

BCSE102L &P –Structured and Object oriented Programming

Dr.R.Priyadarshini



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

SCOPE, VIT Chennai

(Ph : 9840352046, Email : Priyadarshini.r@vit.ac.in)



About Myself & Course-ICT

- **Current Position - Assistant. Professor (Sr. Grade II), TEACHING , SCOPE, VIT**
- A Certified Digital Teacher from ICT , enabling Learner Centered Classrooms, using tools like Active Inspire platform, Google Classrooms, LMS, Kahoot, Cisco WebEx& Zoom for interactive and participatory learning. Focusing on hands-on training the students with current industry applications.
- [My Short CV](#)

Syllabus - Theory

Modules	Contents	No of Hours
Module 1 C programming Fundamentals	Variables- Reserve words-Data Types – Operators –Operator Precedence- Expressions –Type Conversions – I/O Statements – Branching and Looping – If else, Nested if, If –else Ladder, Switch Statement , <u>Goto Statement</u> , Loops –For , While and <u>Do ,while</u> - Break and continue statements	2
Module 2 Arrays and Functions	Array: One dimensional array –Two dimensional array – Strings and its operations. User defined Functions – Declarations –Definition- Call by value and call by reference- Types of functions- Recursive functions – Storage Classes-Scope , Visibility and Life time of variables.	4
Module 3 Pointers	Declaration and Access of pointer Variables, Pointer arithmetic- Dynamic memory allocation-Pointers and arrays –Pointer and functions	4
Module 4 Structure and Union	Declaration Initialization -Access of structure Variables- Array of structure – Arrays within structure-Structure within structures- Structures and Functions –Pointer to Structure	2

Syllabus - Theory

Module 5 Overview of Object Oriented Programming	Features of OOP – Classes and Objects –“This “Pointer-Constructors and destructors- Static Data members, Static Member Functions and Objects –Inline functions- Call by Value and Call by reference, Function with default Arguments, Function with object as arguments – Friend Functions and Friend classes.	5
Module 6 Inheritance	Inheritance –types of inheritance, Single Inheritance, Multiple inheritance, Multilevel Inheritance, Hierarchical Inheritance, Multipath Inheritance, Inheritance and constructors.	5
Module 7 Polymorphism	Function Overloading – Operator Overloading- Dynamic Polymorphism- Virtual Functions –Pure virtual Functions – Abstract	4

Syllabus - Theory

	Classes		
Module 8 Generic Programming	Function Templates and Class Templates, Standard Template Library	4	
Total Hours		30	

Evaluation Process

Components	Marks	Weightage
CAT-1	30	15
CAT-2	30	15
Digital Assignments (I,II,III)	30	30
FAT	100	40
Total		100

EVALUATION PROCEDURE - THEORY

Evaluation Process

Components	Marks	Weightage
CAT-1	30	15
CAT-2	30	15
Digital Assignments (I,II,III)	30	30
FAT	100	40
Total		100

Syllabus - LAB

BCSE102P –Structured and Object oriented Programming (Lab)

(Contents as per the syllabus)

1. Programs using basic control structures, branching and looping
2. Experiment the use of 1-D, 2-D arrays and strings and Functions
3. Demonstrate the application of pointers
4. Experiment structures and unions
5. Programs on basic Object-Oriented Programming constructs.
6. Demonstrate various categories of inheritance
7. Program to apply kinds of polymorphism.
8. Develop generic templates and Standard Template Libraries

EVALUATION PROCEDURE - LAB

Components	Marks	Weightage
Daily Lab exercises	80	
Challenging Task -1 (C)	10	
Challenging Task -2 (C ++)	10	
CAM (Total)	100	60
FAT	50	40
Total		100

Module I –C Programming Fundamentals

Variables- Reserve words-Data Types –
Operators –Operator Precedence- Expressions –
Type Conversions – I/O Statements – Branching
and Looping – If else, Nested if, If –else Ladder,
Switch Statement , Goto Statement, Loops –For ,
While and Do..while- Break and continue
statements

What is c language:-



- C is mother language of all programming language.
- It is a popular computer programming language.
- It is procedure-oriented programming language.

History of c language:-



- C programming language was developed in 1972 by Dennis Ritchie at bell laboratories of AT&T(American Telephone & Telegraph), located in U.S.A.
- Dennis Ritchie is known as founder of c language.
- It was developed to be used in UNIX Operating system.
- It inherits many features of previous languages such as B and BPCL.

History of c programming

Language	year	Developed By
ALGOL	1960	International Group
BPCL	1967	Martin Richards
B	1970	Ken Thompson
Traditional C	1972	Dennis Ritchie
K & R C	1978	Kernighan & Dennis Ritchie
ANSI C	1989	ANSI Committee
ANSI/ISO C	1990	ISO Committee
C99	1999	Standardization Committee

Features of C Language:-

There are many features of c language are given below.

