CL-1002 Programming Fundamentals

LAB - 05

Basic Decision Structure (if, if-else and Switch Statements)

NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES
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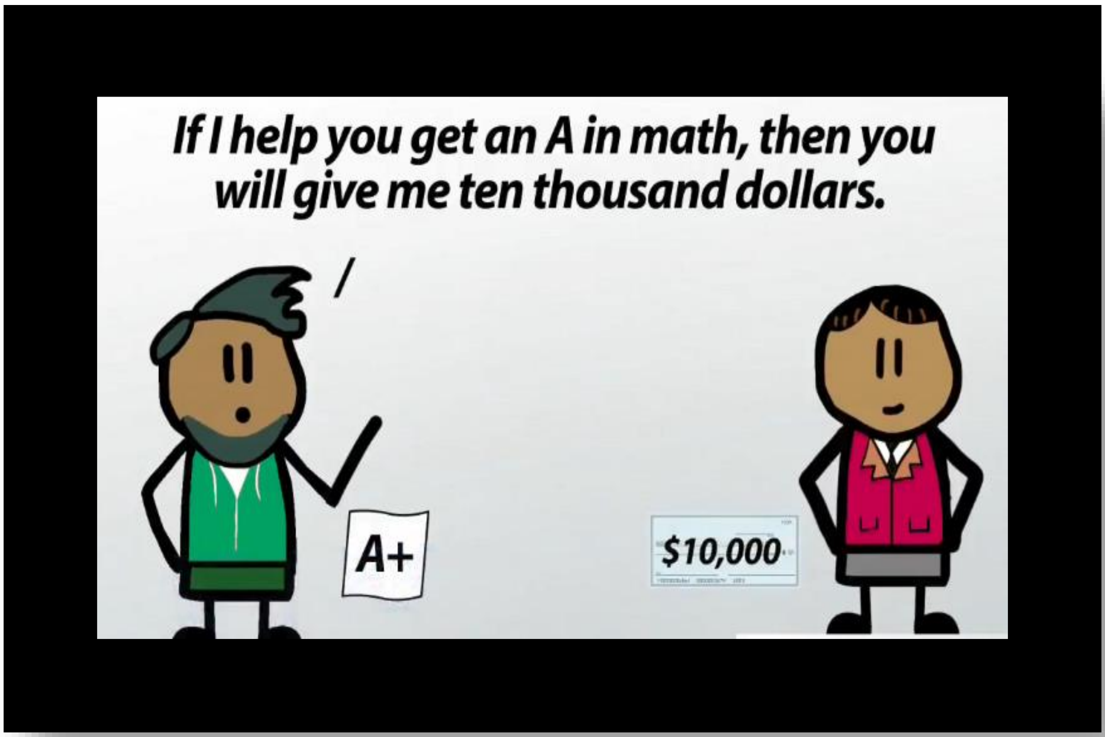
Learning Objectives

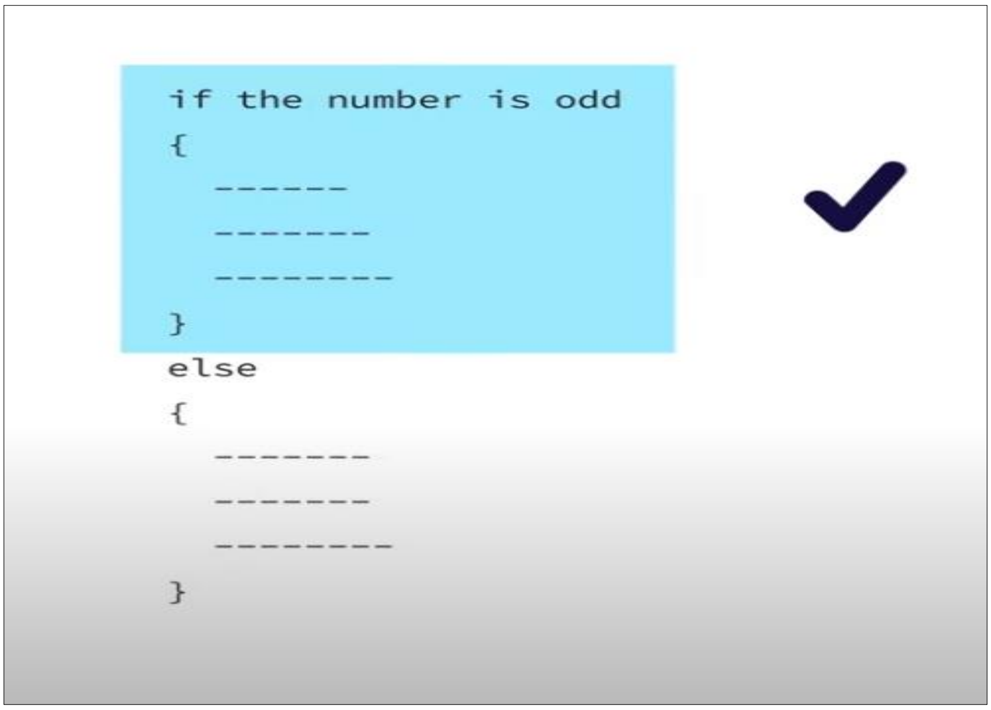
- Introduction to conditional statements
- If structure
- If –else structure
- If-else-if structure
- Switch statements

Conditional Statements

In C programming there are decision making statements, we need this kind of statements because while programming we often need to make a lot of decisions. Like shown below in the pictures.

