CS 161A: Programming and Problem Solving I

Assignment xx Algorithmic Design Document

Make a copy before you begin (File -> Make a copy). Add the Assignment # above and complete the sections below BEFORE you begin to code. The sections will expand as you type. When you are finished, download this document as a PDF (File -> Download -> PDF) and submit to D2L.

This document contains an interactive checklist. To mark an item as complete, click on the box (the entire list will be highlighted), then right click (the clicked box will only be highlighted), and choose the checkmark.

Planning your program before you start coding is part of the development process. In this document you will:

- ❏ Paste a screenshot of your zyBooks Challenge and Participation %
- ❏ Paste a screenshot of your assigned zyLabs completion
- ❏ Write a detailed description of your program, at least two complete sentences
- ❏ If applicable, design a sample run with test input and output
- ❏ Identify the program inputs and their data types
- ❏ Identify the program outputs and their data types
- ❏ Identify any calculations or formulas needed
- ❏ Write the algorithmic steps as pseudocode or a flowchart
- ❏ Tools for flowchart - Draw.io - Diagrams.net

1. Program Description

In the box below, describe the purpose of the program. You must include a detailed description with at least two complete sentences.

Program description:
This program is rock, paper, scissors in coded format. The user plays the computer by inputting their name and either r, p, or s. Winner announcement displays at the bottom

2. Sample Run

If you are designing your own program, you will start with a sample run. Imagine a user is running your program - what will they see? What inputs do you expect, and what will be the outputs from the given inputs? Choose test data you will use to test your program. Calculate and show the expected outputs. Use the sample run to test your program.

Sample run:

```
Welcome to the Rock Paper Scissors Game!

Enter player name: Mario

What is your play Mario?
Enter r, p, or s: R
Computer plays P

Computer wins!

Thank you for playing!
```

3. Algorithmic Design

Before you begin coding, **you must first plan out the logic** and think about what data you will use to test your program for correctness. All programmers plan before coding - this saves a lot of time and frustration! Use the steps below to identify the inputs and outputs, calculations, and steps needed to solve the problem.

Algorithmic design:

a. Identify and list all of the user input and their data types.

Name: string

playerHand: char, r/p/s

b. Identify and list all of the user output and their data types.

systemHand: char, r/p/s

c. What calculations do you need to do to transform inputs into outputs? List all formulas needed, if applicable. If there are no calculations needed, state there are no calculations for this algorithm.

N/A

d. Design the logic of your program using pseudocode or flowcharts. Here is where you would use conditionals, loops or functions (if applicable) and list the steps in transforming inputs into outputs. Walk through your logic steps with the test data from the assignment document or the sample run above.

```
DECLARE name: string

DECLARE playerHand: char

DECLARE systemhand: int

DECLARE i: int

SET i = 0


DISPLAY “Lets play Rock, Paper, Scissors”

DISPLAY “Name please: “

INPUT name


MARKER: top


DISPLAY “Rock(r), Paper(p), or Scissors(s): “

INPUT playerHand

#---
# Validate playerHand
#---
IF  i < 3
  IF playerHand != caseinsensitive(r&&p&&s)
    i++
    IF i == 2
      DISPLAY “Your play must be \”r\”, \”p\”, or \”s\”. Please start over,\n”
      EXIT
    ENDIF
    DISPLAY “Try again”
    RETURN to MARKER: top
```

```
  ENDIF
ENDIF

SET systemHand = randomNumber >=0 && randomNumber <=2

#---
# r = 0
# p = 1
# s = 2
# compare systemHand to playerHand
#---

SELECT playerHand
  CASE ‘r’ || ‘R’
    IF systemHand == 0
      DISPLAY "Computer plays R(ock)\n"
      DISPLAY “\nIt’s a TIE!!!\n”
    ELSEIF systemHand == 1
      DISPLAY  "Computer plays P(aper)\n"
      DISPLAY “\nComputer wins!\n”
    ELSEIF systemHand == 2
      DISPLAY  "Computer plays S(cissors)\n"
      DISPLAY name “n\ wins!\n”
    ENDIF
  CASE ‘p || ‘P’
    IF systemHand == 1
      DISPLAY  "Computer plays P(aper)\n"
      DISPLAY “\nIt’s a TIE!!!\n”
    ELSEIF systemHand == 2
      DISPLAY  "Computer plays S(cissors)\n"
      DISPLAY “\nComputer wins!\n”
    ELSEIF systemHand == 0
      DISPLAY "Computer plays R(ock)\n"
      DISPLAY name “ wins!\n”
    ENDIF
  CASE ‘s’ || ‘S’
    IF systemHand == 2
      DISPLAY  "Computer plays S(cissors)\n"
      DISPLAY “\nIt’s a TIE!!!\n”
    ELSEIF systemHand == 0
      DISPLAY "Computer plays R(ock)\n"
      DISPLAY “\nComputer wins!\n”
    ELSEIF systemHand == 1
      DISPLAY  "Computer plays P(aper)\n"
```

```
    DISPLAY name " wins!\n"
  ENDIF

DISPLAY "\nThanks for playing!"
```