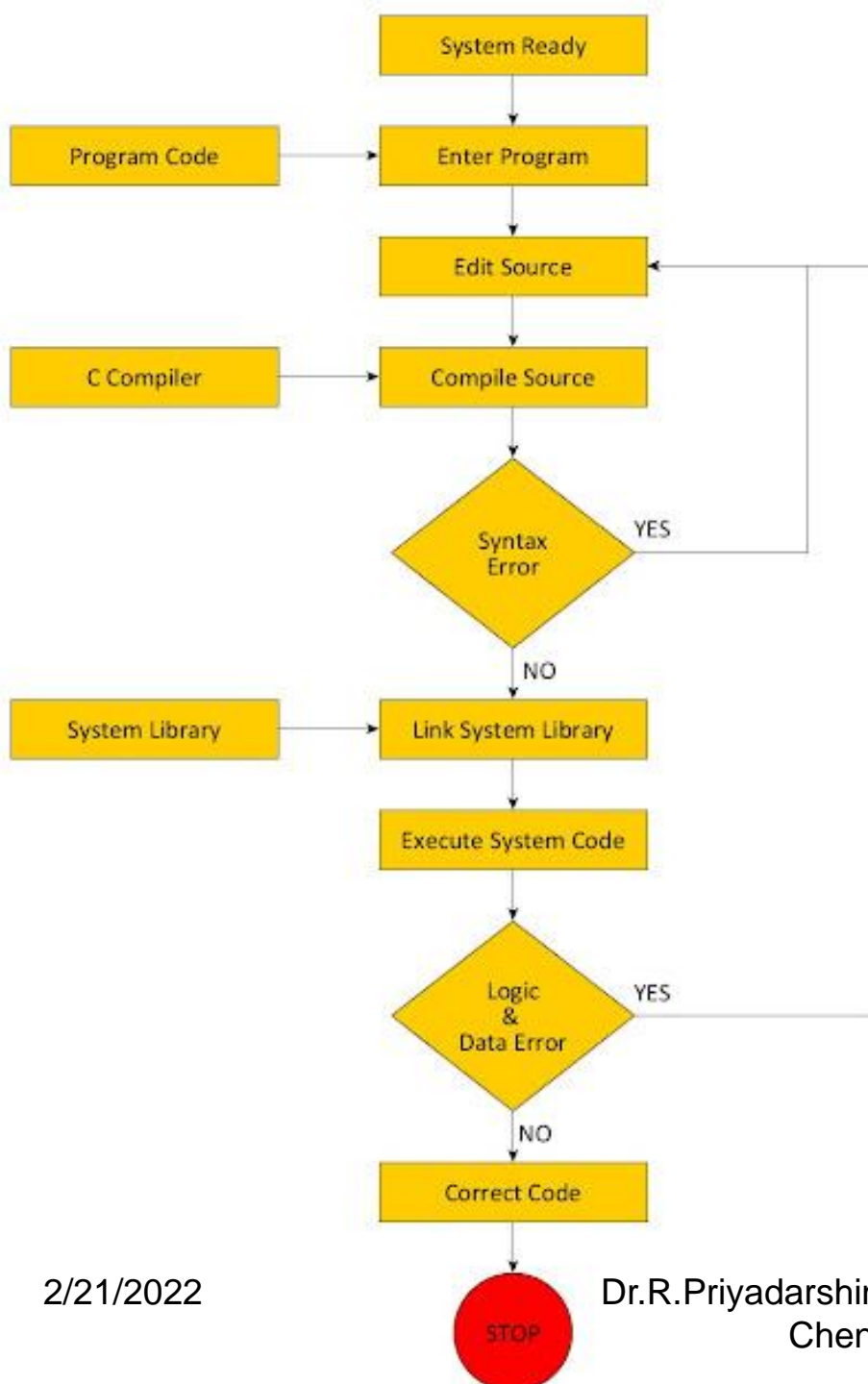
- 1) Machine Independent or Portable
- 2) Mid-level programming language
- 3) structured programming language
- 4) Rich Library
- 5) Memory Management
- 6) Fast Speed
- 7) Pointers
- 8) Recursion
- 9) Extensible

Structure of C Program

Structure of C Program

<i>Header</i>	<code>#include <stdio.h></code>
<i>main()</i>	<code>int main() {</code>
<i>Variable declaration</i>	<code>int a = 10;</code>
<i>Body</i>	<code>printf("%d ", a);</code>
<i>Return</i>	<code>return 0; }</code>





Flow chart for compilation & Execution

Hello World Program

```
#include <stdio.h>
int main() {
    /* my first program in C */
    printf("Hello, World! \n");

    return 0;
}
```


Tokens in C

Tokens in C

A C program consists of various tokens and a token is either a keyword, an identifier, a constant, a string literal, or a symbol. For example, the following C statement consists of five tokens –

```
printf("Hello, World! \n");
```

The individual tokens are –

```
printf  
(  
    "Hello, World! \n"  
)  
;
```

First Program of C Language:-

```
#include <stdio.h>
#include <conio.h>
void main(){
printf(“Hello VITIAN”);
  getch();
}
```

Describe the C Program :-

- **#include <stdio.h>** includes the **standard input output** library functions. The printf() function is defined in stdio.h .
- **#include <conio.h>** includes the **console input output** library functions. The getch() function is defined in conio.h file.
- **void main()** The **main() function is the entry point of every program** in c language. The void keyword specifies that it returns no value.
- **printf()** The printf() function is **used to print data** on the console.
- **getch()** The getch() function **asks for a single character**. Until you press any key, it blocks the screen.

Output of Program is:-

Hello VITIAN

Input output function:-

There are two input output function of c language.

1) First is printf()

2) Second is scanf()

- printf() function is used for output. It prints the given statement to the console.
- Syntax of printf() is given below:
- printf(“format string”,arguments_list);
- Format string can be %d(integer), %c(character), %s(string), %f(float) etc.

Input/ output function

- `scanf()` Function: is used for input. It reads the input data from console.
- `scanf("format string",argument_list);`
- Note:-See more example of input-output function on:-
- www.javatpoint.com/printf-scanf

Data types in C language:-

- There are four types of data types in C language.

Types	Data Types
Basic Data Type	int, char, float, double
Derived Data Type	array, pointer, structure, union
Enumeration Data Type	enum
Void Data Type	void

Keywords in C Language:-

- A keyword is a **reserved word**. You cannot use it as a variable name, constant name etc.
- There are 32 keywords in C language as

