# **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 and submit with your Assignment to D2L (File -> Download -> PDF). The sections will expand as you type.

## zyBooks

Add your zyBooks screenshots for the % and assigned zyLabs completions below. Required percentages: all assigned zyLabs, Challenge Activity with at least 70%, and Participation Activity with at least 80%.

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| **zyLabs, Challenge, and Participation % Screenshot:** |
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| **Assigned zyLabs completion Screenshot:** |
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## Assignment

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| **Program description:** |
| This program will let you play the incredible game “Rock, Paper, Scissors!” with your computer. Just type in Rock, Paper, or Scissors and you’ll be competing with the computer immediately! |

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.

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| **Algorithmic design:** |
| 1. Identify all of the user input. What are the data types of the inputs? Define the input variables. |
| userInput as STRING |
| 1. Describe the program output. What is displayed to the user? What are the data types of the output? Define the output variables. |
| The program will output the following strings:  Lets play Rock, Paper, Scissors!  Please type "Rock", "Paper", or "Scissors" to choose your hand.  Note: You can type "R", "P", or "S" too.  Please choose your Hand:  You have chosen: {userInput}!  The computer has chosen: Paper  Paper beats {userInput}.  The computer has won!  Thank you for playing! |
| 1. 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. |
| **Arithmetic:**  srand((int)time(0)) //Random seed declaration  randomNum = rand() % 3 //Set randomNum 0, 1, or 2  **Comparisons:**  userInput[0] == “r” || “R”  userInput[0] == “p” || “P”  userInput[0] == “s” || “S”  handUser[0] == handComp[0]  handUser[0] == rockU[0], paperU[0], scissorsU[0]  handComp[0] == rockU[0], paperU[0], scissorsU[0]  **Constructors:**  handUser[0, 1, 2, … 7] == “Rock” || “Paper” || “Scissors”  handComp[0, 1, 2, … 7] == “Rock” || “Paper” || “Scissors” |
| 1. Design the logic of your program using pseudocode or flowcharts. See pseudocode syntax at the bottom of this document. Here is where you would use conditionals, loops, functions or array constructs (if applicable) and list the steps in transforming inputs into outputs. Walk through your logic steps with the test data from the assignment document. |
| START  DECLARE randomNum as INTEGER  DECLARE handComp[256] = "" as STRING  DECLARE handUser[256] = "" as STRING  DECLARE userInput[256] = "" as STRING  DECLARE rockL[256] = "rock" as STRING  DECLARE rockU[256] = "Rock" as STRING  DECLARE paperL[256] = "paper" as STRING  DECLARE paperU[256] = "Paper" as STRING  DECLARE scissorsL[256] = "scissors" as STRING  DECLARE scissorsU = "Scissors" as STRING  DISPLAY “Lets play Rock, Paper, Scissors!”  DISPLAY “Please type “Rock”, “Paper”, or “Scissors” to choose your hand.”  DISPLAY “Note: You can type “R”, “P”, or “S” too.”  DISPLAY “Please choose your Hand: ”  INPUT userInput  IF userInput[0] == “r” OR userInput[0] == “R”  SET handUser = Rock  ELSE IF userInput[0] == “p” OR userInput[0] == “P”  SET handUser = Paper  ELSE IF userInput[0] == “s” OR userInput[0] == “S”  SET handUser = Scissors  ELSE  DISPLAY userInStr + “is not a valid input.”  DISPLAY “Please run the program again.”  RETURN 0  DISPLAY “You have chosen ” + handUser  SET seedRandom = systemTime  SET randomNum = random (0 to 2 inclusive both)  IF randomNum == 0  SET handComp = Rock  ELSE IF randomNum == 1  SET handComp = Paper  ELSE  SET handComp = Scissors  DISPLAY “The computer chose: “ + handComp  IF handUser == handComp  DISPLAY “You both chose “ + handUser + “, it’s a tie!”  ELSE IF handUser == Rock AND handComp == Paper  DISPLAY “You have chosen: “ + handUser + “!”  DISPLAY “The computer chose: “ + handComp + “.”  DISPLAY handComp + “ beats ” + handUser + “.”  DISPLAY “The computer has won!”  ELSE IF handUser == Rock AND handComp == Scissors  DISPLAY “You have chosen: “ + handUser + “!”  DISPLAY “The computer chose: “ + handComp + “.”  DISPLAY handUser + “ beats ” + handComp + “.”  DISPLAY “Congratulations, you won!  ELSE IF handUser == Paper AND handComp == Scissors  DISPLAY “You have chosen: “ + handUser + “!”  DISPLAY “The computer chose: “ + handComp + “.”  DISPLAY handComp + “ beats ” + handUser + “.”  DISPLAY “The computer has won!”  ELSE IF handUser == Paper AND handComp == Rock  DISPLAY “You have chosen: “ + handUser + “!”  DISPLAY “The computer chose: “ + handComp + “.”  DISPLAY handUser + “ beats ” + handComp + “.”  DISPLAY “Congratulations, you won!  ELSE IF handUser == Scissors AND handComp == Rock  DISPLAY “You have chosen: “ + handUser + “!”  DISPLAY “The computer chose: “ + handComp + “.”  DISPLAY handComp + “ beats ” + handUser + “.”  DISPLAY “The computer has won!”  ELSE IF handUser == Scissors AND handComp == Paper  DISPLAY “You have chosen: “ + handUser + “!”  DISPLAY “The computer chose: “ + handComp + “.”  DISPLAY handUser + “ beats ” + handComp + “.”  DISPLAY “Congratulations, you won!  ELSE  DISPLAY !Application error. Please alert the programmer!  RETURN 0  DISPLAY “Thank you for playing!”  END |
| 1. Include 2 Sample Program Runs for your program using your own set of data. This data set must be different from my Sample Runs in the Assignment document. This process is similar to Unit Testing and will help you test your program better. |
| Sample Program Run 1:  Lets play Rock, Paper, Scissors!  Please type “Rock”, “Paper”, or “Scissors” to choose your hand.  Note: You can type “R”, “P”, or “S” too.  Please choose your Hand: **Clips**  “**Clips**” is not a valid input.  Please choose your Hand: **Scisrsriuwn**  You have chosen **Scissors**!  The computer chose: Rock.  Rock beats Scissors.  The computer has won!  Thank you for playing.  Sample Program Run 2:  Lets play Rock, Paper, Scissors!  Please type “Rock”, “Paper”, or “Scissors” to choose your hand.  Note: You can type “R”, “P”, or “S” too.  Please choose your Hand: **Paper?**  You have chosen **Paper**!  The computer chose: Rock.  Paper beats Rock.  Congratulations, you won!  Thank you for playing! |

## Pseudocode Syntax

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

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| **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:*  *statement*  *statement*  DEFAULT:  *statement*  *statement*  END SELECT | 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 |
| **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 = star*t 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 |