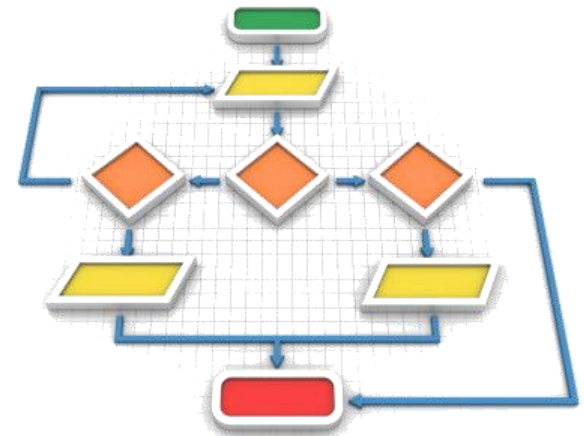




Decision Making, Branching

S6_2





Learning objectives

To learn and appreciate the following concepts

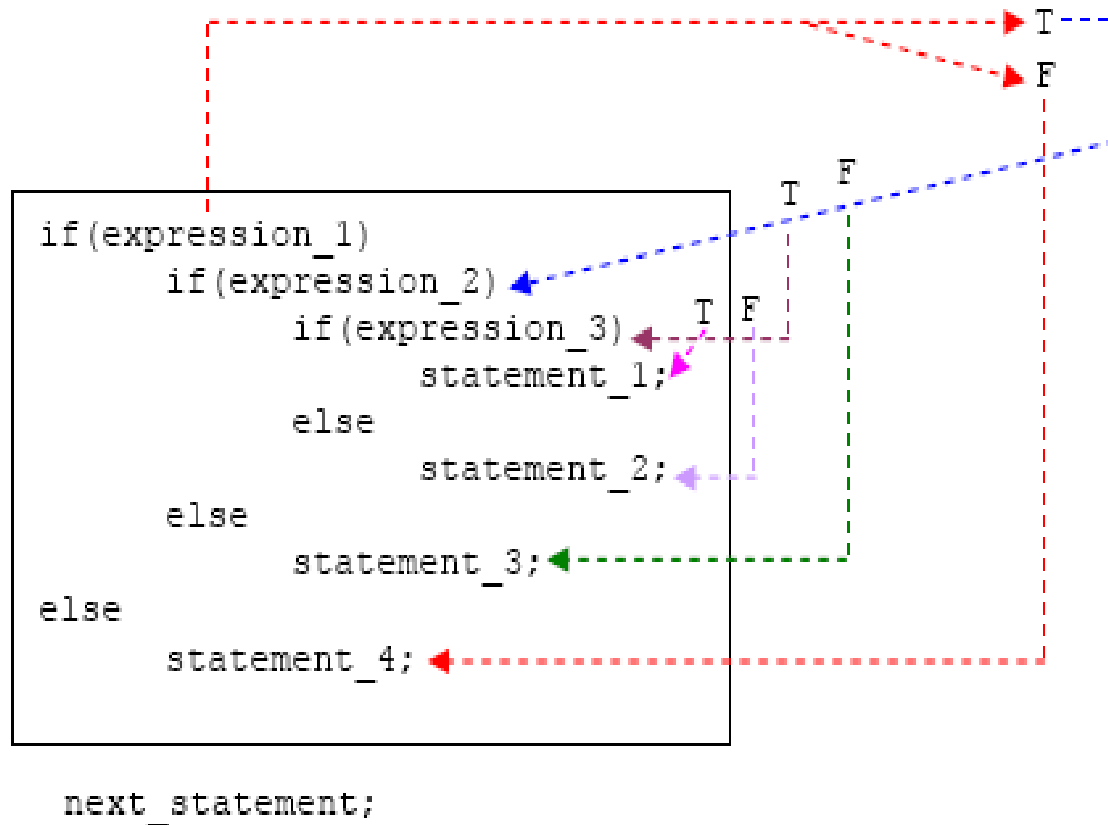
- Nested if Statements
- Else-if ladder



Learning Outcomes

- At the end of session student will be able to learn and understand
 - **Nested if Statements**
 - **Else-if ladder**

Nested if-else Statement



If-else nesting -Explanation

1. The if-else constructs **can be nested** (placed one within another) to any depth.
2. In this nested form, **expression_1** is evaluated.
 - If it is zero (FALSE-F), **statement_4** is executed and the **entire nested if statement is terminated**;
 - If not (TRUE-T), control goes to the second if (within the first if) and **expression_2** is evaluated. If it is zero, **statement_3** is executed;
 - If not, control goes to the third if (within the second if) and **expression_3** is evaluated.
 - If it is zero, **statement_2** is executed;
 - If not, **statement_1** is executed. The **statement_1** (inner most) will only be executed if all the if statement is true.