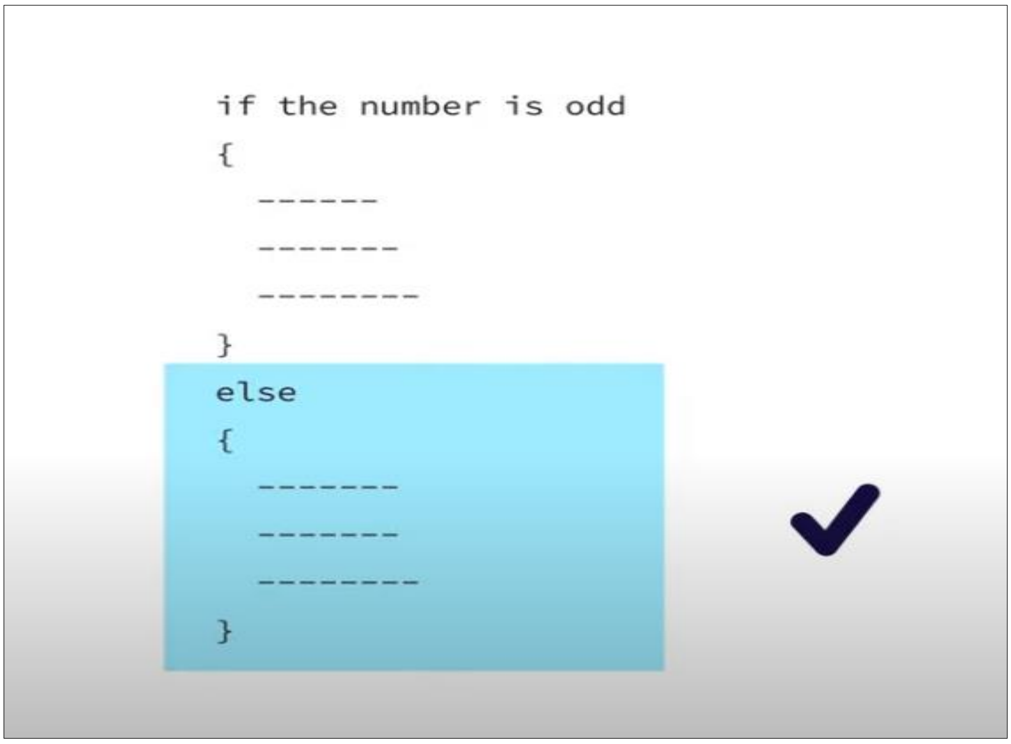

If I help you get an A in math, then you will give me ten thousand dollars.
A+
$10,000

In some cases, we need to execute this block of code



```
if the number is odd
{
   ------
   -------
   --------
}
else
{
   -------
   -------
   --------
}
```

Otherwise we want to execute this block


```
if the number is odd
{
  ------
  -------
  --------
}
else
{
  -------
  -------
  --------
}
```

In C, an if/else statement specifies that one block of code should be executed if a condition is true, and another block should be executed if that condition is false.

To write meaningful if/else statements, it is important to know operators which allow us to compare two expressions and produce a Boolean outcome.

In C, however, there are no distinct values for true or false, instead, false is 0, and anything which is non-zero is true. We will refer to true and false because they make more sense conceptually; the distinction should not make a practical difference in most cases.

expr1 == expr2	tests if expr1 is equal to expr2
expr1 != expr2	tests if expr1 is not equal to expr2
expr1 < expr2	tests if expr1 is less than expr2
expr1 <= expr2	tests if expr1 is less than or equal to expr2
expr1 > expr2	tests if expr1 is greater than expr2
expr1 >= expr2	tests if expr1 is greater than or equal to expr2
!expr	computes the logical NOT of expr
expr1 && expr2	computes the logical AND of expr1 and expr2
expr1 || expr2	computes the logical OR of expr1 and expr2

In 'C' programming conditional statements are possible with the help of the following two constructs:

1. If statement

2. If-else statement

It is also called as branching as a program decides which statement to execute based on the result of the evaluated condition.

If statement

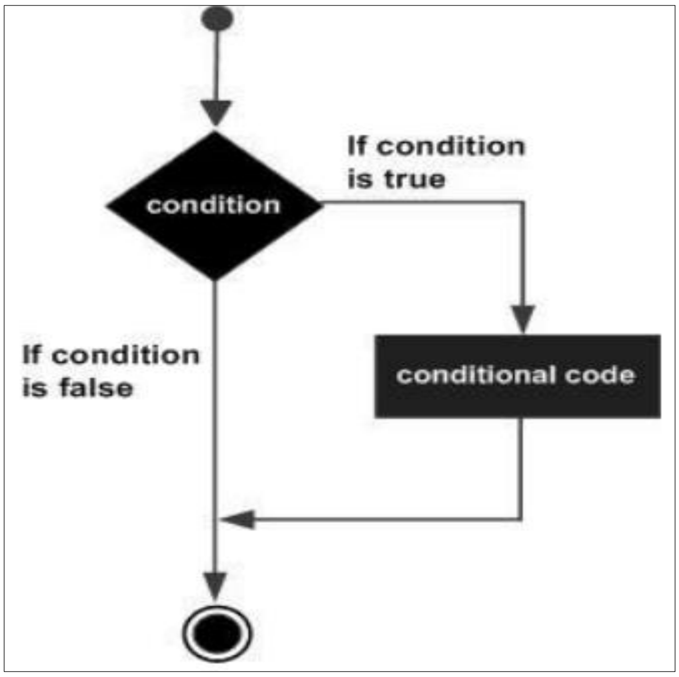
An if statement consists of a conditional expression followed by one or more statements.

