Module 8 – Sequences and Alternative Sequences

"Choice is good. Are you for choice ?"

Quote Professor Schwarz

Sequences - Alternative Sequences and Criteria

Recall that a program is a '***sequence***' of instructions.

If there was only ONE sequence a person could to, they would not be able to do much…

For Example: If a skateboard surfer could only do one type of jump, they would not win many competitions... *No alternatives is not the way to go.*

Now, In life, you do have *choices*… *alternatives* you face at every moment of your waking hours …

You are driving from one place to another… which route should you take ?

In life you have ***choices*** …

If you have multiple tasks you need to do, which 'hat' do you put on first ?

Other terms *you may find for* ***Alternative sequences*** *are:*

- ***Decision,***
- ***Branching,***
- ***Selection,***
- ***Flow control***

Behind all these choices, you have and use a method to decide which choice to take. It 'may be' clear in your mind how you choose, or it 'may not be' entirely clear why you choose what you do, or you may have 'no' idea why you choose what you do..

The key element behind all your choices is that … 'there is **CRITERIA'** you use, consciously or sub consciously, in helping you choose between alternatives.

"Do not every let someone tell you – 'Don't judge'.
They are telling you to disregard your ability to make choices necessary to live."
Quote Professor Schwarz

In every choice, in every decision you make, you are judging, choosing ALTERNATIVES, by using **CRITERIA**.

What is criteria ?

Criteria: a rule, a standard, a test, a measure, a means to make a judgment, a touchstone.

In a person's ever day life, they use many different *touchstones* to decide which path to take…which action to perform… In your life, some criteria yield more accurate results than others. Which level of success do you want ?

Here is only one valid criteria. Can you choose the most reliable criteria ?

'Feelings of self and others', 'Opinions of others', 'My observations of Physical Reality'…

Criteria and Computer Programs

When you write computer programs, you need to have a full and clear understanding of what criteria are, and how to use them. In C++, you need precise, logical, reality-based ***criteria*** to make ***decisions***, to choose the correct alternative.

To make 'decisions', *you use* ***comparisons***, either ***simple*** or ***complex***, to make decisions. To make 'decisions', you use ***relational*** criteria. In the previous module 7, you were introduced to the nature of computer languages. Computer languages use key words, grammar (syntax) and symbols, just like a natural language.

RELATIONAL CRITERIA and symbols

There are six (6) basic types of **Relational Criteria**:

Symbol	Meaning	Example – Compare contents of variable 1 and variable 2	Comparison **Result**: ***2 paths***
>	**Greater** than	var1 > var2	True or False
<	**Less** than	var1 < var2	True or False
>=	**Greater** than or **equal**	var1 >= var2	True or False
<=	**Less** than or **equal**	var1 <= var2	True or False
==	**Equal**	var1 == var2	True or False
!=	**Not** equal	var1 != var2	True or False

You use the '**Result**' of the comparison, to choose which one, of two **(2) paths**, to take. ***Criteria*** are also known as '***condition***'.

Video Watch ME: Relational Operators http://www.youtube.com/watch?v=uiQZRwdUm_U

Relational Operators can be used with the following data types:

- Numbers: integer, double, float - Compares numeric order
- Characters or Strings of Characters – Compares alphabetic order

Note: ***In a math class '=' means equal. In C++, the '=' functions as the 'assignment operator'. (See lecture 7)***
In the C++ programming language, '==' is means equal.

To create alternative paths in a program, you use an IF STATEMENT.

