MIDDLE EAST TECHNICAL UNIVERSITY, NORTHERN CYPRUS CAMPUS
CNG140 C Programming – Programming Assignment 2

Date handed out: **22 March 2019, Friday**

Programming Assignment 2: Yahtzee

Purpose:

The main purpose of this programming assignment is to revise the topics that we have covered in the first six weeks including fundamentals of C programming, conditional statements, repetitive statements, and functions.

Description:

You will write a program for playing a *simplified* version of the Yahtzee game between a player and a computer. Yahtzee is a dice game which was introduced in early 1940s. Further details about this game can be found here: https://en.wikipedia.org/wiki/Yahtzee but please note that you will be coding a *simplified* version of this game. Coding this game will give you practice with all three control constructs (sequence, selection and repetition). We are including some design constraints in the "programming task" section, so you will also use functions. This will give you the experience of decomposing a problem into parts, and then implementing each part in one highly cohesive, loosely coupled function.

Don't try to compile your entire program in one "big bang". *Compile it piece by piece. Test each piece that you have compiled to make sure it works correctly before you add the next piece.*

Yahtzee Rules:

Equipment: 5 dices and a scoresheet
Number of Players: 2 players
How to play: Each player will have a turn to roll 5 dice. The object of the game is to score points by rolling five dice to make certain combinations. The dice can be rolled **up to three times** in a turn to try to make these combinations. After the third roll, the player must choose one of the categories given in table 1. A game consists of **six** rounds. Once a category has been used in the game, **it cannot be used again**. The scoring categories have varying point values, some of which are fixed values and others where the score depends on the value of the dice (s). A **Yahtzee** is five-of-a-kind and scores 50 points; the highest of any category. The winner is the player who scores most points at the end of the six rounds.
Scoresheet: A Scoresheet looks as follows:

Accumulated Round Total	Player 1	Player 2
1	20	50
2	50	63
3	80	63

As you can see scores are **accumulated** from the previous round.

Score calculation: Table 1 shows the scoring of each case.

How to Play Yahtzee?

You will write the program that will allow a player play the Yahtzee game against the computer. Your program will first roll a dice for both computer and the player, and whoever gets the higher score the game will start with that player. Your program will allow the players to play the game for 6 rounds and the end of each round display their scores. At the end of 6 rounds, whoever has the highest score will win the game. In each round, the computer will **roll just one time**, but the other player needs to be able to choose to re-roll the dice or not. Note that player can roll at most three times.

Table 1 Scoring Rules

Categories	Descriptions	Scores	Examples
Fives	Any combination of dice values, just count fives	The sum of dice with the number 5	1, 1, 2, 2, 5 – score: 5
Sixes	Any combination of dice values, just count sixes	The sum of dice with the number 6	2, 3, 6, 6, 6 – score: 18
Three of a kind	At least three dice the same	Sum of all same dice	2, 3, 4, 4, 4 – score: 12
Large Straight	Five sequential dice, example: 1, 2, 3, 4, 5 or 2, 3, 4, 5, 6 note: it just important to have these values and not necessarily get them in this order	40	2, 1, 3, 4, 5 – score: 40
Yahtzee	All five dice the same	50	1, 1, 1, 1, 1 – score: 50
Chance	Any combination	Sum of all dice	1, 1, 3, 3, 5 – score: 13

Sample run:

```
Welcome to the Yahtzee game.
Let's see who is lucky!
Player: 5 - Machine: 3
Player is the lucky one, lets get started!

Round: 1
=====================================
Rolled the dice for you:
Dice1: 2, Dice2: 3, Dice3:4, Dice4: 5, Dice5: 6
Do you want to roll or not (Y/N): N
Your score is: 40, and your total is: 40

Rolled the dice for computer:
Dice1: 6, Dice2: 6, Dice3:6, Dice4: 6, Dice5: 6
Your score is: 50 and your total is: 50


Round: 2
=====================================

Rolled the dice for you:
Dice1: 1, Dice2: 3, Dice3:4, Dice4: 4, Dice5: 4
Do you want to roll or not (Y/N): Y
Dice1: 2, Dice2: 2, Dice3:2, Dice4: 5, Dice5: 6
Do you want to roll or not (Y/N): Y
Dice1: 1, Dice2: 2, Dice3:5, Dice4: 5, Dice5: 5
Your score is: 15 and your total is: 55

Rolled the dice for computer:
Dice1: 1, Dice2: 1, Dice3:1, Dice4: 1, Dice5: 1
Your score is: 50 and your total is: 100
```

….

```
Round: 6
====================================
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……

