

Program name: *Lab3 War Game with Dice Design*

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Description: *Reflection & Test Plan of Lab3 War Game with Dice Design*

● Reflection

1. Original design & Design changes I have made:

In this lab, my actual code is very similar to my design at first place. This is because I've carefully read the description and requirement of this lab. Moreover, I studied the knowledge about inheritance, as well as reading discussions related to this lab on piazza, which helped me avoid many mistakes during coding. When I tested my code on flip server, I only found a couple minor mistakes caused by typo and pointer application, which had no impact to the design of this lab. I've listed the design of my program below:

(1) Main

The main function controls the entire project.

Ask user whether he/she wants to start the game or not.

If the user decided not to start the game, quit the project.

Otherwise, start the game.

After the game ends, ask the user whether he/she wants to play again.

If the user decided to play again, start the game again.

Otherwise, quit the project.

Loop the game until the user decided to quit.

(2) Game Class

Game class implements the game, which includes startMenu(), endMenu(), gameMenu(), and play().

startMenu():

Ask user whether he/she wants to start the game or not.

If the user decided not to start the game, quit the project.

Otherwise, start the game.

endMenu():

After the game ends, ask the user whether he/she wants to play again.

If the user decided to play again, start the game again.

Otherwise, quit the project.

gameMenu():

Promotes the user for information needed to start the game:

How many rounds will be played;

The type of die for each player;

The number of sides for dice of both players.

Store the information in the data members of the class.

play():

Use the information get by gameMenu() to play the game.

Initialize two players' score to 0.

Determine the types of die chosen by the two players and create Die object or Loaded Die object accordingly.

Roll the two die, compare the numbers rolled.

The player who rolls higher number gets one point (add 1 to that play's score).

If both players roll the same number, it is considered a draw and no one gets a point.

Loop the number of rounds players entered and output the detailed result of each round.

Afterwards, display the final score and the final winner of the game.

(3) Die class

Used to create a normal Die object, which includes number of sides on the die and the result of rolling the die once.

(4) LoadedDie class

Used to create a LoadedDie object, which inherits the behavior and elements of Die class, includes number of sides on the die and the result of rolling the die once. However, for the dieRolling function, the number it returns is biased such that the average output of rolling it for several times is higher than that of a Die object with the same number of sides.

(5) Validation

The validation function takes in a string and pass it by reference. The function makes sure the user's input is an integer. Afterwards, it returns the integer the user inputted.

Loop until the user inputs an integer.

When a string inputted, detect whether an extraction has failed and fix it.

If an extraction has failed, ask the user to enter again.

If extraction succeeds, then make sure no extraneous input.

Then detect if every character of the string is digit.

If every character of the string is digit, then the string is an integer.

Otherwise, ask the user to enter again.

If the input string is an integer, transfer it to an integer, and return the integer.

The validation of the range of every integer returned should be validated after the integer returns to the program.

2. How I solved problems encountered:

In my opinion, the biggest challenge in this lab was to study the new knowledge. This is also a major difference between CS 162 and CS161. In CS161, I could master most of new knowledge through lectures posted on Canvas and have an in-depth understanding of some hard points by reading textbook. However, knowledge in CS162 is significantly more complicated than CS161, and studying materials provided on Canvas changed a lot, which gave me a hard time looking for proper learning strategy for this course. I went through all the contents in textbook, video, and external links posted on Canvas in the past week, which is extremely time-consuming. But I

found learncpp.com is very suitable for me. This website not only helped me study new knowledge, but also solved my problems during coding this lab, including how to use inheritance and `rand()` to get a random number.

● Test Plan

The whole output is too long, therefore I only show part of it including the final result.

Case 1	
dieType1	1
dieType2	1
sideNumber1	1
sideNumber2	1
round	1
This test case makes sure the program works well when all inputs is 1.	
<pre> Do you want to satrt the War Game with Dice? Enter 1 if you want to play the game; enter 0 if you want to exit the game. 1 Please enter the type of die for the first player. Enter 1 if you want to choose the normal die; enter 2 if you want to choose the loaded die. 1 Please enter the type of die for the second player. Enter 1 if you want to choose the normal die; enter 2 if you want to choose the loaded die. 1 Please enter the number of sides for dice of the first player. 1 Please enter the number of sides for dice of the second player. 1 Please enter the number of rounds you would like to play. 1 Round 1: Player1 uses normal dice with 1 sides. Player2 uses normal dice with 1 sides. Number player1 rolled: 1 Number player2 rolled: 1 Both players roll the same number, it's a draw and no one gets a point. Player1's score: 0 Player2's score: 0 Final score: player1-0, player2-0 It's a draw. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	
Case 2	
dieType1	1
dieType2	1
sideNumber1	6
sideNumber2	6
round	9
This test case makes sure when two players both choose the normal die with	