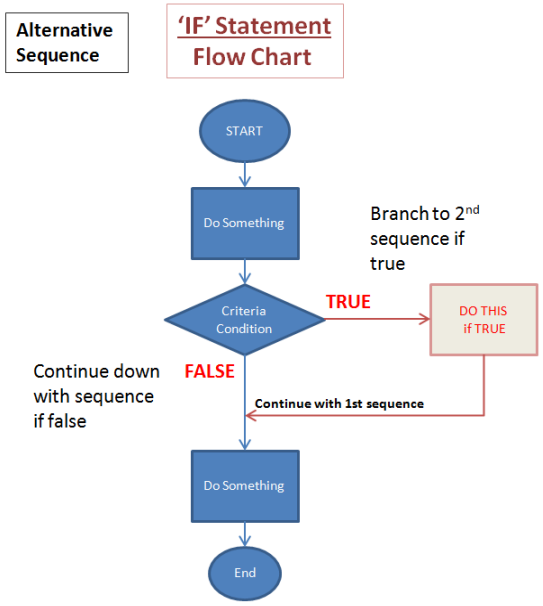
IF STATEMENT

SYNTAX: **if (criteria) { Do this if TRUE }** // You may have one (1) or more lines in the { …body of the if statement… }

Example: int X = 3;

```
if ( X == 3)   { cout << "True – X equals 3"; }                  //  True, would print line
if ( X >= 3 )  { cout << "True – X greater or equal to 3"; }     // True, would print line
if ( X < 3 )   { cout << "True – X less than 3"; }               //  False, would NOT print line
```

The **IF statement** is also called **Single Selection**



Remember that there are two(2) outcome for a condition: ***TRUE*** *or* ***FALSE***

With the 'IF' statement, ONLY the TRUE condition goes to a different path.

This is called ***SINGLE Selection*** *because only ONE branch,* ***TRUE*** *veers off the main sequence.*

Single Selection.

Code Example : Try it

```
#include <iostream>
using namespace std;
int main ( ) {
    int num = 0;  // declare variable and initialize to zero.
    cout << "Enter a number between 1 and 999: ";   // Print Message
    cin >> num;     // Wait for user input
    if ( num < 1 ) { cout << "Number to small, you entered a number less than 1" << endl; }
    if ( num < 100 )  { cout << "Number less than 100" << endl; }
    if ( num <= 500 )  { cout << "Number less than 500" << endl; }
    if ( num < 1000 )  { cout << "Number less than 1000" << endl; }
    if ( num > 999 ) { cout << "Number to large, you entered a number greater than 999" <<
endl; }
    system ("pause");
    return 0;
}
```

Video Watch me: **If Statement**: http://www.youtube.com/watch?v=yEY8xlnarNo

Programmer Alert

Int x = 3;

If (x == 7) is NOT the same as if (x = 7)

(x == 7) The '==' compares the contents of x (which is 3) if it is EQUAL to '7' .. you would get FALSE.

(x = 7) 1st, the '=' assigns(moves) the number 7 into the variable x, then any non zero value is always TRUE.

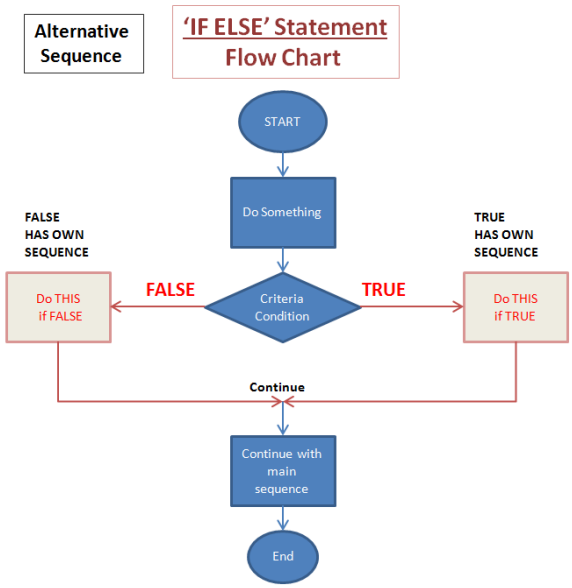
(x = 0) 1st, the '=' assigns(moves) the number 0 into the variable x, then a zero value is always FALSE.

IF ELSE Statement

SYNTAX:

```
if (criteria)
    { Do this if TRUE }          // You may have one (1) or more lines between the { … }
Else
    { Do this if FALSE }         // You may have one (1) or more lines between the { … }
```

The **IF ELSE statement** is also called **Double Selection**



*Remember that there are two(2) outcome for this condition: **TRUE** or **FALSE***

With the 'IF ELSE' statement, BOTH the TRUE condition and the FALSE each have different paths.

