CS11001/CS11002
Programming and Data Structures (PDS) (Theory: 3-0-0)

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Relational Operators

- Used to compare two quantities.

<	is less than
>	is greater than
<=	is less than or equal to
>=	is greater than or equal to
==	is equal to
!=	is not equal to

Relational Operators

```
int x = 20;
int y = 3;
float a=20.3;

if  ( x > y )          /* 20 > 3 ➔ True */
   printf (“%d is larger\n”, x);

if ( x + x > y * 6 )    /* 20+20 > 3*6 ➔ (20+20)>(3*6) ➔ True
  */
  printf(“Double of %d is larger than 6 times %d”,x,y);

if ( x > a )           /* Type cast??? */
  printf(“%d is larger than %f”,x, a);
else
  printf(“%d is smaller than %f”,x, a);
```

Logical Operators

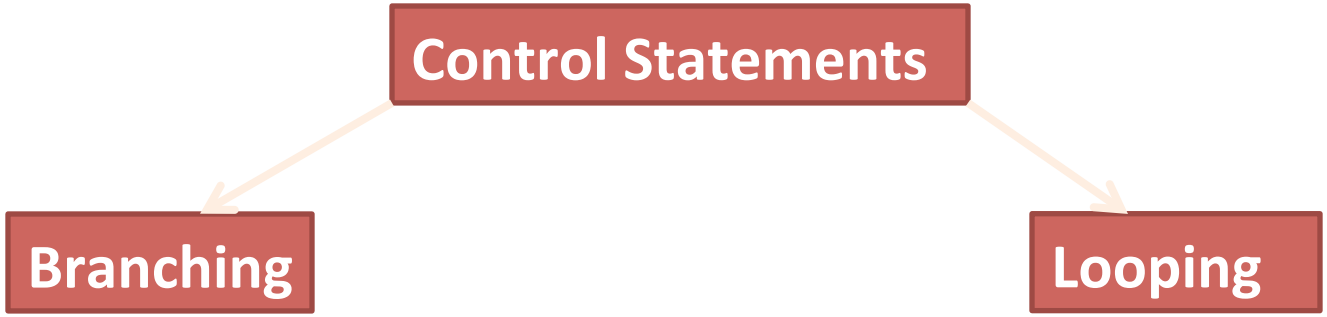
- Unary and Binary Operators
  - ! ➔ Logical NOT, logical negation (True if the operand is False.)
  - && ➔ Logical AND (True if both the operands are True.)
  - || ➔ Logical OR (True if either one of the operands is True.)

X	!X
FALSE	TRUE
TRUE	FALSE

X	Y	X && Y	X || Y
FALSE	FALSE	FALSE	FALSE
FALSE	TRUE	FALSE	TRUE
TRUE	FALSE	FALSE	TRUE
TRUE	TRUE	TRUE	TRUE

```
        int x = 20; int y=3;float
        a=20.3;

if((x>y) && (x>a))    /* FALSE */
        printf("X is largest.");

if((x>y) || (x>a))    /* TRUE */
    printf("X is not smallest.");

if(!(x==y))    /* TRUE */
    printf("X is not same as Y.");

if(x!=y)       /* TRUE */
    printf("X is not same as Y.");
```

Control Statements



Statement takes more than one branches based upon a **condition test** comprising of relational and/or logical (may be arithmetic) operators.

Some set of statements are being executed **iteratively** until a **condition test** comprising of relational and/or logical (may be arithmetic) operators are not being satisfied.

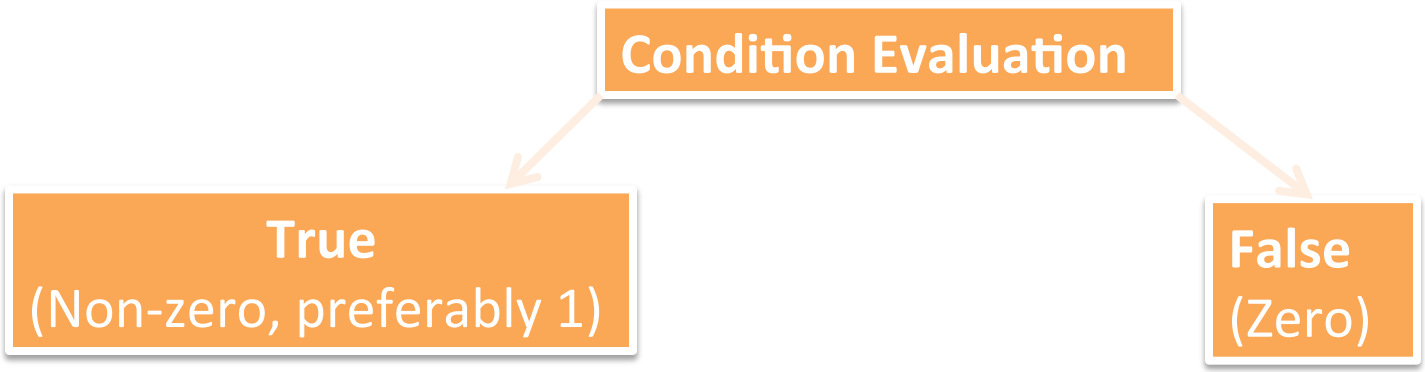
Conditions

- Using relational operators.
  - Four relation operators: <, <=, >, >=
  - Two equality operations: ==, !=

- Using logical operators / connectives.
  - Two logical connectives: &&, | |
  - Unary negation operator: !

Condition Tests

```
if(count <= 100)          /* Relational */
if((math+phys+chem)/3 >= 60) /* Arithmetic, Relational */
if((sex=='M') && (age>=21))  /* Relational, Logical */
if((marks>=80) && (marks<90) )  /* Relational, Logical */
if((balance>5000) | | (no_of_trans>25))  /* Relational,
  Logical */
if(! (grade=='A'))              /* Relational, Logical */
```



Operator confusion

Equality (==) and Assignment (=) Operators

- What is expected in condition?
  - Nonzero values are true, zero values are false
  - Any expression that produces a value can be used in control structures

```
int age=20;
        if ( age > 18 )  /* Logical Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age >= 18 ) /* Logical Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age == 20 ) /* Logical Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age = 18 )  /* Arithmetic Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age = 17 ) /* Arithmetic Operator; Evaluated as TRUE */
          printf( "You are a minor!\n" );
```

Operator confusion

Equality (==) and Assignment (=) Operators

Better is avoid.

```
int age=20;
        if ( age > 18 )  /* Logical Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age >= 18 ) /* Logical Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age == 20 ) /* Logical Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age = 18 )  /* Arithmetic Operator; Evaluated as TRUE */
          printf( "You are not a minor!\n" );

        if ( age = 17 ) /* Arithmetic Operator; Evaluated as TRUE */
          printf( "You are a minor!\n" );
```

Value of age will be 18

Value of age will be 17

There will be no syntax error.

These statements are not logically correct!!!

Operator confusion

Equality (==) and Assignment (=) Operators

```
#include <stdio.h>
int main()
{
    int x,y;
    scanf("%d",&x);
    y=x%2;      /* y will be 1 or zero based on value entered
and stored as x */
    if(y=1) { /* y will be assigned with 1, condition will be
evaluated as TRUE */
        printf("Entered number is odd.");
    } else {
        printf("Entered number is even.");
    }

    return 0;
}
```

Unary Operator

- Increment (++) Operation means i = i + 1;
  - Prefix operation (++i) or Postfix operation (i++)
- Decrement (--) Operation means i = i - 1;
  - Prefix operation (--i) or Postfix operation (i--)
- Precedence
  - Prefix operation : First increment / decrement and then used in evaluation
  - Postfix operation : Increment / decrement operation after being used in evaluation
- Example

```
int t, m=1;
t=++m;
```

m=2
t=2

```
int t,m=1;
t=m++;
```

m=2
t=1

More Examples on Unary Operator

Initial values :: a = 10; b = 20

```
x = 50 + ++a;
```

a = 11, x = 61

Initial values :: a = 10; b = 20;

```
x = 50 + a++;
```

x = 60, a = 11

Initial values :: a = 10; b = 20;

```
x = a++ + --b;
```

b = 19, x = 29, a = 11

Initial values :: a = 10; b = 20;

```
x = a++ - ++a;
```

Undefined value (implementation dependent)

Shortcuts in Assignment Statements

- `A+=C` → `A=A+C`
- `A-=B` → `A=A-B`
- `A*=D` → `A=A*D`
- `A/=E` → `A=A/E`

Input

```
scanf (“control string”,arg1,arg2, …, argn);
```

- Performs input from the standard input device, which is the keyboard by default.
- It requires a control string refers to a string typically containing data types of the arguments to be read in.
- And the (arguments) address or pointers of the list of variables into which the value received from the input device will be stored.
- The address of the variables in memory are required to mention (& before the variable name) to store the data.
- The control string consists of individual groups of characters (one character group for each input data item). Typically, a ‘%’ sign, followed by a conversion character.

```
int size,a,b;
float length;
scanf ("%d", &size) ;
scanf ("%f", &length) ;
scanf (“%d  %d”, &a, &b);
```

Input

Conversion Character	Data Item meaning
c	Single charcater
d	Decimal integer
e	Floating point value
f	Floating point value
g	Floating point value
h	Short int
i	Decimal/hexadecimal/octal integer
o	Octal integer
s	String
u	Unsigned decimal integer
X	Hexadecimal integer

We can also specify the maximum field-width of a data item, by specifying a number indicating the field width before the conversion character.

