CS-1004 Programming Fundamentals

LAB - 05

Basic Decision Structure

NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES
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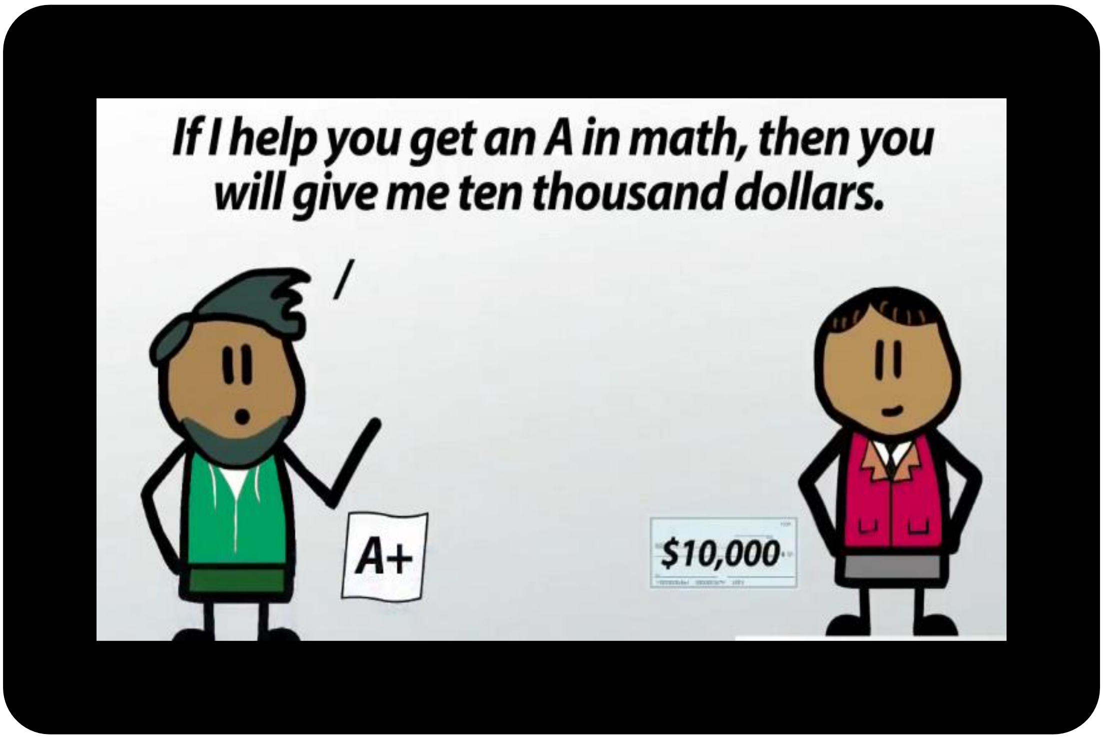
NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES

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 '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

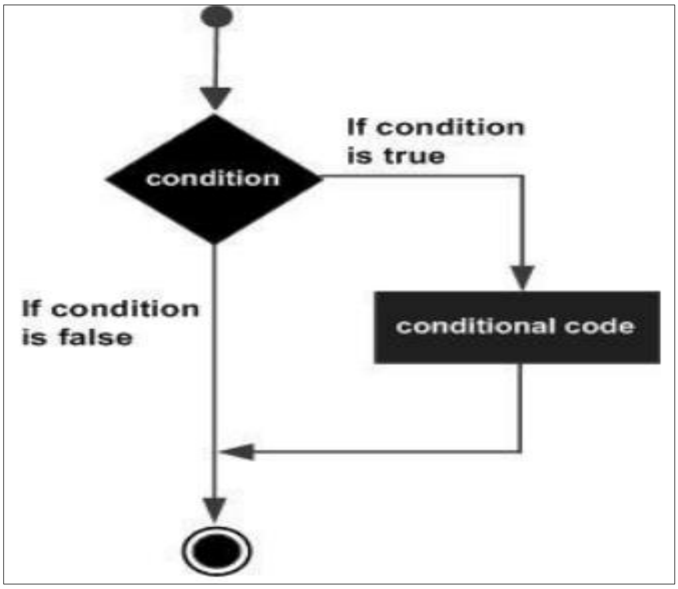
An if statement consists of a conditional expression followed by one or more statements.

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.

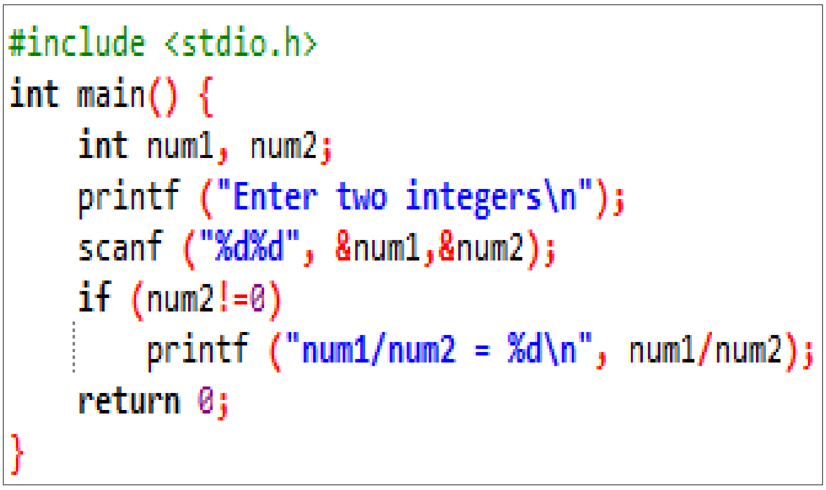
Syntax: The syntax of an if statement in C programming language is:

