Lab 3

Pseudocode

Learning Objectives

Pseudocode is structured English to help you think about and determine what your program should do. There is no formal "syntax" though ... write what makes sense to you and helps you understand what the program should do. For this lab you will generate pseudocode for algorithms to solve different problems. By looking at your pseudocode another person can determine if your algorithm is sound and you're on the right track.

Basic Lab Instructions!

- Talk to your classmates for help.
- You may want to bring your textbook to future labs to look up syntax and examples.
- Stuck? Confused? Have a question? Ask a TA/Lab Engineer for help, or look at the book or past lecture slides.
- Complete as many problems as you can within the allotted time. You don't need to keep working on these exercises after you leave the lab.
- Before you leave today, make sure to check in with one of the Lab Engineers/TAs in the lab to get credit for your work.

Lab Tasks

Task #1

Write a pseudocode to represent a logic of a program that inputs from the user the height and width of a wall, calculates and displays the amount of paint you need to cover the wall. It takes one gallon of paint for every 150 square feet of wall.

Sample Run

```
1 Enter the height (feet):  150
2 Enter the width (feet):   10
3 The amount of paint is 10 gallons.
```

Note: The bold letters mean the computer generates the output. The normal letters indicates the user enters the input from the keyboard

Task #2

A subject has an assignment and an exam. Both the assignment and exam are marked out of 100. The assignment contributes 40% towards the assessment of the subject and the exam 60%. A program is required that allows the user to input and assignment mark (out of 100) and an exam mark (out of 100) and display an overall mark in the proportions specified.

Sample Run

```
Assignment mark (0 to 100): 70
Exam mark (0 to 100): 60
```

Task #3

A shop owner requires a program to calculate the GST payable on items purchased. The GST is one-tenth of the pre GST price. For example, if the pre-GST price was Rs.100 then the GST is Rs.10 and the price including GST is Rs.110. The user is to input the pre-GST price and the program is to display the GST and the final price including GST.

Sample Run

```
Pre GST Price (Rs): 100
GST = Rs. 10.00
Price Including GST = Rs. 110.00
```

Task #4

Write a program to calculate the water rates for a customer. All customers are charged a service fee of Rs. 100. In addition domestic customers are charged Rs. 1.0 per litre and commercial customers Rs 1.2 per litre of water used.

Sample Run

```
Volume used (litres): 500
Type of user (D=Domestic, C=Commercial): D
Cost = Rs. 600
```

Task #5

Write pseudocode to compute a person's income tax. Here is the relevant tax law:

- There is a flat tax rate of 20 percent
- There is a Rs.10,000.00 standard deduction
- There is a Rs. 2000 additional deduction for each dependent

The user inputs are the gross income and number of dependents. The program calculates the income tax based on the inputs and the tax law and then displays the income tax.

Sample Run

```
Enter the gross income:  500000.00
Enter the number of dependents: 4
The income tax is $96400.00
The gross income after tax  $403600.0
```

Task #6

Write psedocode to represent the logic of a program that allows the user to enter a value for the radius of a circle. If the user enters a negative value or zero for the radius, the program should ask the user to enter the radius again until the radius is greater than 0 (Use a loop structure). The program calculates and displays diameter, circumference and area. If the area of the circle is less than 15, then program displays "Circle is small"; otherwise, displays "Circle is big".

Task #7

The pseudocode below calculates the future value of a fixed monthly investment. The user enters fixed monthly investment, yearly interest rate, and number of years invested. The program then calculates and displays the future value. Review the pseudocode and convert the pseudocode to a java program named lab10.java. Review section on pages 160 - 166 from the Java Programs book.

Sample Run

```
Enter the monthly investment (PKR): 10000.00
Enter the yearly interest rate (%): 8
Enter the number of years invested: 3
Future Value PKR 12597.12
```

Task #8

Write a program to display the times table (from 1 to 12) for the number input.

Sample Run

```
6 Times Table
1 x 6 = 6
2 x 6 = 12
3 x 6 = 18
...
12 x 6 = 72
```

Task #9

Write a program to display the number of days in a month. The user is to input the month number. Use an appropriate loop to validate the month number before determining the number of days in the month. Assume there are 28 days in February.

Sample Run 1

```
Month Number (1 to 12, 0 to exit) ? 13
Error: month number must be between 1 and 12, or 0 to Exit
Month Number (1 to 12, 0 to exit) ? 11
30 days
```

Sample Run 2

```
Month Number (1 to 12, 0 to exit) ? -5
Error: month number must be between 1 and 12, or 0 to Exit
Month Number (1 to 12, 0 to exit) ? 0
```

Task #10

The above problem is a simplification of the real problem. What other information needs to be input by the user to be able to determine the correct number of days in a month? Under what circumstances is it needed?

Optional: Bonus Challenge

For the following problems specify the conditional part of the problem (what the conditions are and what actions are dependent on the conditions).

a A program is required to add up three numbers and display their total.

b A program is required to divide two numbers together and display the result. However if the second number is a zero then the calculation can't be done as dividing a number by zero gives a result of infinity.

c A Bank requires a program to calculate the balance of an account after a transaction. The possible transaction types are "D" for Deposit and "W" for Withdrawal. The bank teller inputs the initial account balance, the transaction type and the transaction amount.

d A dog kennel requires a program to calculate the cost of kennelling (boarding) dogs. The cost of kennelling a dog depends on the size of the dog (Small = Rs.6, Medium = Rs.8, Large = Rs.10) and the number of days the dog stays in the kennel. No discounts are given for longer stays (e.g. the same daily rate applies for each day). The user inputs the daily charge amount (e.g. Rs.8) depending on the size of the dog, and the number of days of the stay. The total cost is then to be displayed.

e A program is required to display a grade (e.g. B) for a numeric mark (e.g. 75) input by the user. The grades are A (80 to 100), B (70 to 79), C (60 to 69), D (50 to 59) and N (0 to 49).

Hand in

Hand in the word file for this lab at the appropriate location on the blackboard system at LMS. You should hand in a single file named Lab_3_<your reg. No. XXX without angle brackets>.doc(x) that contains the following.

1. All completed pseudocodes.
2. A paragraph at the end that includes a) a brief explanation of the lab, and b) any comments, or suggestions.

To Receive Credit

1. By showing up on time for lab, working on the lab solution, and staying to the end of the class period, only then you can receive full credit for the lab assignment.
2. Comment your program heavily. Intelligent comments and a clean, readable formatting of your code account for 20% of your grade.
3. In-class lab time is not intended as free time for working on your program assignments. Only if you have completely solved the lab assignment, including all challenges, and have had your work checked off for completeness by your TA/Lab Engineer should you begin the program assignment.