Scientific and Technical Computing: SMR3821

Introduction to Scientific computing and Linux - Introduction to C Programming: Decisions and Iterations

Elliot S. Menkah, Ph.D

National Institute for Mathematical Sciences, Ghana.
Kwame Nkrumah University of Science and Technology, Ghana.
ICTP, Trieste.

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Introduction to Scientific Computing - C programming - Decisions & Iterations

This materials is part of materials used at the National institute for Mathematical Sciences, Ghana, and have been contributed to over time by the follow authors and instructors:

1. Elliot Menkah, Ph.D
2. Peter Amoako-Yirenkyi, Ph.D
3. Ernest Ofori-Yirenkyi
4. Kwesi Smith
5. Shirley A. Akasreku

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Outline

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where are we?

1. Operators
   - Logical
   - Relational
   - Hierarchy
2. IF STATEMENT
   - simple if
   - if..else
   - if..else if
   - if..else if..else
   - nested if
3. SPEED BYTE
4. TERNARY OPERATOR
5. SWITCH
   - fall through

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Logical Operators

The 3 Logical operators of C are:

1. && read as AND
2. || read as OR
3. ! read as NOT

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Relational Operators

Symbol	Meaning
<	less than
>	greater than
<=	less or equal
>=	greater or equal
==	equal
! =	not equal

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Hierarchy of Operators

Priority	Operator	Type
1	!	Logical NOT
2	* / %	Arithmetic
3	+ −	Arithmetic
4	< > <= >=	Relational
5	== ! =	Relational
6	&&	Logical AND
7	‖	Logical OR
8	=	Assignment

- Operators in an expression are evaluated according to their priority in the hierarchy table (1st to 4th).
- If two operators in an expression have the same priority, then then their priority is evaluated from left to right.

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Syntax: if Statement

```
1 if(condition)
2 {
3    [ statement_1;
4      statement_k;]
5 }
```

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E.g.: if Statement

```
1 #include <stdio.h>
2
3 int main()
4 {
5         int age=0;
6
7         printf("How old are you?\n");
8         scanf("%d",&age);
9
10        if(age>=60)
11        {
12                printf("\nYou must retire!\n");
13        }
14
15 }
```

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Syntax: if..else Statement

```
1 if(condition)
2 {
3       [statement_1a;
4        statement_ka;]
5 }
6 else
7 {
8       [statement_1b;
9        statement_kb;]
10 }
```

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E.g.: if..else Statement

```
1 #include <stdio.h>
2
3 int main()
4 {
5     int age=0;
6     printf("How old are you?\n");
7     scanf("%d",&age);
8
9     if(age>=60)
10    {
11       printf("\nYou must retire!\n");
12    }
13    else
14    {
15       printf("\nYou have %d years to retirement\n",60-age
16    }
17 }
```

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Syntax : if..else if Statement

```
1 if(condition_1)
2 {
3       [ statement_1a;
4         statement_ka;]
5 }
6 else  if(condition_2)
7 {
8       [ statement_1b;
9         statement_kb;]
10  }
```

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E.g.: if..else if Statement

```
1 #include <stdio.h>
2 int main()
3 {
4     int age=0;
5     printf("How old are you?\n");
6     scanf("%d",&age);
7     if(age<16)
8     {
9       printf("\nYou cannot work by law!\n");
10    }
11    else if(age>=16 && age<50)
12    {
13      printf("\nKeep working\n");
14    }
15    else if(age>=50)
16    {
17      printf("\nPlan retirement\n");
18    }
19 }
```

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Syntax : if..else if..else Statement

```
1  if(condition_1)
2  {
3        [statement_1a;
4         statement_ka;]
5  }
6  else if (condition_2)
7  {
8        [statement_1b;
9         statement_kb;]
10 }
11 else if (condition_k)
12 {
13       [statement_1c;
14        statement_kc;]
15 }
16 else
17 {
18       [statement_1d;
19        statement_kd;]
20 }
```

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E.g.: if..else if..else Statement

```c
#include <stdio.h>
int main()
{
    int age=0;
    printf("How old are you?\n");
    scanf("%d",&age);
    if(age<16)
    {
      printf("\nYou cannot work by law!\n");
    }
    else if(age>=16 && age<50)
    {
      printf("\nKeep working\n");
    }
    else if(age>=50 && age<60)
    {
      printf("\nPlan retirement\n");
    }
    else
    {
      printf("\nRest time\n");
    }
}
```