same sides, the program works well and the number rolled every time is random.

```
Number player2 rolled: 1
Both players roll the same number, it's a draw and no one gets a point.
Player1's score: 2
Player2's score: 1
Round 5:
Player1 uses normal dice with 6 sides.
Player2 uses normal dice with 6 sides.
Number player1 rolled: 4
Number player2 rolled: 3
Player1 rolled higher number gets 1 point.
Player1's score: 3
Player2's score: 1
Round 6:
Player1 uses normal dice with 6 sides.
Player2 uses normal dice with 6 sides.
Number player1 rolled: 3
Number player2 rolled: 6
Player2 rolled higher number gets 1 point.
Player1's score: 3
Player2's score: 2
Round 7:
Player1 uses normal dice with 6 sides.
Player2 uses normal dice with 6 sides.
Number player1 rolled: 2
Number player2 rolled: 1
Player1 rolled higher number gets 1 point.
Player1's score: 4
Player2's score: 2
Round 8:
Player1 uses normal dice with 6 sides.
Player2 uses normal dice with 6 sides.
Number player1 rolled: 6
Number player2 rolled: 1
Player1 rolled higher number gets 1 point.
Player1's score: 5
Player2's score: 2
Round 9:
Player1 uses normal dice with 6 sides.
Player2 uses normal dice with 6 sides.
Number player1 rolled: 6
Number player2 rolled: 4
Player1 rolled higher number gets 1 point.
Player1's score: 6
Player2's score: 2
Final score: player1-6, player2-2
Final winner: Player1.
Do you want to play the War Game with Dice again?
Enter 1 if you want to play the game again;
enter 0 if you want to exit the game.
```

Case 3

dieType1	1
dieType2	1
sideNumber1	4
sideNumber2	7
round	10

This test case makes sure when two players both choose the normal die but

with different sides, the program works well and the number rolled every time is random, and the player whose die has more sides wins.

```
Number player2 rolled: 5
Player2 rolled higher number gets 1 point.
Player1's score: 0
Player2's score: 5
Round 6:
Player1 uses normal dice with 4 sides.
Player2 uses normal dice with 7 sides.
Number player1 rolled: 1
Number player2 rolled: 6
Player2 rolled higher number gets 1 point.
Player1's score: 0
Player2's score: 6
Round 7:
Player1 uses normal dice with 4 sides.
Player2 uses normal dice with 7 sides.
Number player1 rolled: 2
Number player2 rolled: 4
Player2 rolled higher number gets 1 point.
Player1's score: 0
Player2's score: 7
Round 8:
Player1 uses normal dice with 4 sides.
Player2 uses normal dice with 7 sides.
Number player1 rolled: 2
Number player2 rolled: 4
Player2 rolled higher number gets 1 point.
Player1's score: 0
Player2's score: 8
Round 9:
Player1 uses normal dice with 4 sides.
Player2 uses normal dice with 7 sides.
Number player1 rolled: 4
Number player2 rolled: 7
Player2 rolled higher number gets 1 point.
Player1's score: 0
Player2's score: 9
Round 10:
Player1 uses normal dice with 4 sides.
Player2 uses normal dice with 7 sides.
Number player1 rolled: 2
Number player2 rolled: 5
Player2 rolled higher number gets 1 point.
Player1's score: 0
Player2's score: 10
Final score: player1-0, player2-10
Final winner: Player2.
Do you want to play the War Game with Dice again?
Enter 1 if you want to play the game again;
enter 0 if you want to exit the game.
```

Case 4	
dieType1	1
dieType2	2
sideNumber1	5
sideNumber2	5
round	13
<p>This test case makes sure when the first player chooses the normal die and the second player chooses the loaded die, but with same sides, the program works well and the number rolled every time is random, and the second player wins.</p>	
<pre> Number player2 rolled: 2 Player2 rolled higher number gets 1 point. Player1's score: 3 Player2's score: 5 Round 9: Player1 uses normal dice with 5 sides. Player2 uses loaded dice with 5 sides. Number player1 rolled: 4 Number player2 rolled: 3 Player1 rolled higher number gets 1 point. Player1's score: 4 Player2's score: 5 Round 10: Player1 uses normal dice with 5 sides. Player2 uses loaded dice with 5 sides. Number player1 rolled: 2 Number player2 rolled: 5 Player2 rolled higher number gets 1 point. Player1's score: 4 Player2's score: 6 Round 11: Player1 uses normal dice with 5 sides. Player2 uses loaded dice with 5 sides. Number player1 rolled: 5 Number player2 rolled: 4 Player1 rolled higher number gets 1 point. Player1's score: 5 Player2's score: 6 Round 12: Player1 uses normal dice with 5 sides. Player2 uses loaded dice with 5 sides. Number player1 rolled: 2 Number player2 rolled: 5 Player2 rolled higher number gets 1 point. Player1's score: 5 Player2's score: 7 Round 13: Player1 uses normal dice with 5 sides. Player2 uses loaded dice with 5 sides. Number player1 rolled: 3 Number player2 rolled: 5 Player2 rolled higher number gets 1 point. Player1's score: 5 Player2's score: 8 Final score: player1-5, player2-8 Final winner: Player2. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	