Smallest among three numbers


```
#include <stdio.h>
int main()
{
    int a, b, c, smallest;

    printf("Enter a, b & c\n");
    scanf("%d %d %d", &a,&b,&c);
```


```
    if (a < b)
    {
        if (a < c)
            { smallest = a; }
        else
            { smallest = c; }
    }
    else
    {
        if (b < c)
            { smallest = b; }
        else
            { smallest = c; }
    }
    printf("Smallest is %d",smallest);
    return 0;
}
```

Nested if statements

```
if (number > 5)
    if (number < 10)
        printf("1111\n");
    else printf("2222\n");
```



```
if (number > 5) {
    if (number < 10)
        printf("1111\n");
}
else printf("2222\n");
```



Rule: an else goes with the most recent if, unless braces indicate otherwise



The else-if ladder

```
if (Expression_1 )  
{  
    statement_block1  
}  
else if (Expression_2)  
{  
    statement_block2  
}  
.....  
else if (Expression_n)  
{  
    statement_blockn  
}  
else  
{  
    last_statement  
}
```

Next_statement

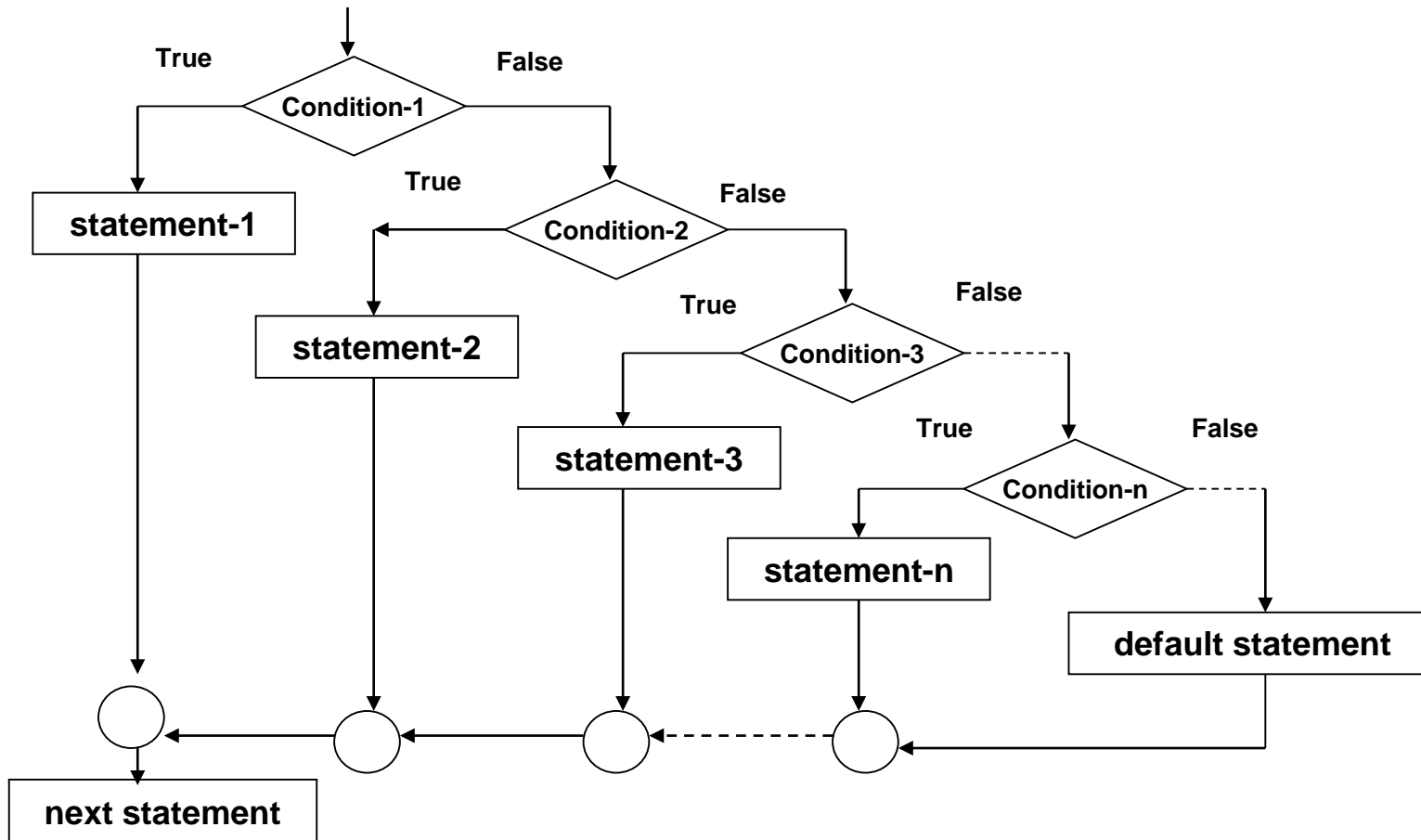


else if ladder -Explanation

- **expression_1** is first evaluated. If it is **TRUE**, **statement_1** is executed and the whole statement terminated and the **next_statement** is executed.
- On the other hand, if **expression_1** is **FALSE**, control passes to the else if part and **expression_2** is evaluated.
- If it is **TRUE**, **statement_2** is executed and the whole system is terminated.
- If it is **False**, **other else if parts** (if any) are tested in a similar way.
- Finally, if **expression_n** is **True**, **statement_n** is executed; if not, **last_statement** is executed.
- **Note that only one of the statements** will be executed others will be skipped.
- The **statement_n's** could also be a **block of statement** and must be put in curly braces.



else-if ladder Flow of control





Testing for character ranges

```
#include<stdio.h>
int main()
{
    char ch;
    printf("enter a character\n");
    scanf("%c",&ch);
    if (ch >= 'a' && ch <= 'z')
        printf("lowercase char\n");
    else if (ch >= 'A' && ch <= 'Z')
        printf("uppercase char\n");
    else if (ch >= '0' && ch <= '9')
        printf("digit char\n");
    else
        printf(" special char\n");
    return 0;
}
```



WAP using else-if ladder to calculate grade for the marks entered

```
#include<stdio.h>
int main() {
    char cgrade;
    int imarks;
    printf("enter marks");
    scanf("%d",&imarks);
    if(imarks>79)
        cgrade = 'A';
    else if (imarks>59)
        cgrade = 'B';
    else if (imarks>49)
        cgrade = 'C';
    else if (imarks>39)
        cgrade = 'D';
    else
        cgrade = 'F';