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Syntax: Nested if Statement

```
1  if(condition_1)
2  {
3    if(condition_1_A)
4    {
5             [statement_1a;
6              statement_ka;]
7    }
8    else
9    {
10            [statement_1b;
11             statement_kb;]
12   }
13 }
14 else
15 {
16    if(condition_2_A)
17    {
18            [statement_1c;
19             statement_kc;]
20    }
21 }
```

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E.g.: nested if Statement

```c
#include <stdio.h>
int main()
{
    int age=0;
    printf("How old are you?\n");
    scanf("%d",&age);
    if(age<16 && age>0)
    {
          printf("\nYou cannot work by law!\n");
          if(age>12 && age<16)
          {
            printf("\nYou should be in JSS\n");
          }
          else
          {
            printf("\nYou should be in Primary School\n");
          }
    }
    else if(age>=16 && age<50)
    {
      printf("\nKeep working\n");
    }
    else if(age>=50 && age<60)
    {
      printf("\nPlan retirement\n");
    }
    else if(age>=60)
    {
      printf("\nRest time\n");
    }
    else
    {
      printf("\nError!\n");
    }
}
```

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where are we?

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where are we?

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Syntax:Ternary Operator

```
1    [variable_name=|printf] expr_1 ? expr_2 : expr_3
```

Example

```
1 #include<stdio.h>
2
3 int main()
4 {
5  float mark=0;
6  printf("Enter Mark\n");
7  scanf("%f",&mark);
8  printf("You %s \n",mark>40 ? "PASSED!" : "FAILED")
9 }
```

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Similarity between ternary operator and if..else

IF..ELSE

```
1 if(x==5)
2 {
3    y=10;
4 }
5 else
6 {
7    y=30;
8 }
```

TERNARY OPERATOR

```
1 y=(x==5 ? 10 :30);
```

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Nested Ternary operator

Its possible to nest ternary operators.

Example

```
1 #include<stdio.h>
2
3 int main()
4 {
5   float mark=0;
6   printf("Enter Mark\n");
7   scanf("%f",&mark);
8   printf("Your Grade =  %s \n",
9     mark>=70.0?"A":mark>=50.0?"B":mark>40.0?"C":"F");
10 }
```

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where are we?

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Syntax : switch

Statement

```
switch(integer_expression)
{
  case const_1:
    [statement_1a;
     statement_ka;]
     break;
  case const_2:
     [statement_kb;
      statement_kb;]
     break;
  case const_m:
     [statement_1;
      statement_3x;]
     break;
  default:
    [statement_1z;
     statement_2z;
     statement_kz;]
}
```

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E.g.: switch Statement

```
1 #include<stdio.h>
2
3 int main()
4 {
5         int value=0;
6         printf("\nEnter a integer \n");
7         scanf("%d",&value);
8
9         switch(value)
10        {
11                case 100:
12                        printf("\nRED\n");
13                        break;
14                case 200:
15                        printf("\nGOLD\n");
16                        break;
17                case 300:
18                        printf("\nGREEN\n");
19                        break;
20                default:
21                        printf("\nBLACK\n");
22                        break;
23        }
24 }
```

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'Fall through' in switch statement

```
switch(integer_expression)
{
  case const_1:
  case const_2:      //strategic use of fall through
    [statement_1a;
     statement_2a;
     statement_3a;]
     break;
  case const_3:
     [statement_1b;
      statement_2b;
      statement_3b;]
           //accidental use of fall through
           //due to omission of break statement
  case const_k:
     [statement_1x;
      statement_2x;
      statement_3x;]
     break;
  default:
    [statement_1z;
     statement_2z;
     statement_kz;]
}
```

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E.g.: 'Fall through' in switch statement

```c
#include<stdio.h>

int main()
{
        int value=0;
        printf("\nEnter a integer \n");
        scanf("%d",&value);

        switch(value)
        {
                case 540:
                case 145:
                        printf("\nPINK\n");
                        break;
                case 200:
                case 720:
                        printf("\nVIOLET\n");
                        //accidental omission of break
                case 300:
                        printf("\nPURPLE\n");
                        break;
        }
}
```

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Speed Byte

Question 1 :

Write a C program that accepts a mark value from the user.
If the mark is greater than 40, the program should print PASSED
otherwise, it should print FAILED

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Speed Byte

Question 2 :

Write a C program that accepts a mark value from the user. System should display the correponding grade for the mark using the table below

Range	Grade
100.0 - 70.0	A
69.9 - 50.0	B
49.9 - 40.0	C
39.9 and below	F

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