4.7: Flowcharts

IT1406 - Introduction to Programming

Level I - Semester 1

4.7. Flowcharts

Introduction to flowcharts

- This appendix introduces flowcharts as an alternative method of representing algorithms.

- Flowcharts are popular because they graphically represent the program logic by a series of standard geometric symbols and connecting lines.

- Flowcharts are relatively easy to learn and are an intuitive method of representing the flow of control in an algorithm.

- For simplicity, just six standard flowchart symbols will be used to represent algorithms in this text

4.7. Flowcharts

Terminal symbol

The terminal symbol indicates the starting or stopping point in the logic. Every flowchart should begin and end with a terminal symbol.

Input/Output symbol

The input/output symbol represents an input or output process in an algorithm, such as reading input or writing output.
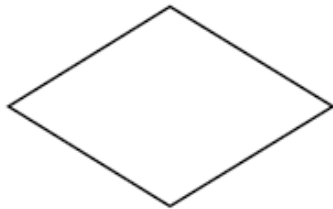
Process symbol

The process symbol represents any single process in an algorithm, such as assigning a value or performing a calculation. The flow of control is sequential.
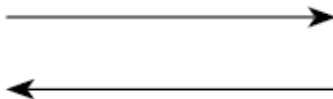
4.7. Flowcharts

Predefined process symbol

The predefined process symbol represents a module in an algorithm – that is, a predefined process that has its own flowchart.

Decision symbol

The decision symbol represents a decision in the logic involving the comparison of two values. Alternative paths are followed, depending on whether the decision symbol is true or false.

Flowlines

Flowlines connect various symbols in a flowchart, and contain an arrowhead only when the flow of control is not from top to bottom or left to right.

4.7. Flowcharts

The three basic control structures and flow charts.

Sequence

- The sequence control structure is defined as the straightforward execution of one processing step after another.

- A flowchart represents this control structure as a series of process symbols, one beneath the other, with one entrance and one exit.
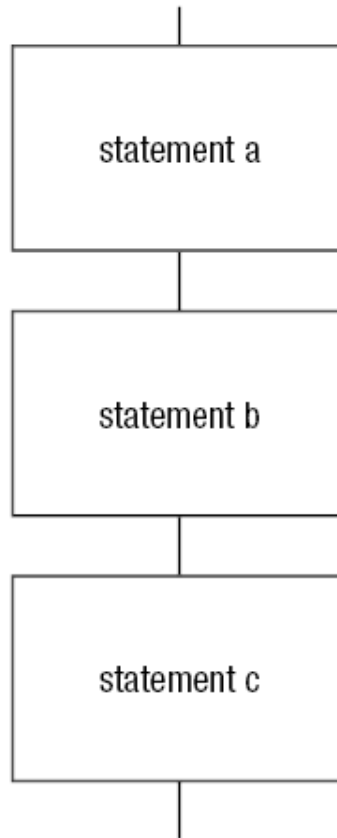
Basic control structures

The three basic control structures and flow charts

Sequence

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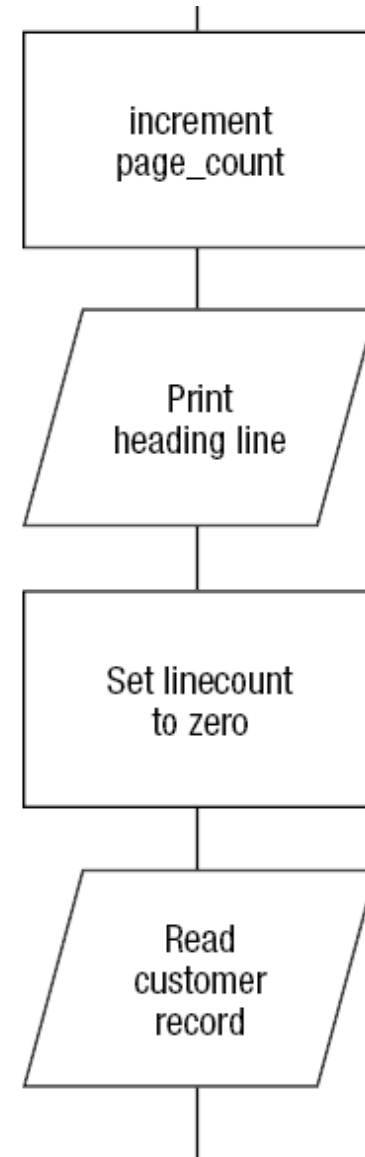# Basic control structures

Sequence

Basic control structures

Sequence

- The sequence control structure can be used to represent the first four basic computer operations; namely, to receive information, put out information, perform arithmetic, and assign values.

