CS 2211
Systems Programming

Part Three: Basic Control in C

CONTROL in C

Three Control Statements in C:

SELECTION Statements:
IF statements and SWITCH statements

ITERATION Statements (loops):
WHILE loops
DO loops
FOR loops

JUMP Statements:
BREAK
CONTINUE
GOTO
RETURN

other C statements:
COMPOUND statements
NULL statements

IF statements

```c
#include <stdio.h>

int main(int argc, char *argv[])
{
    int age;                                        /* Need a variable... */

    printf( "Please enter your age" );                      /* Asks for age */
    scanf( "%d", &age );                          /* The input is put in age */
    if ( age < 10 ) {                             /* If age is less than 100 */
      printf ("You are an adolescent.\n" );
    }
    else if ( age > 12 && age < 20 )
      printf( "You are old\n" );          /* bracket optional if one line */

    else
    {                             /* bracket one separate (stand-alone) line */
      printf( "You are no longer the target market\n" );
    }

    return 0;
}
```

IF statements

```
#include <stdio.h>

int main(int argc, char *argv[])
{
     int age;                                                    */

     printf( "Please enter your age" );                          */
     scanf( "%d", &age );                                        */
     if ( age < 10 ) {                                           */
       printf ("You are an adolescent.\n" );
     }
     else if ( age > 12 && age < 20 )
       printf( "You are old\n" );        /* bracket optional if one line */

     else
     {                              /* bracket one separate (stand-alone) line */
       printf( "You are no longer the target market\n" );
     }

     return 0;
}
```

`!`	logical negation
`&&`	logical and
`||`	logical or
`0`	false
`1`	(or anything else) true
`==`	equal to
`!=`	not equal to

MULTIPLE IF statements

```
#include <stdio.h>

int main(int argc, char *argv[])
{
    int grade;                                  /* Need a variable... */

       if (grade == 3)
         printf("Good");
       else if (grade == 2)
         printf("Average");
       else if (grade == 1)
         printf("Poor");
       else if (grade == 0)
         printf("Failing");
       else
         printf("Illegal grade");

    return 0;
}
```

SWITCH statements

```
#include <stdio.h>

int main(int argc, char *argv[])
{
    int grade;

        switch (grade) {
          case 3:
            printf("Good");
             break;
          case 2:
            printf("Average");
             break;
          case 1:
            printf("Poor");
              break;
          case 0:
             printf("Failing");
               break;
          default:
             printf("Illegal grade");
              break;

    return 0;
}
```

```
if (grade == 3)
  printf("Good");
else if (grade == 2)
  printf("Average");
else if (grade == 1)
  printf("Poor");
else if (grade == 0)
  printf("Failing");
else
  printf("Illegal grade");
```

SWITCH statements

```
#include <stdio.h>

int main(int argc, char *argv[])
{
    int grade;                                          /* Need a variable... */

       switch (grade) {
         case 3:  printf("Good");                      // Without break (or some
         case 2:  printf("Average");                   // other jump statement) at
         case 1:  printf("Poor");                      // the end of a case,
         case 0:  printf("Failing");                   // control will flow into
         default: printf("Illegal grade");            // the next case.
       }

    return 0;
}
```

C Basic Controls

END OF PART 1

WHILE loop

```c
#include <stdio.h>

int main (int argc, char *argv[])
{
    /* local variable definition */
    int a = 10;

    /* while loop execution */
    while( a < 20 )
    {
       printf("value of a: %d\n", a);
    // a++;                          // !!!! INFINITE LOOP !!!!
    }

    return 0;
}
```

WHILE loop

```c
#include <stdio.h>

int main (int argc, char *argv[])
{
    int n = 0;

     while (n < 10)
     {
          n++;
          if (n % 2 == 1)                          /* check that n is odd */
          {
             continue;          /* go back to the start of the while block */
          }

          printf("The number %d is even.\n", n);      /* only if n is even */
      }

    return 0;
}
```

DO - WHILE loop

```
#include <stdio.h>

int main (int argc, char *argv[])
{
   int j=0;

   do
   {
        printf("Value of variable j is: %d\n", j);
        j++;
   } while (j<=3);

   return 0;
}
```

WHILE loops
PRE-TEST

DO-WHILE loops
POST TEST

C Basic Controls

END OF PART 2

FOR loop

```
for (initializationStatement; testExpression; updateStatement)
{
    // statements inside the body of loop
}
```

```
#include <stdio.h>

int main (int argc, char *argv[])
{

    int i;

    for (i = 1; i < 11; i++)
    {
       printf("%d \n", i);
    }

   return 0;
}
```

FOR loop

```c
#include <stdio.h>

int main (int argc, char *argv[])
{

    int i, j = 20, k = 40;

    for (i = 1; i < 11; i++, j--, k-4)
    {
       printf("i :%d and j: %d and k: %d", i, j, k);
    }

   return 0;
}
```