If the conditional expression evaluates to true, then the block of code inside the if statement will be executed. If conditional expression evaluates to false, then the first set of code after the end of the if statement (after the closing curly brace) will be executed.

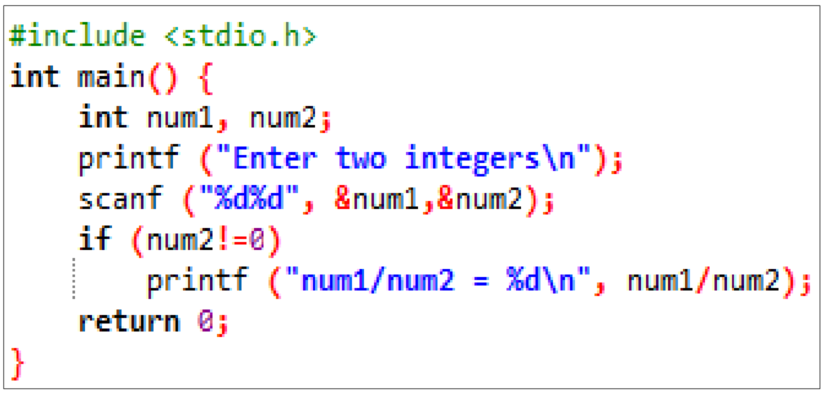
Syntax: The syntax of an if statement in C programming language is:

```
If (condition)
        {
              //statements;
         }
```

Flowchart:



Example:



```c
#include <stdio.h>
int main() {
    int num1, num2;
    printf ("Enter two integers\n");
    scanf ("%d%d", &num1,&num2);
    if (num2!=0)
        printf ("num1/num2 = %d\n", num1/num2);
    return 0;
}
```

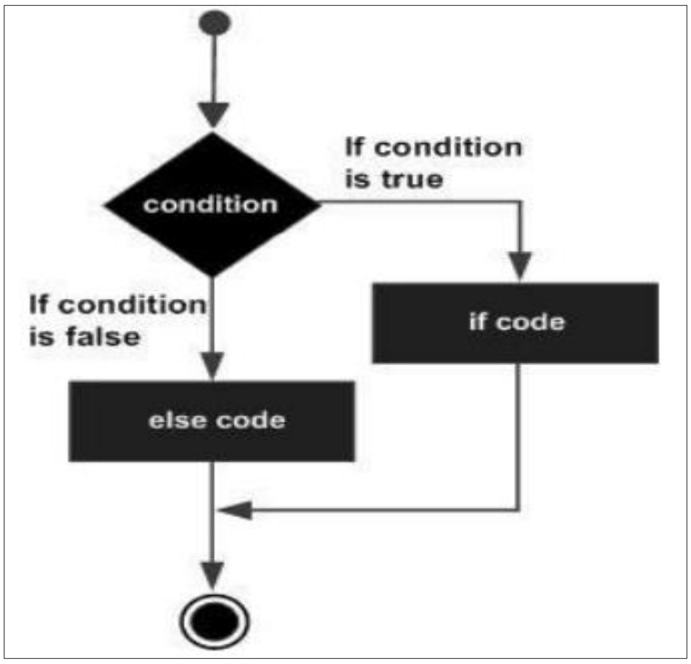
If else statement

An if statement can be followed by an optional else statement, which executes when the boolean expression is false.

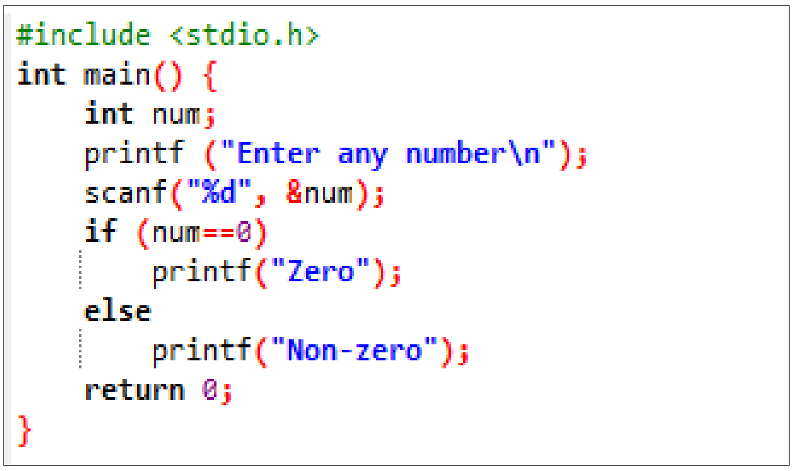
Syntax: The syntax of an if...else statement in C programming language is:

```
If (condition)

            {

              //statements;

              }

else

            {

             //statements;

              }
```

Flowchart:



Example:



```
#include <stdio.h>
int main() {
    int num;
    printf ("Enter any number\n");
    scanf("%d", &num);
    if (num==0)
        printf("Zero");
    else
        printf("Non-zero");
    return 0;
}
```

If else if statement

An **if** statement can be followed by an optional **else if...else** statement, which is very useful to test various conditions using single **if...else if** statement.

