CEng 230 Introduction to C Programming

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Web Pages
Official Course Page: ceng230.ceng.metu.edu.tr
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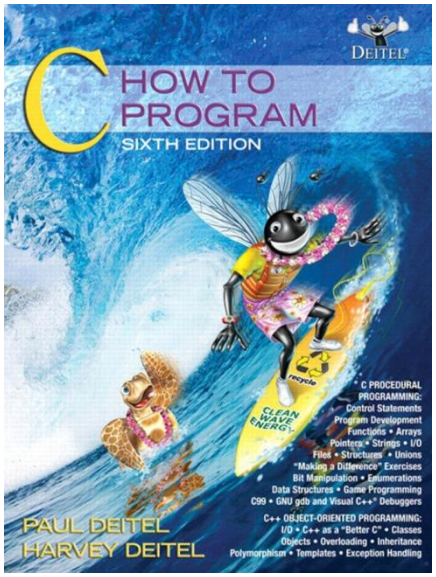
Repetition and Loops

while
do while
for

continue
break



Most programs involve repetition or looping.

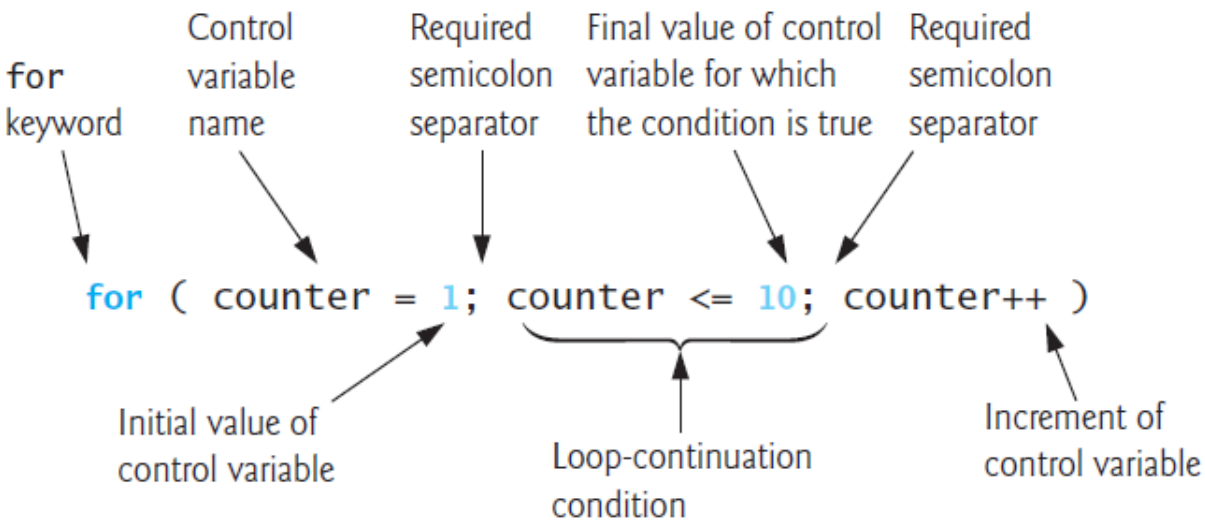
A **loop** is a group of instructions the computer executes repeatedly while some **loop-continuation condition remains true.**

```c
/* Fig. 4.1: fig04_01.c
   Counter-controlled repetition */
#include <stdio.h>

/* function main begins program execution */
int main( void )
{
   int counter = 1; /* initialization */

   while ( counter <= 10 ) { /* repetition condition */
      printf ( "%d\n", counter ); /* display counter */
      ++counter; /* increment */
   } /* end while */

   return 0; /* indicate program ended successfully */
} /* end function main */
```

```
1
2
3
4
5
6
7
8
9
10
```

```
4
5  /* function main begins program execution */
6  int main( void )
7  {
8     int counter; /* define counter */
9
10    /* initialization, repetition condition, and increment
11       are all included in the for statement header. */
12    for ( counter = 1; counter <= 10; counter++ ) {
13       printf( "%d\n", counter );
14    } /* end for */
15
16    return 0; /* indicate program ended successfully */
17 } /* end function main */
```

