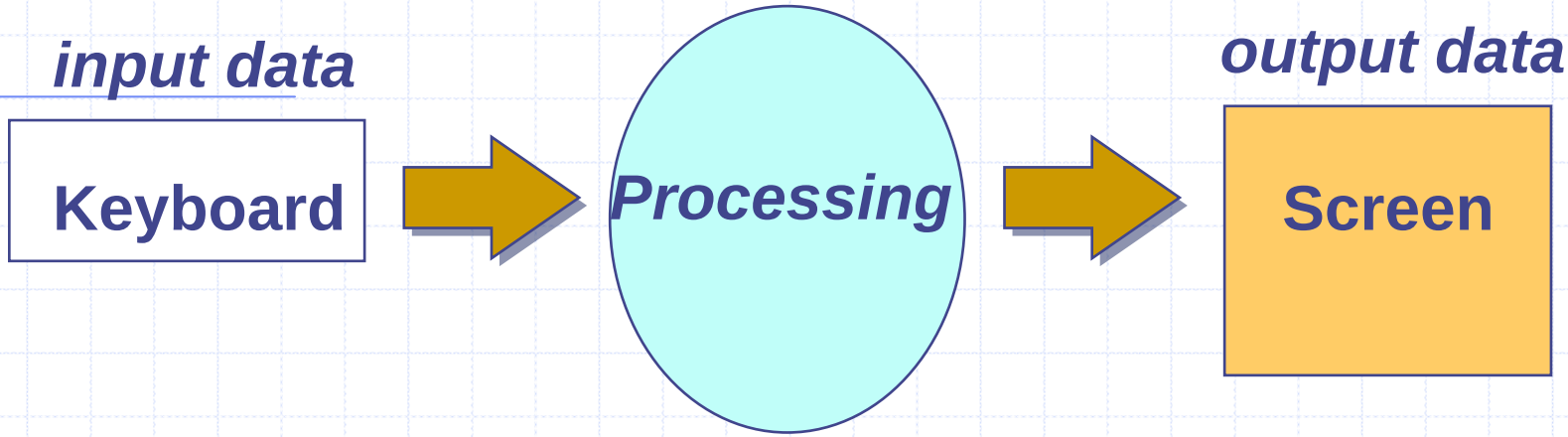
Chapter 2: Java Fundamentals

Variables, Constants and Built-in Data Types

Objectives

- Discovering what is a variable
- Discovering what is a data type
- Learning about the basic data types
- Constants and variables identifiers
- Get acquainted with how to select proper types for numerical data.
- Write arithmetic expressions in Java.

Programs and Data



- Most programs require the temporary storage of data. The data to be processed is stored in a temporary storage in the computer's memory: space memory.
- A space memory has three characteristics
  - **Identifier**
  - **Data Type**
  - **State**

State of the Space Memory

- The state of the space memory is the current value (data) stored in the space memory.

- The state of the space memory:
  - May be changed.
    - In this case the space memory is called variable.
  - Cannot be changed.
    - In this case the space memory is called constant.

Space Memory Identifier

- Identifier is a sequence of characters that denotes the name of the space memory to be used.
  - This name is unique within a program.
- Identifier Rules
  - It cannot begin with a digit (0 – 9).
  - It may contain the letters a to z, A to Z, the digits 0 to 9, and the underscore symbol, _.
  - No spaces or punctuation, except the underscore symbol, _, are allowed.

Identifier Conventions in Java

- Constants:
  - All uppercase, separating words within a multiword identifier with the underscore symbol, _.
- Variables

  All lowercase.

  Capitalizing the first letter of each word in a multiword identifier, except for the first word.

