Programming Fundamentals (CT-175)
Lab 04

Conditional Structure – If-else, Nested If-else, Ladder If-else-if

Objectives

The objective of this lab is to familiarize students with the conditional structure. By the end of this lab students will be able to write conditional programs by using different simple and nested conditional structure.

Tools Required

DevC++ IDE

Course Coordinator –
Course Instructor –
Lab Instructor –
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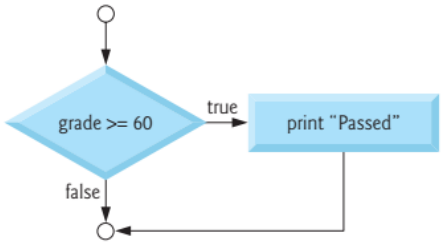
Conditional/Selection Structure in C

A selection structure is a programming feature that performs different processes based on whether a boolean condition is true or false. Selection structures use relational operators to test conditions. There are different types of selection structures that can be used to achieve different outcomes.

If – Single selection Statement

If you want your program to do something if a condition is true, but do nothing if that condition is false, then you should use an if-end structure.

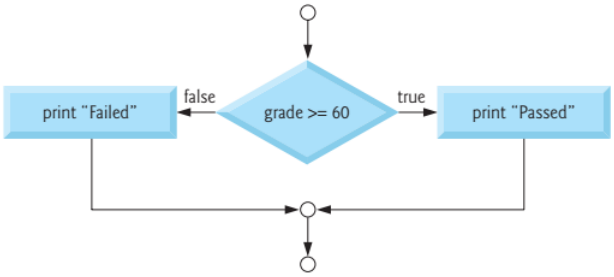
```
if ( grade >= 60 ) {
   printf( "Passed\n" );
} // end if
```



If-else – Double selection Statement

If you want your program to do something if a condition is true and do something different if it is false, then you should use an if-else structure.

```
if ( grade >= 60 ) {
   puts( "Passed" );
} // end if
else {
   puts( "Failed" );
} // end else
```



Example 01: Find out if a person is eligible for voting or not.

```
#include <stdio.h>
int main( ){
  int age;
  printf("Enter your age:");
  scanf("%d",&age);
  if(age >=18)
        printf("You are eligible for voting");
  else
        printf("You are not eligible for voting");
  return 0;
}
```

Note that we can omit the curly braces, enclosing the body, if there is only one statement inside body of if or else.

Ladder If-else-if – Multiple Selection Statement

If you want to test multiple conditions, then you can include an elseif structure within an if-end or if-else structure.

```
if ( grade >= 90 ) {
   puts( "A" );
} // end if
else if ( grade >= 80 ) {
   puts( "B" );
} // end else if
else if ( grade >= 70 ) {
   puts( "C" );
} // end else if
else if ( grade >= 60 ) {
   puts( "D" );
} // end else if
else {
   puts( "F" );
} // end else
```

Example 02: Find maximum of two numbers.

```
#include <stdio.h>
int main( ){
  int var1, var2;
  printf("Input the value of var1:");
  scanf("%d", &var1);
  printf("Input the value of var2:");
  scanf("%d",&var2);
  if (var1 !=var2)
        printf("var1 is not equal to var2\n");
  else if (var1 > var2)
        printf("var1 is greater than var2\n");
  else if (var2 > var1)
        printf("var2 is greater than var1\n");
  else
        printf("var1 is equal to var2\n");
  return 0;
}
```

Nested If... else Statements

Test for multiple cases by placing if...else statements inside if...else statements.

```
if ( grade >= 90 ) {
   puts( "A" );
} // end if
else {
   if ( grade >= 80 ) {
      puts("B");
   } // end if
   else {
      if ( grade >= 70 ) {
         puts("C");
      } // end if
      else {
         if ( grade >= 60 ) {
            puts( "D" );
         } // end if
         else {
            puts( "F" );
         } // end else
      } // end else
   } // end else
} // end else
```