When using **if , else if , else** statements there are few points to keep in mind:

- An **if** can have zero or one else's and it must come after any **else if's**.
- An **if** can have zero to many **else if's** and they must come before the **else**.
- Once an **else if** succeeds, none of the remaining **else if's** or **else's** will be tested.

Syntax: The syntax of an if...else statement in C programming language is:

```
If (condition)
            {
                //statements;
              }
else if (condition)
            {
                //statements;
              }
else if (condition)
            {
               //statements;
              }
else
            {
              //statements;
              }
```

Example:

```
#include <stdio.h>

int main () {

        int a = 100;

        if( a == 10 ) {

                printf("Value of a is 10\n" );

        } else if( a == 20 ) {

                printf("Value of a is 20\n" );

        } else if( a == 30 ) {

                printf("Value of a is 30\n" );

        } else {

                 printf("None of the values is matching\n" );

        }

        printf("Exact value of a is: %d\n", a );

        return 0;

}
```

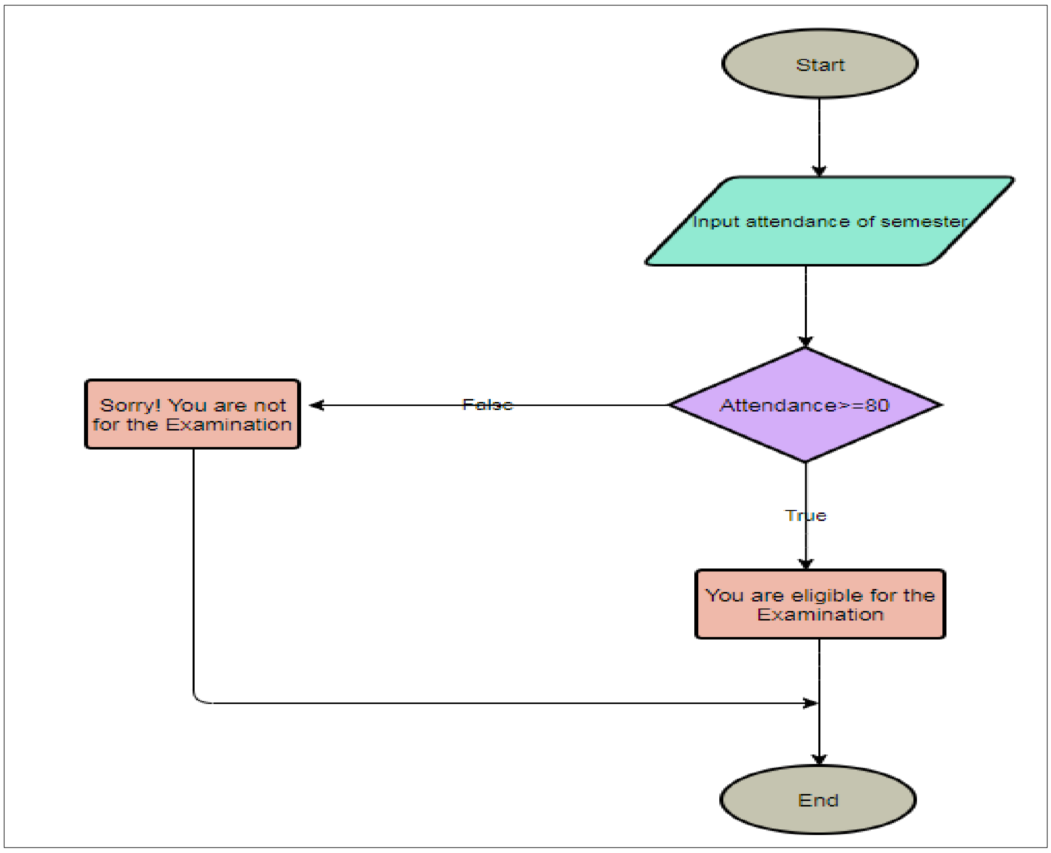
Problem

In FAST University 80% attendance is required for students to appear in the examination otherwise you won't be able to sit in an exam.

Algorithm

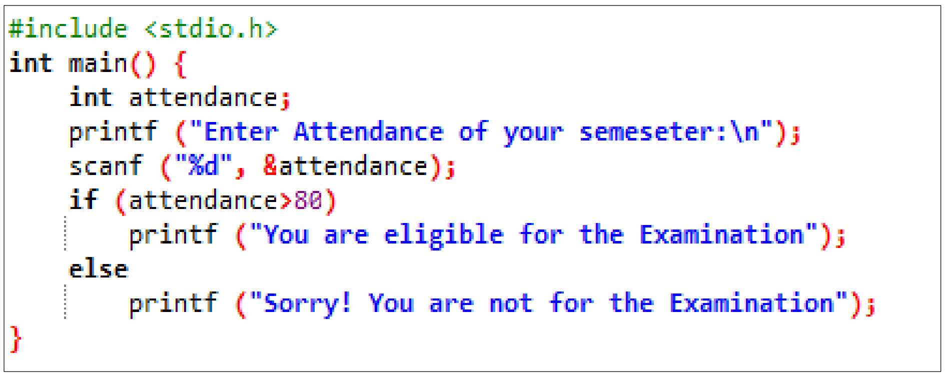
```
Start
Input attendance of semester
IF attendance>=80
    then
        print "You are eligible for the Examination"
ELSE
        print "Sorry you are not eligible for Exam"
END IF
```

