

# **Government College University, Lahore**

## **Department of Computer Science**

### **Programming Fundamentals**

#### **Lab – 04**

##### **Task 01( simple help system) :**

Build a **simple help system** that displays the details for the control statements. The program displays a menu containing the control statements and then waits for you to choose one. After one is chosen, the details of the statement are displayed ( i.e syntax and other info ). In this first version of the program, help is available for only the if statements. The other control statements are added in subsequent labs.

The Program will display following menu :

**Help on:**

- 1. If**
- 2. If-then else**
- 3. If and else if**
- 4. Nested If statements**

**Choose one:**

## Task 02 ( position of falling object ):

Write a program to compute the position of an object after falling for 10 seconds, outputting the position in meters. The formula in Math notation is:

$$x(t) = 0.5 \times at^2 + vit + xi$$

Variable	Meaning	Value
a	Acceleration (m/s <sup>2</sup> )	-9.81
t	Time (s)	10
v <sub>i</sub>	Initial velocity (m/s)	0
x <sub>i</sub>	Initial position	0

Note: The correct value is -490.5 m

## Task 03 ( Pay calculator ) :

Write a program that takes the base pay and hours worked as parameters and prints the total pay or an error.

	Base Pay	Hours Worked
Employee 1	\$7.50	35
Employee 2	\$8.20	47
Employee 3	\$10.00	73

### Task 05 ( Find the winner ) :

Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

### Task 06 :

Write an application that asks a user to enter an integer. Display a statement that indicates whether the integer is **even or odd**.

### Task 07 :

Write an application that asks a user to enter three integers. Display them in **ascending and descending order**.

### Task 08 ( PC Price Calculator ):

Write an application for the **Pearl Continental Hotel**; the program determines the price of a room. Ask the user to choose 1 for a **queen bed**, 2 for a **king**, or 3 for a **king and a pullout couch**.

Display the price of the room: Rs.25,000 for queen, Rs.39,000 for king, and Rs.65,000 for suite with king bed and a pullout couch.

If the user enters an invalid code, display an appropriate message and set the price to 0.

Add a prompt to the Pearl Continental Hotel application to ask the user to specify a (1) lake view or a (2) park view, but ask only if the bed size entry (which is asked above) is valid.

Add Rs.15000 to the price of any room with a lake view. If the view value is invalid, display an appropriate message and assume that the price is for a room with a lake view.

#### Task 04 ( The Date of Easter Problem ):

A convenient algorithm for determining the date of Easter in a given year was devised in 1876 and first appeared in Butcher's Ecclesiastical Handbook. The algorithm is valid for all years in the Gregorian calendar. Subject to minor adaptations, the algorithm is as follows:

1. Let  $y$  be the year
2. Set  $a$  to  $y \% 19$
3. Set  $b$  to  $y / 100$  and  $c$  to  $y \% 100$
4. Set  $d$  to  $b / 4$  and  $e$  to  $b \% 4$
5. Set  $f$  to  $(b + 8) / 25$
6. Set  $g$  to  $(b - f + 1) / 3$
7. Set  $h$  to  $(19 * a + b - d - g + 15) \% 30$
8. Set  $i$  to  $c / 4$  and  $k$  to  $c \% 4$
9. Set  $l$  to  $(32 + 2 * e + 2 * i - h - k) \% 7$
10. Set  $m$  to  $(a + 11 * h + 22 * l) / 451$
11. Set  $n$  to  $(h + 1 - 7 * m + 114) / 31$  and  $p$  to  $(h + 1 - 7 * m + 114) \% 31$
12. Determine  $10 * (p + 1) + n$

Note that all identifiers represent integers.

The value of  $n$  gives the month (3 for March and 4 for April) and the value of  $p + 1$  gives the day of the month. These two values can be combined as  $10 * (p + 1) + n$  when 23 April would be given as 234.

Write a program which, which takes input a year  $y$  and prints the date of Easter in the form shown at step 12.

Verify that the method gives the correct date of Easter for the current year.

### **Task 09 :**

Eagle Parts runs a small factory and employs workers who are paid one of three hourly rates depending on their shift: first shift, Rs.17 per hour; second shift, Rs.18.50 per hour; third shift, Rs.22 per hour.

Each factory worker might work any number of hours per week; any hours greater than 40 are paid at one and one-half times the usual rate as overtime.

In addition, second- and third-shift workers can elect to participate in the retirement plan for which 3% of the worker's total pay is deducted from the paychecks.

Write a program that prompts the user for hours worked and shifts, and, if the shift is 2 or 3, whether the worker elects the retirement.

#### **Display:**

- (1) The Hours Worked
- (2) The Shift
- (3) The Hourly Pay Rate
- (4) The Regular Pay
- (5) Overtime Pay
- (6) The Total Of Regular And Overtime Pay
- (7) The Retirement Deduction, If Any
- (8) The Net Pay.

## Challenging Task :

In the game Rock Paper Scissors, two players simultaneously choose one of three options: rock, paper, or scissors. If both players choose the same option, then the result is a tie.

However, if they choose differently, the winner is determined as follows:

- Rock beats scissors, because a rock can break a pair of scissors.
- Scissors beat paper, because scissors can cut paper.
- Paper beats rock, because a piece of paper can cover a rock.

Create a game in which the computer randomly chooses rock, paper, or scissors. Let the user enter a number 1, 2, or 3, each representing one of the three choices. Then, determine the winner.

(you can also modify the game so that the user enters a string for rock, paper, and scissors, rather than just entering a number.)

**This task is not compulsory to submit.**

**Hint :** use Rand() in time.h library to generate random numbers. You can read more about this on :

<https://www.cplusplus.com/reference/cstdlib/rand/>

<https://www.geeksforgeeks.org/rand-and-srand-in-cpp/>