Sequential Execution

ESC108A Elements of Computer Science and Engineering

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Objectives

- At the end of this lecture, student will be able to
  - Identify sequential program execution
  - Identify flow chart elements and connectors that are associated with sequential program flow
  - Identify the constructs in algorithms that are associated with sequential program flow
  - Apply sequential logic to solve a problem
  - Express sequential logic in C programming language

Contents

- Statements in C
- Sequential Logic
- Flow Charts
  - Processing Statements
  - Input / Output Statements

Statement

- Always terminated with a semi-colon ‘;’ or a block of code ‘{}‘

  An expression

  A function call

  Declaration

  A control structure statement

- Example

```
a = b + c;
printf (“Hello, World!”);
int a;
if (m < 10) { printf(“m less than 10”); }
```

C Statements

- Expression
- Conditional
  - if (expr) { … } else {…}
  - switch (expr) { case c1: case c2: … }
- Iteration
  - while (expr) { … } — zero or more iterations
  - do … while (expr) — at least one iteration
  - for (init ; valid ; next) { … }
- Jump
  - goto label
  - continue; — go to start of loop
  - break; — exit loop or switch
  - return expr; — return from function

Block or Compound Statement

- A group of declarations and statements, grouped together using braces { and }
- Example

```
{
    int a, b;
    a= 10;
    b=15;
    printf("Sum of %d and %d is %d", a,b,a+b);
}
```

Sequential Execution

- Sequential execution
  - Statements in a program are executed one after the other in the order in which they're written

Control Structures

- Transfer of control
  - Possible to specify that the next statement to be executed may be other than the next one in sequence

- Control structure
  - A statement that alters the control flow

Types of Control Structures

- All programs could be written in terms of following control structures
  1. Selection structure/decision making statements
     - if statement (single selection)
     - if…else statement (double selection)
     - switch statement (multiple selection)
  2. Repetition structure/loop statements
     - while statement
     - do…while statement
     - for statement

Flow Charts

- A flowchart
  - A graphical representation of an algorithm or of a portion of an algorithm

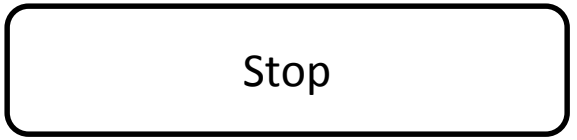
- Flowcharts are drawn using certain special-purpose symbols such as rectangles, diamonds, ovals, and small circles

- Symbols are connected by arrows called flowlines

Flow Charts - Symbols

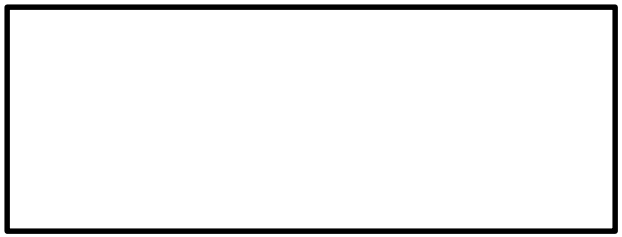
- Oval symbol
- Terminator symbol
  - All programs in C start executing from the first processing statement in main function
  - Flowcharts express the start of a program and termination of the program using a terminator symbol

- Examples

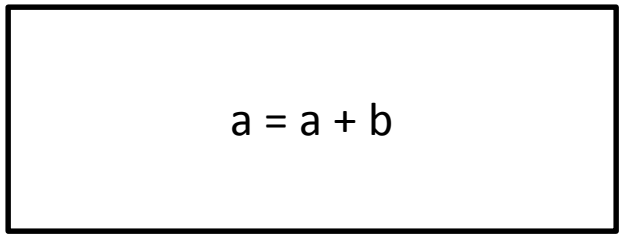


Flow Charts – Symbols contd.

- Rectangle symbol or action symbol
- Processing Statement



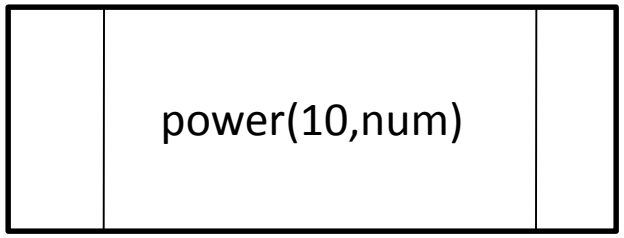
- Example



Flow Charts – Symbols contd.

