# **Assignment Statements** in Programming Languages

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### A Programming Language -**Universal: All Solvable Computations**

- integer values and arithmetic operators ٠ (arithmetic exressions)
- variables

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- assignment statement
- selection statement •
- loop statement/go to statement



# **Simple Assignment Statements** • Simple Assignments - <target\_variable> <assignment\_operator> <exp> • The assignment operator symbol: := ALGOLs, Pascal, Modula-2, Ada

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- = FORTRAN, BASIC, PL/I, C, C++, Java
- = can be bad if it is overloaded for the relational operator for equality.

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### **Compound Assignment Statements**

- Compound assignment operators:
  - The target variable (LHS) is the first operand in the expression (RHS).
  - Abbreviated assignment
  - C, C++, and Java
  - sum = sum + next;
  - sum += next;









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- assignment statement
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### **Levels of Control Flow**

- Flow of control (execution sequence) in a program:
  - Within expressions
  - Among statements
  - Among program units

### **Compound Statements as Blocks**

- A collection of statements: - Introduced by ALGOL 60: begin...end
- Variable declarations in a compound statement.
  - Can define a new scope (with local variables).
  - A block.

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## **Control Statements**

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- 1. Selection
  - Two-way selection
  - Multi-way selection

### 2. Iteration (Loop)

- Counter-controlled loops
- Logically-controlled loops
- 3. Unconditional Branching (Goto)

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# **1. Selection Statements • Two-way** selection statements **• Multi-way** selection statements

# **Two-Way Selection Statements**

#### • Design Issues:

- What is the form and type of the control expression?
- What is the selectable segment form (single statement, statement sequence, compound statement)?
- How should the meaning of nested selectors be specified?













### Multiple (N-Way) Selection Statements

- Design Issues:
  - What is the form and type of the control expression?
  - What segments are selectable (single, compound, sequential)?
  - Is the entire construct encapsulated?
  - Is execution flow through the structure restricted to include just a single selectable segment?
  - What is done about unrepresented expression values?

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### Early Multiple Selectors -FORTRAN

- FORTRAN:
  - Arithmetic IF (a three-way selector):
    IF (arithmetic expression) N1, N2, N3
  - Computed GOTO
  - GO TO (label\_1, label\_2, ..., label\_n) exp - Assigned GOTO

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- Problems:
  - Lack of encapsulation
  - Multiple entries

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# (1) Counter-Controlled Loops

- Design Issues:
  - What is the type and scope of the loop var?
  - What is the value of the loop var at loop termination?
  - Should it be legal for the loop var or loop parameters to be changed in the loop body, and if so, does the change affect loop control?
  - Should the loop parameters be evaluated only once, or once for every iteration?

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# Counter-Controlled Loops -Example for index : = 1, 4, 13, 41 step 2 until 47, 3\*index while index < 1000, 34, 2, -24 do sum := sum + index

1, 4, 13, 41, 43, 45, 47, 141, 423, 34, 2, -24

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### User-Located Loop Control Mechanisms

- Design issues:
  - Should the conditional be part of the exit?
  - Should the mechanism be allowed in an already controlled loop?
  - Should control be transferable out of more than one loop?

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## 3. Unconditional Branching (GOTO)

- Problems:
  - Readability!
- Some languages do not have them. - Modula-2 and Java.
- Should remain, but restricted use!

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