Course Notes

COMP1200 - C Programming

Introduction to Computing for Engineers and Scientists

Control Structures: Repetition

Computer Science and Software Engineering
Auburn University

Precedence for Arithmetic, Relational, and Logical Operators

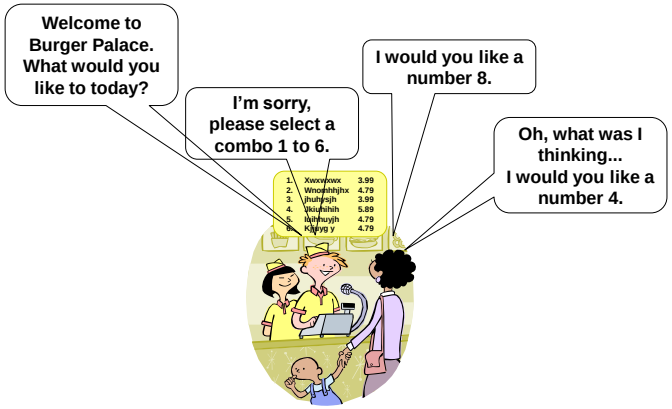
Precedence	Operation	Associativity
1	( )	Innermost first
2	++ -- + - ! (type)	Right to left (unary)
3	* / %	Left to right
4	+ -	Left to right
5	< <= > >=	Left to right
6	== !=	Left to right
7	&&	Left to right
8	||	Left to right
9	= += -= *= /= %=	Right to left

Simple Control Structures

- Sequence
  - Statements performed one after another
- Selection
  - Choose among alternatives
  - An exception
- Repetition
  - Repeat a group of statements

Repetition

Input Validation Loop



Input Validation Loop: `do..while`

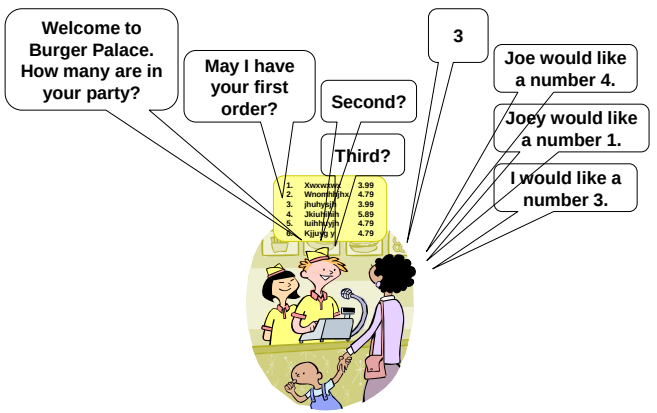
```
int combo;
// before the loop statements
printf( "Welcome to Hamburger Palace\n" );

do
{
   // inside the loop statements
   printf( "Enter the combo number (1-6): " );
   scanf("%d", &combo );

} while ( combo < 1 || combo > 6 );

// process order
```


Counting Loop



Counting Loop: `while`

```
int combo, party, p=1;
// before the loop statements
printf( "Welcome to Hamburger Palace\n" );
printf( "How many are in your party? " )
scanf( "%d", &party );

while ( p <= party )
{
   //  get an order
   //  process order
   p++;
}
// after the loop statements
```

Counting Loop: `for`

```
int combo, party, p;
// before the loop statements
printf( "Welcome to Hamburger Palace\n" );
printf( "How many are in your party? " );
scanf( "%d", &party );

for ( p=1; p<=party; p++ )
{
   // get an order
   // process an order
}
// after the loop statements
```


Nested Loops

- Shouldn't we check for a correct combo number for each person's order?

  Get number in party
  For each person
    While not value combo number get order
    Process order

- A loop inside another loop…nested loops

Nested Loops

```
int combo, party;
// before the loop statements
printf( "Welcome to Hamburger Palace\n" );
printf( "How many are in your party? " );
scanf( "%d", &party );

for ( p=1; p<=party; p++ )
{ // for each person in party
   do
   {
      printf( "Enter the combo number (1-6): " );
      scanf("%d", &combo );
   } while ( combo < 1 || combo > 6 );
   // process person's order
}
// after the for loop statements
```


Kinds of Loops

- A counting loop is controlled by knowing how many times to repeat
- An input-validation loop is repeated until a correct value is entered.
- A sentinel-controlled loop continues until a special value is entered.

