Arab Academy for Science and Technology and Maritime Transport

College of Engineering and Technology

Computer Engineering Department

CC112 Structured Programming

Lecture 5

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Conditions and Logical Expressions

Lecture Outline

i. **Using Relational and Logical Operators to Construct and Evaluate Logical Expressions**

i. ***If-Else* Statements**

Control structures

- This means the control flow of execution in a program or function.

- The three control structures to control execution flow are:
  - Sequence
  - Selection
  - Repetition

- This lecture describes the C control structure for **selection**.

- The **selection control structure** is a control structure that chooses among alternative program statement according to a condition.

- A condition is an expression that is either false (represented by 0) or true (usually represented by 1).

Conditions

- Most conditions that we can use are performed using the following equality/relational operators:

operator	Meaning
<	Less than
>	Greater than
<=	Less than or equal
>=	Greater than or equal
==	Equal
!=	Not equal

EXAMPLE:

x	power	MAX_POW	y	item	MIN_ITEM	mom_or_dad	num	SENTINEL
-5	1024	1024	7	1.5	-999.0	'M'	999	999

Operator	Condition	English Meaning	Value
<=	x <= 0	x less than or equal to 0	1 (true)
<	power < MAX_POW	power less than MAX_POW	0 (false)
>=	x >= y	x greater than or equal to y	0 (false)
>	item > MIN_ITEM	item greater than MIN_ITEM	1 (true)
==	mom_or_dad == 'M'	mom_or_dad equal to 'M'	1 (true)
!=	num != SENTINEL	num not equal to SENTINEL	0 (false)

Conditions

- Logical operators:

operator	Meaning
||	Logical OR
&&	Logical AND
!	NOT

- EXAMPLE:

Salary<100 && Age>=35

Conditions

- The && operators :

Operator 1	Operator 2	&&
false	false	false
false	true	false
true	false	false
true	true	true

False =zero

True = non-zero

Conditions

- The || operators :

Operator 1	Operator 2	||
false	false	false
false	true	true
true	false	true
true	true	true

False =zero
True = non-zero

Conditions

- The ! operators :

Operator	!
true	false
false	true

False =zero
True = non-zero

EXAMPLE

```
int   age, height, weight;

age = 25;
height = 70;
weight = 145;
```

EXPRESSION	VALUE
!(age < 10)	
!(height > 60)	
(height > 60) || (age > 40)	
(weight < 180) && (age >= 20)	
! (height > 60) || (age > 50)	

IF – ELSE STATEMENT

- In C, the if statement is the primary selection control structure.

SYNTAX

```
if  ( Expression )
        StatementA
else
        StatementB
```

EXAMPLE

if the student's grade is greater than or equal to 60 then print *Passed*

```
if ( grade >= 60 )
{
   printf( "Passed\n" );
} /* end if */
```

EXAMPLE

print *Passed* if the student's grade is greater than or equal to 60 and print *Failed* if the student's grade is less than 60.

```
if ( grade >= 60 )
{
   printf( "Passed\n" );
} /* end if */
else
{
   printf( "Failed\n" );
} /* end else */
```

EXAMPLE

```
int    carDoors,  driverAge ;
 double  premium,  monthlyPayment ;


if  ( (carDoors == 4 )  &&  (driverAge > 24) )
   {
          premium = 650.00 ;
          printf( " LOW RISK ") ;
  }
  else
  {
          premium = 1200.00 ;
          printf("HIGH RISK ") ;
  }
  monthlyPayment = premium / 12.0 + 5.00 ;
```

What happens if you omit braces?

```
if  ( (carDoors == 4 )  &&  (driverAge > 24) )
        premium = 650.00 ;
        printf( " LOW RISK ") ;
else
        premium = 1200.00 ;
        printf( " HIGH RISK " ) ;

monthlyPayment = premium / 12.0 + 5.00 ;
```

COMPILE ERROR OCCURS. The "if clause" is the single statement following the if.

Braces can only be omitted when each clause is a single statement

```
if  ( lastInitial  <= 'K' )

        volume = 1;

else

        volume = 2;

printf(  "Look it up in volume # %d of the
phone book", volume ) ;
```

What is the output? and Why?

```
int  age;

age =  30;

if  ( age <  18 )

        printf( “Do you drive?”);
        printf( “Too young to vote”);
```

What is the output? and Why?

```
int  age;

age = 20;

if  ( age == 16 )
{
        printf( “Did you get driver’s license?”) ;
}
```

Nested If statement

```
If student's grade is greater than or equal to 90
   Print "A"
else
   If student's grade is greater than or equal to 80
      Print "B"
   else
      If student's grade is greater than or equal to 70
         Print "C"
      else
         If student's grade is greater than or equal to 60
            Print "D"
         else
            Print "F"
```

Nested If statement

```
if ( grade >= 90 )
    printf( "A" );
else if ( grade >= 80 )
    printf( "B" );
else if ( grade >= 70 )
    printf( "C" );
else if ( grade >= 60 )
    printf( "D" );
else
    printf( "F" );
```

EXAMPLE: MAIL ORDER

Write a program to calculate the total price of a certain purchase. There is a discount and shipping cost:

- **The discount rate is 25% and the shipping is 10.00 if purchase is over 100.00.**
- **Otherwise, The discount rate is 15% and the shipping is 5.00 pounds.**

```
if ( purchase > 100.00 )
{
        discountRate = .25 ;
        shipCost  = 10.00 ;
}
else
{
        discountRate = .15 ;
        shipCost  = 5.00 ;
}

totalBill = purchase * (1.0 - discountRate) +
shipCost ;
```

THANK YOU