- Predefined Process

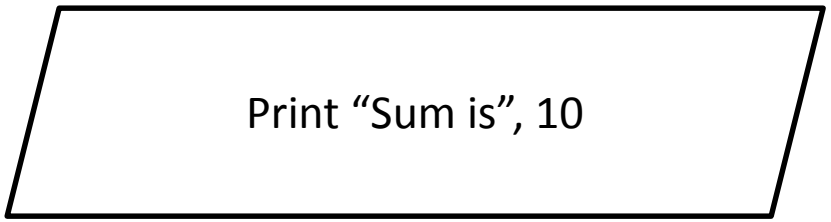
- Example

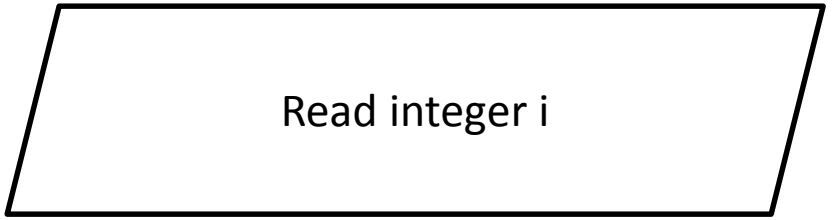


Flow Charts – Symbols contd.

- I/O statement

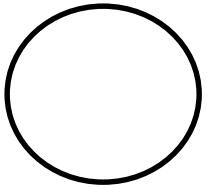
- Examples



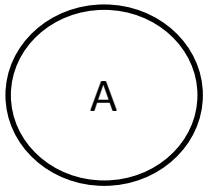


Flow Charts – Symbols contd.

- Connectors

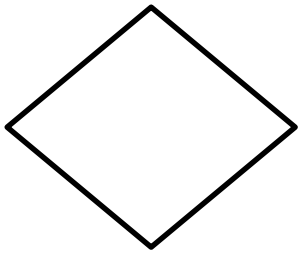


- Examples

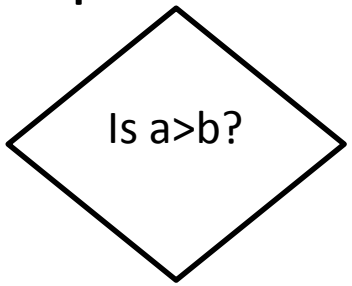


Flow Charts – Symbols contd.

- Diamond symbol or decision symbol – indicates that a decision is to be made
- Contains an expression, such as a condition, that can be either true or false