*This is called **DOUBLE Selection** because BOTH outcomes **True** and **False** veer off the main sequence on their own path.*

Double Selection.

Code Example 1: Try it

```
#include <iostream>
using namespace std;
int main ( ) {
      int X = 3;     // Declare variable and assign initial value

      cout << "X = " << X << endl;
      if ( X == 3)
      { cout << "True - X equals 3" << endl; }
      else
      { cout << "False - X not equal 3" << endl; }

      if ( X >= 3 )
      { cout << "True - X greater or equal to 3" << endl; }
      else
      { cout << "False - X not greater nor equal to 3" << endl; }

      if ( X < 3 )
      { cout << "True - X less than 3" << endl; }
      else
      { cout << "False - X not less than 3" << endl; }

       system ("pause");
       return 0;
}
```

Video Watch me: **If else Statement**: http://www.youtube.com/watch?v=jK83lln_T1k

Code Example 2: **Try it**

```
#include <iostream>
using namespace std;
int main ( ) {
   int x = 3;      // Declare variable and assign initial value
   if (x > 10)
      { cout << "TRUE"; }
   else
      { cout << "FALSE"; }

   cout << endl << endl;
   system ("pause");
   return 0;
}
```

Code Example 3: **Try it**

```
#include <iostream>
using namespace std;
int main() {
int x = 0;    // Make a variable to store an integer
cout << " Enter an Integer: "; // allows you to write a message
cin >> x;  // allow the input to be placed into the variable x
if ( x >= 10 )
{
   // print message if condition is True - Greater or equal than 10
       cout << endl << " x(" << x << ") is greater or equal to 10 " << endl;
}
else
{
   // print message if condition is False - less than 10
   cout << endl << " x(" << x << ") is less than 10 " << endl;
}
       cout << endl;
       system ("pause");
       return 0;
}
```

The criteria/conditions we have studied so far are called SIMPLE condition.

Next week, we will look at multiple conditions which are also called COMPLEX or COMPOUND conditions

Assignment:

Program 1 – Write the '***Grade conversion program: Numeric to letter grade***" program using ***Nested IF ELSE*** statements

Video Watch me- Nested if statements: http://www.youtube.com/watch?v=iqylu_q2ovE

Program 2 – Write the "**Will I each lunch**" program (see above).

Think of 6 conditions that together determine if you will have lunch.

Have a user input the values to each of the condition.

Use the nested if statements to determine if they will have lunch or not.

Inform user why they are or are not having lunch at McDonalds, based on their conditions.

Program 3 - Write ONE "***Temperature Conversion"*** program.

Prompt the user to choose: 1) Centigrade to Fahrenheit, 2) Fahrenheit to centigrade.

Prompt the user for temp to convert.

Calculate a new temp2. The calculation of the new temp2 depends on choice 1 or 2 above.

Print out temp2.

Be sure to use the C and F temp notation.

Program 4 - Write a program that calculates ticket prices.

The Amusement Park Ticket Price is $20.00.

Write a program that calculate, prints out the ticket price for a person who what to buy a ticket.

Prompt for the age of the Ticket Purchaser.

If age of purchaser is less than 5 years then 100% discount.
If age of purchaser is more than 5 but less than 12 years then 50% discount.
If age of purchaser is more than 12 but less than 26 years then 10% discount.
If age of purchaser is more than 60 years then 25% discount.

Use the if else statements…

Questions - 5

1) What are the characteristics of Alternative Sequences ?
2) Why do you need alternative sequences in a program ?
3) Why do you need alternative sequences in a real life ?
4) What are criteria ?
5) Integrated studies: Computer Science Alternative Sequences (Branching, Selection, Decision) and Individual Liberty. *Each person has a 'volitional conceptual facility' which they can use to create and set '**criteria**' to select '**alternative sequences**'. Using their mind, each person can best choose the 'productive paths' of life. Is that choice, that volitional, the basis, the link for the next level concept of Individual Liberty, freedom ?*