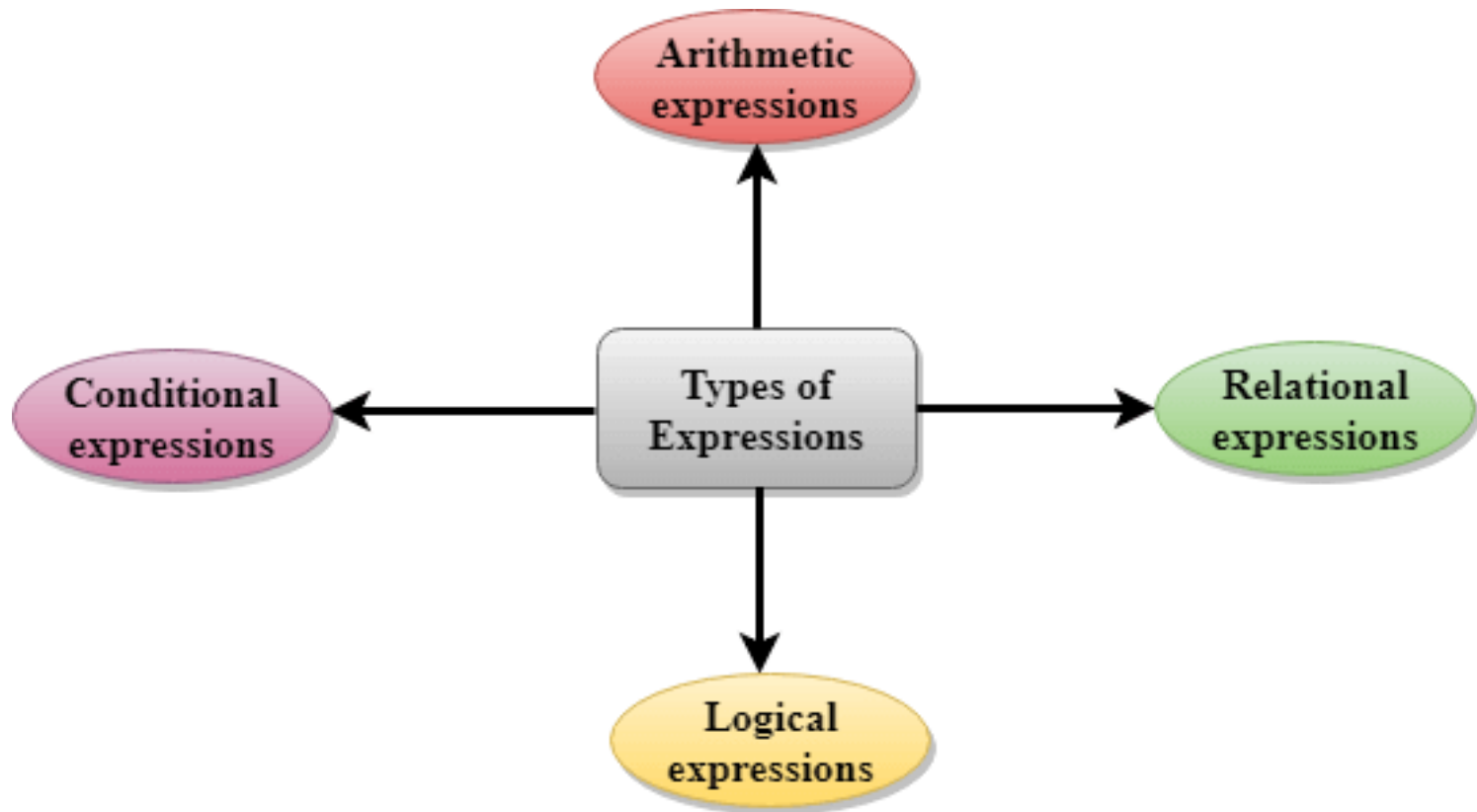
auto	break	case	char	const	continue	default	do
double	else	enum	extern	float	for	goto	if
int	long	register	return	short	signed	sizeof	static
struct	switch	typedef	union	unsigned	void	volatile	while

Operators in C language:-

➤ There are following types of operators to perform different types of operations in C language.

- 1) Arithmetic Operators
- 2) Relational Operators
- 3) Logical Operators
- 4) Bitwise Operators
- 5) Assignment Operator
- 6) Ternary or Conditional Operators

Expressions



Expressions

- $x = 9/2 + a - b;$

The entire above line is a statement, not an expression. The portion after the equal is an expression.

<https://www.javatpoint.com/c-expressions>

Operator Precedence

Operator precedence determines the grouping of terms in an expression and decides how an expression is evaluated. Certain operators have higher precedence than others; for example, the multiplication operator has a higher precedence than the addition operator.

For example, $x = 7 + 3 * 2$; here, x is assigned 13, not 20 because operator $*$ has a higher precedence than $+$, so it first gets multiplied with $3*2$ and then adds into 7.

Here, operators with the highest precedence appear at the top of the table, those with the lowest appear at the bottom. Within an expression, higher precedence operators will be evaluated first.

Operator Precedence

Equality	== !=	Left to right
Bitwise AND	&	Left to right
Bitwise XOR	^	Left to right
Bitwise OR		Left to right
Logical AND	&&	Left to right
Logical OR		Left to right

Operator Precedence

Relational	< <= > >=	Left to right
Equality	== !=	Left to right
Bitwise AND	&	Left to right
Bitwise XOR	^	Left to right
Bitwise OR		Left to right
Logical AND	&&	Left to right

Operator Precedence

Equality	== !=	Left to right
Bitwise AND	&	Left to right
Bitwise XOR	^	Left to right
Bitwise OR		Left to right
Logical AND	&&	Left to right
Logical OR		Left to right

https://www.tutorialspoint.com/compile_c_online.php

Control statement in C language:-

- 1) if-else
- 2) switch
- 3) loops
- 4) do-while loop
- 5) while loop
- 6) for loop
- 7) break
- 8) continue

C if else statement:-

➤ There are many ways to use if statement in C language:

1) If statement

2) If-else statement

3) If else-if ladder

4) Nested if

if statement:-

➤ In if statement is used to execute the code if condition is true.

➤ syntax:-

```
if(expression){  
//code to be execute  
}
```

If else statement:-

➤ The if-else statement is used to execute the code if condition is true or false.

➤ Syntax:

```
if(expression){
```

```
//code to be executed if condition is true
```

```
}else{
```

```
//code to be executed if condition is false
```

```
}
```

if else-if ladder Statement:-

Syntax:

```
if(condition1){  
//code to be executed if condition1 is true  
}else if(condition2){  
//code to be executed if condition2 is true  
}  
else if(condition3){  
//code to be executed if condition3 is true  
}  
...  
else{  
//code to be executed if all the conditions are false  
}
```

C Switch Statement:-

➤ **Syntax:**

```
switch(expression){  
case value1:  
    //code to be executed;  
    break; //optional  
case value2:  
    //code to be executed;  
    break; //optional  
.....  
default:  
    code to be executed if all cases are not matched;  
}
```

Loops in C language:-

- Loops are used to execute a block of code or a part of program of the program several times.

Types of loops in C language:-

- There are 3 types of loops in c language.

- 1) do while
- 2) while
- 3) for

do-while loop in C:-

➤ It is better if you have to execute the code at least once.

➤ Syntax:-

do{

//code to be executed

}while(condition);

while loop in c language:-

➤ It is better if number of iteration is not known by the user.

➤ Syntax:-

```
while(condition){  
//code to be executed  
}
```


For loop in C language:-

➤ It is good if number of iteration is known by the user.

➤ Syntax:-

```
for(initialization;condition;incr/decr){  
//code to be executed  
}
```

C break statement:-

➤ it is used to break the execution of loop (while, do while and for) and switch case.