Flowchart



Start
Input attendance of semester
Attendance>=80
False
Sorry! You are not for the Examination
True
You are eligible for the Examination
End

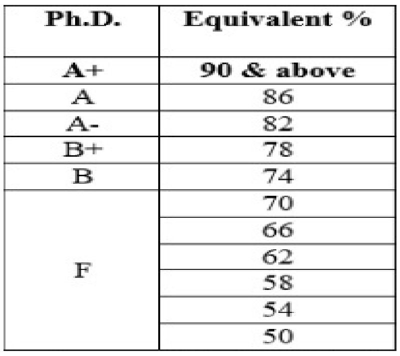
C Code



```c
#include <stdio.h>
int main() {
    int attendance;
    printf ("Enter Attendance of your semeseter:\n");
    scanf ("%d", &attendance);
    if (attendance>80)
        printf ("You are eligible for the Examination");
    else
        printf ("Sorry! You are not for the Examination");
}
```

Problem

FAST University wants to assign a grade to every PhD student according to the obtained marks. The grading criteria for the PhD students is given below.

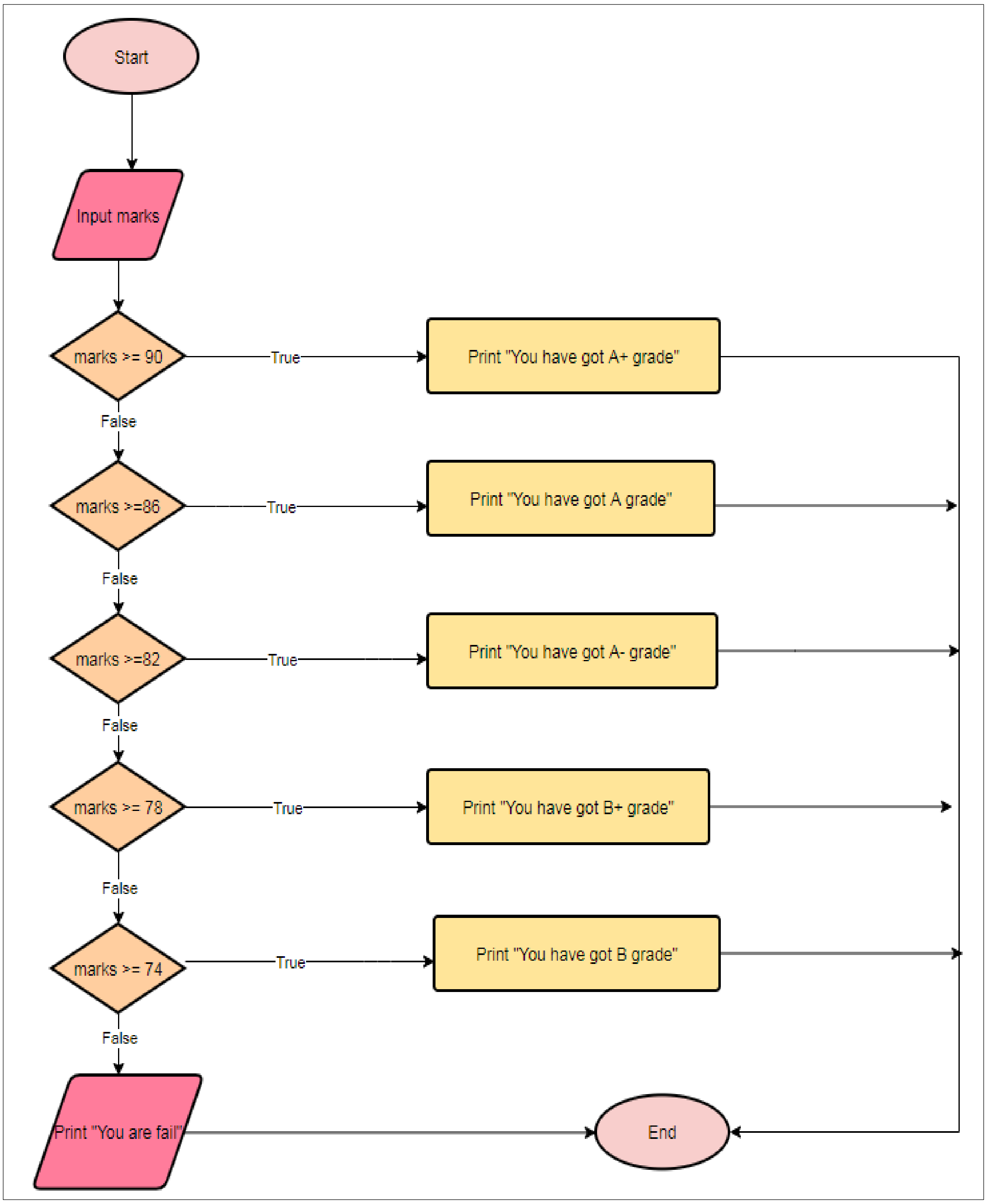


Ph.D.	Equivalent %
A+	90 & above
A	86
A-	82
B+	78
B	74
F	70
	66
	62
	58
	54
	50

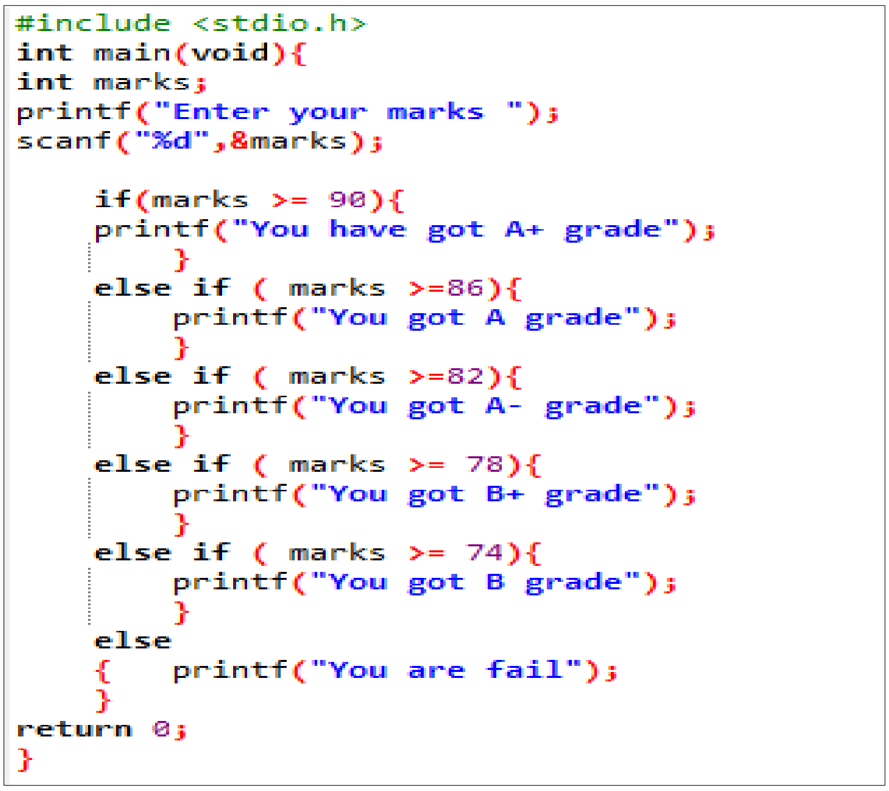
Write a program to assign the grade to each student according to his marks.

```
1) Start
2) Input marks
3) IF marks>=90
      then
           print "You have got A+ grade"
   ELSE
     IF marks>=86
       then
           print "You have got A grade"
   ELSE
     IF marks>=82
       then
           print "You have got A- grade"
   ELSE
     IF marks>=78
       then