Example: scanf ("%3d %5d", &a, &b);

Output

```
printf (“control string”,arg1,arg2, …, argn);
```

- Performs output to the standard output device (typically defined to be the screen).
- Control string refers to a string containing formatting information and data types of the arguments to be output;
- The arguments arg1, arg2, … represent the individual output data items.
- The conversion characters are the same as in scanf.

```
int size,a,b;
float length;
scanf ("%d", &size) ;          printf(“%d”,size);
scanf ("%f", &length) ;        printf(“%f”,length);
scanf (“%d  %d”, &a, &b);        printf(“%d %d”,a,b);
```

Formatted Output

```
float a=3.0, b=7.0;
printf("%f %f %f %f",a,b,a+b,sqrt(a+b));
3.000000 7.000000 10.000000  3.162278
```

Total Space

Will be written exactly.

```
printf("%4.2f %5.1f\na+b=%3.2f\tSquare
Root=%-6.3f",a,b,a+b,sqrt(a+b));
3.00  7.0
a+b=10.00    Square Root=3.162
```

Left Align

After decimal place

Tab

For integer, character and string, no decimal point.

Character I/O

```
char ch1;
scanf("%c",&ch1);       /* Reads a character */
printf("%c",ch1);       /* Prints a character */
ch1=getchar();        /* Reads a character */
putchar(ch1);     /* Prints a character */
```

```
char name[20];
scanf("%s",name);       /* Reads a string */
printf("%s",name);      /* Prints a string */
gets(name);           /* Reads a string */
puts(name);           /* Prints a string */
```

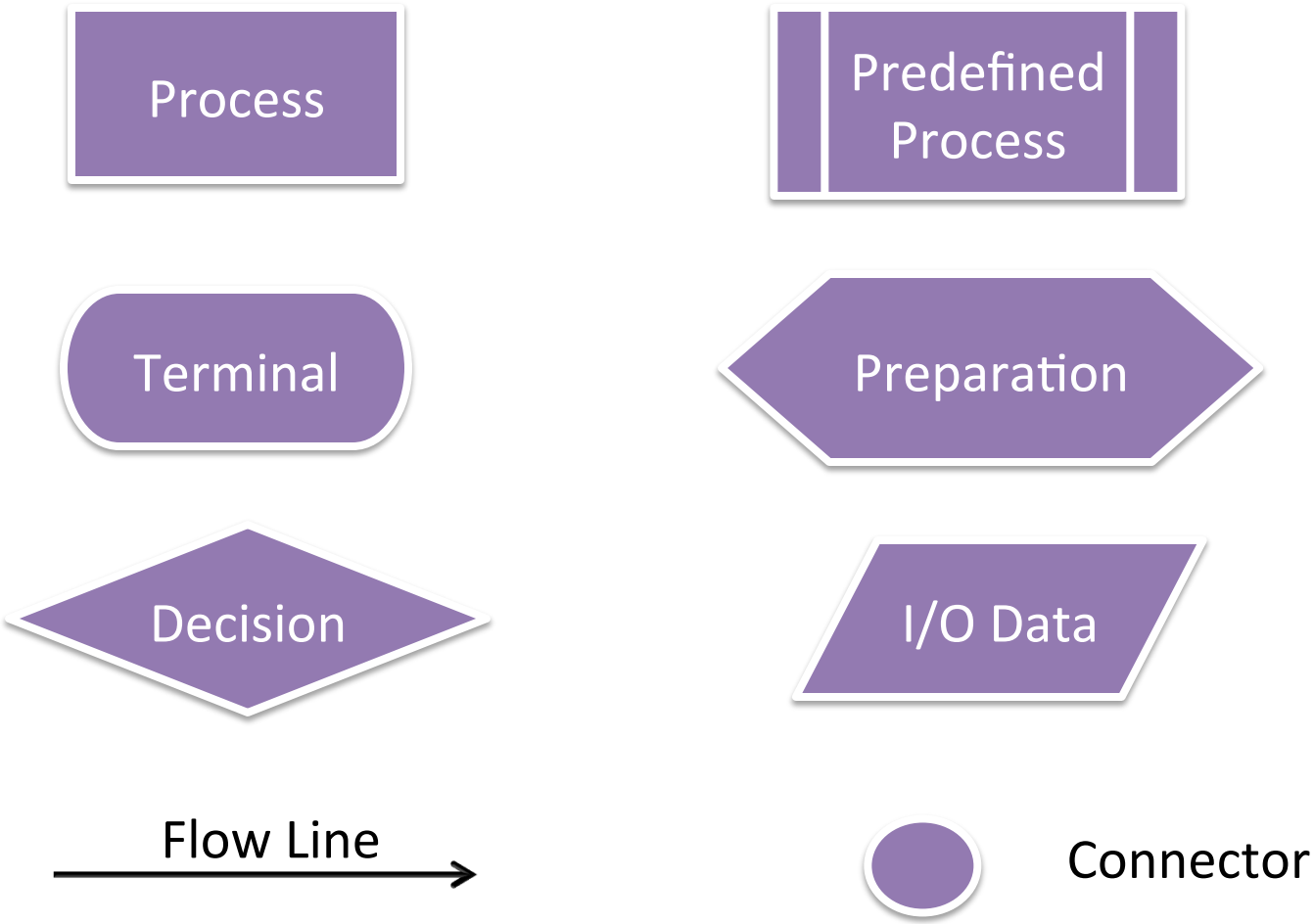
Help for any command:

$ man gets

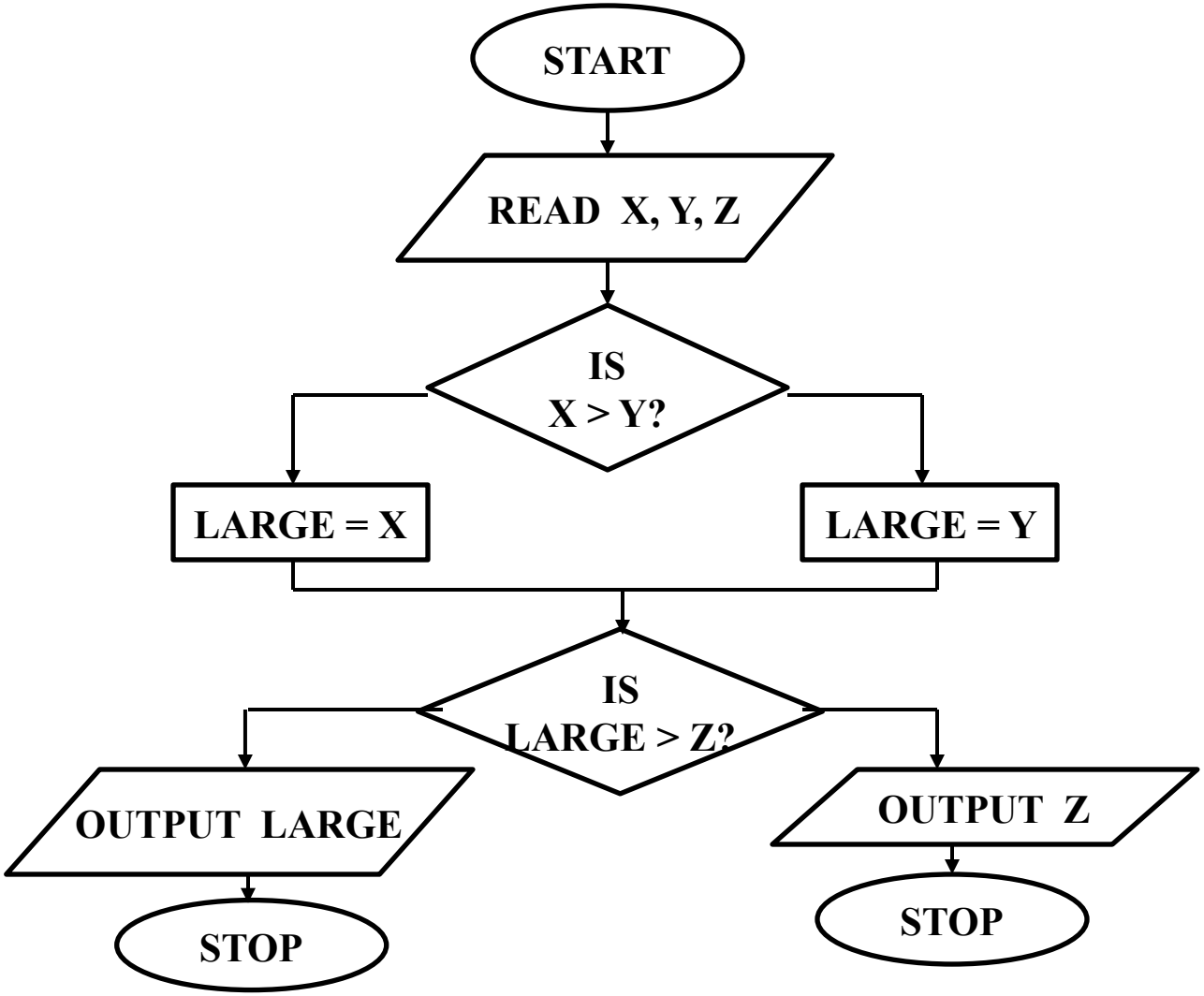
Problem solving

- Step 1:
  - Clearly specify the problem to be solved.
- Step 2:
  - Draw flowchart or write algorithm.
- Step 3:
  - Convert flowchart (algorithm) into program code.
- Step 4:
  - Compile the program into executable file.
- Step 5:
  - For any compilation error, go back to step 3 for debugging.
- Step 6:
  - Execute the executable file (program).