4. Pseudocode Syntax

Think about each step in your algorithm as an action and use the verbs below:

To do this:	**Use this verb:**	**Example:**
Create a variable	DECLARE	`DECLARE integer num_dogs`
Print to the console window	DISPLAY	`DISPLAY "Hello!"`
Read input from the user into a variable	INPUT	`INPUT num_dogs`
Update the contents of a variable	SET	`SET num_dogs = num_dogs + 1`
Conditionals		

Use a single alternative conditional	IF *condition* THEN
	statement
	statement
	END IF
		`IF num_dogs > 10 THEN`
		`  DISPLAY "That is a lot of dogs!"`
		`END IF`

Use a dual alternative conditional	IF *condition* THEN
	statement
	statement
	ELSE
	statement
	statement
	END IF
		`IF num_dogs > 10 THEN`
		`  DISPLAY "You have more than 10 dogs!"`
		`ELSE`
		`  DISPLAY "You have ten or fewer dogs!"`
		`END IF`

Use a switch/case statement	SELECT *variable or expression*
	CASE *value_1:*
	statement
	statement
	CASE *value_2:*
	statement
	statement
	CASE *value_2:*
		`SELECT num_dogs`
		`  CASE 0: DISPLAY "No dogs!"`
		`  CASE 1: DISPLAY "One dog.."`
		`  CASE 2: DISPLAY "Two dogs.."`
		`  CASE 3: DISPLAY "Three dogs.."`
		`  DEFAULT: DISPLAY "Lots of dogs!"`
		`END SELECT`

	statement *statement* DEFAULT: *statement* *statement* END SELECT	
Loops		

Loop while a condition is true - the loop body will execute 0 or more times.	WHILE *condition*
	statement
	statement
	END WHILE
		`SET num_dogs = 1`
		`WHILE num_dogs < 10`
		`  DISPLAY num_dogs, " dogs!"`
		`  SET num_dogs = num_dogs + 1`
		`END WHILE`

Loop while a condition is true - the loop body will execute 1 or more times.	DO
	statement
	statement
	WHILE *condition*
		`SET num_dogs = 1`
		`DO`
		`  DISPLAY num_dogs, " dogs!"`
		`  SET num_dogs = num_dogs + 1`
		`WHILE num_dogs < 10`

Loop a specific number of times.	FOR *counter* = *start* TO *end*
	statement
	statement
	END FOR
		`FOR count = 1 TO 10`
		`  DISPLAY num_dogs, " dogs!"`
		`END FOR`

Functions		

Create a function	FUNCTION *return_type name (parameters)*
	statement
	statement
	END FUNCTION
		`FUNCTION Integer add(Integer num1, Integer num2)`
		`  DECLARE Integer sum`
		`  SET sum = num1 + num2`
		`  RETURN sum`
		`END FUNCTION`

Call a function	CALL *function_name*	`CALL add(2, 3)`
Return data from a function	RETURN *value*	`RETURN 2 + 3`