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

Flowchart:



Example: Divisibility by 0.



```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;
}
```

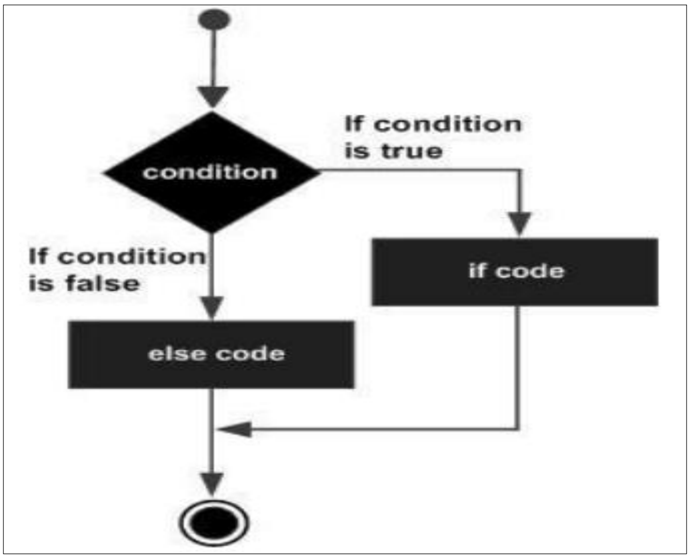
If else statement

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;
                  }
```

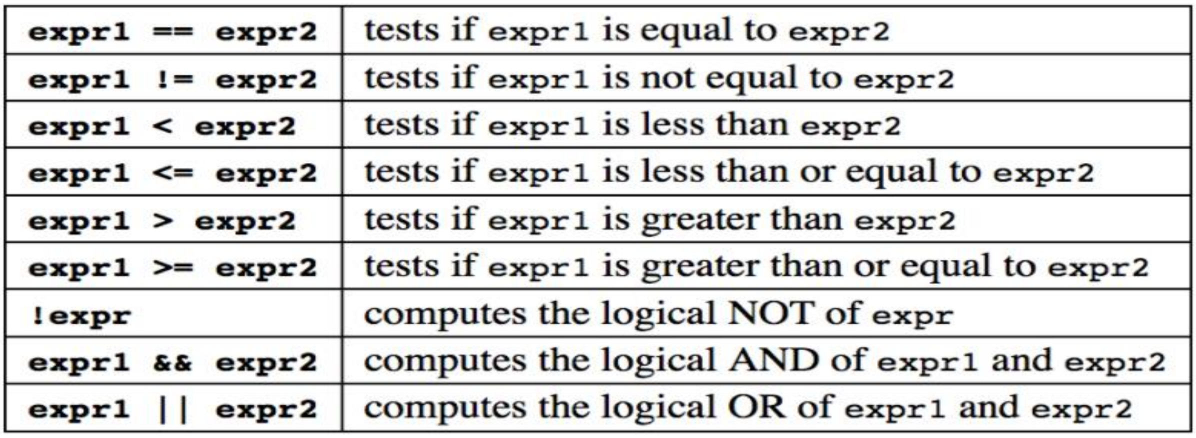
Flowchart:



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.

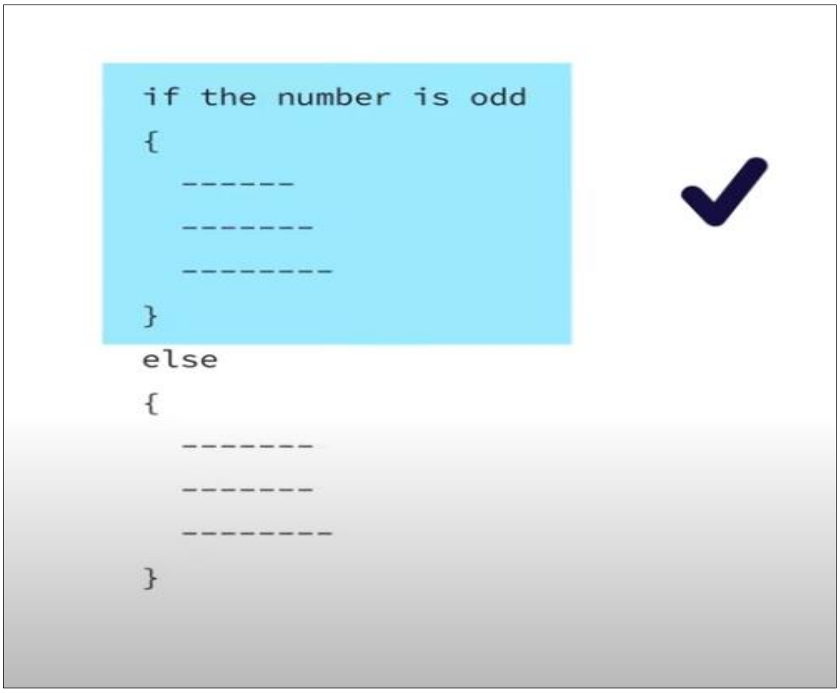
To write meaningful if/else statements, it is important to know operators which allow us to compare two expressions and produce a Boolean outcome.

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.



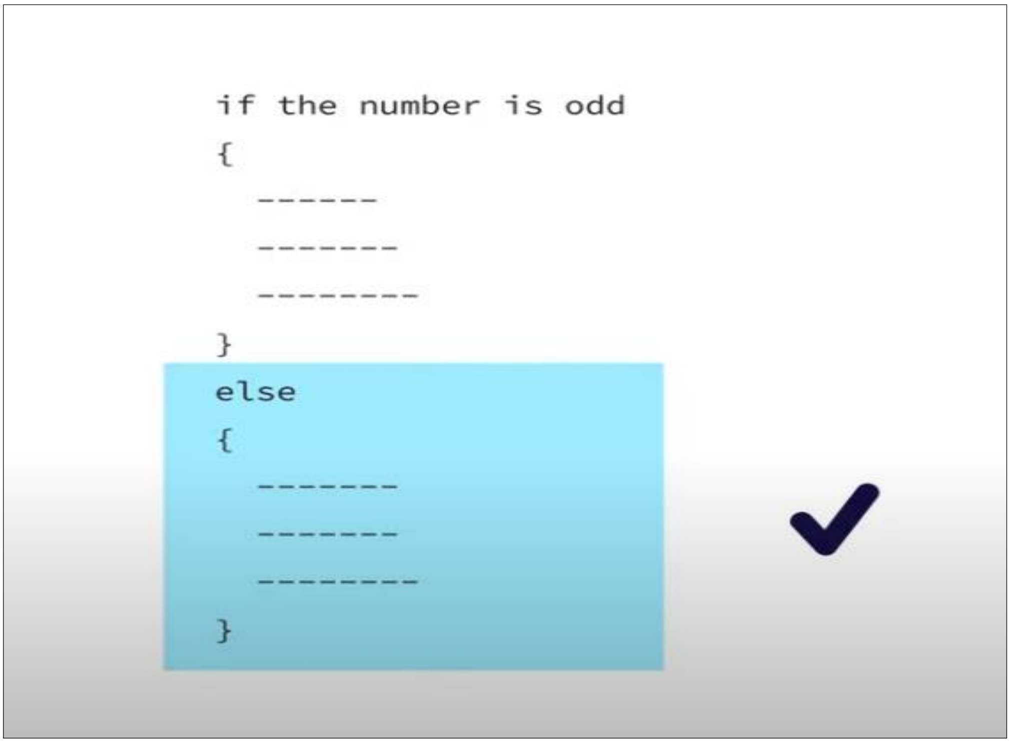
`expr1 == expr2`	tests if `expr1` is equal to `expr2`