           print "You have got B+ grade"
   ELSE
     IF marks>=74
       then
           print "You have got B grade"
   ELSE
           print "You are fail"
   END IF

4) END
```

Algorithm


Start
Input marks
marks >= 90
True
Print "You have got A+ grade"
False
marks >=86
True
Print "You have got A grade"
False
marks >=82
True
Print "You have got A- grade"
False
marks >= 78
True
Print "You have got B+ grade"
False
marks >= 74
True
Print "You have got B grade"
False
Print "You are fail"
End

C Code

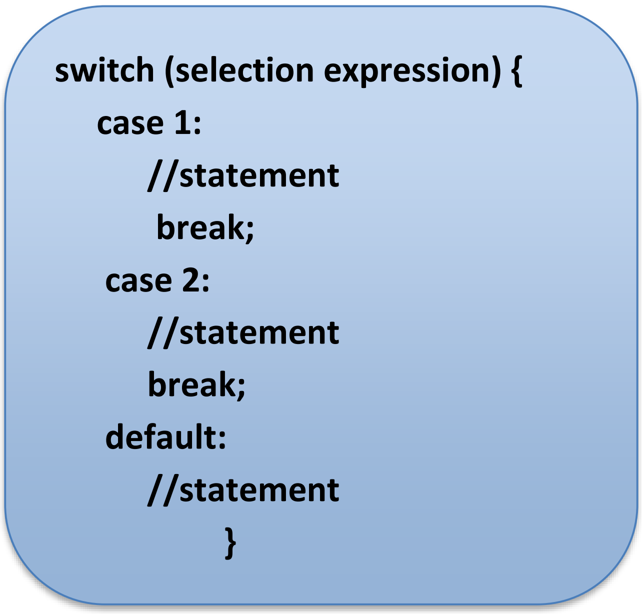


```
#include <stdio.h>
int main(void){
int marks;
printf("Enter your marks ");
scanf("%d",&marks);

    if(marks >= 90){
    printf("You have got A+ grade");
        }
    else if ( marks >=86){
        printf("You got A grade");
        }
    else if ( marks >=82){
        printf("You got A- grade");
        }
    else if ( marks >= 78){
        printf("You got B+ grade");
        }
    else if ( marks >= 74){
        printf("You got B grade");
        }
    else
    {   printf("You are fail");
    }
return 0;
}
```

Switch Statement

Another way that programs can make decisions is to use switch/case. The syntax of switch/case is shown in the figure below.

