

Chapter 4: Control structures

Introduction

Objectives

- What are control structures
- Relational Operators
- Logical operators
- Boolean expressions
- Conditional (Decision) statements
- Loop statements

What are Control Structures

- Without control structures, a computer would evaluate the instructions in a program step-by-step
- Control structures allow:
 - Defining which instructions are evaluated
 - Changing the order in which instructions are evaluated
 - and Controlling the “flow” of the program
- Control structures include:
 - Block statements (anything contained within curly brackets)
 - Decision statements
 - Loops

Relational Operators

Relational operators produce *boolean* values.

==	Equal to
!=	Not equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to

Use of relational Operators

left_operand *relational_operator* **right_operand**

- counter < 5
- counter <= maximum
- Relational operators can be combined with arithmetic operators:
 - $5 + 3 < 4$
 - **false** because 8 is not < 4
 - $\text{myNumber} \% 2 == 1$
 - **false** if myNumber is odd
 - **true** otherwise
- Relational operators are always performed last!!

Logical Operators

Symbol **Operator Name**

&& **AND**

|| **OR**

! **NOT**

&&	T	F
T	T	F
F	F	F

 	T	F
T	T	T
F	T	F

	T	F
!	F	T

Boolean Expressions

- **Boolean expression** is an expression that is evaluated to a boolean value.
- **Atomic Boolean expression** uses one and only one of the relational operators.
 - `myBalance <= yourBalance`
- **Complex Boolean expressions** may be defined by *linking* other Boolean expressions using logical operators.
 - `(myBalance <= yourBalance) && (yourAge > 20)`
 - `(!(myBalance <= yourBalance)) !! (yourAge <= 20)`
- Boolean expressions may be assigned to boolean variables.
 - `boolean isHeOlder = (myAge < hisAge) ;`