➤ Syntax:-

jump-statement;

break;

Continue statement in C language:-

- it is used to continue the execution of loop (while, do while and for). It is used with *if condition* within the loop.
- Syntax:-

jump-statement;

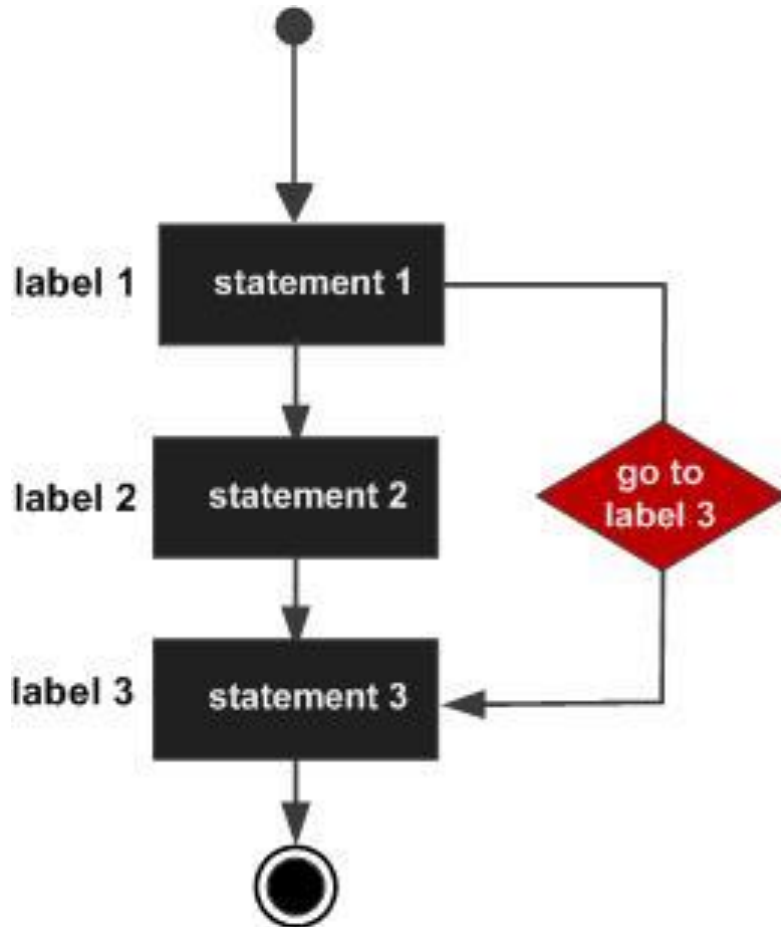
continue;

Note:- you can see the example of above all control statements on.

www.javatpoint.com/c-if-else

Go- To Statements in C

https://www.tutorialspoint.com/c-programming/c_goto_statement.htm



Break and Continue statements

Break Statement

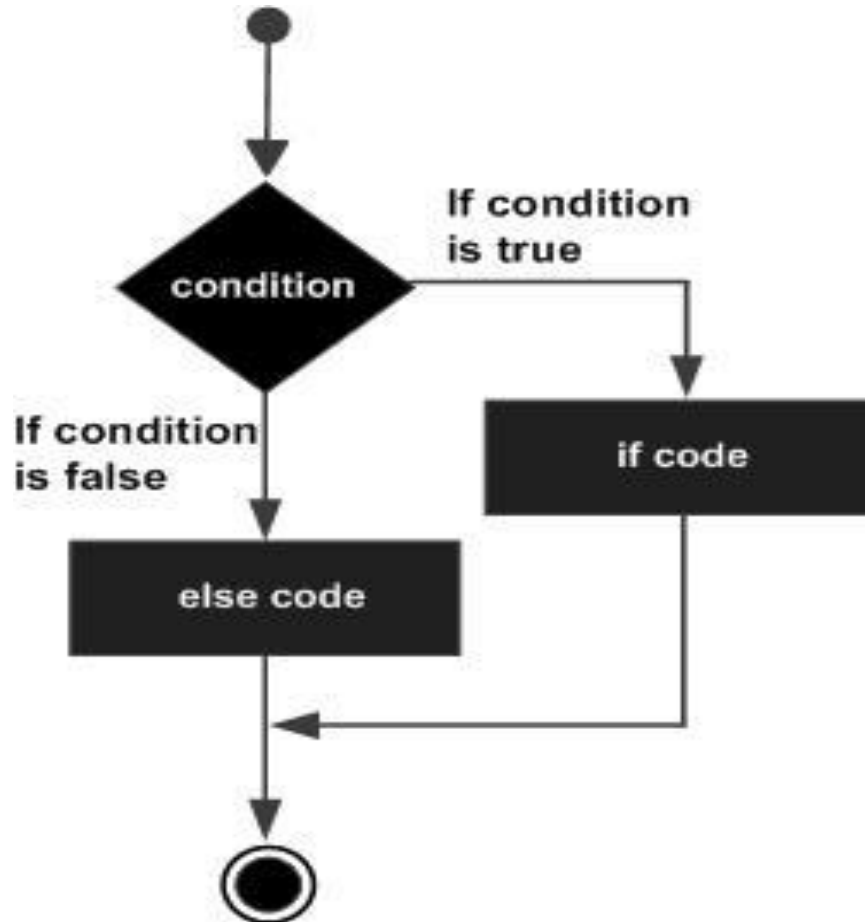
The break statement is usually used with the switch statement, and it can also use it within the while loop, do-while loop, or the for-loop.

Continue Statement

The continue statement is not used with the switch statement, but it can be used within the while loop, do-while loop, or for-loop.

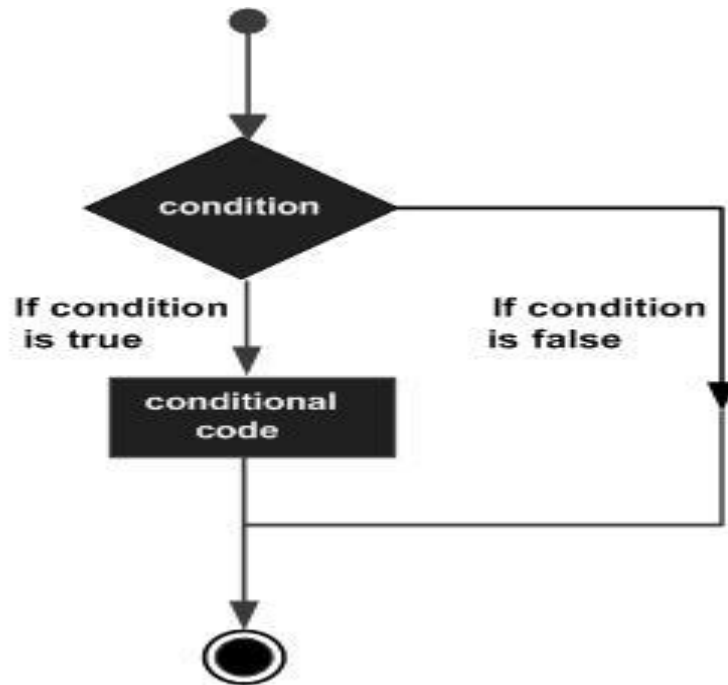
- <https://www.programiz.com/c-programming/c-break-continue-statement>

