National University of Computer and Emerging Sciences



Laboratory Manual

for

Programming Fundamentals

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# Lab Manual 03

# Introduction

## Objectives

After performing this lab, students shall be able to understand decision making structure.

**1: First predict the behavior(output) of the following programs.**

**2: In case of any errors (syntax or logical) then suggest improvement.**

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| **int main(){**  **int x = 5;**  **if(x%2 != 0){**  **cout << "inside if\n";**  **return 0;**  **}**  **cout << "back in main\n";**  **return 0;**  **}** | **int main()**  **{**  **int marks = 48;**  **if(marks >= 50)**  **cout << "congrats\n";**  **cout << "promoted\n"**  **cout << "back in main\n";**  **return 0;**  **}** |
| **int main(){**  **int x = 4, y = 6;**  **if(x/y = 0){**  **cout << "inside if\n";**  **}**  **cout << "back in main\n";**  **return 0;**  **}** | **int main()**  **{**  **int x = 4;**  **if(x = = 0)**  **cout << "inside if\n";**  **cout << "back in main\n";**  **return 0;**  **}** |
| **int main()**  **{**  **int marks = 28;**  **if(marks >= 50);**  **cout << "congrats\n";**  **cout << "promoted\n"**  **cout << "back in main\n";**  **return 0;**  **}** | **int main(){**  **int x = 7, y = 9;**  **if(x = y)**  **cout << "x and y are equal\n";**  **else**  **cout << "x and y are not equal\n"**  **cout << "back in main\n";**  **return 0;**  **}** |
| **Assume that values are**  **a = 24, b = 4, c = 5, d = 7**  **c = a – b\*= c + a / = c +d;’**  **c = ?** | **Assume that a = 4, x = 9, z = 13, r = 0**  **r = ++a \* x++ / y-- ;**  **r = ?** |
| **State the order of evaluation of the operators in each of the following C++ statements**  **and show the value of x after each statement is performed.**  **a) x = 8 + 15 \* ( 6 – 2) - 1;**  **b) x = 5 % 5 + 5 \* 5 - 5 / 5;**  **c) x = ( 5 \* 7 \* ( 5 + ( 7 \* 5 / ( 7 ) ) ) );** | |

**Q#1:** Writeaprogram that prompts the user to enter an integer. Your task is to determine and display whether the provided integer is positive or negative.

**Q#2:** Write a program that prompts the user to enter a four-digit positive integer. Make sure that your program should only accept four-digit positive integer. In case of any other input your program must terminate after displaying a message “Invalid input. Please run this application again and provide a valid data”. Terminating a program in case of invalid input is not a good practice but for now you can terminate the program by writing a statement **return 0** in the corresponding block. In case of valid input your task is to determine whether the provided integer is a palindrome or not. A palindrome is an integer or a string that remains the same when reversed e.g., (6226, 1221, 7887 etc.)

**Sample input and output:**

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| Enter a four-digit positive integer: 654  Invalid input. Please run this application again and provide a valid data |
| Enter a four-digit positive integer: 6543  Not a palindrome |
| Enter a four-digit positive integer: 6336  Palindrome |

**Q#3:** Writea program that prompts the user to enter the slope of a line. Your task is to determine whether the line is horizontal or not. Keep in mind that the slope of horizontal line is 0.

**Q#4:** Write a program that prompts the user to enter the slope of two lines. Your program should only accept one-digit number i.e., the valid range is -9 to 9. Your task is to determine whether the lines are perpendicular or not. The lines are perpendicular if the product of slope of both the lines is -1. Also check whether the lines are parallel or not. Lines are parallel if their slopes are equal. Display a proper message in output.

**Q#5:** Write a program that prompts the user to enter two integers. Your task is to determine the input order and display the output in ascending order if it is already in the descending order otherwise if it is already in the ascending order then display the output in descending order. (Think about the equality case when both the values are already equal)

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| **Sample Input and output:**  Enter the values of two integers (comma separated): 87, 32  Provided input is in descending order.  Data in the ascending order: 32, 87 |
| Enter the values of two integers (comma separated): 28, 52  Provided input is already in ascending order.  Data in the descending order: 52, 28 |

**Q#6:** Write a program that prompts the user to enter numerator and denominator. Your task is to determine and display whether the fraction is proper or in-proper.

**Q#7:** Write a program that declares and initialize a constant of float data type “PI=3.14”. Check whether the value of PI is equals to 3.14. Display a message “experiment successful” inside if block. If it fails to enter if block then check the reason and solution at the end of this manual.

**Q#8:** Write a program that prompts the user to enter the total storage capacity of a smart phone in GB. Your program should not accept any value less than 128 GB. (Terminate your program in case of valid input by display a proper message like one shown in the sample output). We know that installed operating systems and system applications occupy some of the storage capacity which is 30% in this case i.e., 30% of the total storage capacity is already occupied by the installed operating system and the other system applications. Assume that 25 images will occupy the 4% of the available storage capacity and there are 178 images in the gallery. After storing the images, available memory will be used to store the videos. Assume that 18 videos will occupy the space of 4.5 GB and there are 81 videos in the gallery. Available Cache is 12 GB (Most frequently used websites or applications are available in cache so that these websites or applications can be launched at faster rate than usual). 70% cache is currently utilized, and amount of memory occupied by the social media applications like (Facebook, WhatsApp, Instagram, twitter etc.) and other gaming applications is 24.56 GB. Now user wants to install another application that requires storage capacity of 15.7 GB. Your task is to calculate and display the available storage to the user. If the available storage is less than 16 GB then prompt the message “In sufficient memory. Clear Cache or insert memory card” otherwise display the display the message “Sufficient memory to install this application”.

**Sample Input and output:**

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| Enter the total storage capacity in GB: 64  Invalid input. Please run this application again and provide a valid input greater than 128. |
| Enter the total storage capacity in GB: 128  Available storage capacity is: 10.87192 GB  In sufficient memory. Clear Cache or insert memory card |

**Q#7 (Solution):**

It is not advisable to directly compare floating point values because they have precision issues which means 3.14 stored in PI (constant float or double) might not exactly match 3.14 in your comparison due to rounding errors.

**Solution:**

1. Define small tolerance for minor difference e.g., declare a double constant say epsilon and initialize with very small value say 1e-6.
2. Use tolerance in comparison to check if the difference between the numbers is smaller than tolerance.

double epsilon = 1e-6; // a small tolerance factor

float PI = 3.14;

if ((PI - 3.14) < epsilon) //comparison

cout<<"experiment successful\n";

return 0;