`expr1 != expr2`	tests if `expr1` is not equal to `expr2`
`expr1 < expr2`	tests if `expr1` is less than `expr2`
`expr1 <= expr2`	tests if `expr1` is less than or equal to `expr2`
`expr1 > expr2`	tests if `expr1` is greater than `expr2`
`expr1 >= expr2`	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 some cases we need to execute this block of code



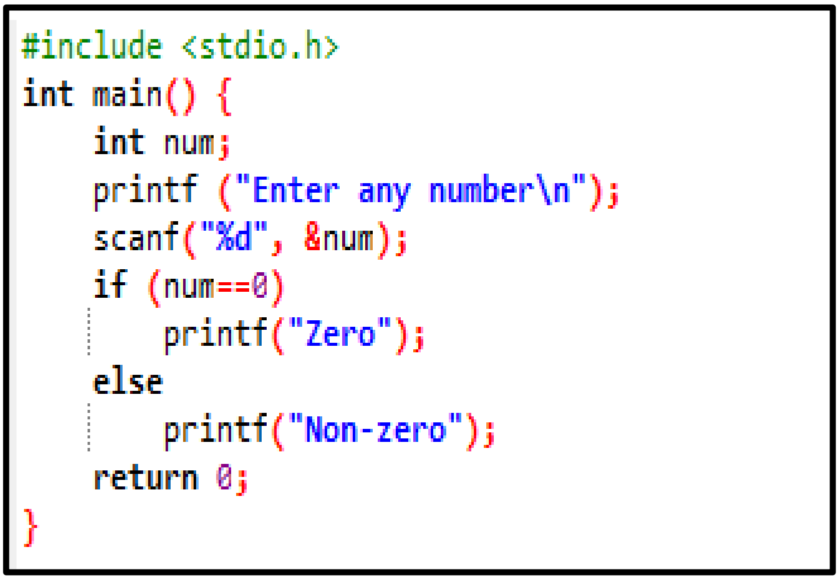
```
if the number is odd
{
  ------
  -------
  --------
}
else
{
  -------
  -------
  --------
}
```

Otherwise we want to execute this block



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

Example: Checking if the number input by user is 0 or not. If its 0 then print Zero else print Non-zero



```
#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.