If-else Statement



https://www.tutorialspoint.com/cprogramming/if_else_statement_in_c.htm

If – Statement



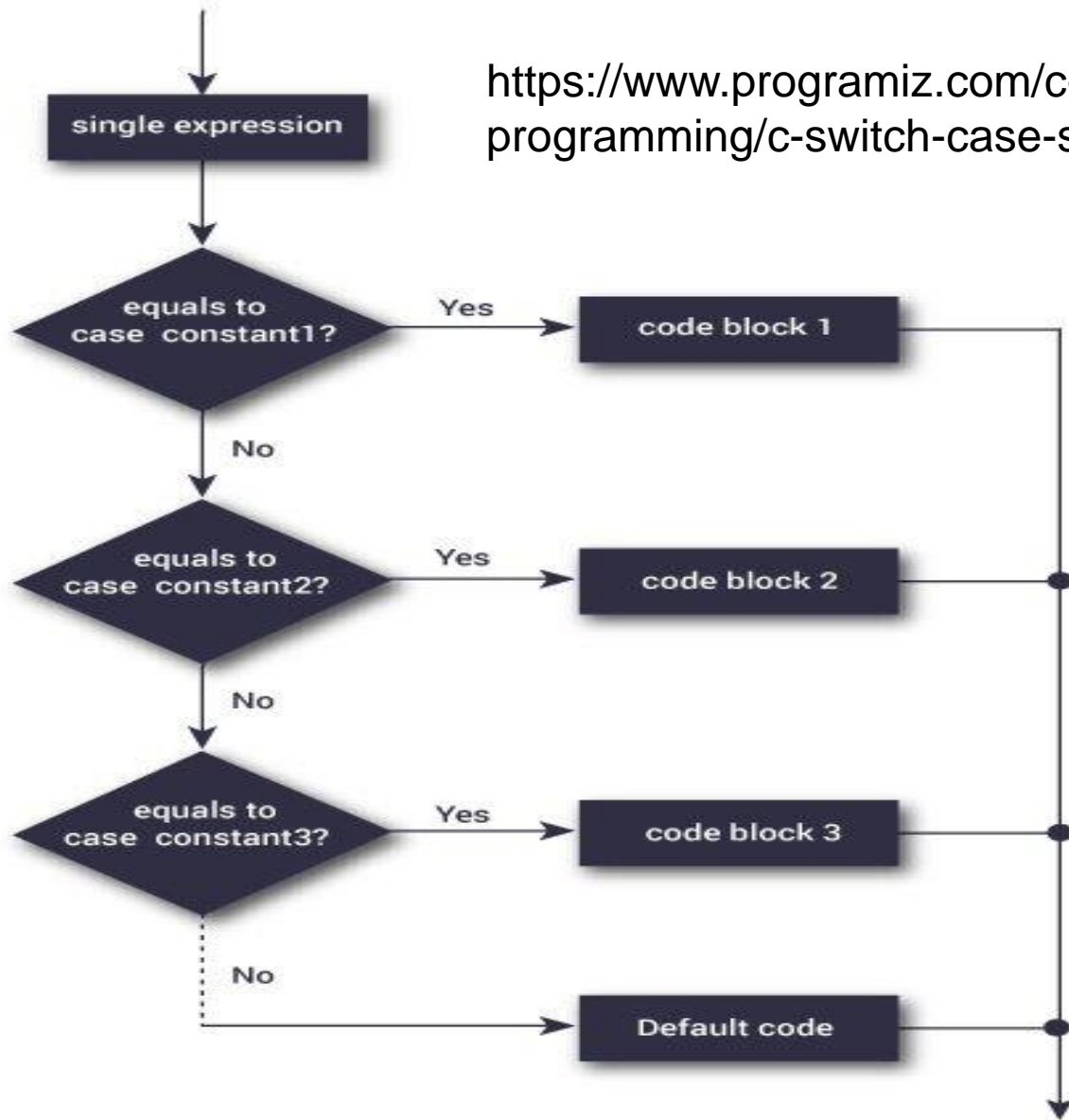
https://www.tutorialspoint.com/cprogramming/if_statement_in_c.htm

Nested If

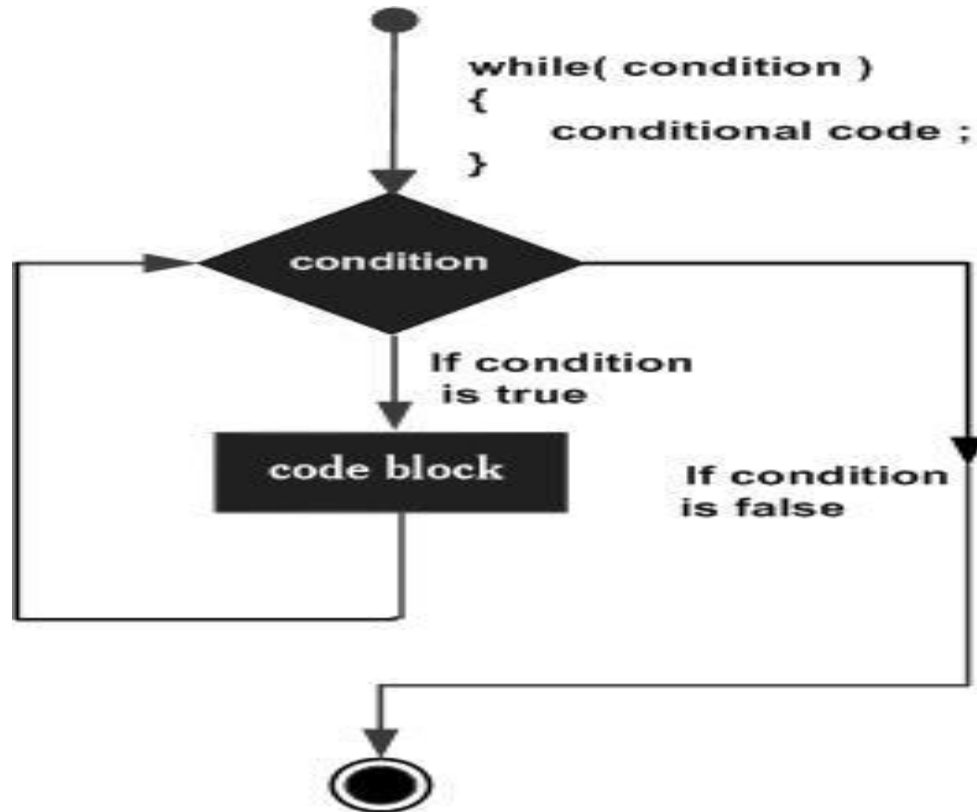
- `if(boolean_expression 1) {`
- `/* Executes when the boolean expression 1 is true */`
- `if(boolean_expression 2) {`
- `/* Executes when the boolean expression 2 is true */`
- `}`
- `}`