Case 5	
dieType1	1
dieType2	2
sideNumber1	19
sideNumber2	8
round	34
<p>This test case makes sure when the first player chooses the normal die with more sides and the second player chooses the loaded die with less sides, the program works well and the number rolled every time is random, and the first player has chance to win.</p>	
<pre> Number player2 rolled: 8 Player2 rolled higher number gets 1 point. Player1's score: 20 Player2's score: 7 Round 30: Player1 uses normal dice with 19 sides. Player2 uses loaded dice with 8 sides. Number player1 rolled: 14 Number player2 rolled: 2 Player1 rolled higher number gets 1 point. Player1's score: 21 Player2's score: 7 Round 31: Player1 uses normal dice with 19 sides. Player2 uses loaded dice with 8 sides. Number player1 rolled: 8 Number player2 rolled: 8 Both players roll the same number, it's a draw and no one gets a point. Player1's score: 21 Player2's score: 7 Round 32: Player1 uses normal dice with 19 sides. Player2 uses loaded dice with 8 sides. Number player1 rolled: 2 Number player2 rolled: 8 Player2 rolled higher number gets 1 point. Player1's score: 21 Player2's score: 8 Round 33: Player1 uses normal dice with 19 sides. Player2 uses loaded dice with 8 sides. Number player1 rolled: 12 Number player2 rolled: 2 Player1 rolled higher number gets 1 point. Player1's score: 22 Player2's score: 8 Round 34: Player1 uses normal dice with 19 sides. Player2 uses loaded dice with 8 sides. Number player1 rolled: 6 Number player2 rolled: 8 Player2 rolled higher number gets 1 point. Player1's score: 22 Player2's score: 9 Final score: player1-22, player2-9 Final winner: Player1. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	

Case 6	
dieType1	2
dieType2	1
sideNumber1	7
sideNumber2	7
round	12
<p>This test case makes sure when the first player chooses the loaded die and the second player chooses the normal die, but with same sides, the program works well and the number rolled every time is random, and the first player wins.</p>	
<pre> Number player2 rolled: 2 Player1 rolled higher number gets 1 point. Player1's score: 4 Player2's score: 3 Round 8: Player1 uses loaded dice with 7 sides. Player2 uses normal dice with 7 sides. Number player1 rolled: 6 Number player2 rolled: 3 Player1 rolled higher number gets 1 point. Player1's score: 5 Player2's score: 3 Round 9: Player1 uses loaded dice with 7 sides. Player2 uses normal dice with 7 sides. Number player1 rolled: 3 Number player2 rolled: 2 Player1 rolled higher number gets 1 point. Player1's score: 6 Player2's score: 3 Round 10: Player1 uses loaded dice with 7 sides. Player2 uses normal dice with 7 sides. Number player1 rolled: 2 Number player2 rolled: 3 Player2 rolled higher number gets 1 point. Player1's score: 6 Player2's score: 4 Round 11: Player1 uses loaded dice with 7 sides. Player2 uses normal dice with 7 sides. Number player1 rolled: 3 Number player2 rolled: 1 Player1 rolled higher number gets 1 point. Player1's score: 7 Player2's score: 4 Round 12: Player1 uses loaded dice with 7 sides. Player2 uses normal dice with 7 sides. Number player1 rolled: 4 Number player2 rolled: 2 Player1 rolled higher number gets 1 point. Player1's score: 8 Player2's score: 4 Final score: player1-8, player2-4 Final winner: Player1. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	