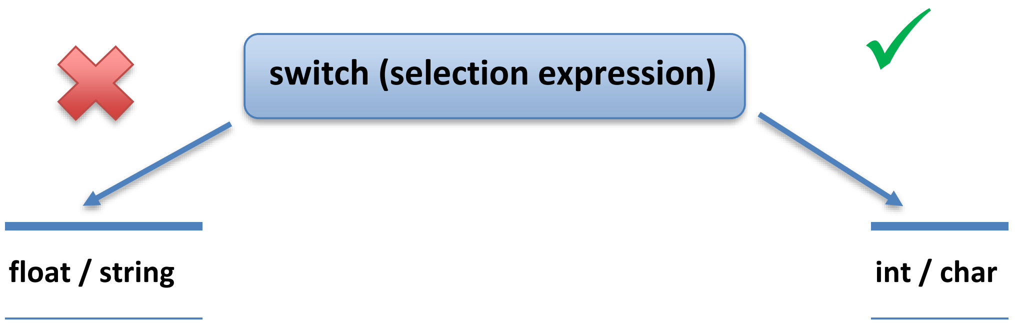
Syntax:



```
switch (selection expression) {
    case 1:
        //statement
         break;
     case 2:
        //statement
        break;
     default:
        //statement
            }
```

Here, when the execution arrow reaches the switch statement, the selection expression—in parenthesis after the keyword switch—is evaluated to a value.

This value is then used to determine which case to enter. The execution arrow then jumps to the corresponding case—the one whose label (the constant immediately after the keyword case) matches the selection expression's value. If no label matches, then the execution arrow jumps to the default case if there is one, and to the closing curly brace of the switch if not.



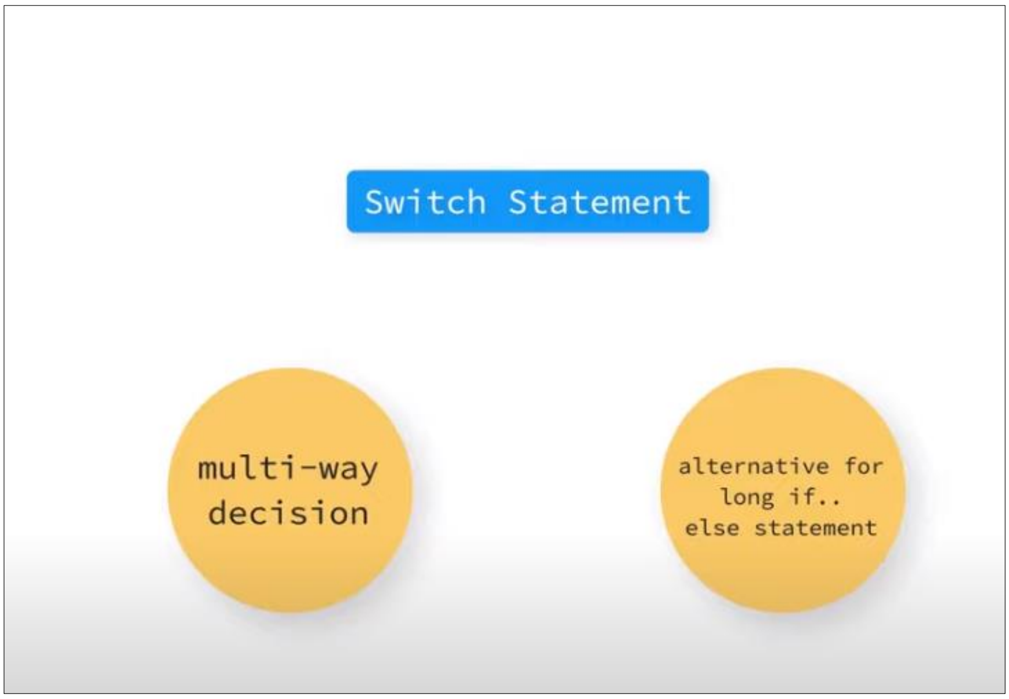
The following rules apply to a **switch** statement:

- The **expression** used in a **switch** statement must have an integral or enumerated type, or be of a class type in which the class has a single conversion function to an integral or enumerated type.
- You can have any number of case statements within a switch. Each case is followed by the value to be compared to and a colon.