Flowchart: basic symbols



Example 2: find the largest among three numbers

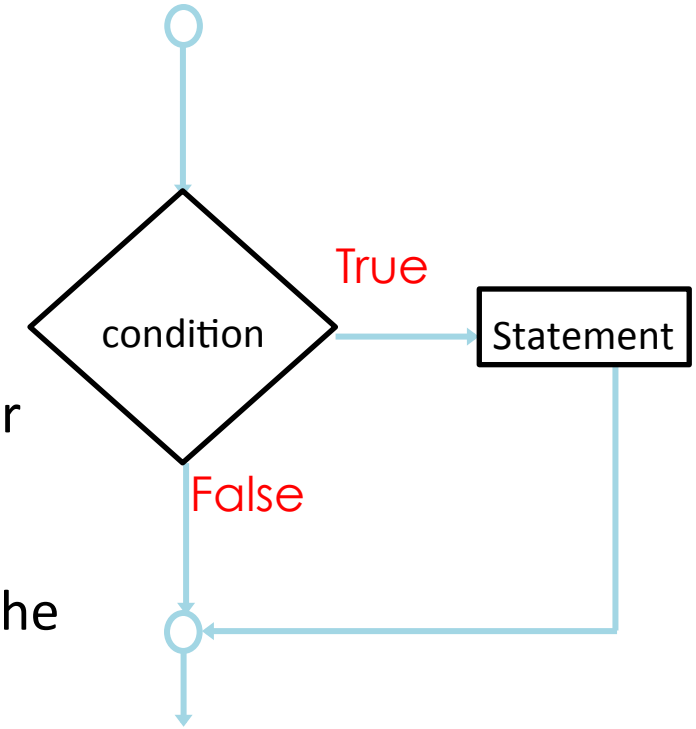


Branching: *if* Statement

- General syntax:

  if (condition) { …….. }

- Test the condition, and follow appropriate path.
- Contains an expression that can be TRUE or FALSE.
- Single-entry / single-exit structure.
- If there is a single statement in the block, the braces can be omitted.




```
if (basicPay<18000)
        printf("Bonus Applicable");
```

```
if (basicPay<18000)
{
        int bonus;
        bonus=basicPay*0.30;
        printf("Bonus is %d",bonus);
}
```

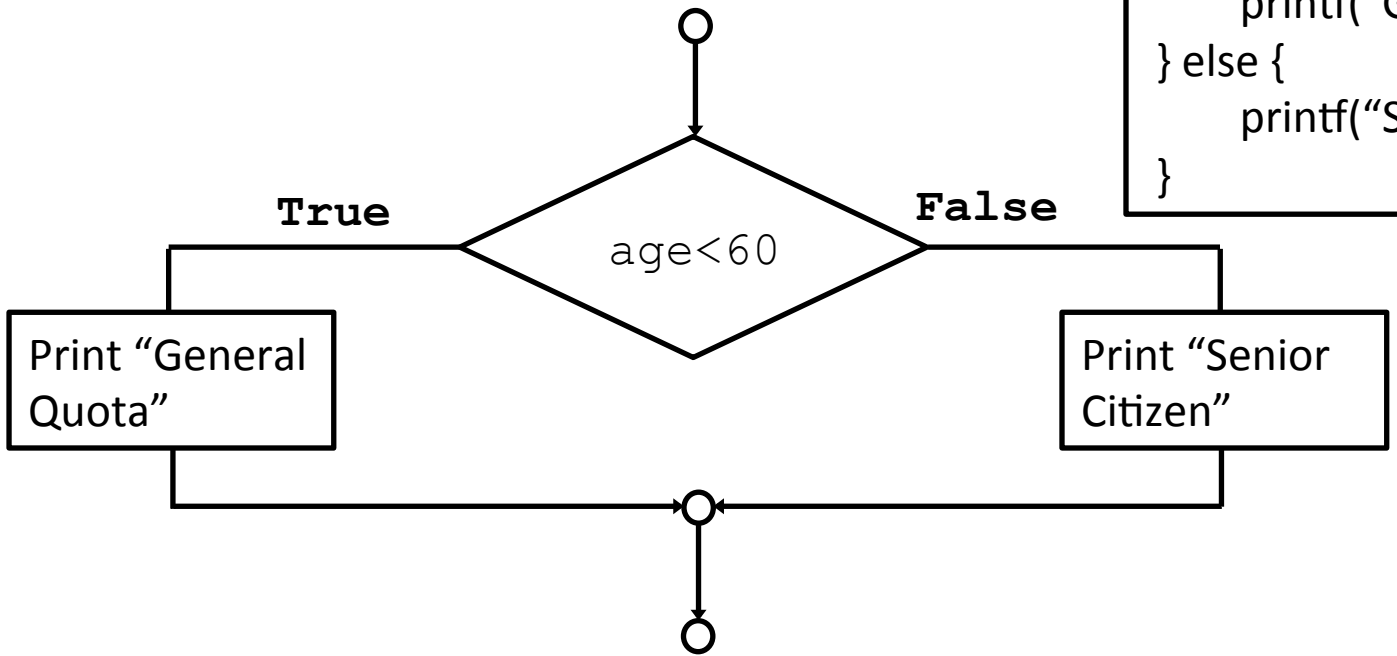
Branching: *if-else* Statement

- General syntax:

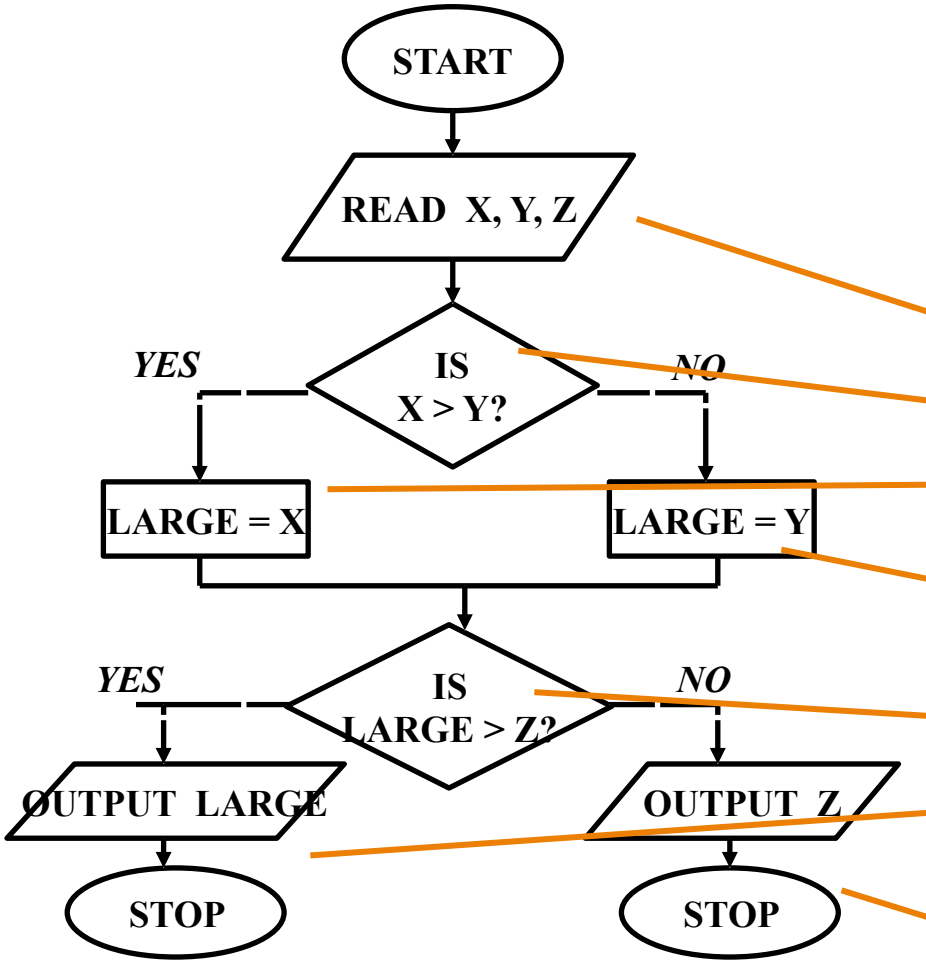
```
if  (condition)   { …… block 1 ……. }
else  { …….. block 2 …….. }
```

- Also a single-entry / single-exit structure.
- Allows us to specify two alternate blocks of statements, one of which is executed depending on the outcome of the condition.
- If a block contains a single statement, the braces can be omitted.

```
if(age<60) {
      printf("General Quota");
} else {
      printf("Senior Citizen");
}
```



Example 2: find the largest among three numbers




```
#include <stdio.h>
int main()
{
    int  X,Y,Z,Large;
    scanf ("%d %d %d", &X, &Y, &Z);
    if (X>Y)     {
       Large=X;
     }    else {
    Large=Y;
   }
   if (Large>Z)
      printf ("\nThe largest number
  is: %d",Large);
    else
      printf ("\n The largest
  number is: %d",Z);
   return 0;
}
```

Nested branching

- It is possible to nest if-else statements, one within another.
- All if statements may not be having the “else” part.
  - Confusion??
- Rule to be remembered:
  - An “else” clause is associated with the closest preceding unmatched “if”.