Example:

Checking the value of variable a, if it contains 10 then print value of a is 10, if it contains 20 then print value of a is 20, if its 30 then print value of a is 20 otherwise print None of the value is matching

```
#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;

}
```

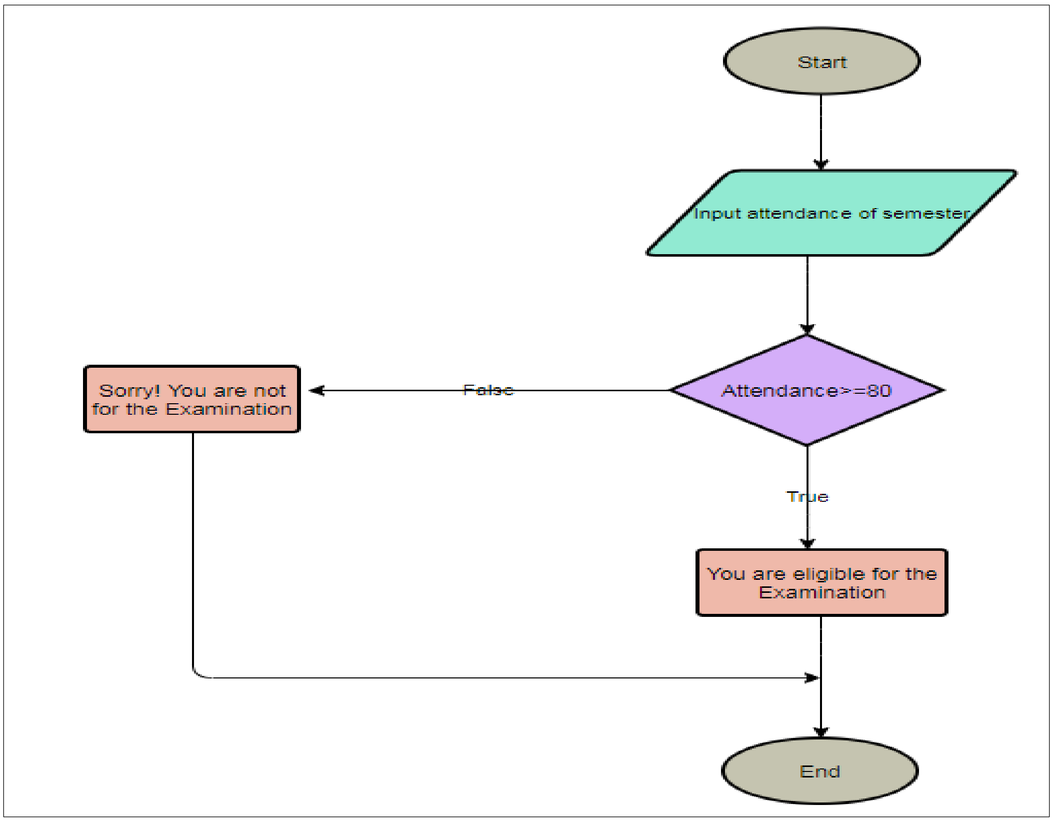
Problem

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.

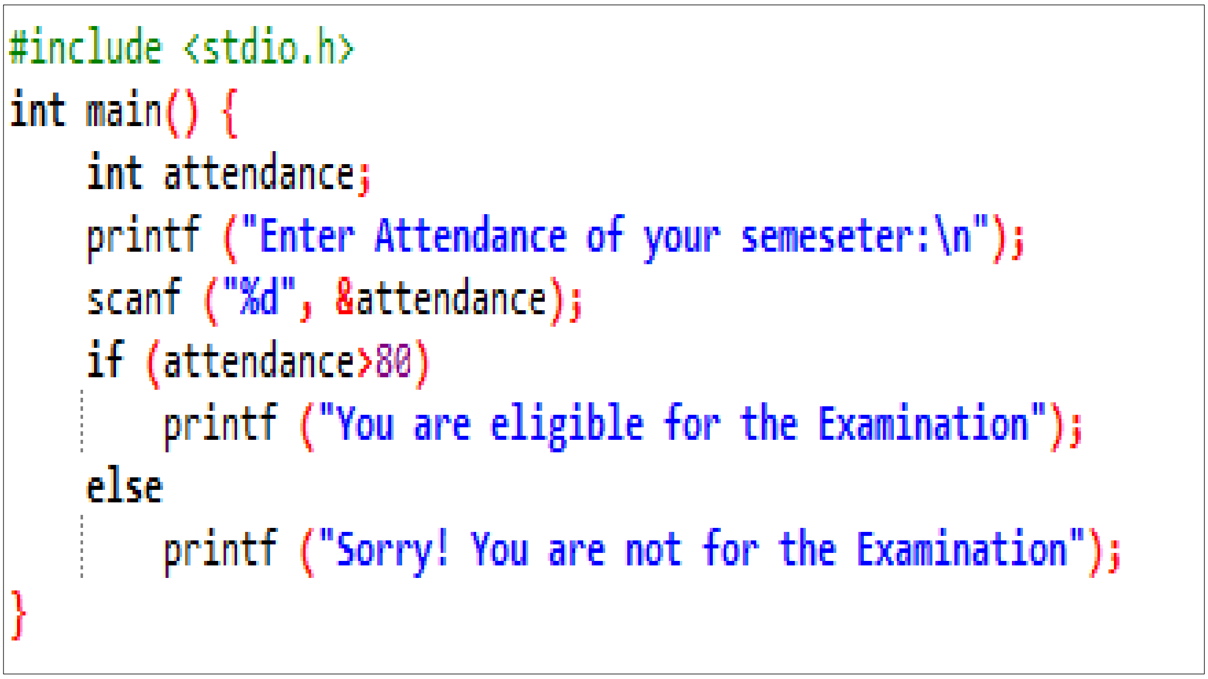
Algorithm

```
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
True
Sorry! You are not for the Examination
You are eligible for the Examination
End

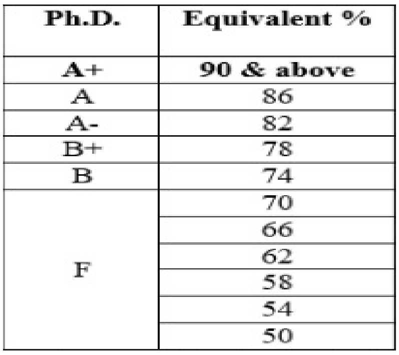
C Code



```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.