```
Winner is Computer!
```

Programming Requirements:

In order to implement this game you will need to write at least the following functions, but if you need more functions you can add them.

roll-a-dice () – This function will roll a dice and return the result. The rolling action will give random values. Each result (1-6) should be equally likely. In otherwords having each outcome should have the same probability.

play_computer() – This function will mainly be responsible from making the computer play the game.

computer_strategy_decider() – This function will decide which scoring strategy will be used. The computer will have a simple greedy strategy. It will check the scoring of all the strategies and go for the one which will give the computer highest score for that turn. However, please note that a strategy can only be used **once**. Therefore, in each round the computer will have one less strategy to check.

play-human() – This function will mainly be used to get the player play a turn.

scoresheet() – This function will be used to display the scoresheet on the screen.

Grading Schema:

Your program will be graded as follows:

Grading Point	**Mark (100)**
Maintaining the number of rounds and the total scores	10
roll-a-dice() function	5
play_computer() function	20
computer_strategy_decider() function	20
play_user() function	20
scoresheet() function	10
Code quality (e.g., variable names, formulation of selection statements and loops, function prototypes, etc)	15

Rules:

Please make sure that you follow the restrictions for the assignment as follows.

- Strictly obey the input output format. Do not print extra things.
- **You are not allowed to use global variables**.
- **You are not allowed to use data structures such as arrays to store values** as we have not covered them in the class yet**.**
- **You are not also allowed to use external files.**
- Name your source file "Yacht.c".
- Upload only source file. Do not compress it (zip, rar, …)

You can see the detailed sample run below:

Detailed Sample run:

Welcome to the Yahtzee game.

Let's see who is lucky!

Player: 5 – Machine: 3
Player is the lucky one, lets get started!

Round: 1
==========
Rolled the dice for you:
Dice1: 2, Dice2: 3, Dice3: 4, Dice4: 5, Dice5: 6
Do you want to roll or not (Y/N): N
Please choose your strategy : (1)Fives, (2)Sixes, (3)Three of a kind, (4)Large Straight, (5)Yahtzee, (6)Chance : 4
Your score is: 40, and your total is: 40

Rolled the dice for computer:
Dice1: 6, Dice2: 6, Dice3: 6, Dice4: 6, Dice5: 6
Computer selects Yahtzee
Computer score is: 50 and computer total is: 50

Round 1 Scoresheet:

Computer : 50
Player : 40

Round: 2
==========
Rolled the dice for you:
Dice1: 1, Dice2: 3, Dice3: 4, Dice4: 4, Dice5: 4
Do you want to roll or not (Y/N): Y
Dice1: 2, Dice2: 2, Dice3: 2, Dice4: 5, Dice5: 6
Do you want to roll or not (Y/N): Y
Dice1: 1, Dice2: 2, Dice3: 5, Dice4: 5, Dice5: 5
Please choose your strategy : (1)Fives, (2)Sixes, (3)Three of a kind, (5)Yahtzee, (6)Chance : 1
Your score is: 15 and your total is: 55
Rolled the dice for computer:
Dice1: 5, Dice2: 5, Dice3: 5, Dice4: 5, Dice5: 1
Computer selects Fives
Computer score is: 20 and computer total is: 70

Round 2 Scoresheet:

Computer : 70
Player : 55

Round: 3
==========
Rolled the dice for you:
Dice1: 1, Dice2: 1, Dice3: 1, Dice4: 3, Dice5: 4
Do you want to roll or not (Y/N): Y
Dice1: 6, Dice2: 6, Dice3: 6, Dice4: 5, Dice5: 2
Do you want to roll or not (Y/N): N
Please choose your strategy : (2)Sixes, (3)Three of a kind, (5)Yahtzee, (6)Chance : 2
Your score is: 18 and your total is: 73

Rolled the dice for computer:
Dice1: 4, Dice2: 4, Dice3: 4, Dice4: 6, Dice5: 5
Computer selects Three of a kind
Computer score is: 12 and computer total is: 82

Round 3 Scoresheet:

Computer : 82
Player : 73

Round: 4
==========
Rolled the dice for you:
Dice1: 3, Dice2: 3, Dice3: 4, Dice4: 4, Dice5: 4
Do you want to roll or not (Y/N):N
Please choose your strategy : (3)Three of a kind, (5)Yahtzee, (6)Chance : 3
Your score is: 12 and your total is: 85
Rolled the dice for computer:
Dice1: 1, Dice2: 2, Dice3: 3, Dice4: 4, Dice5: 5
Computer selects Large Straight
Computer score is: 40 and computer total is: 122

Round 4 Scoresheet:

Computer : 122
Player : 85

Round: 5
==========
Rolled the dice for you:
Dice1: 6, Dice2: 6, Dice3: 6, Dice4: 6, Dice5: 4
Do you want to roll or not (Y/N): N
Please choose your strategy : (5)Yahtzee, (6)Chance : 6
Your score is: 28 and your total is: 113
Rolled the dice for computer:
Dice1: 6, Dice2: 5, Dice3: 3, Dice4: 6, Dice5: 6
Computer selects Sixes
Computer score is: 18 and computer total is: 140

Round 5 Scoresheet:

Computer : 140
Player : 113

Round: 6
==========
Rolled the dice for you:
Dice1: 3, Dice2: 3, Dice3: 3, Dice4: 4, Dice5: 4
Do you want to roll or not (Y/N):Y
Dice1: 2, Dice2: 1, Dice3: 5, Dice4: 4, Dice5: 4
Do you want to roll or not (Y/N):Y
Dice1: 1, Dice2: 2, Dice3: 3, Dice4: 4, Dice5: 5
Please choose your strategy : (6)Yahtzee : 4
Invalid strategy! Please choose valid strategy!
Please choose your strategy : (6)Yahtzee : 6

Inappropriate dices!! Your score is: 0 and your total is: 113
Rolled the dice for computer:
Dice1: 1, Dice2: 2, Dice3: 3, Dice4: 4, Dice5: 5
Computer selects Chance
Computer score is: 15 and computer total is: 155

Round 6 Scoresheet:

Computer : 155
Player : 113

Game has finished!!

Computer : 155
Player : 113

COMPUTER WON!

Note the following:

1) For player: if the combination does not fit any of the strategies left, then score for that round is 0.
2) Computer strategy decider selects the highest score strategy, if strategies are equal then selects randomly.