FOR loop

```c
#include <stdio.h>

int main (int argc, char *argv[])
{

    // int i, j = 20, k = 40;  // if only used WITHIN the loop

    for (int i = 1, j = 20, k = 40; i < 11; i++, j--, k-=4)
    {
       printf("i :%d and j: %d and k: %d", i, j, k);
    }

   return 0;
}
```

FOR loop

```c
#include <stdio.h>

int main (int argc, char *argv[])
{

 int i, k, levels, space;
    printf("Enter the number of levels in pyramid:");
    scanf("%d",&levels);

    space = levels;

    for ( i = 1 ; i <= levels ; i++ )
    {
        for ( k = 1 ; k < space ; k++ )
            printf(" ");
        space--;

        for ( k = 1 ; k <= 2*i - 1 ; k++ )
            printf("*");
        printf("\n");
    }

   return 0;
}
```

```
*
**
***
****
*****
******
*******
```

FOR loop with a BREAK

```
#include <stdio.h>

int main (int argc, char *argv[])
{

     // Loops that read user input up to ten times,
     // terminating when a particular value
     // is entered, often fall into this category

    for (int i = 1; i<=10; i++)
    {
        printf("Enter a number (enter 0 to stop): ");
        scanf("%d", &n);

        if (n == 0)
            break;
         printf("%d cubed is %d\n", n, n * n * n);
    }

   return 0;
}
```

FOR loop with a NULL

```
#include <stdio.h>

int main (int argc, char *argv[])
{

   char string = "Something or Another");
   {
      int i ;   // i MUST be declared OUTSIDE the loop to survive ...
      for ( i = 0 ; string [ i ] != '\0' ; i++ )
         /* NULL STATEMENT! */ ;

      return i ; // … otherwise i is dereferenced before control passes back
   }

   return 0;
}
```

C Basic Controls

END OF PART 3

CONDITIONAL OPERATOR (? symbol)

```
#include<stdio.h>

int main()
{
int num;

printf("Enter the Number : ");
scanf("%d",&num);

flag = ((num%2==0)?1:0);

if(flag==0)
   printf("\nEven");
else
   printf("\nOdd");
}
```

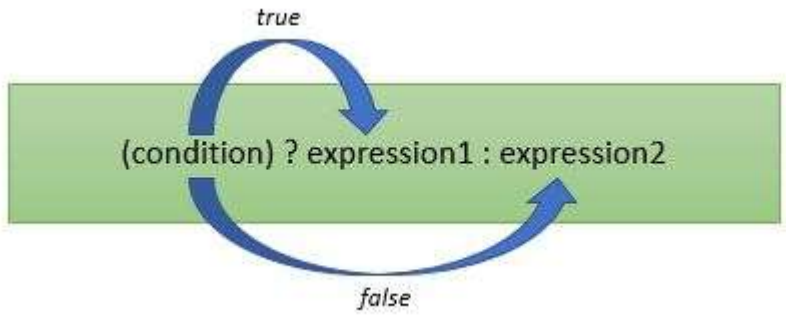
```
#include<stdio.h>

int main()
{
int num;

printf("Enter the Number : ");
scanf("%d",&num);

(num%2==0)? printf("Even"): printf("Odd");

}
```



CONDITIONAL OPERATOR (? symbol)

```
#include<stdio.h>

int main()
{
double x, y, z;

x = 3;
y = 12;


if( x > y )
    z = x;
  else
    z = y;
}
```

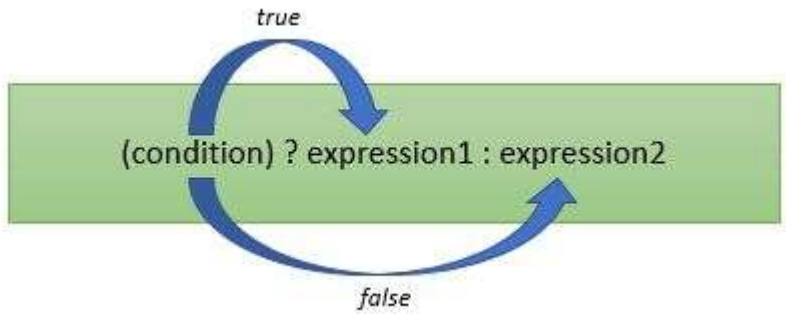
```
#include<stdio.h>

int main()
{
double x, y, z;

x = 3;
y = 12;

z = ( x > y ) ? x : y;

}
```



CONDITIONAL statements

```c
#include <stdio.h>

int main(int argc, char *argv[])
{
    int i, k;                                   /* Need a variable... */

    i = 2;
    j = 3;

    k = i > j ? i : j;              /* k is now 2 */
    k = (i >= 0 ? i : 0) + j;       /* k is now 3 */


    return i > k ? i : k;
}
```

C Basic Controls

END OF PART 4