- For example, a typical sequence of statements in a flowchart might read:

Basic control structures

Sequence Structure

Basic control structures

Sequence Structure

- These instructions illustrate the sequence control structure as a straightforward list of steps, written one after the other, in a top-to-bottom fashion.

- Each instruction will be executed in the order in which it appears.

Basic control structures

Selection

- The selection control structure can be defined as the presentation of a condition, and the choice between two actions depending on whether the condition is true or false.

- This construct represents the decision-making abilities of the computer, and is used to illustrate the fifth basic computer operation; namely, to compare two variables and select one of two alternative actions.

- A flowchart represents the selection control structure with a decision symbol, with one line entering at the top, and two lines leaving it, following the true path or false path, depending on the condition.

- These two lines then join up at the end of the selection structure.

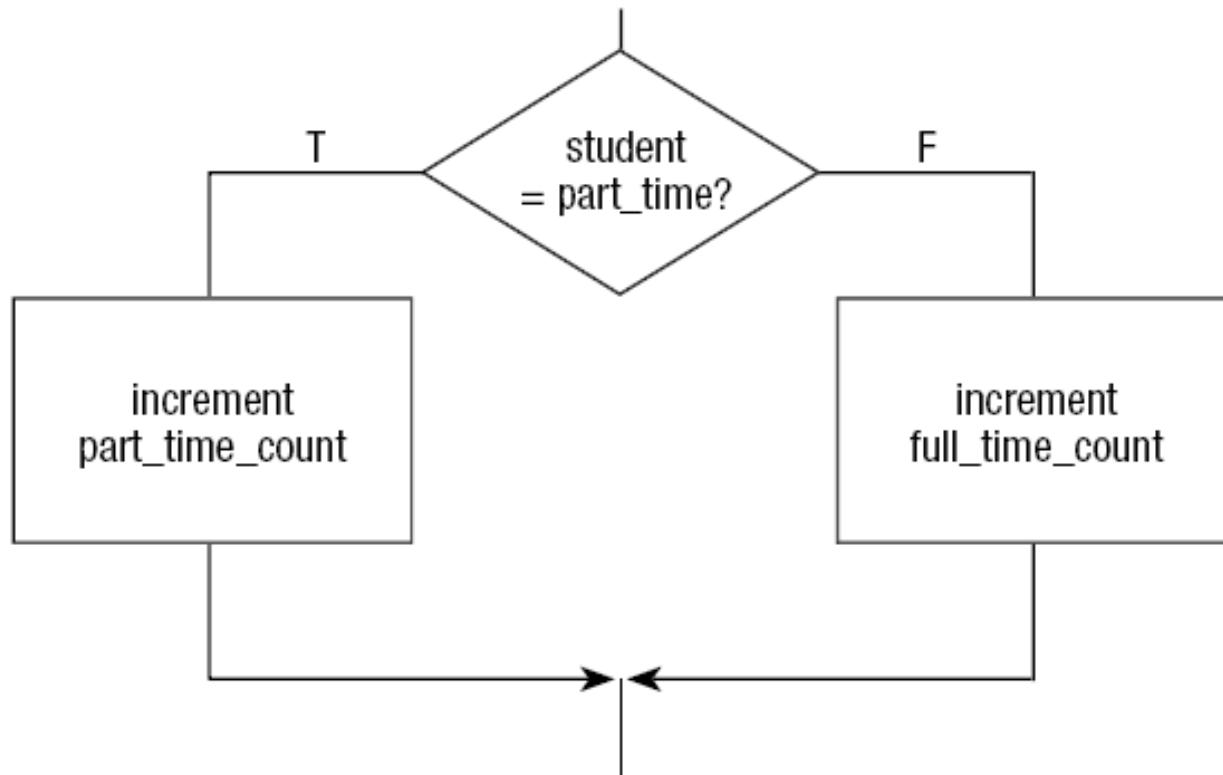# Basic control structures
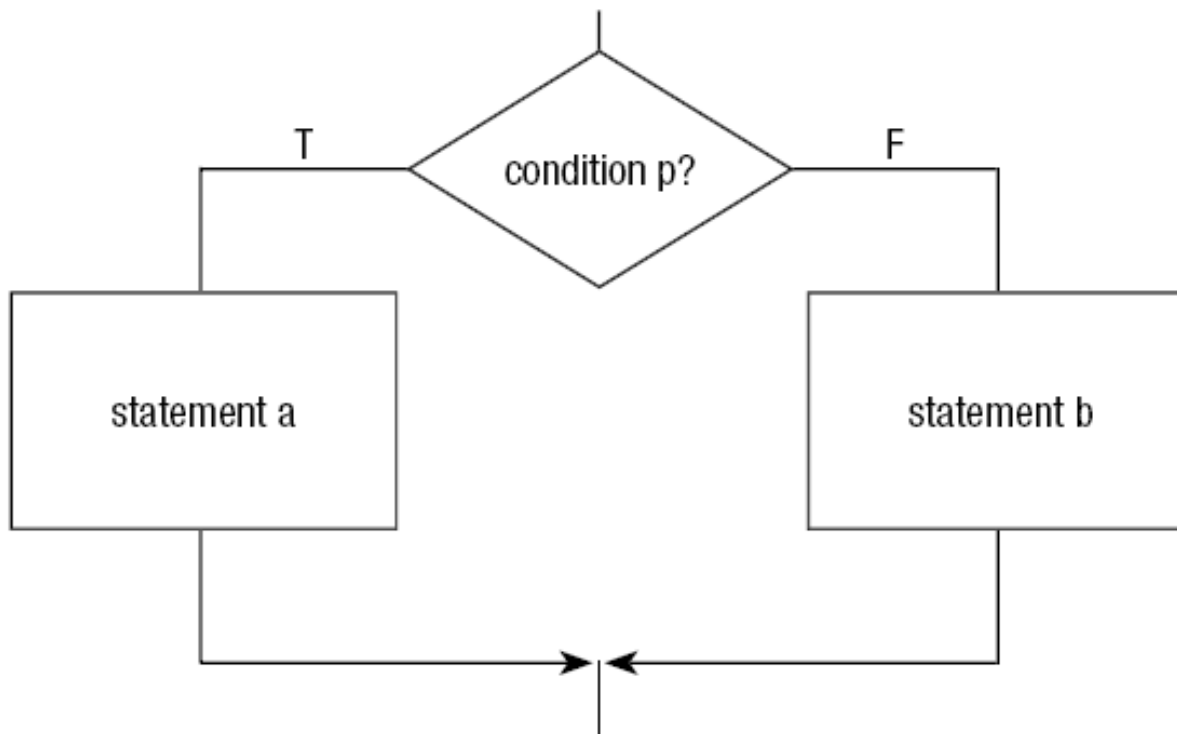
Selection