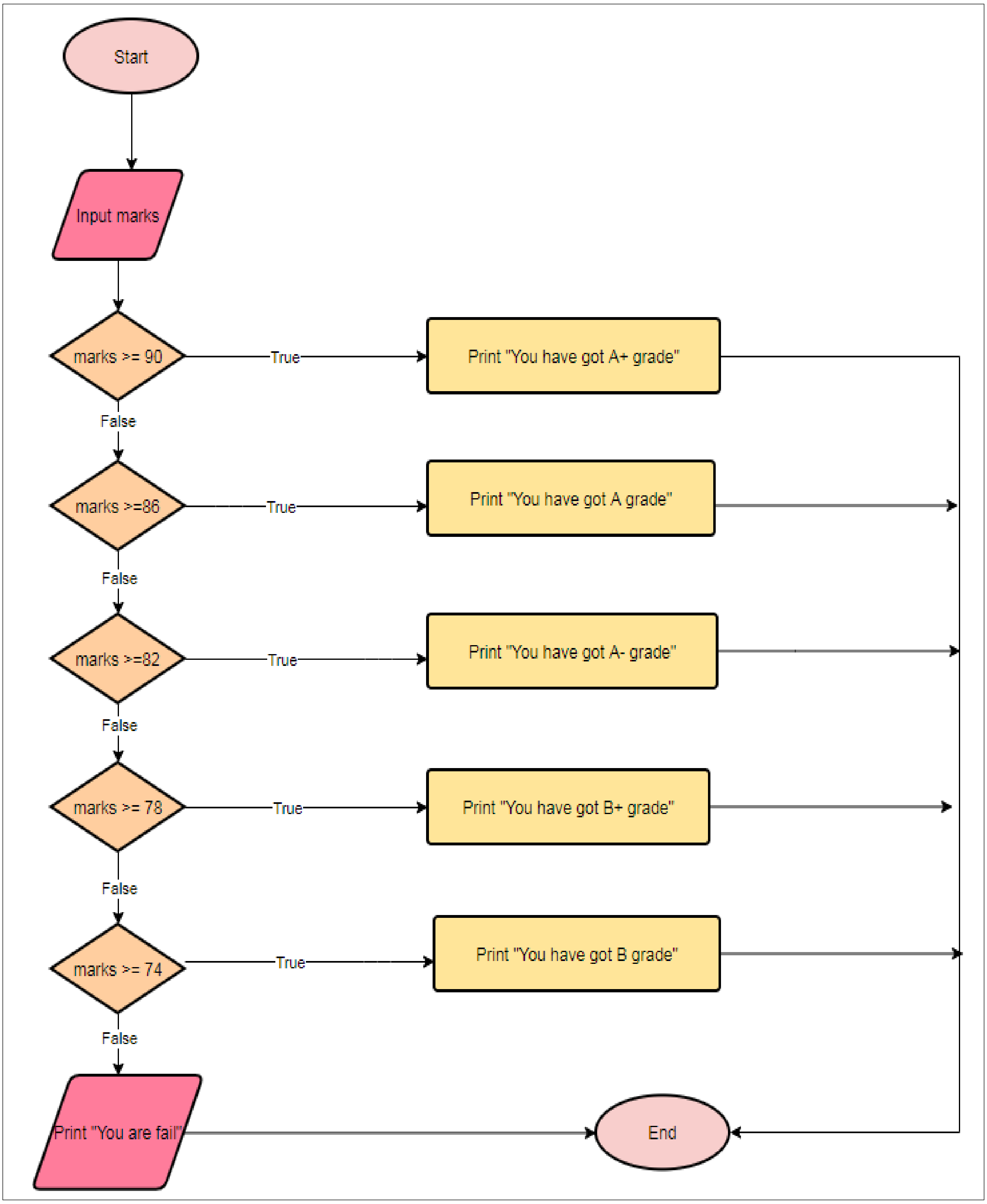


Ph.D.	Equivalent %
A+	90 & above
A	86
A-	82
B+	78
B	74
F	70
	66
	62
	58
	54
	50

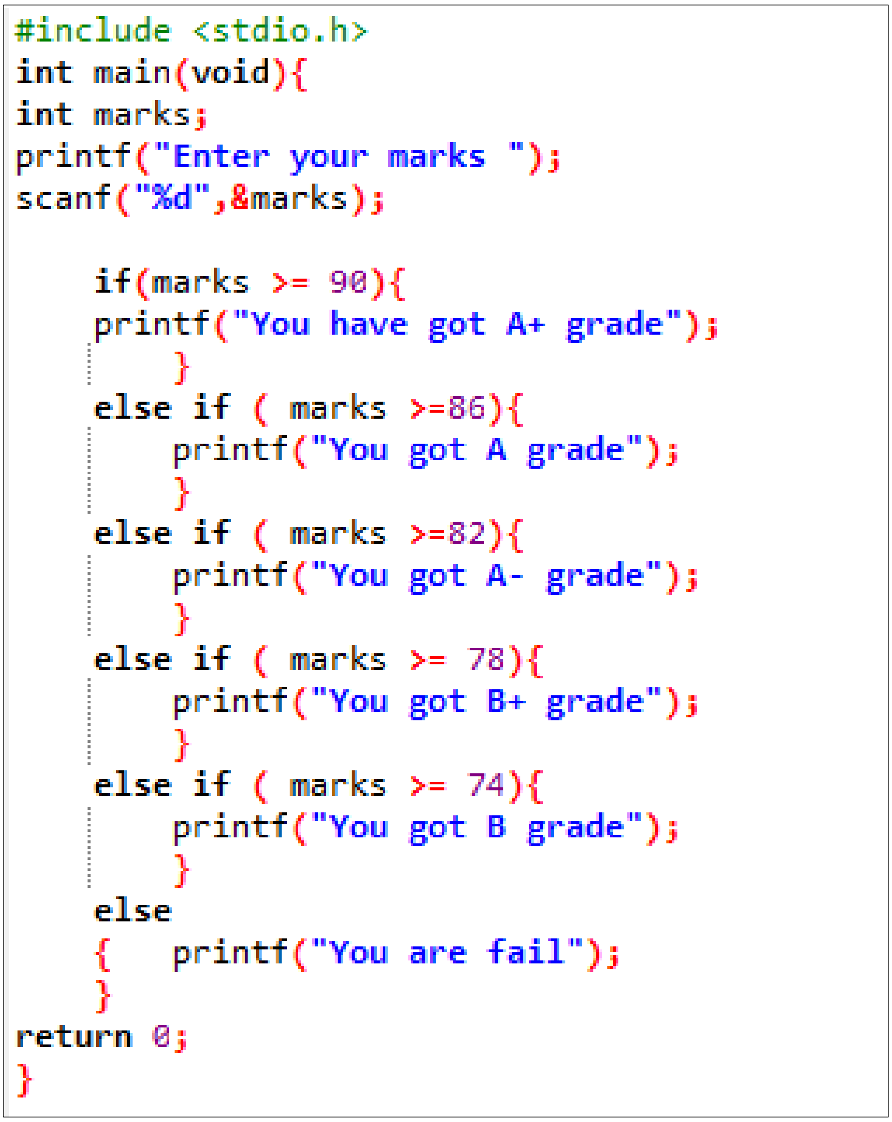
Write a program to assign the grade to each student according to his marks.

```
Start
Input marks
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”
```

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