- Example:

```
if(age<60) {
    if(age<5) {
        printf(“Kid Quota”);
    } else if (age<10) {
        printf(“Child Quota”);
    } else {
        printf(“General Quota”);
    }
} else {
    printf(“Senior Citizen”);
}
```

Desirable Programming Style

- Clarity
  - The program should be clearly written.
  - It should be easy to follow the program logic.
- Meaningful variable names
  - Make variable/constant names meaningful to enhance program clarity.
    - 'area' instead of 'a'
    - 'radius' instead of 'r'
- Program documentation
  - Insert comments in the program to make it easy to understand.
  - Never use too many comments.
- Program indentation
  - Use proper indentation.
  - Structure of the program should be immediately visible.

Indentation Example :: Good Style

```
/* A program to check the age based quota in Indian Railway ticketing system */

#include <stdio.h>
#define SENIOR      60          /* Declare the age of Senior Citizen */

int main()
{
        int age;
        scanf("%d",&age);
        if(age< SENIOR) {
                if(age<5) {
                        printf("Kid Quota");
                } else if (age<10) {
                        printf("Child Quota");
                } else {
                        printf("General Quota");
                }
        } else {
                printf("Senior Citizen");
        }
        return 0;
}
```

Indentation Example :: Bad Style

```
#include <stdio.h>
#define SENIOR       60
int main()
{
int age;
scanf(“%d”,&age);
if(age< SENIOR) {
 if(age<5) {
 printf(“Kid Quota”);
 } else if (age<10) {
 printf(“Child Quota”);
 } else {
 printf(“General Quota”);
 }
 } else {
 printf(“Senior Citizen”);
 }
return 0;
}
```

```
#include <stdio.h>
#define SENIOR       60
int main()
{
int age;
scanf(“%d”,&age);
if(age< SENIOR) {
 if(age<5) {  printf(“Kid Quota”); }
 else if (age<10) { printf(“Child Quota”);
 } else {  printf(“General Quota”); }
 } else {  printf(“Senior Citizen”);  }
return 0;
}
```

Example 3:
Grade computation

MARKS ≥ 90 → Ex

89 ≥ MARKS ≥ 80 → A

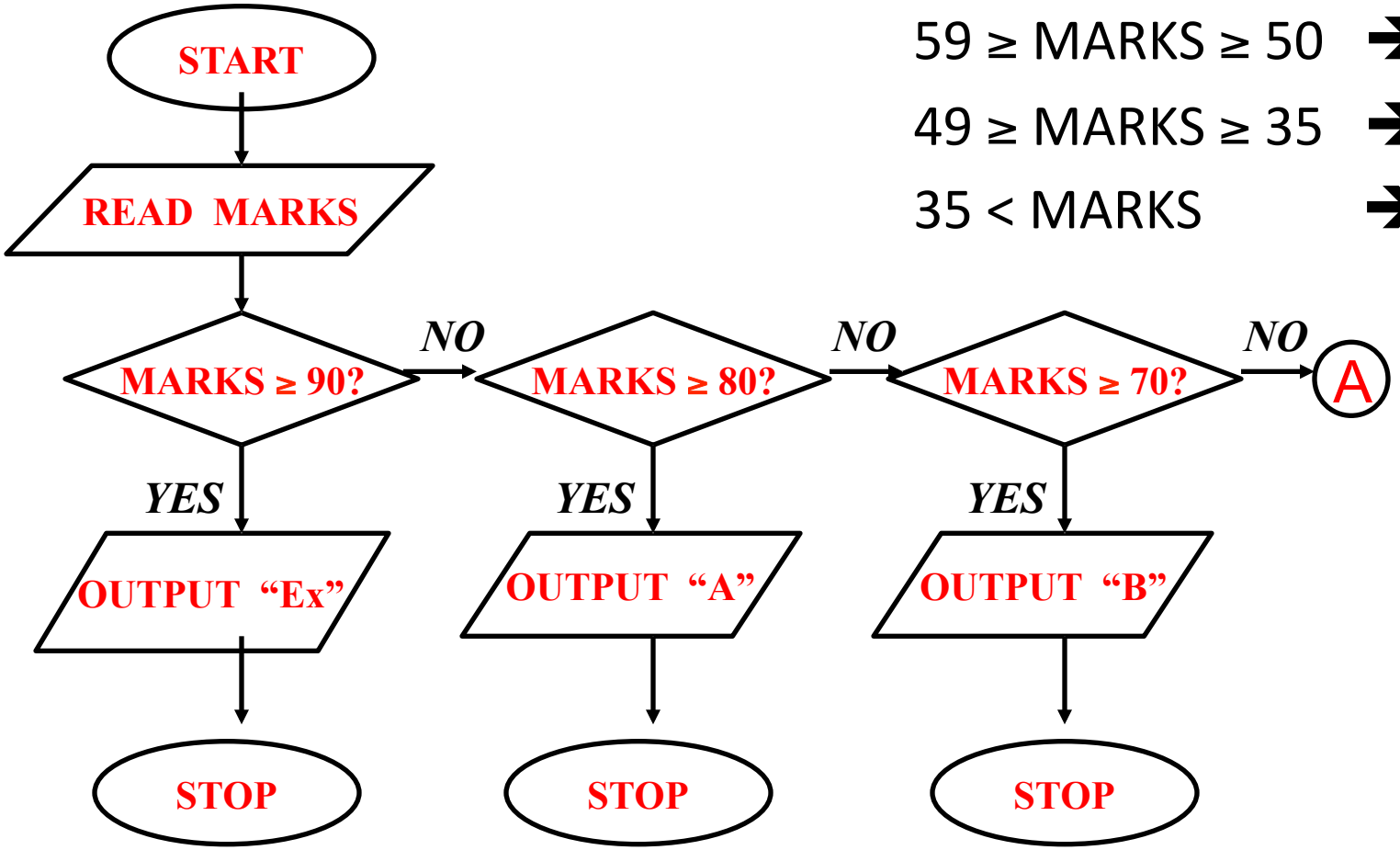
79 ≥ MARKS ≥ 70 → B

69 ≥ MARKS ≥ 60 → C

59 ≥ MARKS ≥ 50 → D

49 ≥ MARKS ≥ 35 → P

35 < MARKS → F



Example 3:
Grade computation

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49 ≥ MARKS ≥ 35 → P

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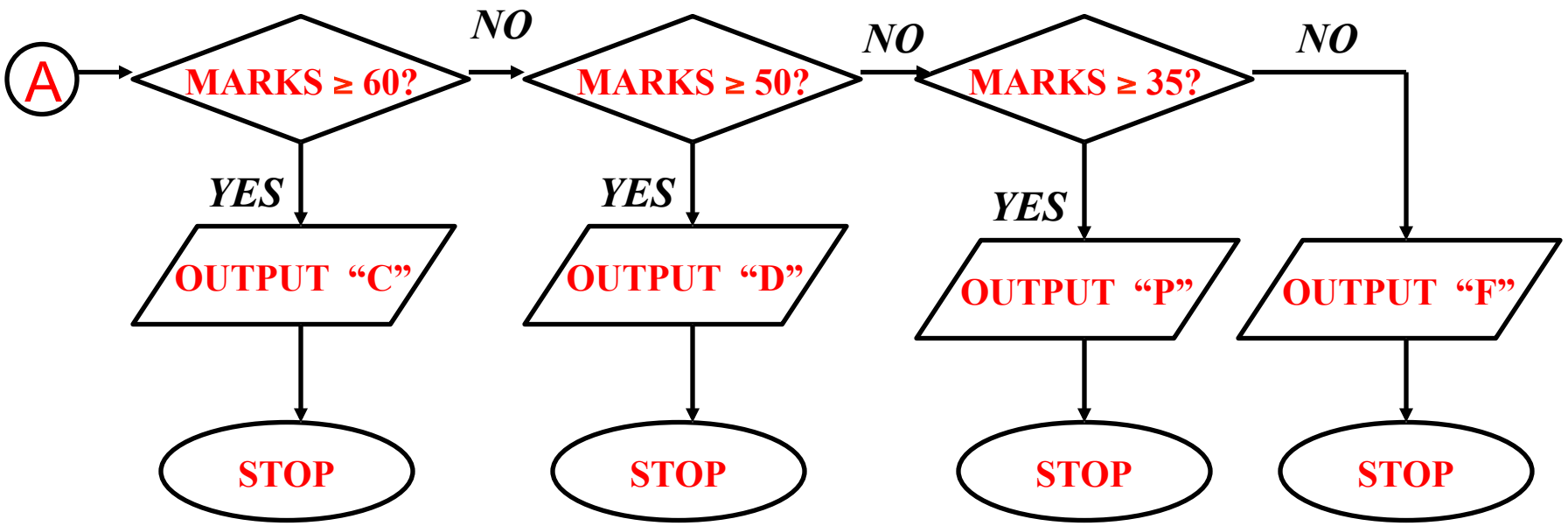
Homework:
Convert to a C program



Ternary conditional operator (?:)

- Takes three arguments (condition, value if true, value if false).
- Returns the evaluated value accordingly.