Case 7	
dieType1	2
dieType2	1
sideNumber1	4
sideNumber2	10
round	16
<p>This test case makes sure when the first player chooses the loaded die with less sides and the second player chooses the normal die with more sides, the program works well and the number rolled every time is random, and the second player has chance to win.</p>	
<pre> Number player2 rolled: 5 Player2 rolled higher number gets 1 point. Player1's score: 3 Player2's score: 7 Round 12: Player1 uses loaded dice with 4 sides. Player2 uses normal dice with 10 sides. Number player1 rolled: 3 Number player2 rolled: 3 Both players roll the same number, it's a draw and no one gets a point. Player1's score: 3 Player2's score: 7 Round 13: Player1 uses loaded dice with 4 sides. Player2 uses normal dice with 10 sides. Number player1 rolled: 3 Number player2 rolled: 8 Player2 rolled higher number gets 1 point. Player1's score: 3 Player2's score: 8 Round 14: Player1 uses loaded dice with 4 sides. Player2 uses normal dice with 10 sides. Number player1 rolled: 4 Number player2 rolled: 3 Player1 rolled higher number gets 1 point. Player1's score: 4 Player2's score: 8 Round 15: Player1 uses loaded dice with 4 sides. Player2 uses normal dice with 10 sides. Number player1 rolled: 4 Number player2 rolled: 4 Both players roll the same number, it's a draw and no one gets a point. Player1's score: 4 Player2's score: 8 Round 16: Player1 uses loaded dice with 4 sides. Player2 uses normal dice with 10 sides. Number player1 rolled: 4 Number player2 rolled: 6 Player2 rolled higher number gets 1 point. Player1's score: 4 Player2's score: 9 Final score: player1-4, player2-9 Final winner: Player2. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	

Case 8	
dieType1	2
dieType2	2
sideNumber1	9
sideNumber2	9
round	35
<p>This test case makes sure when two players both choose the loaded die with same sides, the program works well and the number rolled every time is random, and their final scores are much the same.</p>	
<pre> Number player2 rolled: 5 Player1 rolled higher number gets 1 point. Player1's score: 13 Player2's score: 15 Round 31: Player1 uses loaded dice with 9 sides. Player2 uses loaded dice with 9 sides. Number player1 rolled: 8 Number player2 rolled: 4 Player1 rolled higher number gets 1 point. Player1's score: 14 Player2's score: 15 Round 32: Player1 uses loaded dice with 9 sides. Player2 uses loaded dice with 9 sides. Number player1 rolled: 9 Number player2 rolled: 7 Player1 rolled higher number gets 1 point. Player1's score: 15 Player2's score: 15 Round 33: Player1 uses loaded dice with 9 sides. Player2 uses loaded dice with 9 sides. Number player1 rolled: 7 Number player2 rolled: 9 Player2 rolled higher number gets 1 point. Player1's score: 15 Player2's score: 16 Round 34: Player1 uses loaded dice with 9 sides. Player2 uses loaded dice with 9 sides. Number player1 rolled: 7 Number player2 rolled: 6 Player1 rolled higher number gets 1 point. Player1's score: 16 Player2's score: 16 Round 35: Player1 uses loaded dice with 9 sides. Player2 uses loaded dice with 9 sides. Number player1 rolled: 5 Number player2 rolled: 3 Player1 rolled higher number gets 1 point. Player1's score: 17 Player2's score: 16 Final score: player1-17, player2-16 Final winner: Player1. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	

Case 9	
dieType1	2
dieType2	2
sideNumber1	3
sideNumber2	10
round	24
<p>This test case makes sure when two players both choose the loaded die but with different sides, the program works well and the number rolled every time is random, and the player whose die has more sides wins.</p>	
<pre> Number player2 rolled: 9 Player2 rolled higher number gets 1 point. Player1's score: 0 Player2's score: 18 Round 20: Player1 uses loaded dice with 3 sides. Player2 uses loaded dice with 10 sides. Number player1 rolled: 3 Number player2 rolled: 8 Player2 rolled higher number gets 1 point. Player1's score: 0 Player2's score: 19 Round 21: Player1 uses loaded dice with 3 sides. Player2 uses loaded dice with 10 sides. Number player1 rolled: 2 Number player2 rolled: 8 Player2 rolled higher number gets 1 point. Player1's score: 0 Player2's score: 20 Round 22: Player1 uses loaded dice with 3 sides. Player2 uses loaded dice with 10 sides. Number player1 rolled: 3 Number player2 rolled: 5 Player2 rolled higher number gets 1 point. Player1's score: 0 Player2's score: 21 Round 23: Player1 uses loaded dice with 3 sides. Player2 uses loaded dice with 10 sides. Number player1 rolled: 3 Number player2 rolled: 4 Player2 rolled higher number gets 1 point. Player1's score: 0 Player2's score: 22 Round 24: Player1 uses loaded dice with 3 sides. Player2 uses loaded dice with 10 sides. Number player1 rolled: 2 Number player2 rolled: 10 Player2 rolled higher number gets 1 point. Player1's score: 0 Player2's score: 23 Final score: player1-0, player2-23 Final winner: Player2. Do you want to play the War Game with Dice again? Enter 1 if you want to play the game again; enter 0 if you want to exit the game. </pre>	