Project 1

Title:
Blackjack

Course:
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Rules

The objective of the card game "Blackjack" or "21" is to get the highest total value without going over twenty one. In this version of 21, there is one human player and one computer player that acts as the dealer. Therefore, the objective in this case is to beat the dealer. If the human player has a value over twenty one, it is called a "bust" and it is an automatic loss. This is true even if the dealer also "busts." In the case that the player and dealer have the same value of cards, it counts as a draw and is called a "push." In this version, the player's original bet is returned.

To determine the value of a player's hand, each card is given a specific value and the summation of all cards is the player's hand. The numbered cards are worth their face value. The Jack, King, and Queen are worth ten points each. The Ace has a variety of values in this version of 21. The ace counted as either eleven or one. The Joker card is not used in this game.

The game 21 is started with the dealer dealing the player two cards, and then dealing him/herself two cards also. The player is able to see what cards he/she has but the dealer only reveals one of his/her cards. In this version of 21, the player then has a choice to "hit," "stay," "surrender," "double down," "split pairs," or buy "insurance." If the player chooses to surrender, the player forfeits his/her cards and is given half of the original bet back. If the player chooses to double down, the player has an additional bet up to the value of the original bet and receive one and only one additional card. If the player chooses to split pairs, the pair of cards are split into two separate hands and the player has to have another bet of equal size for the new hand. If the Dealer shows an Ace, the player can buy insurance up to half the original amount of the bet. If the dealer has Blackjack, the player gets double the insurance bet but losses the original bet. If

the player chooses to hit, the dealer deals the player an additional card and the value of this card is added to the player's total value of his/her hand. The player can continue to hit as long as his/her total value does not go over 21. When the player does not wish to hit, the player can stay and keep his/her current hand. After the player's turn has ended, as long as the player did not bust, the dealer reveals his/her cards. The dealer is required to hit until the dealer's total value of cards remains under seventeen. Sometimes the dealer hits at seventeen and this is called a "soft 17." In this version of 21, this is not the case.

Some additional rules are that if player has an Ace and a ten value card (Blackjack), the player's payout is 1:1. If the player or the dealer has Blackjack, they win, unless they both have Blackjack and in this case it is a push. The player can only split his/her pair once and there is no double down after a split.

Stats

Using Basic Strategy:

Overall Player Win Percentage = 48%

Overall Dealer Win Percentage = 52%

Player Blackjack Probability = 1 out of 21 hands

Player Bust Percentage = 16%

Dealer Bust Percentage = 28%

Summary

This project is based on the card game "21" or "Blackjack." This version of the game is for one human player and one computer player that is also the dealer. The is a betting system and the player starts with $50 and the minimum bet is $5. There is only one player not counting the dealer, ties are counted as a push and the player gets his/her money back, and Aces are valued as high or low.

In the game 21, the statistics are in the dealer's favor because not only does the human player go first, but statistically, the player only has a forty-eight percent chance of winning. The player also only has a one in twenty-one chance to get "blackjack," and the player has a sixteen percent chance to bust and automatically lose the game.

This version of the game was designed to be user friendly by setting default decisions and validating the user's input. This game also outputs what steps are happening and it always tells the user the most recent card or cards that are dealt and calculates the total value of the user's hand. Once the user is done playing, he/she can open the results file and see the total wins, losses, and win percentage. The player's score, or money, is also shown on the leaderboard if he/she has one of the top ten scores.

Overall, this project uses a large majority of the concepts learned so far and satisfies all of the requirements. Some future improvements for this project include but are not limited to having more than one player, split pairs as many times as possible, and provide even more additional blackjack rules and options.

Sample Inputs and Outputs

Player's Initials:

Input – "AB" or "ABCD"

Output – "You can only enter three characters"

Player's Cards:

Output – "Card 1 = Ace", "Card 2 = 3", "The total value of your cards is 14"

Dealer's Cards:

Output – "Card 1 = Jack", "Card 2 = ?"

Hit or Stay Option:

Input – "H" for hit

Output – "You Draw an additional card", "Card = 2", "The total value of your cards is 16"