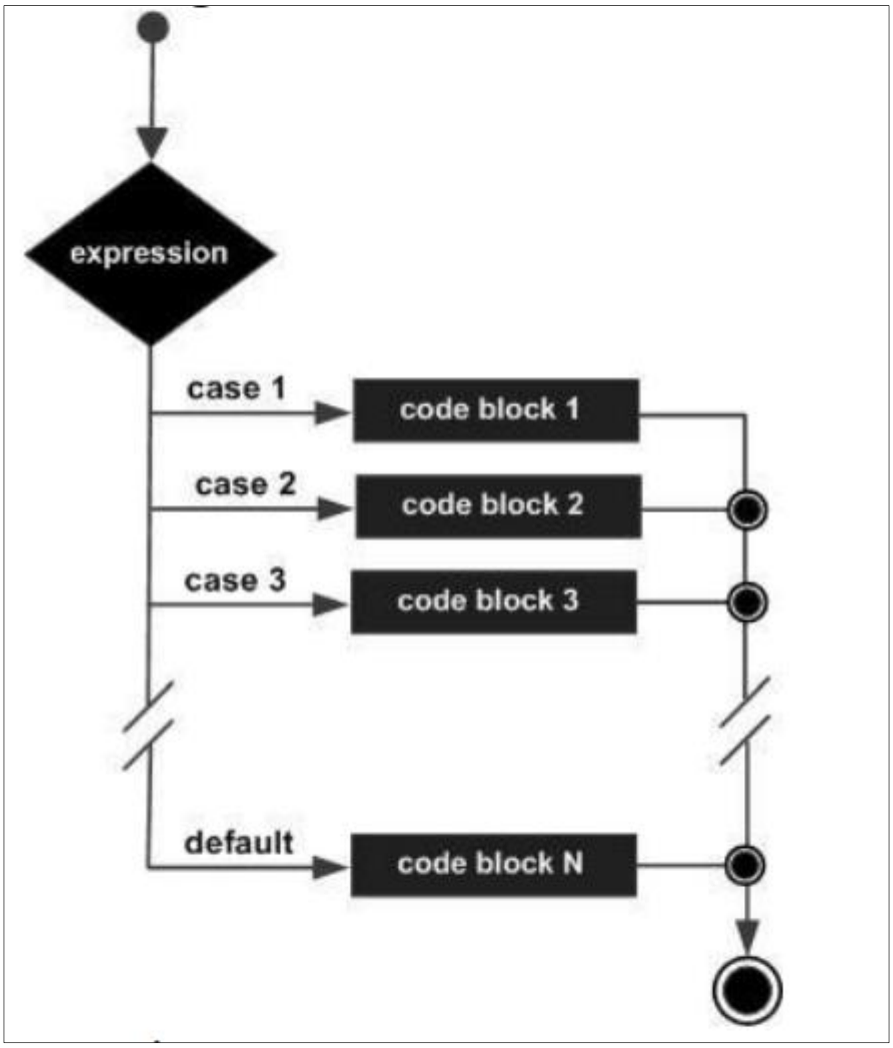
Switch statement is better than if else statement

A switch statement is **usually more efficient than a set of nested ifs**

Switch statement acts as a substitute for a long **if-**else-if ladder that is used to test a list of cases.



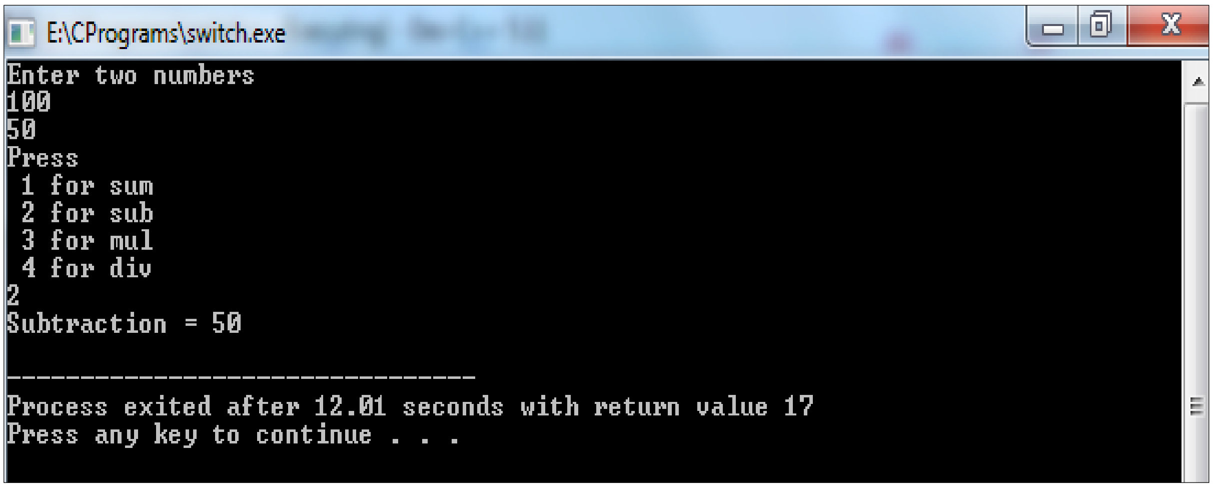
Flowchart


expression
case 1
code block 1
case 2
code block 2
case 3
code block 3
default
code block N

Example:

```c
#include <stdio.h>
int main() {
    int num1, num2, choice;
    printf ("Enter two numbers\n");
    scanf("%d%d", &num1, &num2);

    printf("Press \n 1 for sum \n 2 for sub \n 3 for mul \n 4 for div\n");
    scanf ("%d", &choice);

    switch (choice) {
        case 1:
            printf("Sum = %d\n", num1 + num2);
            break;
        case 2:
            printf("Subtraction = %d\n", num1 - num2);
            break;
        case 3:
            printf("Multiplication = %d\n", num1 * num2);
            break;
        case 4:
            printf("Division = %d\n", num1 / num2);
            break;
        default:
            printf("Enter valid choice\n");
    }
}
```

Output:



E:\CPrograms\switch.exe

```
Enter two numbers
100
50
Press
 1 for sum
 2 for sub
 3 for mul
 4 for div
2
Subtraction = 50

--------------------------------
Process exited after 12.01 seconds with return value 17
Press any key to continue . . .
```