(condition1)? (expr1): (expr2);

```
age >= 60 ? printf("Senior Citizen\n") : printf("General Quota\n");
```

Example:

```
bonus = (basicPay<18000) ? basicPay*0.30 : basicPay*0.05;
```

switch Statement

- This causes a particular group of statements to be chosen from several available groups.
  - Uses “switch” statement and “case” labels.
  - Syntax of the “switch” statement:

```
switch (expression)  {
  case expression1: { …….. }
  case expression2: { …….. }

  case expressionm: { …….. }
  default: { …… }
}
```

switch example

```
switch ( letter ) {
   case 'A':
    printf("First letter\n");
    break;
   case 'Z':
    printf("Last letter\n");
    break;
   default :
    printf("Middle letter\n");
    break;
}
```

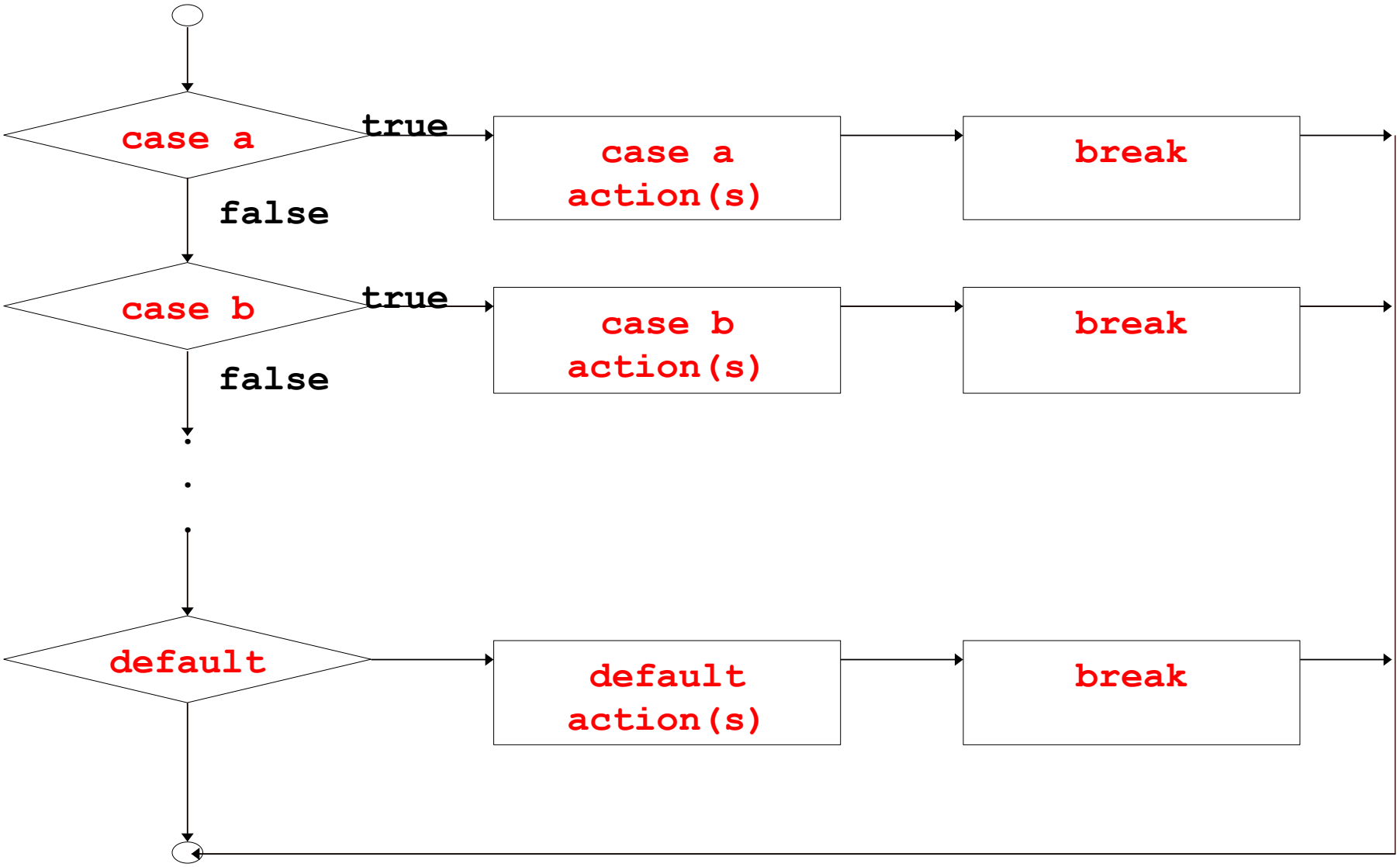
"break" statement is used to break the order of execution.

The *break* Statement

- Used to exit from a switch or terminate from a loop.

- With respect to “switch”, the “break” statement causes a transfer of control out of the entire “switch” statement, to the first statement following the “switch” statement.