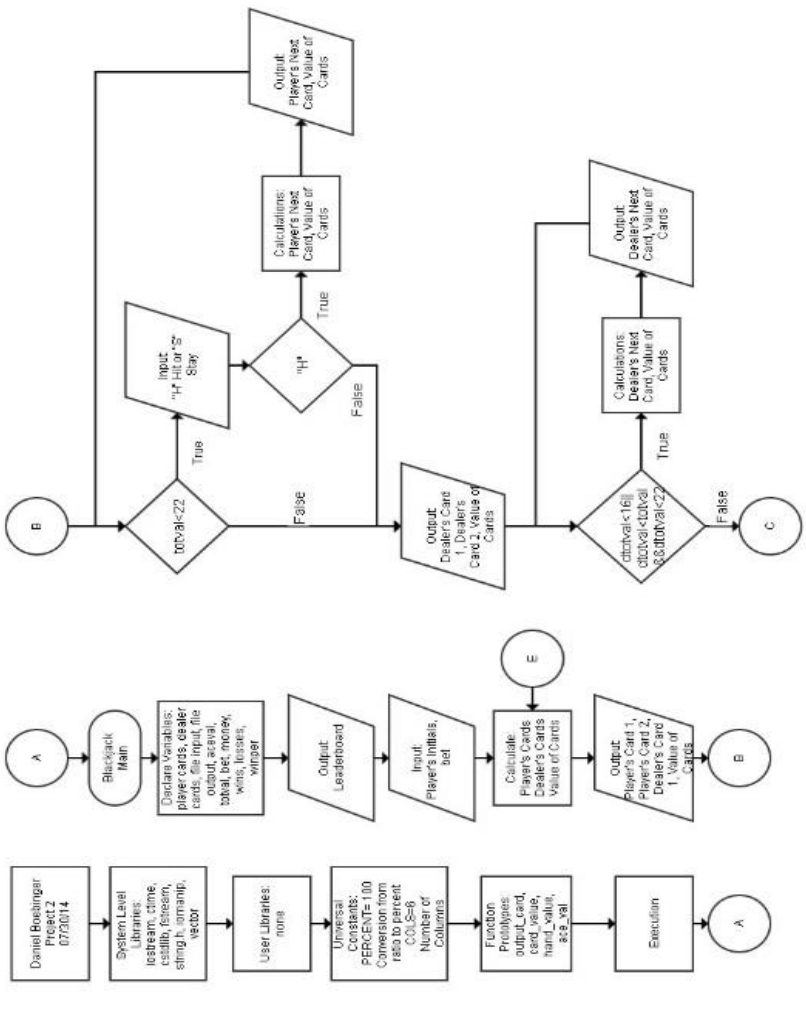
Determining Winner:

Output – "You Bust", "Dealer Busts", "Dealer Wins", or "You Win"

Results.txt:

Output – "Wins = 7 Losses = 9 Win Percentage = 43.75%"

Flowchart


Project2
Daniel Boebinger
Project 2
07/30/14
System Level Libraries: iostream, ctime, cstdlib, fstream, string.h, iomanip, vector
User Libraries: none
Universal Constants: PERCENT=100 Conversion from ratio to percent COLS=6 Number of Columns
Function Prototypes: output_card, card_value, hard_value, ace_val
Execution
A
Blackjack Main
Declare Variables: player cards, dealer cards, file input, file output, aceval, totval, bet, money, wins, losses, wimper
Output: Leaderboard
Input: Player's Initials, bet
E
Calculate: Player's Cards Dealer's Cards Value of Cards
Output: Player's Card 1, Player's Card 2, Dealer's Card 1, Value of Cards
B
totval<22
True
Input: "H" Hit or "S" Stay
"H"
True
Calculations: Player's Next Card, Value of Cards
Output: Player's Next Card, Value of Cards
False
Output: Dealer's Card 1, Dealer's Card 2, Value of Cards
dtotval<16|| dtotval<totval &&dtotval<22
True
Calculations: Dealer's Next Card, Value of Cards
Output: Dealer's Next Card, Value of Cards
False
C
totval>21
True
Output: Player Busts
Calculations: losses++ money-=bet
False
dtotval>21
True
Output: Dealer Busts
Calculations: wins++ money+=bet
False
dtotval>totval
True
Output: Dealer Wins
Calculations: losses++ money-=bet
False
Output: Player Wins
Calculations: wins++ money+=bet
D
Input: "y" yes play again or "N" no
"y"
True
E
False
Calculations: winpercent= (wins+losses)* PERCENT
Output: approx, actual, error, updated leaderboard
End Main Program

Pseudocode

Execution Starts Here!
Declare and Initialize Variables
Inputs and Constants
Input from file
Number
Leader Board with initials and scores from file
Size set to 4 for the 3 initials and null terminator
Initials of User
Outputs
User's Money (Buy-in at $50)
Player's Cards
Player's Second hand if splitting cards
Dealer's Cards
Size of vector for player's cards
Size of vector for player's second hand
Size of vector for dealer's cards
User's Bet in dollars
An additional Bet if needed
Insurance Bet if needed
Player's Total value of all cards
Player's Total value of all cards for second hand
Dealer's total value of all cards
Player's Decision
Number of wins
Number of losses
Winning percentage
Output to file

Set the Random Seed

Input Values
Open the Leader Board file
Test File For Open Failures
Input Leader Board

Output Game Title
Output Current Leader Board

Input Player's Initials

Output Pre-Game Instructions

Set loop=true
Do: Game Loop
Output Start of New Game Information
Input Player's Bet

Initialize Hands and Values

Determine Values for Card 1 and 2 for Player

Calculate Size of Vector for Player's Cards

Output Player's Cards

Determine Value of Player's Cards

Determine Values for Card 1 and 2 for Dealer

Calculate Size of Vector for Dealer's Cards Minus One

Output Dealer's Card 1
Output Dealer's Card 2 as Unknown

Calculate Actual Size of Vector for Dealer's Cards

Calculate total value of Player's cards

Determine Best Ace Value for Player's Cards

Ask Player for First Decision

Evaluate Player's Decision and Change Bet Value If Needed

Player Hit Loop For First Hand
While Total Value of Player's Card is Less than 22 and Player Chooses Hit