Basic control structures

Selection

- If condition p is true, the statement or statements in the true path will be executed.

- If condition p is false, the statement or statements in the false path will be executed.

- Both paths then join up to the flow line following the selection control structure.

- A typical flowchart might look like the one shown in the following slide:

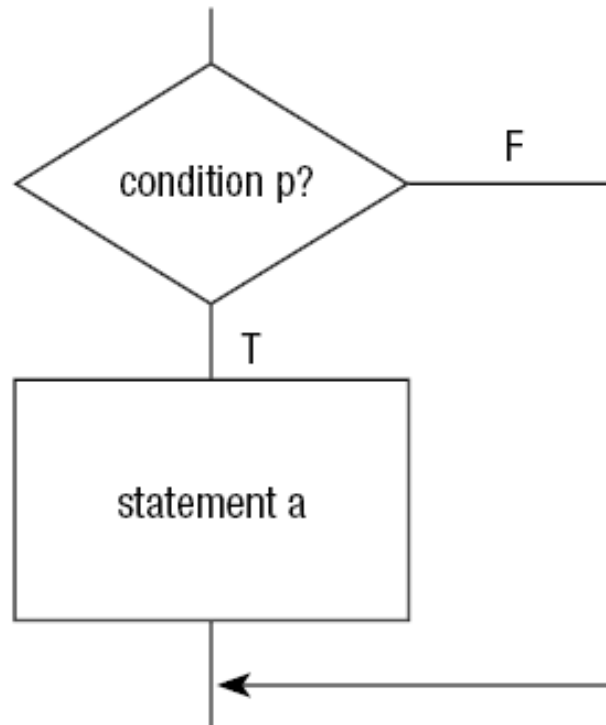# Basic control structures

Selection

Basic control structures

Selection

- A variation of the selection control structure is the null ELSE structure, which is used when a task is performed only if a particular condition is true.

- The flowchart that represents the null ELSE construct has no processing in the false path.

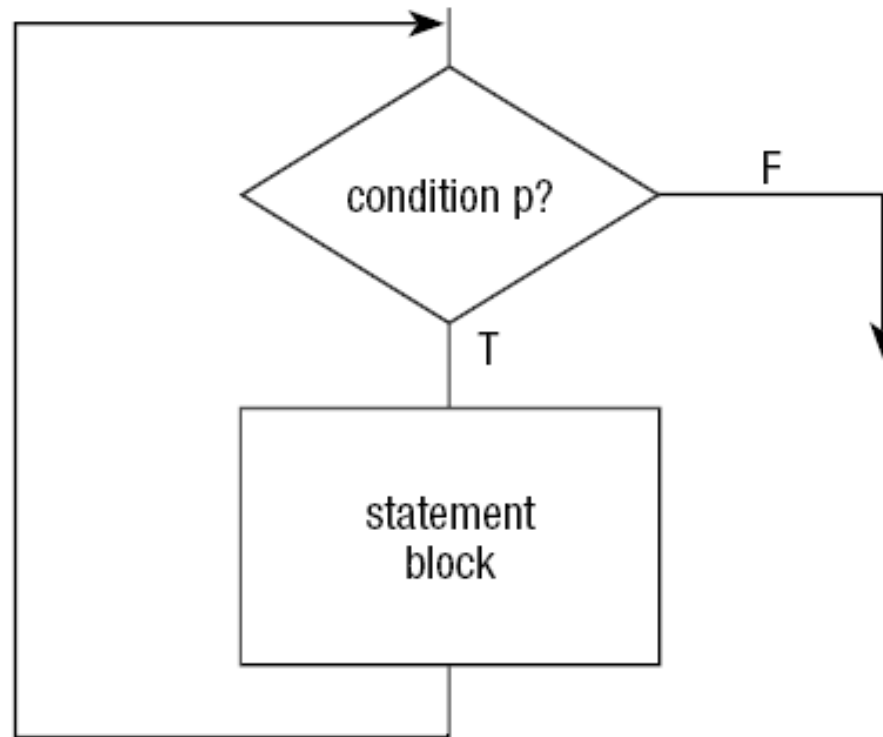# Basic control structures

Selection

Basic control structures

Repetition

- The repetition control structure can be defined as the presentation of a set of instructions to be performed repeatedly, as long as a condition is true.

- The basic idea of repetitive code is that a block of statements is executed again and again, until a terminating condition occurs.

- This construct represents the sixth basic computer operation; namely, to repeat a group of actions.

- A flowchart represents this structure as a decision symbol and one or more process symbols to be performed while a condition is true.

- A flow line then takes the flow of control back to the condition in the decision symbol, which is tested before the process is repeated.

Basic control structures

Repetition

Basic control structures

Repetition

- While condition p is true, the statements inside the process symbol will be executed.

- The flow line then returns control upwards to retest condition p.

- When condition p is false, control will pass out of the repetition structure down the false path to the next statement.

- We will now look at a flowchart that represents the repetition control structure:

Basic control structures

Sequence

Simple algorithms that use the sequence control structure

Add three numbers

A program is required to <u>read</u> three numbers, <u>add</u> them together and <u>print</u> their total.

Basic control structures

Sequence

- **Simple algorithms that use the sequence control structure**

Input	Processing	Output
number1	Read three numbers	total
number2	Add numbers together	
number3	Print total number	

Basic control structures

- The three basic control structures and flow charts
- Simple algorithms that use the sequence control structure

Solution algorithm