Data Abstraction
Review of Java Constructs

Janyl Jumadinova

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Data Types

- Java has two categories of data:
  - primitive data (e.g., number, character)
  - reference/object data (programmer created types)
- There are 8 primitive data types: byte, short, int, long, float, double, char, boolean
- Primitive data are only single values; they have no special capabilities.
A constant value in Java is created by using a literal representation of it.

- 100 (integer literal)
- 98.6 (float literal)
- ’X’ (character literal)
- ‘‘This is a test’’ (String literal)
Constants

- Constants hold the same value during their existence.
- Can use a keyword `final` before the type and name of the variable:
  - always contains the same value.
- `final int MAX_BUDGET = 1000;`
Expression

Expression is a combination of one or more operators (+, −, %, ...) and operands (literals, constants, variables,...)
Order of Precedence

- Operators are evaluated in an expression according to the rules of precedence.
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- Operators are evaluated in an expression according to the rules of precedence.
- Operators within ( ) are evaluated first.
- *, /, % evaluated next (L to R).
- +, - evaluated last (L to R).
Conversion

Widening
- from byte to short, int, long, float or double
- from short to int, long, float, double
- from char to int, long, float, double
- from int to long, float, double
- from long to float, double
- from float to double
Conversion

- Narrowing/shortening - should be avoided!
  - from `byte` to `char`
  - from `short` to `byte, char`
  - from `char` to `byte, short`
  - from `int` to `byte, short, char`
  - from `long` to `byte, short, char, int`
  - from `float` to `byte, short, char, int, long`
  - from `double` to `byte, short, char, int, long, float`
Conversion

- **Assignment:** `grade = 'A'`

- **Promotion:** `total/count`, where `total` is a floating point value and `count` is an integer
  - Occurs automatically, `count` is *promoted* to a floating point value

- **Casting:** `grade = (int) total`
  - Java operator: type name in parentheses
  - Casting converts floating point value `total` into an integer, truncating any fractional part.
Three Groups of Control Structures

1. **Sequential Structure**
   - It is just built into the language itself.
Control Structures

Three Groups of Control Structures

1. **Sequential Structure**
2. **Selection Structures**
   - *if*: single selection
   - *if/else*: double or multiple selection
   - *switch*: multiple selection
Control Structures

Three Groups of Control Structures

1. Sequential Structure
2. Selection Structures
3. Repetition Structure
   - while
   - do/while
   - for

![Loop (Iteration)](image-url)
Control Structures

- Java programs are built from only these seven control structures:
  - *three selection* (if, if/else, switch)
  - *three repetition* (while, do/while, for)
- You implement computer algorithms by stringing sequences of these seven control structures together.
Standard Java arrays

- An **array** is a logical, homogenous collection of data elements, grouped together under a common variable name and referenced individually by position number.
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To refer to a particular location or element in the array, we specify the name of the array and the position number of the particular element in the array.