Switch Case

<https://www.programiz.com/c-programming/c-switch-case-statement>

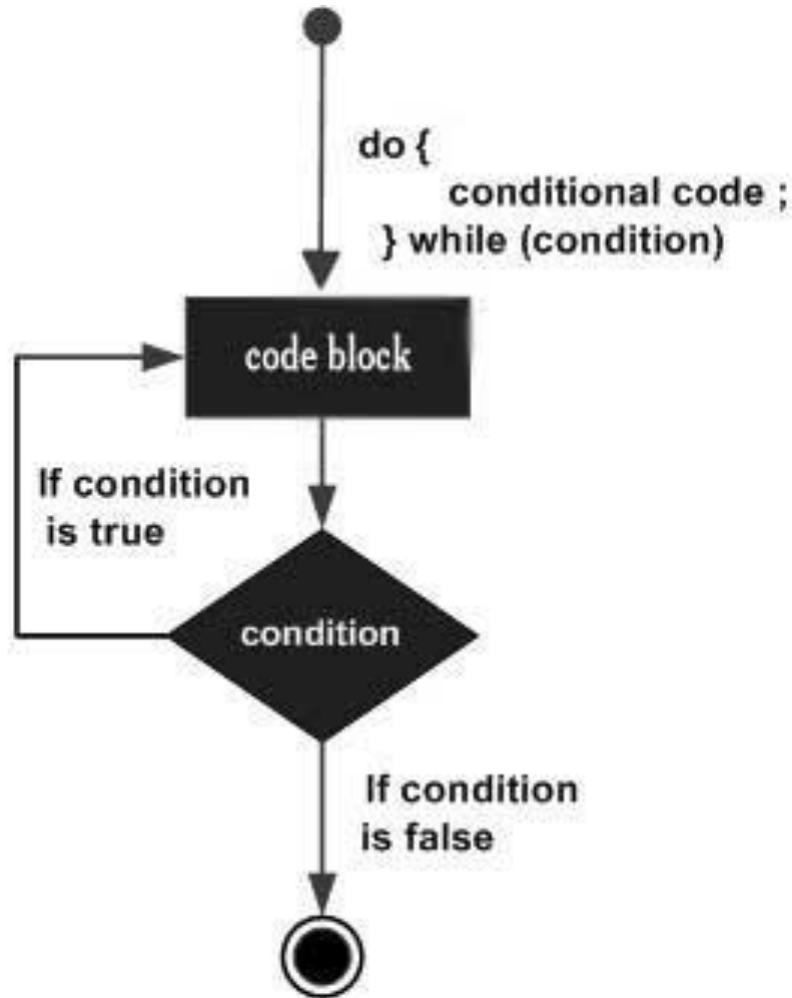


While - Loop



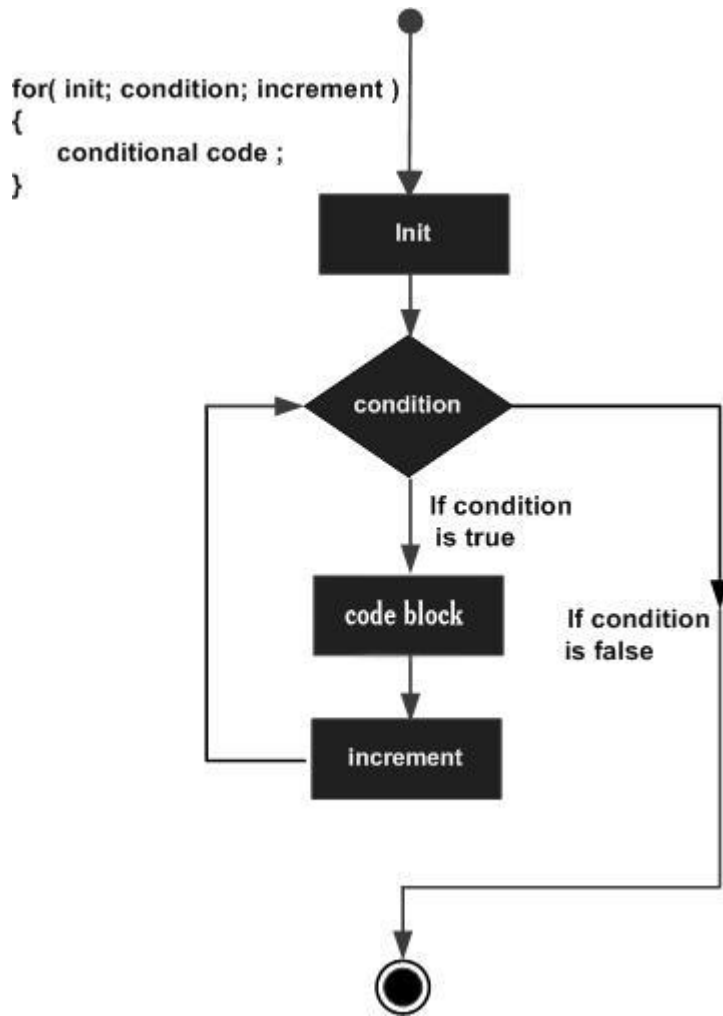
https://www.tutorialspoint.com/cprogramming/c_while_loop.htm

Do-While Loop



https://www.tutorialspoint.com/cprogramming/c_do_while_loop.htm

For-Loop



- https://www.tutorialspoint.com/cprogramming/c_for_loop.htm

Loops in C

C has three loop statements: the while, the for, and the do...while. The first two are pretest loops, and the third is a post-test loop. We can use all of them for event-controlled and counter-controlled loops.