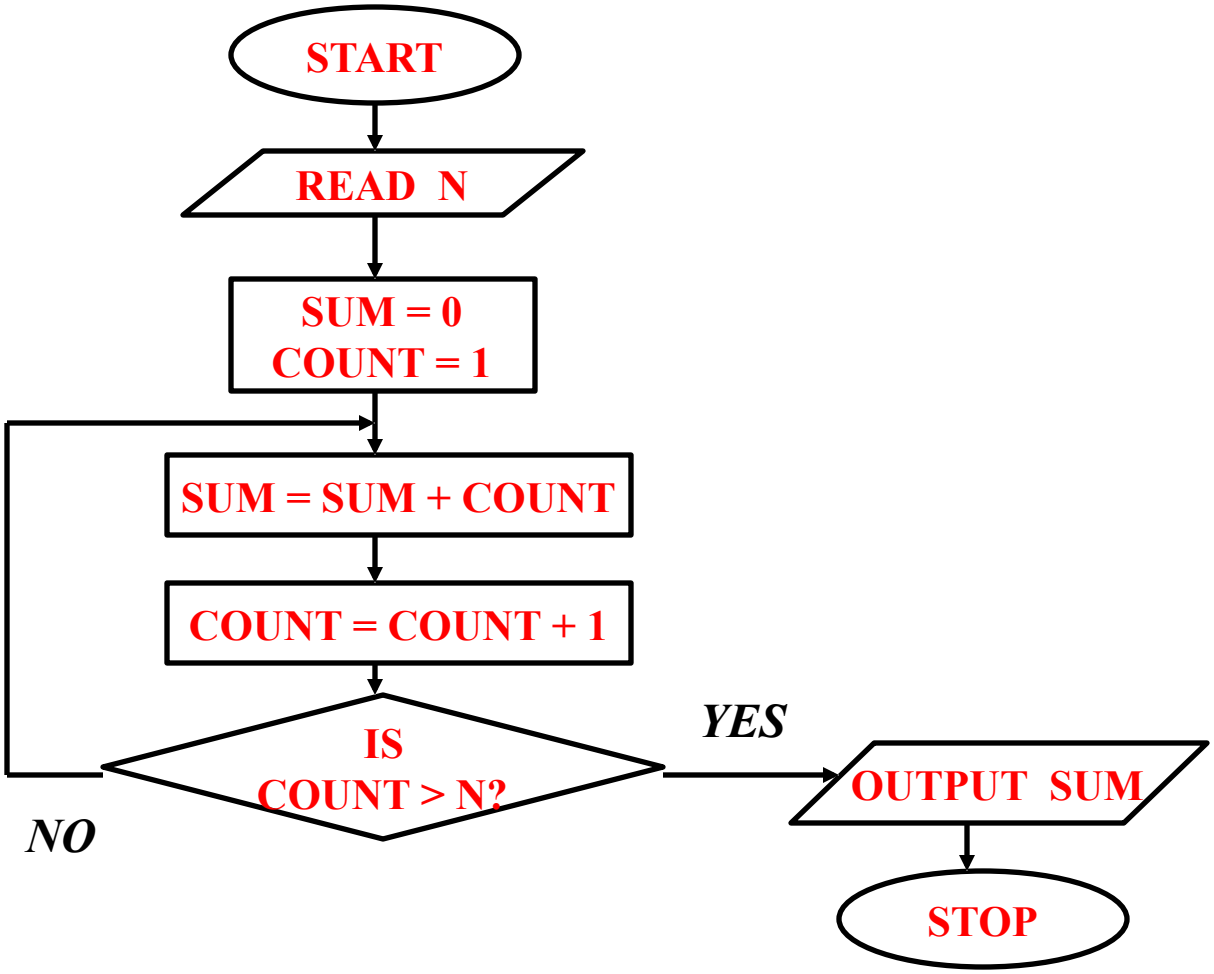
Flowchart for switch statement



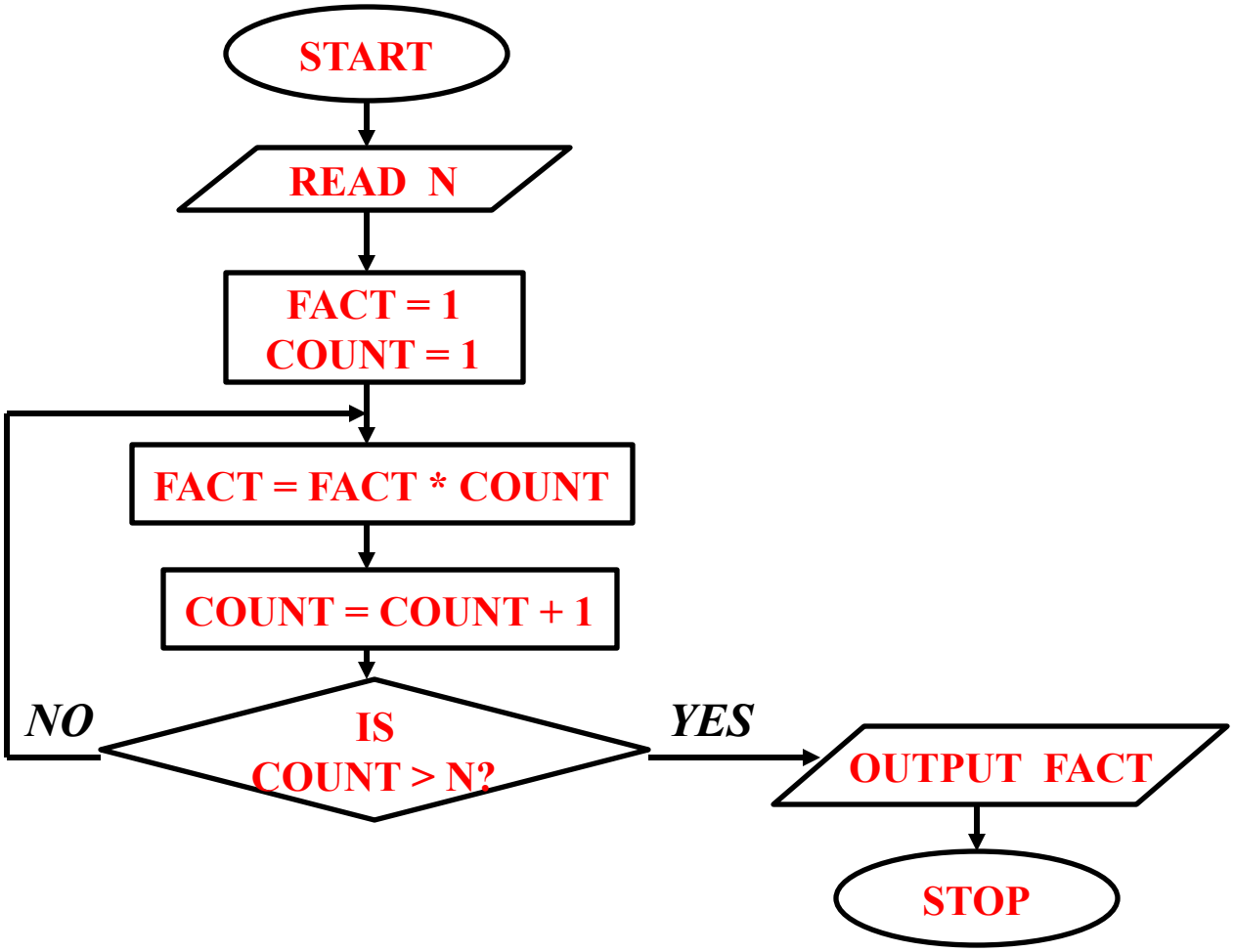
Example: switch break

```
switch  (primaryColor = getchar())  {

   case 'R': printf ("RED \n");
       break;

   case 'G': printf ("GREEN \n");
       break;

   case 'B': printf ("BLUE \n");
       break;
   default:  printf ("Invalid Color \n");
       break;       /* break is not mandatory here
   */
}
```

Example 5: *Sum of first N natural numbers*



Example 6: *Computing Factorial*



Exercise 1: Find the *Roots of a quadratic equation*

$$ax^2 + bx + c = 0$$

Coefficients (a,b,c) are your input.

The Essentials of Repetition

- Loop
  - Group of instructions computer executes repeatedly while some condition remains true
- Counter-controlled repetition
  - Definite repetition - know how many times loop will execute
  - Control variable used to count repetitions
- Sentinel-controlled repetition
  - Indefinite repetition
  - Used when number of repetitions not known
  - Sentinel value indicates "end of data"

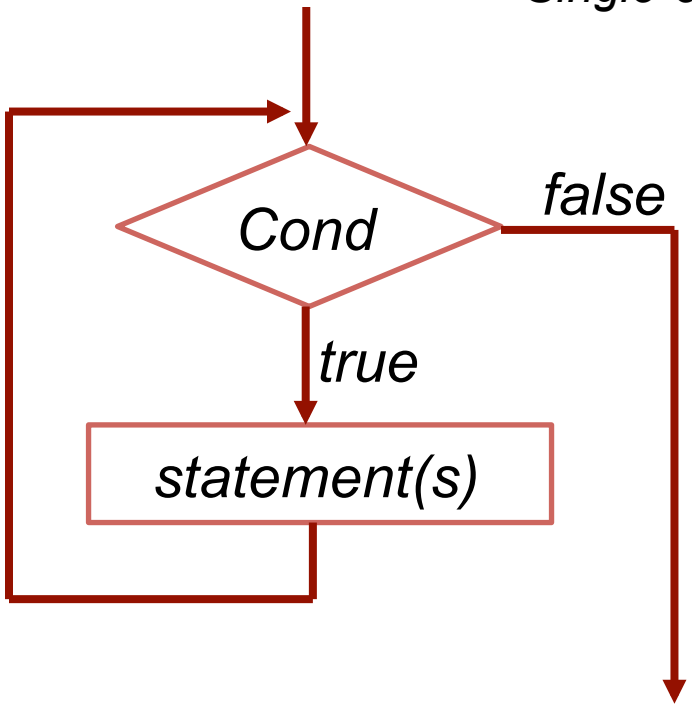
Counter-Controlled Repetition

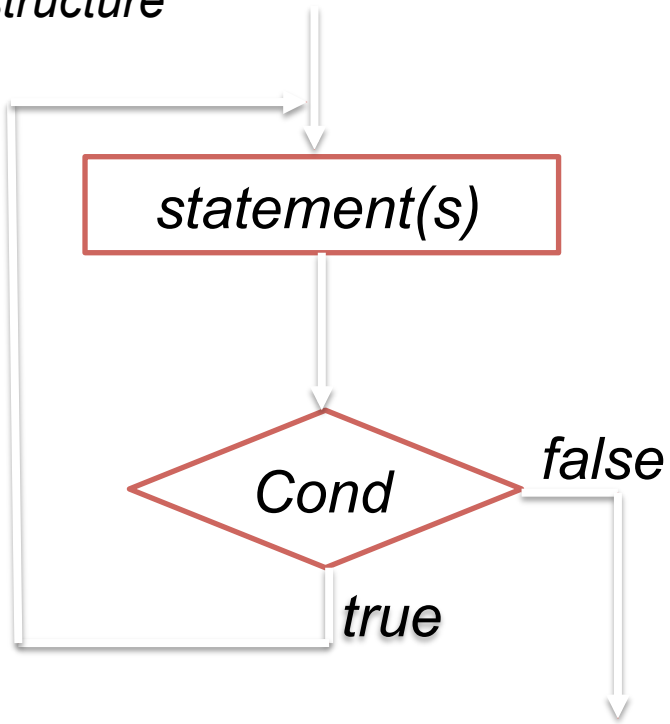
- Counter-controlled repetition requires
  - *name* of a control variable (or loop counter).
  - *initial value* of the control variable.
  - condition that tests for the *final value* of the control variable (i.e., whether looping should continue).
  - *increment* (or *decrement*) by which the control variable is modified each time through the loop.

```
int counter =1;                          /* initialization */
while (counter <= 10) {    /* repetition condition */
      printf( "%d\n", counter );
      ++counter;                          //increment
}
```

Repetition: Flowchart

Single-entry / single-exit structure






```
int counter =1;

while (counter <= 10) {
        printf( "%d\n", counter );
        ++counter;
}
```

May not execute at all based on condition.

```
int counter =1;

do {
        printf( "%d\n", counter );
        ++counter;
} while (counter <= 10) ;
```

Will be executed at least once, whatever be the condition.