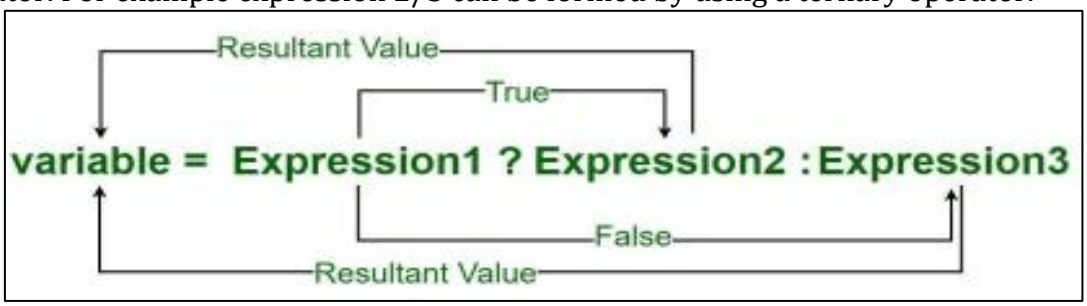
Example 03: Find maximum of two numbers.

```
#include <stdio.h>
int main( ){
```

```
  int var1, var2;
  printf("Input the value of var1:");
  scanf("%d", &var1);
  printf("Input the value of var2:");
  scanf("%d",&var2);
  if (var1 != var2){
        printf("var1 is not equal to var2\n");
        //Nested if else
        if (var1 > var2)
              printf("var1 is greater than var2\n");
        else
              printf("var2 is greater than var1\n");
  }
  else
        printf("var1 is equal to var2\n");
  return 0;
}
```

Ternary Operator in C (?:)

The ternary operator takes three operands/expressions as input. If the result of expression1 is true then expression2 is returned otherwise expression3 is returned. It is equivalent to simple if-else statement. We can nest ternary operator within a ternary operator. For example expression 2/3 can be formed by using a ternary operator.



Example 04: Find out if a person is eligible for voting or not.

```
#include <stdio.h>
int main() {
  int age;
  // take input from users
  printf("Enter your age: ");
  scanf("%d", &age);
  // ternary operator to find if a person can vote or not
  (age >= 18) ? printf("You can vote") : printf("You cannot vote");
  return 0;
}
```

Example 05:

```
#include <stdio.h>
int main( ) {
  char operator = '+';  // create variables
  int num1 = 8, num2 = 7,  result=0 ;
  result= (operator == '+') ? (num1 + num2) : (num1 - num2);
  printf("%d", result);
  return 0;
}
```

Exercise

1. Write a C program to input a character from user and check whether given character is small alphabet, capital alphabet, digit or special character, using if else.
2. Write a C program to receive an 8-bit number into a variable and then check if its 4th and 7th bits are on. If these bits are found to be on, then put them off.
3. An online shopping store is providing discounts on the items due to the Eid. If the cost of items is more than 1999 it will give a discount upto 50%. If the cost of shopping is 2000 to 4000, a 20% discount will be applied. If the cost of shopping is 4001 to 6000, a 30% discount will be applied. If it's more than 6000 then 50% discount will be applied to the cost of shopping. Print the actual amount, saved amount and the amount after discount.
4. Write a C program to find all roots of a quadratic equation by using the given formula; it is required to take user input for a, b and c values.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

5. Teacher asks the student to check whether the input number is divisible by 7 or not. For checking the divisibility, take the last digit and double it, take the rest of the digits and subtract the doubled last digit repeat until the result is 7, -7 or 0. For example:
   10976 -> 1097-12 = 1085 -> 108-10 = 98 -> 9-16 = -7
   49 -> 4 - 18 = 14 -> 1 - 8 = -7
6. Write a program that asks for the number of calories and fat grams in a food. The program should display the percentage of calories that come from fat. If the calories from fat are less than 30% of the total calories of the food, it should also display a message indicating that the food is low in fat. One gram of fat has 9 calories, so Calories from fat = fat grams * 9. The percentage of calories from fat can be calculated as: calories from fat/total calories
   Input validation: Make sure the number of calories and fat grams are not less than 0. Also, the number of calories from fat cannot be greater than the total number of calories. If that happens, display an error message indicating that either the calories or fat grams were incorrectly entered.

Lab 04 Evaluation		
Student Name:	**Student ID:**	**Date:**
Task No.	**Marks**	**Remarks by teacher in accordance with the rubrics**
1		
2		
3		
4		
5		