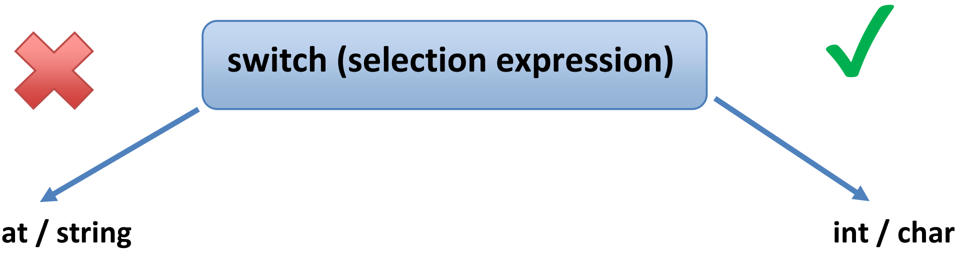
Another way that programs can make decisions is to use switch/case. The syntax of switch/case is shown in the figure below.

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.



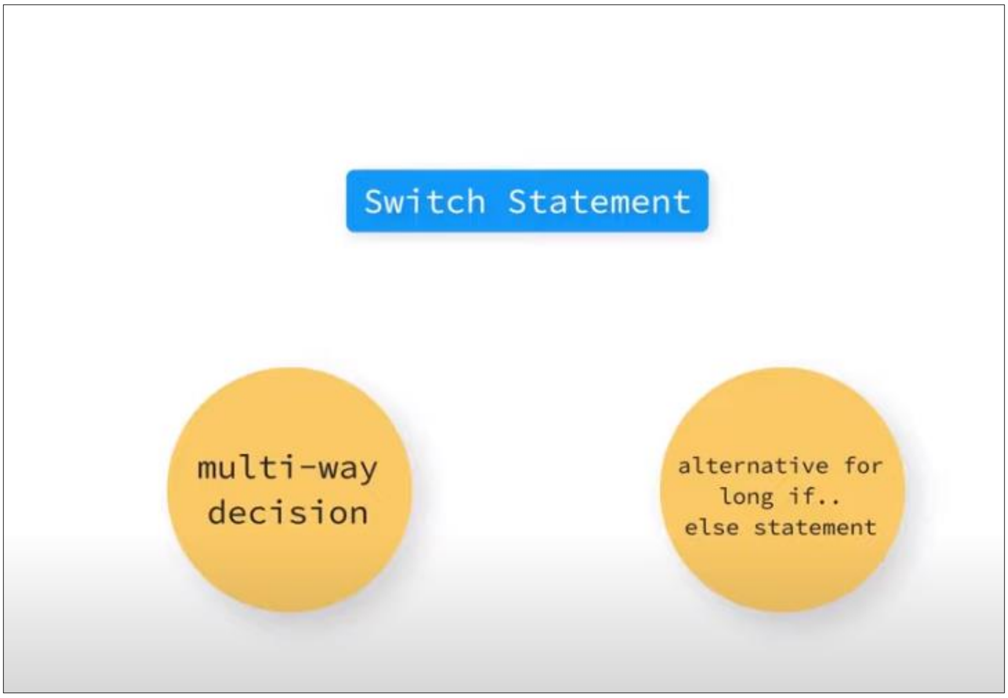
The following rules apply to a **switch** statement:

- 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.

