BIRZEIT UNIVERSITY

Elementary Programming

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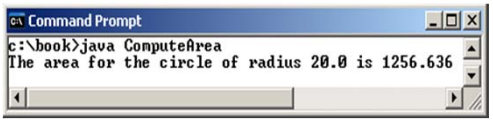
Trace a Program Execution

```
public class ComputeArea {
  /** Main method */
  public static void main(String[] args) {
    double radius;
    double area;

    // Assign a radius
    radius = 20;

    // Compute area
    area = radius * radius * 3.14159;

    // Display results
    System.out.println("The area for the circle of radius " +
      radius + " is " + area);
  }
}
```

memory

radius	20
area	1256.636



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Identifiers

- An **identifier** is a sequence of characters that consist of letters, digits, underscores (_), and dollar signs ($).
- An identifier must start with a letter, an underscore (_), or a dollar sign ($). It cannot start with a digit.
  - An identifier cannot be a reserved word. (See **Appendix A**, "Java Keywords").
- An identifier cannot be **true**, **false**, or **null**.
- An identifier can be of any length.

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Declaring Variables

```
int x;            // Declare x to be an integer variable
double radius;    // Declare radius to be a double variable
char a;           // Declare a to be a character variable
```

Assignment Statements

```
x = 1;            // Assign 1 to x
radius = 1.0;     // Assign 1.0 to radius
a = 'A';          // Assign 'A' to a
```

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Declaring and Initializing in One Step

```
int x = 1;
double d = 1.4;
```

Named Constants

```
final datatype CONSTANTNAME = VALUE;
final double PI = 3.14159;
final int SIZE = 3;
```

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Naming Conventions

- Choose **meaningful** and descriptive names.
- Variables and method names:
  - Use lowercase.
  - If the name consists of several words, concatenate all in one, use lowercase for the first word, and capitalize the first letter of each subsequent word in the name.
  - For example, the variables **radius** and **area**, and the method **computeArea**.

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Naming Conventions, cont.

- **Class names:**
  - Capitalize the first letter of each word in the name.
  - For example, the class name **ComputeArea**.

- **Constants**:
  - Capitalize all letters in constants, and use underscores to connect words.
  - For example, the constant **PI** and **MAX_VALUE**

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Numerical Data Types

Name	Range	Storage Size
`byte`	-2^7 to $2^7 - 1$ (-128 to 127)	8-bit signed
`short`	-2^{15} to $2^{15} - 1$ (-32768 to 32767)	16-bit signed
`int`	-2^{31} to $2^{31} - 1$ (-2147483648 to 2147483647)	32-bit signed
`long`	-2^{63} to $2^{63} - 1$ (i.e., -9223372036854775808 to 9223372036854775807)	64-bit signed
`float`	Negative range: -3.4028235E+38 to -1.4E-45 Positive range: 1.4E-45 to 3.4028235E+38	32-bit IEEE 754
`double`	Negative range: -1.7976931348623157E+308 to -4.9E-324 Positive range: 4.9E-324 to 1.7976931348623157E+308	64-bit IEEE 754

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double vs. float

The double type values are more accurate than the float type values. For example,

```
System.out.println("1.0 / 3.0 is " + 1.0 / 3.0);
```

displays `1.0 / 3.0 is 0.3333333333333333`

16 digits

```
System.out.println("1.0F / 3.0F is " + 1.0F / 3.0F);
```

displays `1.0F / 3.0F is 0.33333334`

7 digits

Increment and Decrement Operators

Operator	*Name*	*Description*	*Example (assume i = 1)*
`++var`	preincrement	Increment `var` by `1`, and use the new `var` value in the statement	`int j = ++i;` `// j is 2, i is 2`
`var++`	postincrement	Increment `var` by `1`, but use the original `var` value in the statement	`int j = i++;` `// j is 1, i is 2`
`--var`	predecrement	Decrement `var` by `1`, and use the new `var` value in the statement	`int j = --i;` `// j is 0, i is 0`
`var--`	postdecrement	Decrement `var` by `1`, and use the original `var` value in the statement	`int j = i--;` `// j is 1, i is 0`

Numeric Type Conversion

Consider the following statements:

```
byte i = 100;

long k = i * 3 + 4;

double d = i * 3.1 + k / 2;
```

Conversion Rules

- When performing a binary operation involving two operands of different types, Java automatically converts the operand based on the following rules:

1. If one of the operands is **double**, the other is converted into double.
2. Otherwise, if one of the operands is **float**, the other is converted into float.
3. Otherwise, if one of the operands is **long**, the other is converted into long.
4. Otherwise, both operands are converted into **int**.

Type Casting

Implicit casting

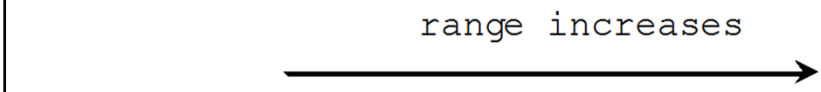
double d = 3; (type widening)

Explicit casting

int i = (int)3.0; (type narrowing)

int i = (int)3.9; (Fraction part is truncated)

What is wrong? int x = 6 / 2.0;



byte, short, int, long, float, double

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Character Data Type

char letter = 'A'; (ASCII)

char numChar = '4'; (ASCII)

char letter = '\u0041'; (Unicode)

char numChar = '\u0034'; (Unicode)

NOTE: The increment and decrement operators can also be used on **char** variables to get the next or preceding Unicode character. For example, the following statements display character **b**.

```
char ch = 'a';
System.out.println(++ch);
```

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The String Type

❖ The char type only represents **one** character. To represent a string of characters, use the data type called **String**. For example:

```
String message = "Welcome to Java!";
```

❖ String is actually a predefined class in the Java library.

❖ The String type is not a primitive type. It is known as a ***reference** type*.

String Concatenation

```
// Three strings are concatenated
String message = "Welcome " + "to " + "Java";

// String Chapter is concatenated with number 2
String s = "Chapter" + 2; // s becomes Chapter2

// String Supplement is concatenated with character B
String s1 = "Supplement" + 'B'; // s1 becomes SupplementB
```

Console Input

- You can use the **Scanner** class for console input.
- Java uses **System.in** to refer to the standard input device (i.e. Keyboard).

```
import  java.util.Scanner;
public class Test{
   public static void main(String[] s){
      Scanner input = new Scanner(System.in);
      System.out.println("Enter  X : ");
       int x = input.nextInt();
       System.out.println("You entered: "+ x);
   }
}
```

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Reading Numbers from the Keyboard

Scanner input = new Scanner(System.in);
int value = input.nextInt();

Method	Description
`nextByte()`	reads an integer of the `byte` type.
`nextShort()`	reads an integer of the `short` type.
`nextInt()`	reads an integer of the `int` type.
`nextLong()`	reads an integer of the `long` type.
`nextFloat()`	reads a number of the `float` type.
`nextDouble()`	reads a number of the `double` type.

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