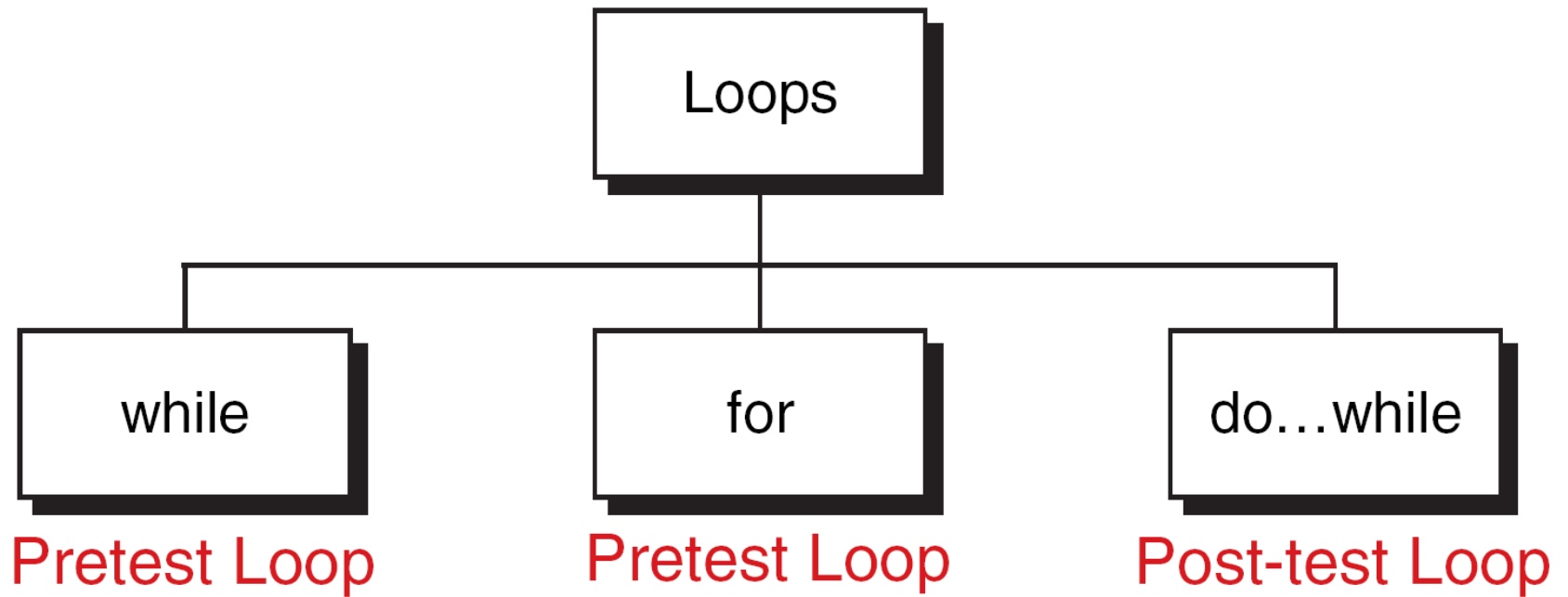
Topics discussed in this section:

The *while* Loop

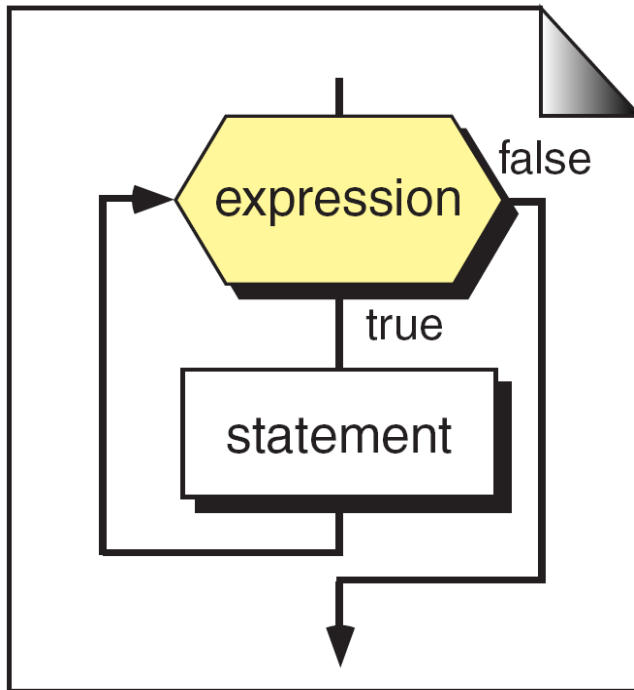
The *for* Loop

The *do...while* Loop

The Comma Expression



C Loop Constructs



(a) Flowchart

```
while (expression)  
  
    statement
```

(b) Sample Code

The while Statement

PROGRAM 6-2 A *while* Loop to Print Numbers

```
1  /* Simple while loop that prints numbers 10 per line.
2     Written by:
3     Date:
4  */
5  #include <stdio.h>
6
7  int main (void)
8  {
9  // Local Declarations
10     int num;
11     int lineCount;
12
13 // Statements
14     printf ("Enter an integer between 1 and 100: ");
15     scanf ("%d", &num);           // Initialization
16
17     // Test number
18     if (num > 100)
19         num = 100;
20
```


PROGRAM 6-3 Adding a List of Numbers

Results:

Enter your numbers: <EOF> to stop

15

22

3^d

The total is: 40

Note

A *for* loop is used when a loop is to be executed a known number of times. We can do the same thing with a *while* loop, but the *for* loop is easier to read and more natural for counting loops.