Fig. 4.2 | Counter-controlled repetition with the `for` statement. (Part 2 of 2.)


for keyword
Control variable name
Required semicolon separator
Final value of control variable for which the condition is true
Required semicolon separator
for (counter = 1; counter <= 10; counter++)
Initial value of control variable
Loop-continuation condition
Increment of control variable

1. Vary the control variable from 1 to 100 in increments of 1.

```
for ( i = 1; i <= 100; i++ )
```

2. Vary the control variable from 100 to 1 in increments of -1 (decrements of 1).

```
for ( i = 100; i >= 1; i-- )
```

3. Vary the control variable from 7 to 77 in steps of 7.

```
for ( i = 7; i <= 77; i += 7 )
```

4. Vary the control variable from 20 to 2 in steps of -2.

```
for ( i = 20; i >= 2; i -= 2 )
```

5. Vary the control variable over the following sequence of values: 2, 5, 8, 11, 14, 17.

```
for ( j = 2; j <= 17; j += 3 )
```

6. Vary the control variable over the following sequence of values: 44, 33, 22, 11, 0.

```
for ( j = 44; j >= 0; j -= 11 )
```

```c
/* Fig. 4.5: fig04_05.c
   Summation with for */
#include <stdio.h>

/* function main begins program execution */
int main( void )
{
   int sum = 0; /* initialize sum */
   int number; /* number to be added to sum */

   for ( number = 2; number <= 100; number += 2 ) {
      sum += number; /* add number to sum */
   } /* end for */

   printf( "Sum is %d\n", sum ); /* output sum */
   return 0; /* indicate program ended successfully */
} /* end function main */
```

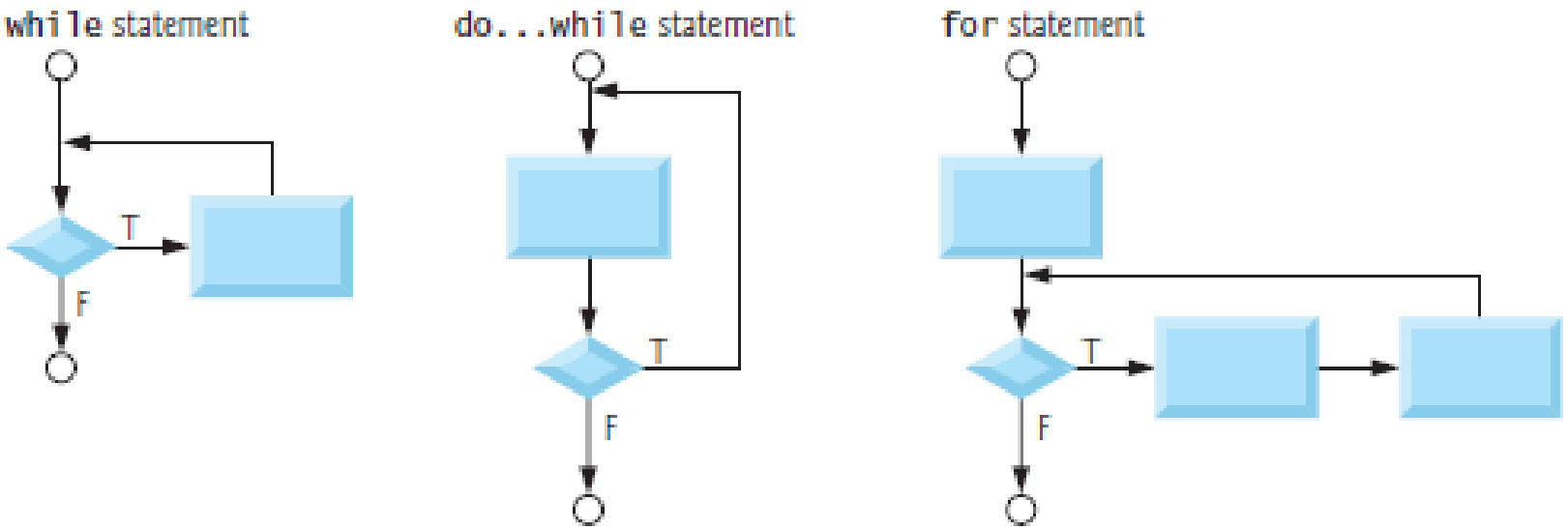
```
Sum is 2550
```

```c
/* Fig. 4.9: fig04_09.c
   Using the do/while repetition statement */
#include <stdio.h>

/* function main begins program execution */
int main( void )
{
   int counter = 1; /* initialize counter */

   do {
      printf( "%d  ", counter ); /* display counter */
   } while ( ++counter <= 10 ); /* end do...while */

   return 0; /* indicate program ended successfully */
} /* end function main */
```

```
1  2  3  4  5  6  7  8  9  10
```

