in alphabetical order? (y/n)" << endl;
            cin >> asc;
            while (asc!= 'y' && asc!='n' && asc!='Y' && asc!='N') {
                cout << "Please enter y/n\n"
                    << "Would you like to view scores by username in alphabetical order? (y/n)" << endl;
                cin >> asc;
            }
            if (asc=='y' || asc=='Y') {
                bublSrt(scores, rounds, names, SIZE); //Bubble sort
                cout << "High Scores (Alphabetical):" << endl;
                for (int k=0; k<SIZE; k++) {
                    cout << setw(10) << names[k] << " " << setw(6) << scores[k] << " " << setw(3) << rounds[k] << endl; //Single dimensional array output post-bubble sort
                }
                scrSrch(scores, names, SIZE);
            }
            else {
                cout << "You selected \"No\"...\n" << endl;
                scrSrch(scores, names, SIZE);
                cout << "from bottom of chart...\n"
                    << "Goodbye" << endl;
            }
    }
```

```
        else {
            cout << "You selected \"No\"..." << endl
                 << "Goodbye" << endl;
            exit(0);
        }
}

unsigned short rndCrd(vector<unsigned short> &crd) {
    for (int i=0; i<crd.size(); i++) {
        crd[i] = rand()%(14+1-2)+2; //Randomization function for cards
    } //Outputs card value and inputs into array through iteration
}


unsigned short rndSuit() {
    unsigned short num;
        num = rand() % 4 + 1;
    return num;
}

string faceGen(vector<unsigned short> crds, int x) {
    string face;
        if (crds[x] >= 11) { //Independent if to display face cards
            switch (crds[x]) { //Conversion from denoted number
                case 11:
                    face = "Jack";
                    break;

                case 12:
                    face = "Queen";
```

```
            break;

        case 13:
            face = "King";
            break;

        case 14:
            face = "Ace";
            break;

      }
    }
  return face;
}

string suitGen(unsigned short stVal[], const int n) {
  string suit;
    switch (stVal[n]) {
      case 1:
        suit = "Hearts";
        break;

      case 2:
        suit = "Clubs";
        break;

      case 3:
        suit = "Diamonds";
        break;
```

```
            case 4:
                suit = "Spades";
                break;
        }
    return suit;
}

void endGame(unsigned short rnds, float pWinngs, string name) {
    float avgWin;
    cout << endl << "Thank you for playing Baccarat, " << name << "!" << endl
         << endl << "Total Rounds (Denoted by X):" << endl;

    for (int i=0; i<rnds; i++) { //Visual representation of rounds played
        cout << "                    X" << endl;
    }

    avgWin = (pWinngs-1000)/static_cast<float>(rnds); //Conversion to float using type casting
    cout << "Average profit per game (rounded to nearest $): " << round(avgWin) << endl
         << endl << "Check file \"gamestats.dat\" for statistics" << endl;

}

void bublSrt(int a[], int r[], string nms[], const int n) {
    int temp; //For swapping
    int temp2;
    string temp3;
    for (int i=0; i<n-1; i++) {
        for (int j=0; j<n-i-1; j++) {
            if (nms[j]>nms[j+1]) {
                temp = a[j];
```

```
            temp2 = r[j];
            temp3 = nms[j];
            a[j] = a[j+1];
            r[j] = r[j+1];
            nms[j] = nms[j+1];
            a[j+1] = temp;
            r[j+1] = temp2;
            nms[j+1] = temp3;
        }
    }
  }
}

void selSrt(int a[], int b[], string c[], const int n) { //Conversion for dual
   int temp; //For swapping int 1 in process of sorting
   int temp2; //For swapping int 2
   string temp3; //For names swapping string input (corresponding names)
   for (int i=0; i<n-1; i++) {
      for (int j = i+1; j<n; j++) {
         if (a[j] > a[i]) { //Sort from high to low for high scores
         //Swapping
         temp = a[i];
         temp2 = b[i];
         temp3 = c[i];
         a[i] = a[j];
         b[i] = b[j];
         c[i] = c[j];
         a[j] = temp;
         b[j] = temp2;
         c[j] = temp3;
```

```
            }
        }
    }
}

bool binSrch(int a[], string b[], int n, int value, int index) {
    bool found = false;
    for (int i=0; i<n; i++) {
        if (a[i]==value) {
            found = true;
            index=i;
            cout << value << " at completion by " << b[i] << " in position " << index << endl;
            exit(0); //Exit if found = true
        }
        else {
            found = false;
        }
    }
    return found;
}

float hPay(float pay[], int a, int b, int c) { //Function utilizing pass by value to calculate winnings
    int hCalc;
    hCalc = pay[a] + pay[b] + pay[c];
    return hCalc;
}

void refFunc(unsigned short& oT, unsigned short sT[], int a, int b, int c) {
    oT = sT[a] + sT[b] + sT[c]; //Overall total calc from subtotal input
} //Function utilizing pass by reference to make changes
```

```
void prnt(string usrName = "Player 1") { //Function overloading - output with string input
   cout << "Get ready, " << usrName << "...\n\n"; //Set with default argument
}

void prnt(float pMon, float hMon) { //Function overloading - output with unsigned short input
   cout << "Player money: $" << fixed << setprecision(2) << pMon << endl
        << " House money: $" << hMon << endl << endl;
}

void scrSrch(int scrA [], string nms[], const int n) {
   int index;
   char scr; //Variable to hold yes/no
   int sScr; //User entry for score search
   bool fnd; //True or false if score found
   cout << "Would you like to search for a score? (y/n)\n";
   cin >> scr; //Enter y or Y to run binary search function
   while (scr!= 'y' && scr!='n' && scr!='Y' && scr!='N') {
      cout << "Please enter y/n\n"
           << "Would you like to search for a score? (y/n)\n";
   cin >> scr;
   }
   if (scr=='y' || scr=='Y') {
      cout << "Enter a score to search for...\n";
      cin >> sScr;

      fnd = binSrch(scrA, nms, n, sScr, index); //runs function to find presence and index of score entered
      if (fnd==false) {
         cout << "Score not found...\nGoodbye" << endl;
      }
```

```
    }
    else {
        cout << "You entered \"No\"...\n"
             << "Goodbye\n";
;    }
}
```