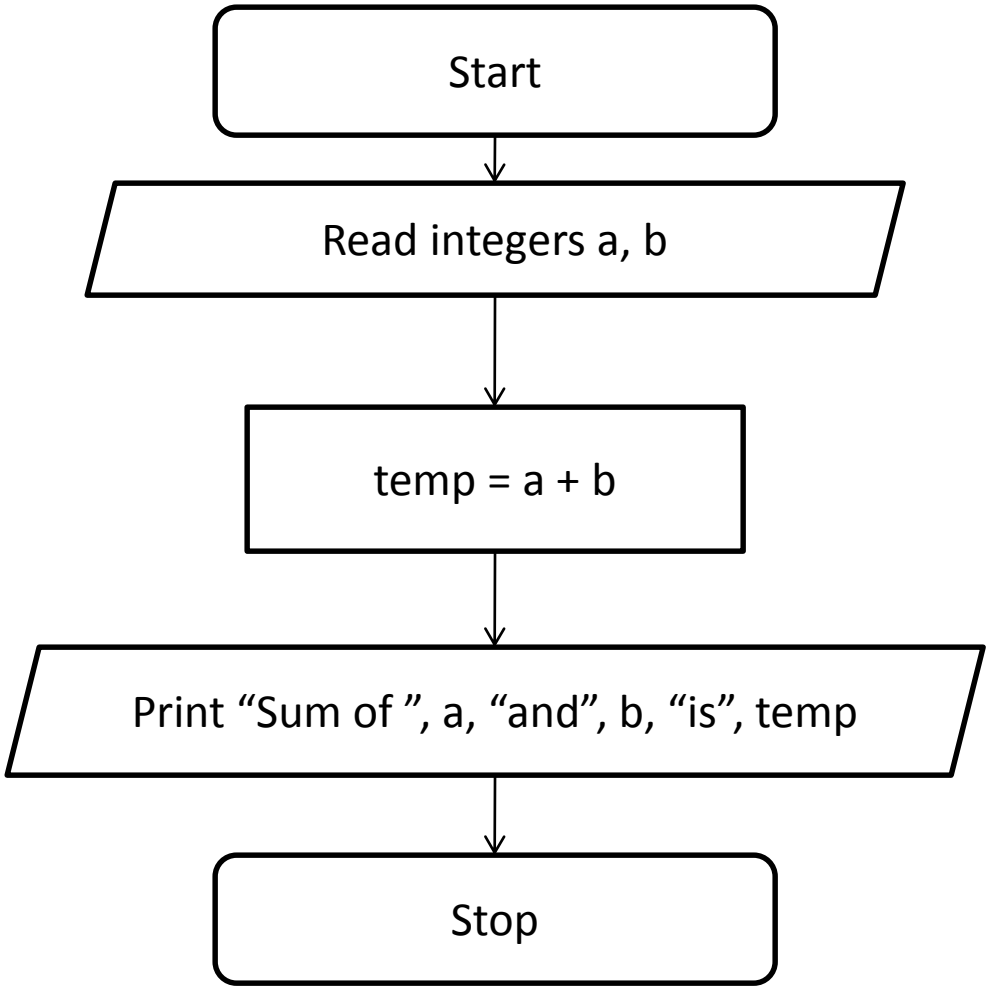


- Examples



Flow Charts - Example

- Adding 2 numbers



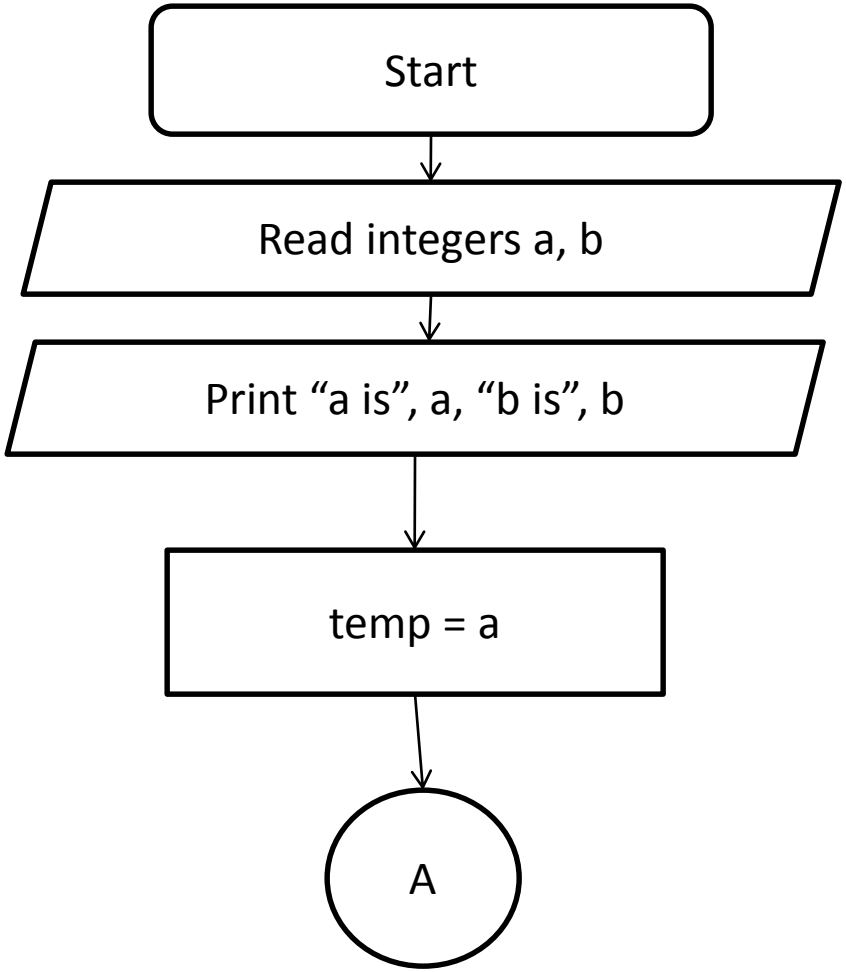
Algorithms

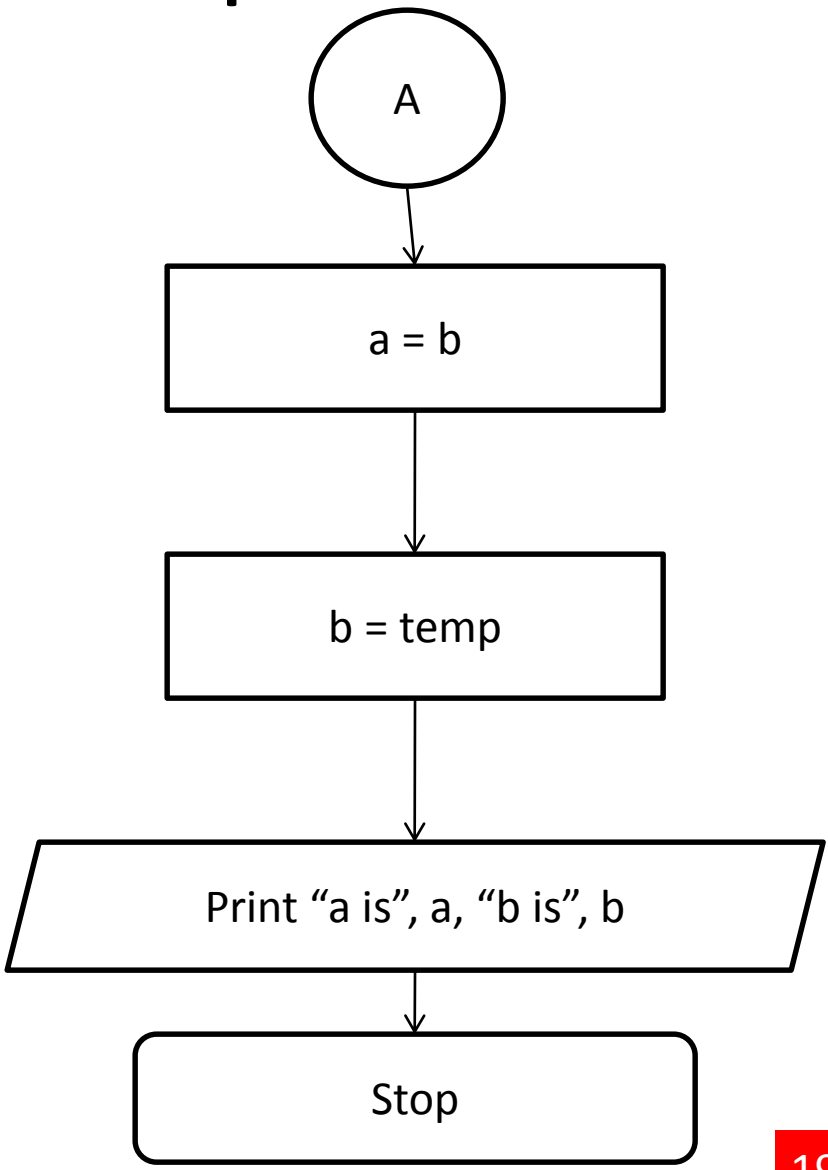
- Swapping 2 numbers

```
Algorithm swap()
var temp, a, b : Integer;
begin
    readln(a);
    readln(b);
    writeln('The current values of a and b are', a, b);
    temp := a;
    a := b;
    b := temp;
    writeln('The current values of a and b are', a, b);
end
```

Flow Charts - Example

- Swapping 2 numbers





Summary

- The order in which the statements are executed is known as control flow
- Sequential flow is the major component in all computer programs
- Flow Charts are graphical representation of Algorithms and clearly show the control flow
- Generally, sequential flow is found in input/output and processing statements

Further Problems

- Write an algorithm and flow chart to check whether the given number is odd or even
- Write an algorithm and flowchart to provide average in a subject given marks in assignment, mid term exams and final exam

Further Reading

Dromey, R. (1982) *How To Solve it By Computer.* Noida: Pearson Education Inc.

Kernighan, B. W. and Richie, D. (1992) *The C Programming Language.* 2nd ed., New Delhi:PHI.