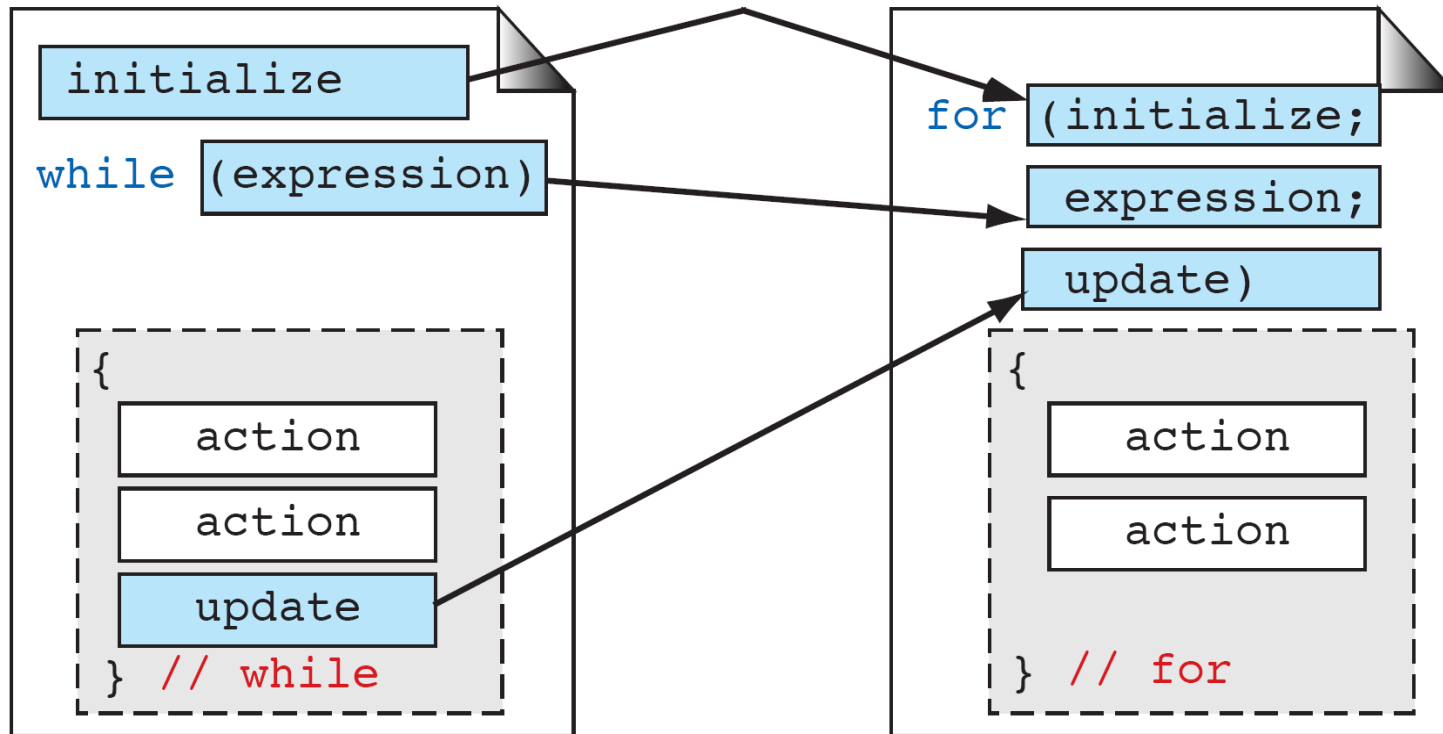


FIGURE 6-14 Comparing *for* and *while* Loops

PROGRAM 6-5 A Simple Nested *for* Loop

Results:

```
Row 1:  1  2  3  4  5
Row 2:  1  2  3  4  5
Row 3:  1  2  3  4  5
```

PROGRAM 6-8 Comparison of *while* and *do...while*

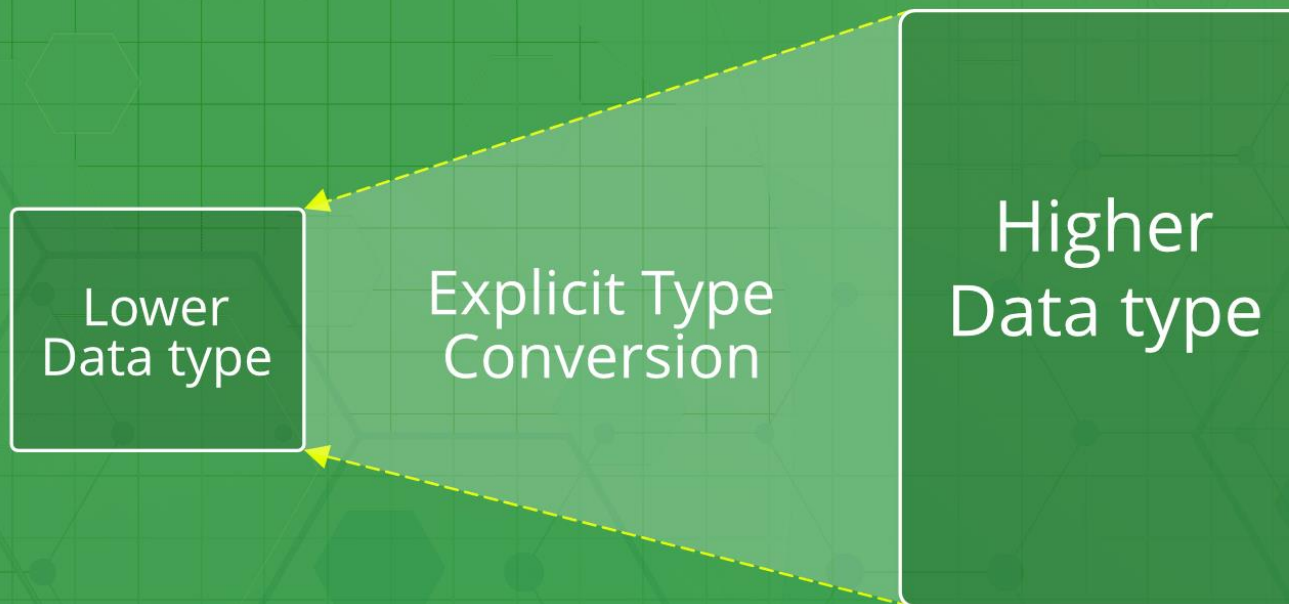
```
1  /* Demonstrate while and do..while loops.
2      Written by:
3      Date:
4  */
5  #include <stdio.h>
6
7  int main (void)
8  {
9  // Local Declarations
10     int loopCount;
11     int testCount;
12
13 // Statements
14     loopCount = 1;
15     testCount = 0;
16     printf("while loop:          ");
17     while (testCount++, loopCount <= 10)
18         printf("%3d", loopCount++);
19     printf("Loop Count:          %3d\n", loopCount);
```

Typecasting in C

- Converting simple Converting one datatype into another is known as type casting or, type-conversion. For example, if you want to store a 'long' value into a simpleinteger integer then you can type cast 'long' to 'int'. You can convert the values from one type to another explicitly using the
- cast operator cast operator as follows –
- (expression(type_name) expression
- Consider pointConsider the following example where the cast operator causes the division of one integer variable by another to be performed as a floating-pointoperation operation
- https://www.tutorialspoint.com/cprogramming/c_type_casting.htm
- <https://www.geeksforgeeks.org/difference-between-type-casting-and-type-conversion/?ref=rp>

Type Conversion

Explicit Type Conversion



Lab Sessions-1,2,3

- Overview of C : Operators, Expressions, Input/output Statements
- Conditional and Looping Statements
- Assignments Given:
 - 1 – 10 Programs
 - 2 – 10 Programs
 - 3 – 5 Programs