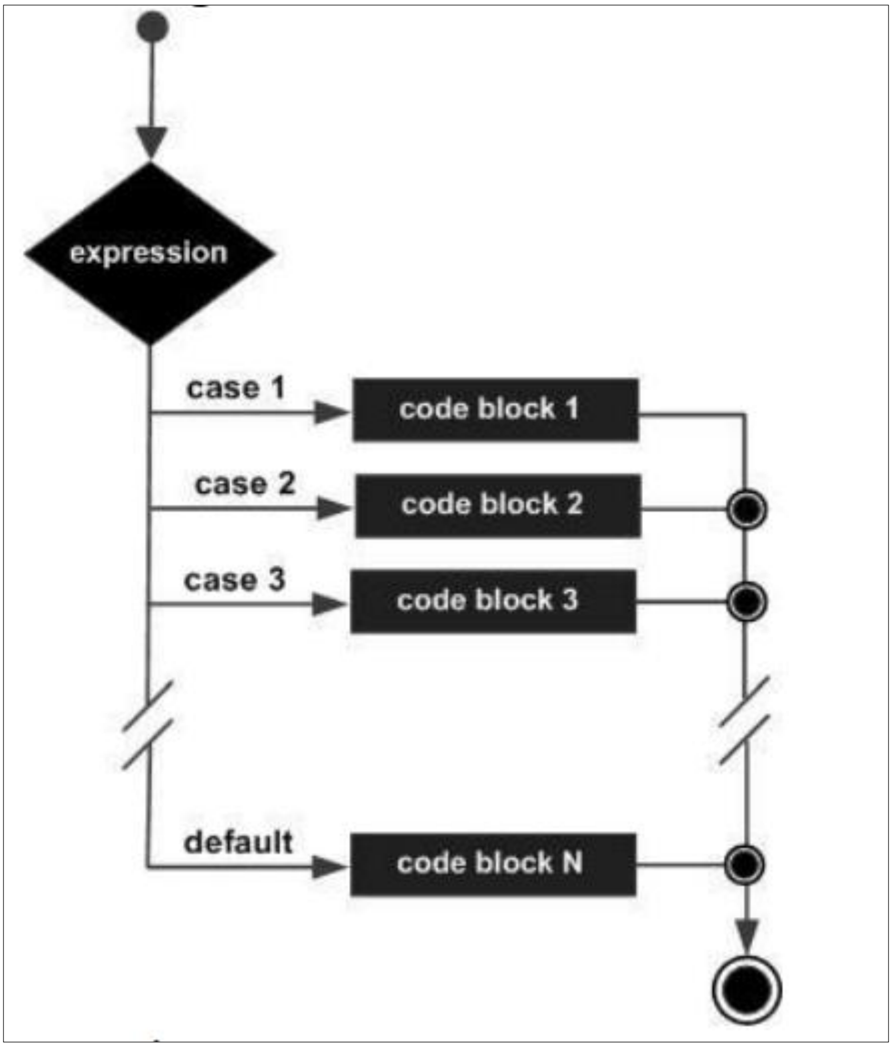
Switch statement is better than if else statement

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

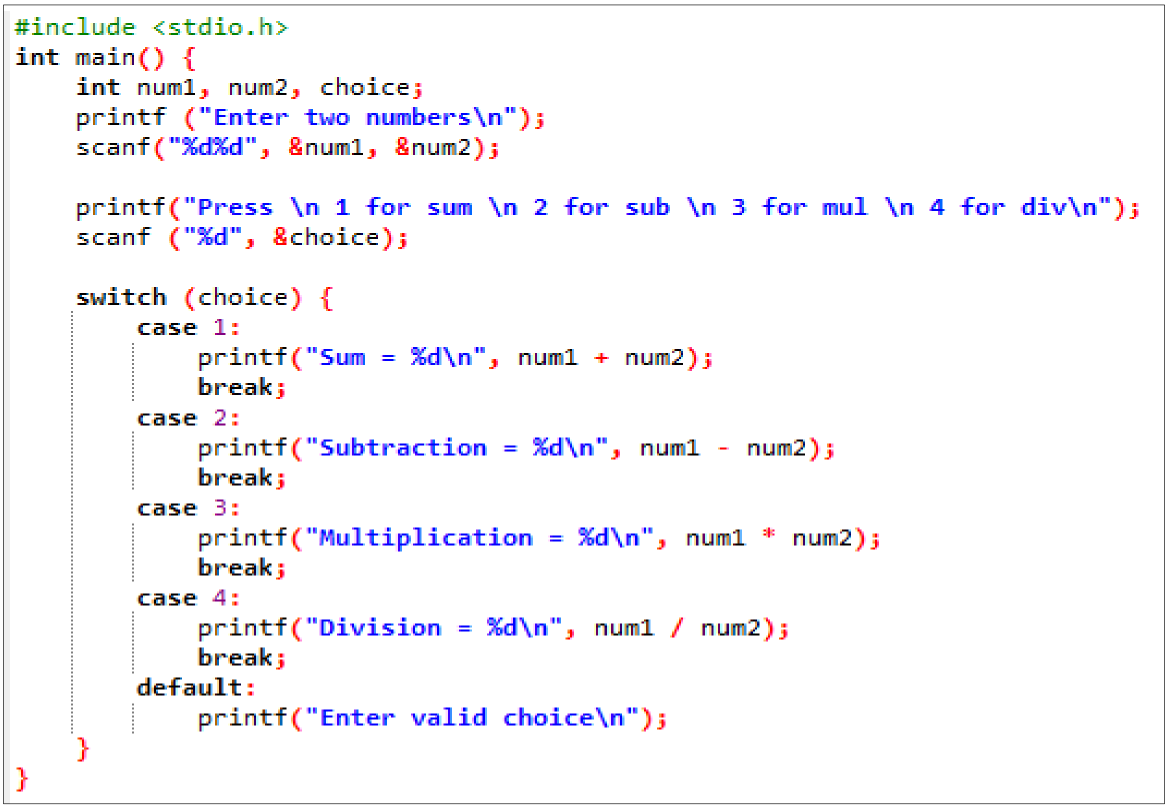
Switch statement acts as a substitute for a long **if-**else-if ladder that is used to test a list of cases.