while, do-while Statement

```
while (condition)
   statement_to_repeat;

while (condition) {
    statement_1;
    ...
    statement_N;
}
```

```
int  digit = 0;
while  (digit <= 9)
  printf ("%d \n", digit++);
```

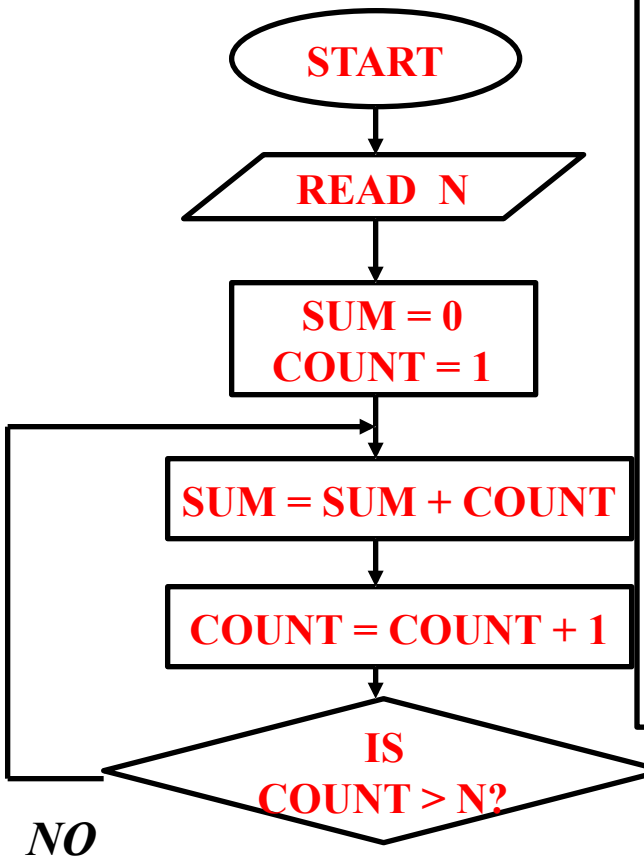
```
int weight=75;
while ( weight > 65 ) {
     printf("Go, exercise, ");
     printf("then come back. \n");
     printf("Enter your weight: ");
     scanf("%d", &weight);
   }
```

```
weight=75;
do {
    printf("Go, exercise, ");
    printf("then come back. \n");
    printf("Enter your weight: ");
    scanf("%d", &weight);
  } while ( weight > 65 ) ;
```

```
do {
    statement-1;
    statement-2;
        ……..
     statement-n;
} while ( condition );
```

At least one round of exercise is ensured.

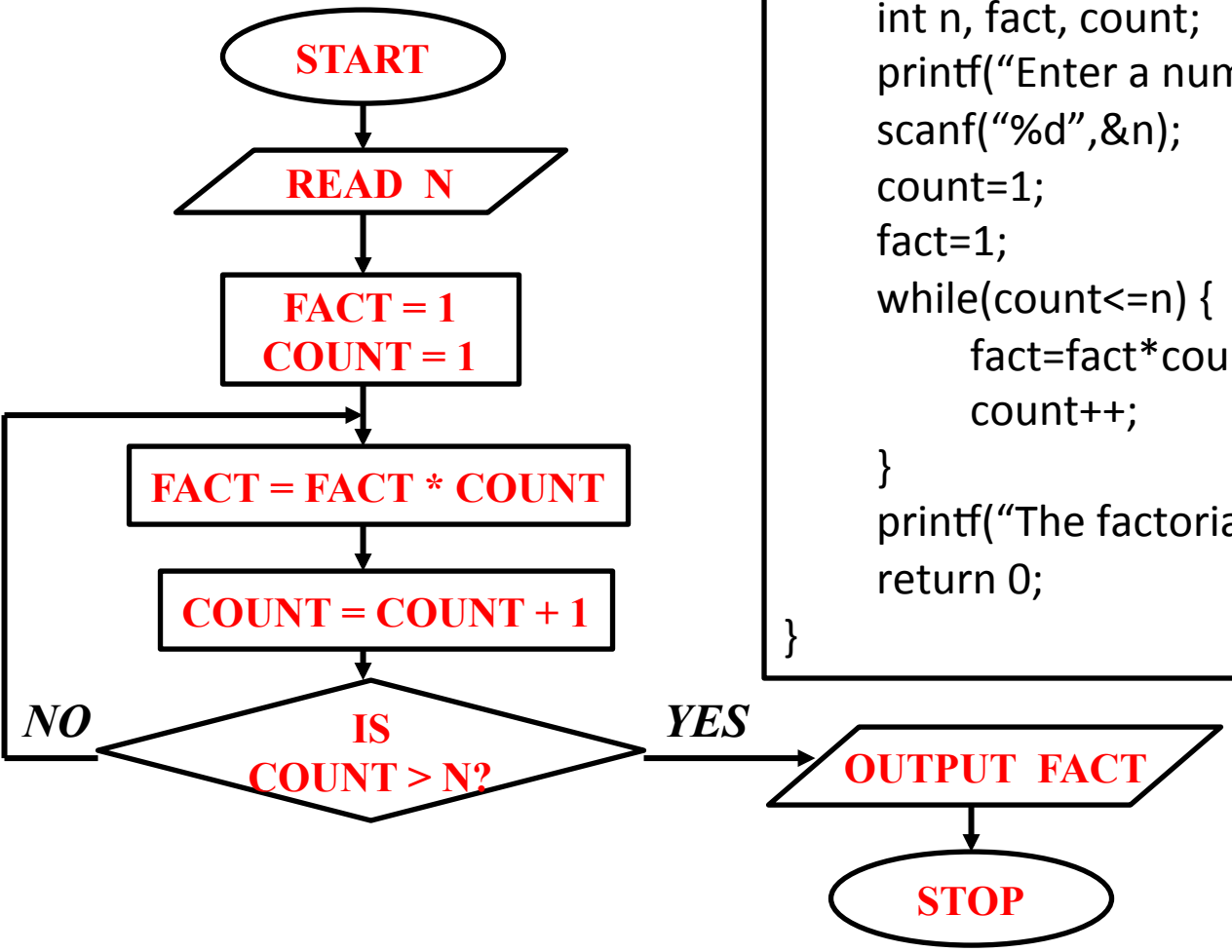
Example 5: *Sum of first N natural numbers*




```
#include <stdio.h>

int main()
{
        int n, sum, count;
        printf("Enter a natural number: ");
        scanf("%d",&n);
        count=0;
        sum=0;
        while(count<=n) {
                sum+=count;   // sum=sum+count
                count++;
        }
        printf("The sum of first %d natural numbers is: %d",
                        n,sum);
        return 0;
}
```

Line break in a statement is allowed after a comma.

Example 6: *Computing Factorial*




```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        count=1;
        fact=1;
        while(count<=n) {
                fact=fact*count;
                count++;
        }
        printf("The factorial of %d is: %d",n,fact);
        return 0;
}
```

Considering large factorial value, you may declare *fact* as float.

Example 7: *Computing Factorial*

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        count=1;
        fact=1;
        while(count<=n) {
                fact=fact*count;
        count++;
        }
        printf("%d",fact);
        return 0;
}
```

count may increment.

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        count=n;
        fact=1;
        while(count>=1) {
                fact=fact*count;
        count--;
        }
        printf("%d",fact);
        return 0;
}
```

count may decrement.

Loop variable may decrement

Counter-Controlled Repetition

- Counter-controlled repetition requires
  - *name* of a control variable (or loop counter).
  - *initial value* of the control variable.
  - condition that tests for the *final value* of the control variable (i.e., whether looping should continue).
  - *increment* (or *decrement*) by which the control variable is modified each time through the loop.

```
for (initial; condition; iteration)
        statement_to_repeat;
```

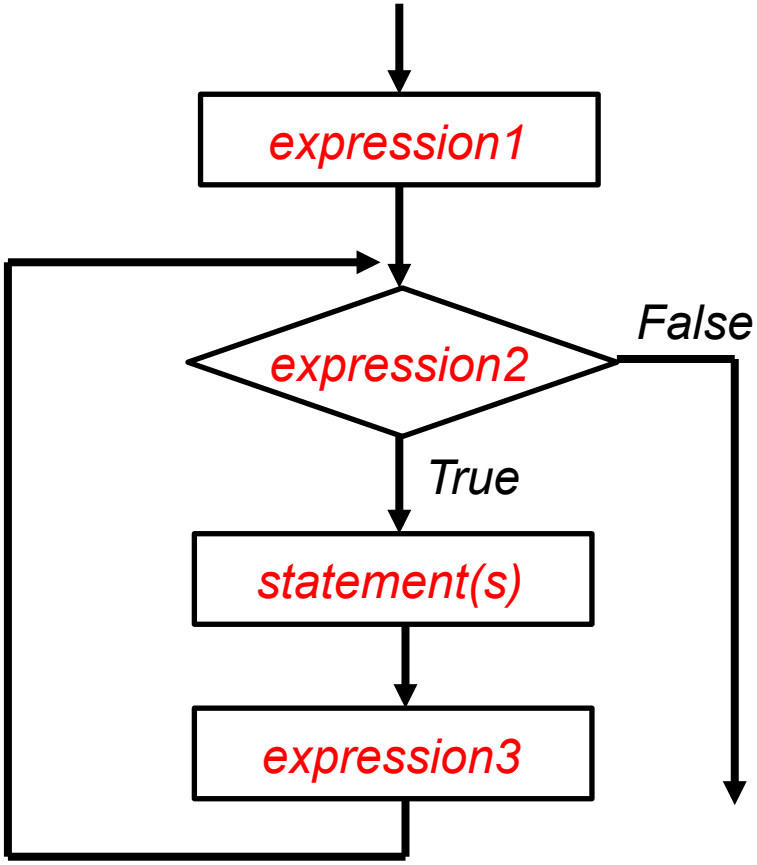
All are expressions.
initial → expr1
condition → expr2
iteration → expr3

```
for (initial; condition; iteration)  {
        statement_to_repeat;
        ……
        statement_to_repeat;
}
```

```
fact = 1;     /* Calculate 10! */
for ( i = 1; i < =10; i++)
    fact = fact * i;
```

for loop

Single-entry / single-exit structure




```
for (initial; condition;
   iteration)  {
        statement_1;
        ……
        statement_n;
}
```