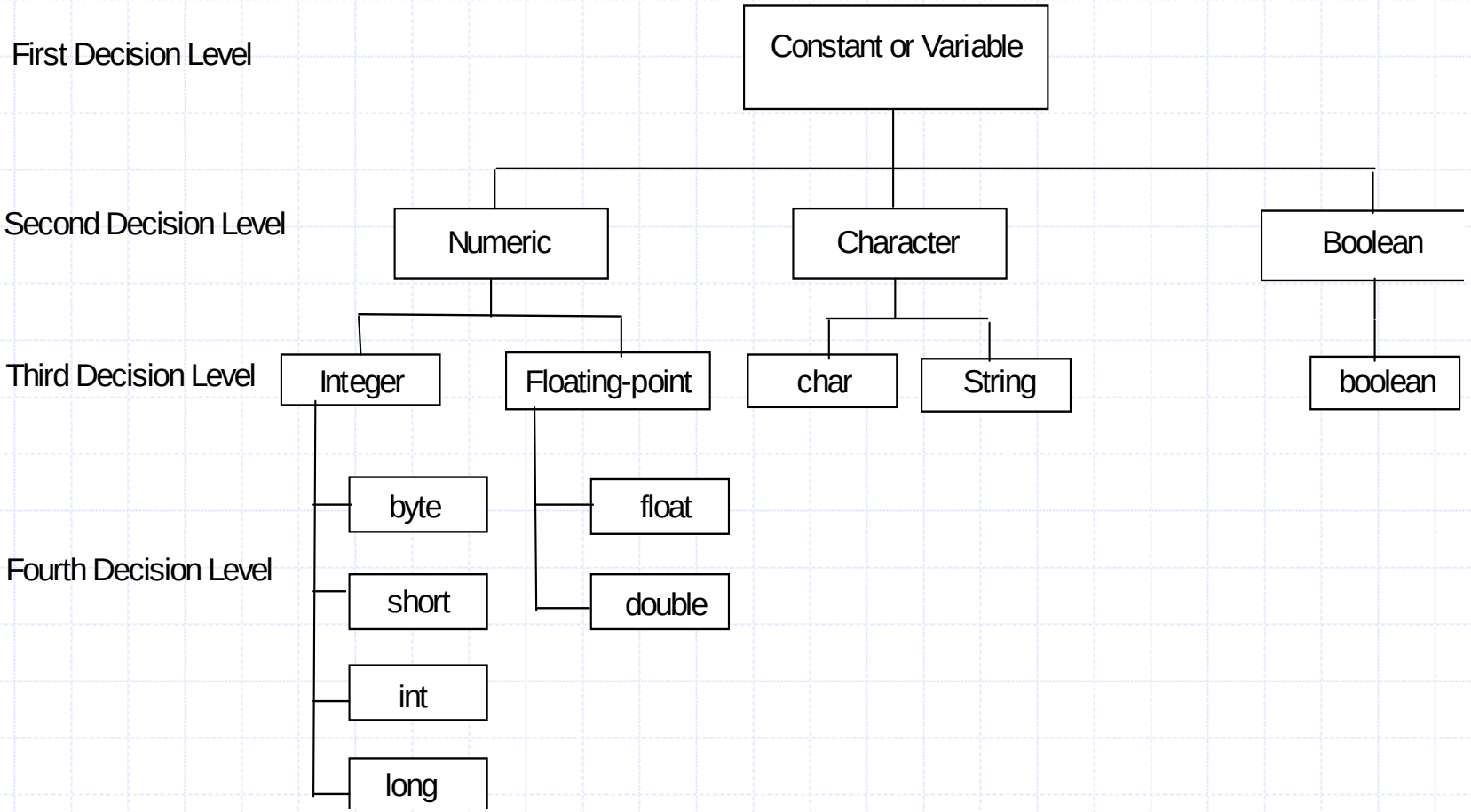
Identifiers are Case-Sensitive

- Identifiers in Java are case-sensitive. Thus, the identifiers myNumber and mynumber, are seen as two different identifiers by the compiler.

Data Type

- The data type defines what kinds of values a space memory is allowed to store.
- All values stored in the same space memory should be of the same data type.
- All constants and variables used in a Java program must be defined prior to their use in the program.

Java built-in Data Types



Primitive Data Types

Type	Size (bits)	Range	Description
boolean		true, false	Stores a value that is either true or false.
char	16		Stores a single 16-bit Unicode character.
byte	8	-128 to +127	Stores an integer.
short	16	-32768 to +32767	Stores an integer.
int	32 bits	-2,147,483,648 to +2,147,483,647	Stores an integer.
long	64 bits	-9,223,372,036,854,775,808 to +9,223,372,036,854,775,807	Stores an integer.
float	32 bits	accurate to 8 significant digits	Stores a single-precision floating point number.
double	64 bits	accurate to 16 significant digits	Stores a double-precision floating point number.

Variable/Constant Declaration

- When the declaration is made, memory space is allocated to store the values of the declared variable or constant.
- The declaration of a variable means allocating a space memory which state (value) may change.
- The declaration of a constant means allocating a space memory which state (value) cannot change.

Constant Declaration

```
final dataType constIdentifier = literal | expression;
```

```
final double PI                = 3.14159;
final int    MONTH_IN_YEAR     = 12;
final short  FARADAY_CONSTANT  = 23060;
```

The reserved word **final** is used to declare constants.

These are constants, also called *named constant*.

These are called *literals.*

```
final int MAX                  = 1024;
final int MIN                  = 128;
final int AVG                  = (MAX + MIN) / 2;
```

This is called *expression.*

Variable Declaration

- A variable may be declared:
  - With initial value.
  - Without initial value.

- Variable declaration with initial value;

```
dataType variableIdentifier = literal | expression;
```

```
double avg                  = 0.0;
int    i                    = 1;
int    x =5, y = 7, z = (x+y)*3;
```

- Variable declaration without initial value;

```
dataType variableIdentifier;
```

```
double avg;
int    i;
```