    printf("Grade :%c\n",cgrade);
    return 0;
```

For inputs
imarks= 46
grade = D
imarks= 64
grade = B



Example: else-if

// Program to implement the sign function

```
#include <stdio.h>
int main ( )
{
    int number, sign;
    printf("Please type in a number: ");
    scanf("%d",&number);
    if ( number < 0 )
        sign = -1;
    else if ( number == 0 )
        sign = 0;
    else // Must be positive
        sign = 1;
    printf("Sign = %d",sign);
    return 0;
}
```



Example – multiple choices

/* Program to evaluate simple expressions of the form number operator number */

```
#include <stdio.h>
int main ( )
{
float value1, value2,result;
char operator;
printf("Type in your expression.\n");
scanf("%f %c %f", &value1,&operator,&value2);
if ( operator == '+' )
    {result=value1+value2;
    printf("%f",result);}
else if ( operator == '-' )
    {result=value1-value2;
    printf("%f",result);}
else if ( operator == '*' )
    {result=value1*value2;
    printf("%f",result);}
else if ( operator == '/' )
    {result=value1/value2;
    printf("%f",result);}
else
    printf("Unknown operator.\n");
return 0;
}
```



Problem...

- Find the roots of a quadratic equation ax^2+bx+c using if else control statements.
- Roots of a quadratic equation

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

- 3 cases
 - Discriminant < 0 ; roots are imaginary $\rightarrow 1 + i 2.45$
 - Discriminant $= 0$; roots are real and equal $\rightarrow -b/2a$
 - Discriminant > 0 ; roots are real and unequal \rightarrow

$$r1 = (-b + \sqrt{\text{disc}})/(2a)$$

$$r2 = (-b - \sqrt{\text{disc}})/(2a)$$



Find the roots of Quadratic equation using if-else statement

```
#include<stdio.h>
int main()
{
    float a,b,c,root1,root2,re,im, disc;
    scanf("%f %f %f",&a,&b,&c);
    disc=b*b-4*a*c;

    if (disc<0)
    {
        printf("imaginary roots\n");
        re= - b / (2*a);
        im = pow(fabs(disc),0.5)/(2*a);
        printf("root1=%.21f+%.21fi and
root2 =%.21f-%.21fi", re,im,re,im);
    }
```

```
else if (disc==0)
{
    printf("Real & equal roots");
    re=-b / (2*a);
    printf("Root1 and root2 are
%.21f",re);
}

else /*disc > 0 */
{
    printf("Real & distinct roots");
    printf("Roots are");
    root1=(-b + sqrt(disc))/(2*a);
    root2=(-b - sqrt(disc))/(2*a);
    printf("Root1 = %.21f and root2
=%.21f",root1,root2);
}
return 0;
}
```




Session 6 Summary

At the end of session the student will be able to

- The if Statement
- The if-else Statement
- Nested if Statements
- Else-if ladder



Poll Question

Go to chat box/posts for the link to the Poll question

[Submit your solution in next 2 minutes](#)

Click the result button to view your score