

# Nested *if-elses*

```
/* A quick demo of nested if-else */
main( )
{
    int i;

    printf ( "Enter either 1 or 2 " );
    scanf ( "%d", &i );

    if ( i == 1 )
        printf ( "You would go to heaven !" );
    else
    {
        if ( i == 2 )
            printf ( "Hell was created with you in mind" );
        else
            printf ( "How about mother earth !" );
    }
}
```

# Forms of *if*

```
(a)  if ( condition )  
      do this ;
```

```
(b)  if ( condition )  
      {  
          do this ;  
          and this ;  
      }
```

```
(c)  if ( condition )  
      do this ;  
      else  
      do this ;
```

```
(d)  if ( condition )  
      {  
          do this ;  
          and this ;  
      }  
      else  
      {  
          do this ;  
          and this ;  
      }
```

```
(e)  if ( condition )  
      do this ;  
      else  
      {  
          if ( condition )  
              do this ;  
          else  
          {  
              do this ;  
              and this ;  
          }  
      }
```

```
(f)  if ( condition )  
      {  
          if ( condition )  
              do this ;  
          else  
          {  
              do this ;  
              and this ;  
          }  
      }  
      else  
      do this ;
```

# Use of Logical Operators

- AND Operator &&
- OR Operator ||
- NOT Operator !

# Working of operators AND (&&), OR (||)

X	Y	X && Y	X    Y
True (Any non zero value)	False ( 0 )	False	True
True (Any non zero value)	True (Any non zero value)	True	True
False ( 0 )	True (Any non zero value)	False	True
False ( 0 )	False ( 0 )	False	False

**Example** The marks obtained by a student in 5 different subjects are input through the keyboard. The student gets a division as per the following rules:

- Percentage above or equal to 60 - First division
- Percentage between 50 and 59 - Second division
- Percentage between 40 and 49 - Third division
- Percentage less than 40 - Fail
- Write a program to calculate the division obtained by the student

## **Algorithm:**

- 1: Enter Marks M1, M2, M3, M4, M5.**
- 2: Percentage =  $((M1+M2+M3+M4+M5)/500)*100$**
- 3: IF Percentage  $\geq 60$  Print "First division"
4. Else IF Percentage  $\geq 50$  and Percentage  $\leq 59$  Print "Second division"
5. Else If Percentage  $\geq 40$  and Percentage  $\leq 49$  Print "Third division"
6. Else if Percentage  $< 40$  Print "Fail"
7. Exit

```
/* Method – I */
```

```
main( )
```

```
{
```

```
    int  m1, m2, m3, m4, m5, per ;
```

```
    printf ( "Enter marks in five subjects " ) ;
```

```
    scanf ( "%d %d %d %d %d", &m1, &m2, &m3, &m4, &m5 ) ;
```

```
    per = ( m1 + m2 + m3 + m4 + m5 ) / 5 ;
```

```
    if ( per >= 60 )
```

```
        printf ( "First division " ) ;
```

```
    else
```

```
    {
```

```
        if ( per >= 50 )
```

```
            printf ( "Second division" ) ;
```

```
        else
```

```
        {
```

```
            if ( per >= 40 )
```

```
                printf ( "Third division" ) ;
```

```
            else
```

```
                printf ( "Fail" ) ;
```

```
        }
```

```
    }
```

```
}
```

```
/* Method – II */
```

```
main( )
```

```
{
```

```
    int m1, m2, m3, m4, m5, per ;
```

```
    printf ( "Enter marks in five subjects " ) ;
```

```
    scanf ( "%d %d %d %d %d", &m1, &m2, &m3, &m4, &m5 ) ;
```

```
    per = ( m1 + m2 + m3 + m4 + m5 ) / 5 ;
```

```
    if ( per >= 60 )
```

```
        printf ( "First division" ) ;
```

```
    if ( ( per >= 50 ) && ( per < 60 ) )
```

```
        printf ( "Second division" ) ;
```

```
    if ( ( per >= 40 ) && ( per < 50 ) )
```

```
        printf ( "Third division" ) ;
```

```
    if ( per < 40 )
```

```
        printf ( "Fail" ) ;
```

```
}
```



# The *else if* Clause

```
/* else if ladder demo */
main( )
{
    int  m1, m2, m3, m4, m5, per ;

    per = ( m1+ m2 + m3 + m4+ m5 ) / per ;

    if ( per >= 60 )
        printf ( "First division" ) ;
    else if ( per >= 50 )
        printf ( "Second division" ) ;
    else if ( per >= 40 )
        printf ( "Third division" ) ;
    else
        printf ( "fail" ) ;
}
```

Note that the **else if** clause is nothing different. It is just a way of rearranging the **else** with the **if** that follows it. This would be evident if you look at the following code:

```
if ( i == 2 )  
    printf ( "With you..." );  
else  
{  
    if ( j == 2 )  
        printf ( "...All the time" );  
}
```

```
if ( i == 2 )  
    printf ( "With you..." );  
else if ( j == 2 )  
    printf ( "...All the time " );
```

**Example:** A company insures its drivers in the following cases:

- If the driver is married.
- If the driver is unmarried, male & above 30 years of age.
- If the driver is unmarried, female & above 25 years of age.