- How it works?
  - "expression1" is used to *initialize* some variable (called *index*) that controls the looping action.
  - "expression2" represents a *condition* that must be true for the loop to continue.
  - "expression3" is used to *alter* the value of the *index* initially assigned by "expression1".

Example 8: *Computing Factorial*

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        count=1;
        fact=1;
        while(count<=n) {
                fact=fact*count;
        count++;
        }
        printf("%d",fact);
        return 0;
}
```

while loop

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        fact=1;
        for(count=1;count<=n;count++) {
                fact=fact*count;
        }
        printf("%d",fact);
        return 0;
}
```

for loop

Example 9: *Computing Factorial*

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        count=1;
        fact=1;
        for(;count<=n;) {
                fact=fact*count;
        count++;
        }
        printf("%d",fact);
        return 0;
}
```

for loop working as while

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        fact=1;
        for(count=1;count<=N;count++) {
                fact=fact*count;
        }
        printf("%d",fact);
        return 0;
}
```

for loop

Homework:
Rewrite the factorial using *for* loop and by decrementing count.

Example 10: *Computing Factorial*

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        fact=1;
        for(count=1;count<=n;count++) {
                fact=fact*count;
        }
        printf("%d",fact);
        return 0;
}
```

for loop

```
#include <stdio.h>

int main()
{
        int n, fact, count;
        printf("Enter a number: ");
        scanf("%d",&n);
        for(fact=1,count=1;count<=n;count++) {
                fact=fact*count;
        }
        printf("%d",fact);
        return 0;
}
```

for loop with comma operator

The comma operator:

We can give several statements separated by commas in place of "expression1", "expression2", and "expression3".

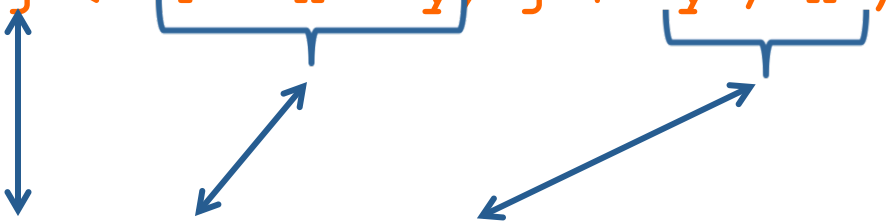
Advanced expression in *for* structure

- Arithmetic expressions
  - Initialization, loop-continuation, and increment can contain arithmetic expressions.
  - e.g. Let `x = 2` and `y = 10`

```
for ( j = x; j <= 4 * x * y; j += y / x )
```

is equivalent to

```
for ( j = 2; j <= 80; j += 5 )
```



"Increment" may be negative (decrement)

If loop continuation condition initially false

Body of ***for*** structure not performed

Control proceeds with statement after ***for*** structure

Specifying “Infinite Loop”

```
count=1;
while(1) {
        printf(“Count=%d”,count);
        count++;
}
```

```
count=1;
do {
        printf(“Count=%d”,count);
        count++;
} while(1);
```

```
count=1;
for(;;) {
        printf(“Count=%d”,count);
        count++;
}
```

```
for(count=1;;count++) {
        printf(“Count=%d”,count);
}
```

break Statement

- Break out of the loop { }
  - can use with
    - *while*
    - *do while*
    - *for*
    - *switch*
  - does not work with
    - *if {}*
    - *else {}*
- Causes immediate exit from a while, for, do/while or switch structure
- Program execution continues with the first statement after the structure
- Common uses of the break statement
  - Escape early from a loop
  - Skip the remainder of a switch structure

Break from “Infinite Loop”

```
count=1;
while(1) {
        printf(“Count=%d”,count);
        count++;
        if(count>100)
                break;
}
```

```
count=1;
do {
        printf(“Count=%d”,count);
        count++;
        if(count>100)
                break;
} while(1);
```

```
count=1;
for(;;) {
        printf(“Count=%d”,count);
        count++;
        if(count>100)
                break;
}
```

```
for(count=1;;count++) {
        printf(“Count=%d”,count);
        if(count>100)
                break;
}
```

continue Statement

- continue
  - Skips the remaining statements in the body of a while, for or do/while structure
    - Proceeds with the next iteration of the loop
  - while and do/while
    - Loop-continuation test is evaluated immediately after the `continue` statement is executed
  - for structure
    - Increment expression is executed, then the loop-continuation test is evaluated.
    - *expression3* is evaluated, then *expression2* is evaluated.

An Example with *break* and *continue*

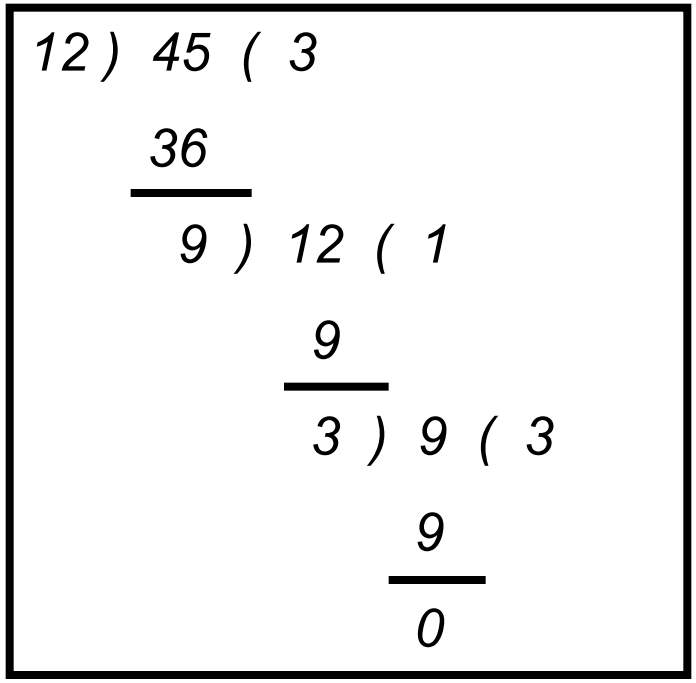
```
fact = 1;        /* a program to calculate 10 ! */
i = 1;
while  (1)  {
   fact = fact * i;
   i++ ;
   if(i<10) {
    continue;    /* not done yet! Go to next
   iteration*/
   }
   break;
}
```

Example 11: Primality testing

```
#include <stdio.h>
int main()
{
   int  n, i=2;
   scanf (“%d”, &n);
   while (i < n)  {
    if (n % i == 0)  {
        printf (“%d is not a prime \n”, n);
        break;
    }
    i++;
   }
   if(i>=n)
    printf (“%d is a prime \n”, n);
   return 0;
}
```

Example 12: Compute GCD of two numbers

```
#include  <stdio.h>
int main()
{
   int  A, B, temp;
   scanf (%d %d", &A, &B);
   if  (A > B)  {
    temp = A;
    A = B;
    B = temp;
   }
   while ((B % A) != 0)  {
    temp = B % A;
    B = A;
    A = temp;
   }
   printf ("The GCD is %d", A);
   return 0;
}
```



Initial: A=12, B=45
Iteration 1: temp=9, B=12,A=9
Iteration 2: temp=3, B=9, A=3
B % A = 0 ➔ GCD is 3

Example 13: Find the sum of digits of a number

```
#include  <stdio.h>
int main()
{
   int n, sum=0;
   scanf (“%d”, &n);
   while (n != 0)  {
    sum = sum + (n % 10);
    n = n / 10;
   }
   printf (“The sum of digits of the number is %d
   \n”, sum);
   return 0;
}
```

N=56342;

56342 % 10=2;
56342 / 10 = 5634;
5634 % 10 = 4;
5634 / 10 = 563;
563 % 10 = 3;
563 / 10 = 56;
56 % 10 = 6;
56 / 10 = 5;
5 % 10 = 5;
5 / 10 = 0;
N=0;

Exercise 2:

Write a C program that will read a decimal integer and will convert to equivalent to binary number.