Sentinel-controlled Loops

- Let's take the fast food line scenario one step farther.
- How would we handle multiple groups and individuals?

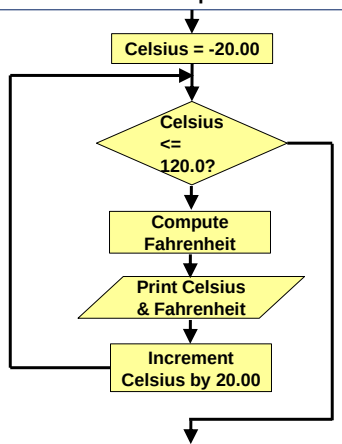
Get number in party until there are no more people in line
  For each person
    While not value combo number get order
    Process order

Sentinel-controlled Loops

```
int combo, party=0, p;
// before the loop statements
printf( "Welcome to Hamburger Palace\n" );
printf( "How many are in your party? (enter 0 to end)" );
scanf( "%d", &party );

while ( party > 0 )
{
   for ( p=1; p<=party; p++ )
   { //  for each person in party
      do
      {
           printf( "Enter the combo number (1-6): " );
          scanf("%d", &combo );
      } while ( combo < 1 || combo > 6 );
        // process person's order
   } //end for …ready for another party
   printf("How many are in your party? (enter 0 to end)");
   scanf( "%d", &party );
} // end while
```


Flowchart for Repetition Structure



What kind of loop do you use?

```
Table of Celsius and Fahrenheit degrees

Degrees          Degrees
Celsius          Fahrenheit
-20.00             -4.00
  0.00             32.00
 20.00             68.00
 40.00            104.00
 60.00            140.00
 80.00            176.00
100.00            212.00
120.00            248.00
```

for loop

```
double degC, degF;

for (degC = -20.0; degC <= 120.0; degC += 20.0 )
{
   degF  = degC * 9./5. +32.;
   printf ("    %7.2f         %7.2f \n", degC, degF);
}
```


while loop

```
double degC, degF;
degC = -20.0;

while( degC <= 120.0
{
    degF  = degC * 9./5. +32.;
    printf ("    %7.2f         %7.2f \n", degC, degF);
    degC += 20.0;
}
```


do..while loop

```
double degC, degF;
degC = -20.0;

do
{
    degF  = degC * 9./5. +32.;
    printf ("    %7.2f         %7.2f \n", degC, degF);
    degC += 20.0;
} while( degC <= 120.0 );
```

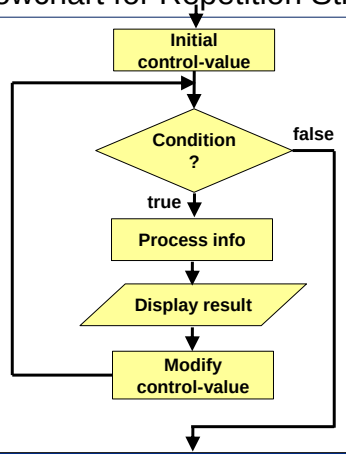

How many times will the assignment stmt in the loop be executed?

```
int x = 0;
do
{
   x = x - 1;
}while (x > 0);
```

```
int x = 0;
while (x > 0)
{
   x = x - 1;
}
```

```
int x = 0;
int y = 6;
do
{
   x = x + 2;
}while (x <= y);
```

Flowchart for Repetition Structure



C Structures for Loops

```
controlValue initialzed;
while (compare controlValue with terminationValue)
{
    // do something
    modify controlValue;
}
```

```
controlValue initialzed;
do
{
    // do something
    modify controlValue;
} while (compare controlValue with terminationValue);
```

```
for (controlValue initialzed;
     compare controlValue with terminationValue;
     modify controlValue)
{
    // do something
}
```


Kinds of Loops

Kind	When Used	C Structure
Counting	Know before the loop how many times it will be repeated	`while` `for`
Sentinel-controlled	Input of a list of data any length ended by a special value	`while` `for`
Endfile-controlled	Input of a single list of data of any length from a data file	`while` `for`
Input validation	Repeated interactive input of a data value until a value within the range is entered	`do-while`
General conditional	Repeated processing of data until a desired condition is met	`while` `for`