Fig. 4.9 | do...while statement example.

Repetition



Nested loops

```c
#include <stdio.h>

/* function main begins program execution */
int main( void )
{
   int x;
   int y;
   int i;
   int j;

   /* prompt user for input */
   printf( "Enter two integers in the range 1-20: " );
   scanf( "%d%d", &x, &y ); /* read values for x and y */

   for ( i = 1; i <= y; i++ ) { /* count from 1 to y */

      for ( j = 1; j <= x; j++ ) { /* count from 1 to x */
         printf( "@" ); /* output @ */
      } /* end inner for */

      printf( "\n" ); /* begin new line */
   } /* end outer for */

   return 0; /* indicate program ended successfully */
} /* end function main */
```

infinite loops

(loops that do not finish executing)

```c
#include <stdio.h>

/* function main begins program execution */
int main( void )
{
   int counter = 1; /* initialization */

   while ( 1 ) { /* repetition condition */
      printf ( "%d\n", counter ); /* display counter */
      counter++; /* increment */
   } /* end while */
  system("pause");
   return 0; /* indicate program ended successfully */
} /* end function main */
```

4.36 What does the following program segment do?

```
1   for ( i = 1; i <= 5; i++ ) {
2      for ( j = 1; j <= 3; j++ ) {
3         for ( k = 1; k <= 4; k++ )
4            printf( "*" );
5         printf( "\n" );
6      }
7      printf( "\n" );
8   }
```

41) What is the output?

```
   for(i=0; i<=2; i++)
   for(j=1; j<3; j++)
      printf("%d%d",i,j);
  printf("%d%d",i,j);
```

a) 01021112212233
b) 0102111221222
c) 011121021222
d) 01112102122233
e) 01112102122222

42) What is the output?

```
int n=0,i=9,j=0;
for(i=1,j=7; i<=j; i++,j--)
   n++;
printf("%d%d%d",i,j,n);
```

a) 170 **b)** 443 **c)** 444 **d)** 534 **e)** 900

43) What is the output?

```
int k=456;
float t=0;
while(k/100>4){
   t=t+k/100;
   k=k-100;
}
printf("%f",t);
```

a) 0.000000 **b)** 4.000000 **c)** 4.560000

d) 56.000000 **e)** infinite loop

44) What is the output?

```
for(i=0; i<9; i++){
   printf("%d",i);
   for(j=0; j<2; j++)
      i=i+2;
}
```

a) 012345678 **b)** 036 **c)** 048

d) 05 **e)** compile-time error

45) What is the output?

```
for(i=2;i<10;i++) {
if (i%3==0) continue;
if (i%6==0) break;
printf("%d",i); }
```

a) 2345 **b)** 245 **c)** 24578 **d)** 3 **e)** 39

46)
```
for(i=0; i<4; i++){
  for(j=0; j<4-i ; j++)
    printf("%d ",___(1)___);
  printf("\n");   }
```

Which expression should be replaced with ___(1)___ for this output;

```
0 3 6 9
2 5 8
4 7
6
```

a) `i*(i+1)+3*j` **b)** `3*i+2*j` **c)** `2*i+3*j`
d) `(i+j)*3` **e)** `3*i+j*(j+1)`

47) What will be the output when the input below?