Determine Value of Card for Player

Calculate Size of Vector for Player's Cards

Output Player's Cards

Determine Value of Player's Cards

```
    Calculate total value of Player's cards

    Determine Best Ace Value for Player's Cards

    Output Value of Player's Cards

    If Total Value of Player's Cards is less than 22

Player Hit Loop For Second Hand if Needed
While Total Value of Player's Card is Less than 22 and Player Chooses Hit

    Determine Value of Card for Player

    Calculate Size of Vector for Player's Cards

    Output Player's Cards

    Determine Value of Player's Cards

    Calculate total value of Player's cards

    Determine Best Ace Value for Player's Cards

    Output Value of Player's Cards

    If Total Value of Player's Cards is less than 22
    Else
        Exit Hit Loop

Calculate Total Value of Dealer's Cards
If Both Cards are Valued as 10
    Total Value of Dealer's Cards is 20
Else if Both Cards are valued as 11
    Total Value of Dealer's Cards is 12
Else if One Card is Ace and The Other is Valued as 10 and Ace Value is High or Either
    Total Value of Dealer's Cards is 21
Else if Card 1 is Valued at 10
    Total Value of Dealer's Cards is 10 plus Card Number
Else if Card 2 is Valued at 10
    Total Value of Dealer's Cards is 10 plus Card Number
Else
    Total Value of Dealer's Cards is Card 1 Number plus Card 2 Number

Dealer's Turn in relation to Player's First Hand
If Player Cards has Blackjack
```

```
        output Blackjack
    If Dealer Cards has Blackjack
        output Blackjack
     If dealer has same value as player
        Output Push
    If Dealer's cards are greater than player's cards
    }else if (dtotval>totval&&dtotval>16){
        Output Dealer as Winner
    if Total Value of Dealer's Cards is Less than Total Value of Player's Cards and Both are
Less than 22
        Dealer Hit Loop
        While Total Value of Dealer's Cards is less than Total Value of Player's Cards or 16,
and  Less than 22
        while ((dtotval<totval||dtotval<=16)&&dtotval<22){
            Determine Value of Dealer's Card

            Calculate Size of Vector for Dealer's Cards

            Output Dealer's Cards

            Determine Value of Dealer's Cards

            Calculate total value of Dealer's cards

            Determine Best Ace Value for Dealer's Cards

            Output Total Value of Dealer's Cards

        Determine winner in accordance to first hand
        If the hands Tie
            Output Push"<<endl;
        If Total Value of Dealer's Cards is Over 21
            Output That Dealer Busts and Player Wins
        if Total Value of Dealer's Cards is Over Total Value of Player's Cards
            Output That Dealer Wins
        Else
            Output That Player Wins
    Else
        Output That Player Busts

Repeat for Player's Second Hand if there is a second hand

If player chose to Surrender
    Output Surrender

End of Game Loop
```

If player does not have enough money
Output You do not have enough money to play again!
Else
Ask to Play Again
If Player Chooses Yes Continue Game Loop
Default End Game Loop

While: Player Wants to Play and has enough money

Calculate Win Percentage

Update Leader Board
Enter User's Name and Score to Leader Board
Enter Name to Leader Board
Enter Score to Leader Board

Search and Sort Leader Board

Output Sorted Leader Board to file

Output the results to file
Output Total Wins
Output Total Losses
Output Win Percentage
Inform Player Results were Outputted to File

Exit Stage Right!
Close Files

Concept Checklist

Used in Code	Concept	Example in Code
X	cout	Line 66
X	cin	Line 98
X	endl	Line 66
X	#include	Line 8
X	short	Line 53
X	int	Line 43
X	float	Line 55
X	char	Line 37
X	character strings	Line 37
X	bool	Line 114
X	Math Expressions	Line 706
X	Type Casting	Line 706
X	Naming Constants	Line 20
X	Combined Assignment	Line 73
	Format Input	NONE
X	Format Output	Line 790
X	File Input	Line 63
X	File Output	Line 779
X	Relational Operators	Line 70
X	if	Line 88
X	if/else	Line 65
X	if/else if	Line 124

X	switch	Line 690
X	Menus	Line 183
X	Logical Operators	Line 130
X	Validating User Input	Line 96
X	String Function	Line 99
X	Increment and Decrement Operators	Line 69
X	while	Line 346
X	do-while	Line 96
X	for	Line 69
X	1-D Array or Vector	Line 40
X	2-D Array	Line 35
X	Passing Array (or vector) between functions	Line 24
X	Pass by value for a function	Line 24
X	Pass by reference for a function	Line 27
X	Defaulted parameters for a function	Line 26
X	Return primitive data types for a function	Line 26
X	Sorting	Line 740
X	Searching	Line 740

Future Improvements

- Multiple players
- Split as many pairs as possible
- Additional blackjack rules and options
- Shorten overall code length

References

Dr. Mark Lehr
Savitch, Walter. *Problem Solving With C++*. 8th Edition. 2012 Pearson Education, Inc.
http://www.goldentouchcraps.com/tamburin_005.shtml