In all other cases the driver is not insured. If the marital status, sex and age of the driver are the inputs, write a program to determine whether the driver is to be insured or not.

# Algorithm

1. Start
2. Enter MS, Gender and Age of the driver.
3. If MS= Married then Print “driver is Insured”.
4. Else If MS = Unmarried && Gender=Male && Age  $\geq 30$  then Print “driver is Insured”.
5. Else If MS = Unmarried && Gender= female & Age  $\geq 25$  then Print “driver is Insured”
6. Else Print “Driver is not Insured”
7. Exit

```
/* Insurance of driver - without using logical operators */
```

```
main( )
```

```
{
```

```
    char  sex, ms ;
```

```
    int  age ;
```

```
    printf ( "Enter age, sex, marital status " ) ;
```

```
    scanf ( "%d %c %c", &age, &sex, &ms ) ;
```

```
    if ( ms == 'M' )
```

```
        printf ( "Driver is insured" ) ;
```

```
    else
```

```
    {
```

```
        if ( sex == 'M' )
```

```
        {
```

```
            if ( age > 30 )
```

```
                printf ( "Driver is insured" ) ;
```

```
            else
```

```
                printf ( "Driver is not insured" ) ;
```

```
        }
```

```
    else
```

```
    {
```

```
        if ( age > 25 )
```

```
            printf ( "Driver is insured" ) ;
```

```
        else
```

```
            printf ( "Driver is not insured" ) ;
```

```
    }
```

```
}
```

```
}
```

```
/* Insurance of driver - using logical operators */
main( )
{
    char  sex, ms ;
    int   age ;

    printf ( "Enter age, sex, marital status " ) ;
    scanf ( "%d %c %c" &age, &sex, &ms ) ;

    if ( ( ms == 'M') || ( ms == 'U' && sex == 'M' && age > 30 ) ||
          ( ms == 'U' && sex == 'F' && age > 25 ) )
        printf ( "Driver is insured" ) ;
    else
        printf ( "Driver is not insured" ) ;
}
```

In this program it is important to note that:

- The driver will be insured only if one of the conditions enclosed in parentheses evaluates to true.
- For the second pair of parentheses to evaluate to true, each condition in the parentheses separated by **&&** must evaluate to true.
- Even if one of the conditions in the second parentheses evaluates to false, then the whole of the second parentheses evaluates to false.
- The last two of the above arguments apply to third pair of parentheses as well

# **&& and || are useful in the following programming situations:**

- When it is to be tested whether a value falls within a particular range or not.
- When after testing several conditions the outcome is only one of the two answers (This problem is often called yes/no problem).



**Example :** Write a program to calculate the salary as per the following table:

Gender	Years of Service	Qualifications	Salary
Male	$\geq 10$	Post-Graduate	15000
	$\geq 10$	Graduate	10000
	$< 10$	Post-Graduate	10000
	$< 10$	Graduate	7000
Female	$\geq 10$	Post-Graduate	12000
	$\geq 10$	Graduate	9000
	$< 10$	Post-Graduate	10000
	$< 10$	Graduate	6000

```
main( )
{
    char  g ;
    int  yrs, qual, sal ;

    printf ( "Enter Gender, Years of Service and
             Qualifications ( 0 = G, 1 = PG ):" ) ;
    scanf ( "%c%d%d", &g, &yrs, &qual ) ;

    if ( g == 'm' && yrs >= 10 && qual == 1 )
        sal = 15000 ;
    else if ( ( g == 'm' && yrs >= 10 && qual == 0 ) ||
              ( g == 'm' && yrs < 10 && qual == 1 ) )
        sal = 10000 ;
    else if ( g == 'm' && yrs < 10 && qual == 0 )
        sal = 7000 ;
    else if ( g == 'f' && yrs >= 10 && qual == 1 )
        sal = 12000 ;
    else if ( g == 'f' && yrs >= 10 && qual == 0 )
        sal = 9000 ;
    else if ( g == 'f' && yrs < 10 && qual == 1 )
        sal = 10000 ;
    else if ( g == 'f' && yrs < 10 && qual == 0 )
        sal = 6000 ;

    printf ( "\nSalary of Employee = %d", sal ) ;
}
```

# Home Exercise #1

Any character is entered through the keyboard, write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol.

The following table shows the range of ASCII values for various characters.

Characters	ASCII Values
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
special symbols	0 - 47, 58 - 64, 91 - 96, 123 - 127

# Home Exercise #2

An Insurance company follows following rules to calculate premium.

- (1) If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then the premium is Rs. 4 per thousand and his policy amount cannot exceed Rs. 2 lakhs.
- (2) If a person satisfies all the above conditions except that the sex is female then the premium is Rs. 3 per thousand and her policy amount cannot exceed Rs. 1 lakh.
- (3) If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then the premium is Rs. 6 per thousand and his policy cannot exceed Rs. 10,000.
- (4) In all other cases the person is not insured.

Write a program to output whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.