Input: 200 1000 4 30 -1

```
int n,min=50000,tot=0;
do {
 scanf("%d",&n);
 if (n<min) min=n;
 tot=tot+min;
} while (n!=-1);
printf("%d %d",min,tot);
```

a) `4 204` **b)** `4 408` **c)** `-1 203`
d) `4 1234` **e)** `-1 407`

48) What is the output?

```
int b=1;
while(b<10 && b>-10) {
 b=b*-2;
  printf("%d ",b);
}
```

a) 1 -2 4 -8 **b)** -2 4 -8 16
c) 1 -2 4 -8 16 **d)** -2 4 -8
e) no output

49) How many DONE will be printed with the input 5 ?

```
int i;
scanf("%d",&i);
do{
printf("DONE");
} while(i<10);
```

a)0 **b)** 1 **c)** 5 **d)**infinite **e)**10

50) What is the output?

```
int i=0, j=0;
do{
for(i =0 ; i< 5 ; i++)
j+=i;
}while(j<10);
printf("%d %d", i, j);
```

a) 10 10 **b)** 0 10 **c)** 10 5 **d)** 5 10 **e)** infinite loop

39) Which of the following displays "hello" 5 times ?

a) for(i=-1; i<=2; i+=1) printf(" hello ");

b) for(i=1; i<6; i+=2) printf(" hello ");

c) for(i=12; i<=16; i+=1) printf(" hello ");

d) for(i=0; i<=4; i-=1) printf(" hello ");

e) for(i=5; i<=0; i-=1) printf(" hello ");

40) What is the output of the following code segment?

```
s=5;
while(s<10)
{
   s += 2;
   printf("%3d", 2*s);
   s++;
}
```

a) 7 10 **b)** 14 20 **c)** 5 6 **d)** 10 7 **e)** None of them

41) If the following statements display "computers" 3 times, what should be the statement ____(1)____?

```
int i = 7/2;
while (i <= 10)
{    ++i;
     printf("computers");
     _____(1)_____;
}
```

a) i=i+1; **b)** i=i+2; **c)** i=i+3; **d)** i=i+4; **e)** i=i+5

42) What is the output of the following code segment?

```
for( i = 10;  i > 4;  i--)
{          printf("%d ",  i-2);
           i -= 3;
}
```

a) 7 5 **b)** 8 4 **c)** 10 8 **d)** 8 2 **e)** 8 10

43) Which loop outputs 0 1 2 ?

a) for(i=1/2; i<6; i+=2) printf("%3d", i-2);
b) for(i=2; i<6; i+=2) printf("%3d", i-3);
c) for(i=5/2-1; i<9/2; i+=1) printf("%3d", i-1);
d) for(i=0; i<6; i+=2) printf("%3d", i);
e) for(i=2; i<6; i+=1) printf("%3d", i+3);

44) What is the output of the following program segment

```
k=5;
m=10;
while( k > 0 )
{   if( m%3 )
        printf("%3d", m-- );
    else
        printf("%3d", --m);
        k -= 2;
 }
 printf("%3d", k);
```

a) 10 7 7 1
b) 9 9 7 -1
c) 10 8 8 -1
d) 9 8 7 -1
e) 9 9 8 -1

45) What is the output of the following code segment?

```
int i, k;
k=5/2;
for (i=3;i<=10; i+=2)
{    ++i;
    if(k=3&&i%2)
       printf("BBB");
    else
           printf("AAA");
           k++;
 }
```

a) BBBAAA
b) AAABBBBBB
c) AAABBB
d) AAABBBAAA
e) BBBAAABBB

46) How many times the condition is checked?

```
i=1;
k=5;
while (i <=10-k)
{    ++i;
     printf("%3d",i);
     k+=2;   }
```

a) 1 **b)** 2 **c)** 3 **d)** 4 **e)** 5

47) What will the following program print?

```
#include<stdio.h>
int x,y;
main( )
{  for (x=1,y=1; x<5 && y<3; x=x+1, y=y+1) printf("*");  }
```

a) Nothing
b) **
c) ***
d) *****
e) ********(8 asterisk)