Flowchart


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

Example: Calculator using numbers to choose operators, if 1 is pressed then addition is performed, if 2 is pressed then subtraction if 3 is pressed then multiplication, if 4 is pressed then division otherwise print invalid choice.

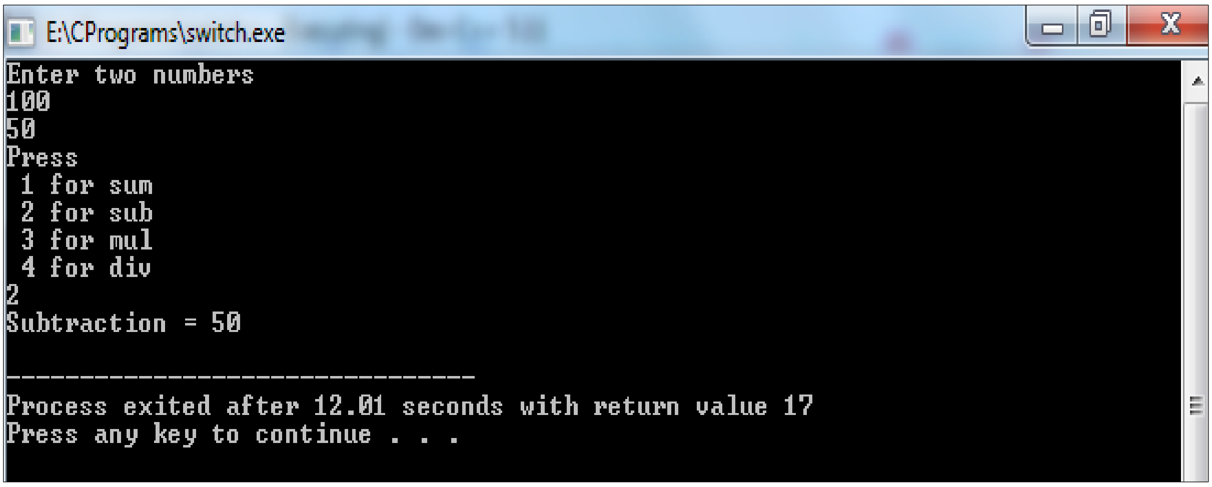


```c
#include <stdio.h>
int main() {
    int num1, num2, choice;
    printf ("Enter two numbers\n");
    scanf("%d%d", &num1, &num2);

    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:



```
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 . . .
```

Lab Tasks

1. Write a C program to check whether a number is multiple of 6 and 3 or not. If it is then print “This number is multiple of 6 and 3”, otherwise print “This number is not multiple of 6 and 3”.

2. Write a program to say greeting according to time using 24 hour format if time between is 5 to 11 it should greet “Good Morning”, if time is between 12 to 18 it should greet “Good Evening”, if time between 18 to 24 it should greet “Good Night”.

3. Write a C program to check whether a triangle is valid or not if angles are given.

4. Create a calculator asking for operator (+ or – or * or /) and operands and perform calculation according to the user input using switch statement.

5. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:

   For first 50 units Rs. 0.75/unit

   For next 100 units Rs. 1.50/unit

   For next 100 units Rs. 1.75/unit

   For unit above 250 Rs. 2.0/unit

6. Write a program that accepts three numbers and prints "All numbers are equal" if all three numbers are equal, "All numbers are different" if all three numbers are different and "Neither all are equal or different" otherwise.

7. Given a number N, if the number is between 1 and 10 both inclusive then return the number in words (Lower case English Alphabets) otherwise return "not in range".

8. Assign a value to cost depending on the value of distance as follows:

Distance	Cost
0 through 100	5.00
More than 100 but not more than 500	8.00
More than 500 but less than 1,000	10.00
1,000 or more	12.00

9. If a number is odd, change its value so that it is now 3 times number plus 1, otherwise change its value so that it is now half of number.