48) What will the following program print?

```
#include<stdio.h>
int x,y;
main( )
{
 for (x=1; x<5; y=y+1)
 for (y=x+1; y<5; x=x+1) printf("*");
 }
```

a) the printing of * will not stop
b) **
c) ***
d) *****
e) ********(8 asterisk)

49) What will the following program print?

```
#include<stdio.h>
 int x,a,b,c;
 main( )
 {
 for (a=5; a>=1; a=a-1)
 for (b=1; b<=a; b=b+1)
 for (c=1; c<=b; c=c+1) x = x+1;
 printf("%d",x);
 }
```

a) 18 **b)** 17 **c)** 35 **d)** 70 **e)** 140

50) Which is true for the given program?

```
#include<stdio.h>
int i = 0,  j = 0;
main( ) {
  do { printf("%d ",i+j);
     if((i+j)%2) printf("%d ",i+j);
     i++;
     j++; } while (i<=j<3);
  }
```

a) Will go into an infinite loop.
b) Will output 0 2 4
c) Will output 0 2
d) Will produce a compile time error.

Use below program to answer questions 21-22.

```
#include <stdio.h>
int main() {
   int a=0,b=0,c=0,f,g,h;
   scanf("%d%d%d",&f, &g, &h);
   for (a=g;a<f;a++)
    switch(a) {
     case 1: c++;break;
     default: c += 2;
    }
   printf("%d\n",c);
}
```

21- What is the output of the above program for the input 4 1 1?

a) 1 b) 2 c) 3 d) 4 e) 5

22- What is the output of the above program for the input 5 2 1?

a) 1 b) 4 c) 6 d) 10 e) 7

23- What is the output of the above program for the input 5 1 1?

a) 1 b) 4 c) 5 d) 7 e) 15

```
#include <stdio.h>
int main() {
   int a=0, b=0, c=0, f, g;
   scanf("%d%d",&f, &g);
   c=0;
   for (a=g;a<f;a++)
   for (b=g;b<a;b++)
     c++;
   printf("%d\n",c);
}
```

24- one of the below is the output of the above program for the input 5 2?

a) 3 b) 6 c) 10 d) 12 e) 15

25- one of the below is the output of the above program for the input 6 3?

a) 3 b) 6 c) 10 d) 12 e) 15

32. What will be the output of the below code segment?

```
m=0;
do {
      m=m-2;
} while (m>5)
printf("%d",m);
```

a) 0 **b)** 2 **c)** -2 **d)** 5 **e)** 7

33. What will be the output of the below code segment?

```
m=0;
while (m>5)
    m=m-2;
printf("%d",m);
```

a) 0 **b)** 2 **c)** -2 **d)** 5 **e)** 7

34. What will be the value of dif at the end of following code segment?

```
int  m=1;
int myvar,dif;
while(m<=2)
    myvar=m++;
dif=m-myvar;
```

a) 0 **b)** 1 **c)** -1 **d)** 2 **e)** -2

Use below program to answer to questions 34-35.

```
counter1 =0
counter2=0;
while (counter1 <3 ) {
    while ( (counter2+counter1)%2==0)
        printf("%d",counter2++);
    counter1++;
}
```

35. How many times will the printf statement be executed?

a) 3 **b)** 4 **c)** 7 **d)** 0 **e)** 2

36. What will be the value of the *counter2* after the execution of the above code segment?

a) 3 **b)** 0 **c)** 2 **d)** 4 **e)** 1

13. What will be the value of x after the following program segment is executed?

```
int i, x;  x = 0;  i = 100;
while  (i > 0) {
  x++;
  i = i / 2;
}
```

a) 6
b) 7
c) 8
d) 9

15. What will be the output of the following program segment?

```
int n = 12, j = 2;
while (j <= n) {
    if (n % j == 0){
       n = n / j;
       printf("%d ",j);
    }
    else  j++;
}
```

Review
before lab midterm