Chapter 6: Transition to Java

Programming with Alice and Java
First Edition

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Objectives

- Compare the concepts you saw in Alice to their counterparts in Java
- Learn about program development environments for Java
- Access the Java API support library and its online documentation
- Explore several Java program examples
- Practice using various Java statements

Java Features

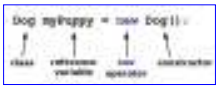
- Java is a *general-purpose programming language.*
- Java has control statements for making decisions and repetition that are similar to the ones in Alice.
- Java classes are organized into packages, rather than galleries.
- Inheritance is used to derive new classes from existing classes.
- Objects are created dynamically during program execution.
- Methods and properties are defined in classes.
- Programs must be compiled before they can be executed.
- A Java compiler reports syntax errors.

Java Program Development

- There are many development environments that can be used to test Java programs.
- Java development environments use text-based editing.
- *Source code* is translated into Java *bytecode* by a *compiler*.
- A program may contain syntax errors, which compilers catch, and logic errors, which it will not.
- *Compile-time errors* are issued if a program breaks the language's *syntax* rules

Classes and Objects

- An object in Java is created using a programming statement:



- A class *constructor* uses a new operator to create an object.
- The constructor has the same name as the class.
- Java classes are organized into *packages*.
- *Java API* (application programming interface) is a library of predefined classes.
- *Child* class can be derived from *parent* class, and it automatically *inherits* the methods and properties of the parent.

Data Types in Java

- Each variable in Java must be *declared* before being used.
- Variable declaration establishes the particular *data type*.
- Eight primitive data types built into the language are:
  - integers:
    - byte
    - short
    - int
    - long
  - floating point numbers:
    - float
    - double
  - character data type:
    - char
  - Boolean data type:
    - boolean
- Objects are created from a class, which is another data type.

Operators in Java and Alice

	Alice	Java
Assignment	set value	=
Basic Arithmetic	+, −, *, /	+, −, *, /
Remainder	IEEERemainder	%
Equality	==, ≠	==, !=
Relational	<, ≤, >, ≥	<, <=, >, >=
Logical NOT	not a	!a
Logical AND	both a and b	a && b
Logical OR	either a or b, or both	a || b

Java Statements

- The *assignment* statement: `total = total + 25;`
- The *print* statement uses two methods, print and println:

```
System.out.println("The result is " + total);
```

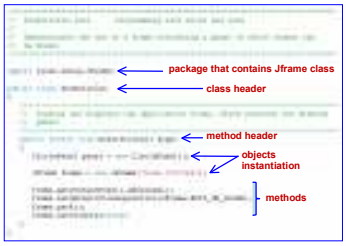
- The *if-else* statement:

```
if (height > 69)
   height = height / 2;
else
   System.out.println("Current height: " + height);
```

- A main method is the default starting point in every Java program.

Java Classes and Objects

- Each circle is an object;
- The window *frame* is another object;
- Each object has properties: color, size, location;



- When the program is executed, a main method is executed first and drives everything else;
- The DrawCircles class is the program *driver*.

The CirclePanel Class

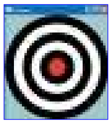
- Another method – *constructor*
- *Visibility modifiers* – private and public;
- Classes and methods are often declared public;
- Instance data is often private;
- *Encapsulation* – every object manages its own data.

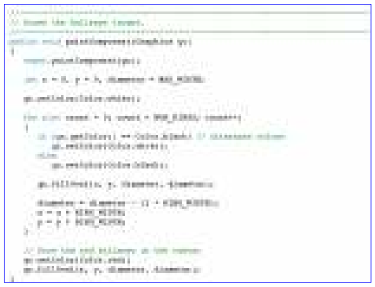
The Circle Class

The Circle Class - methods

Java coordinate system:

The for Loop Example





Program Example

- The CoinFlip program flips a virtual coin.
- Sample run:
- The CoinFlip class contains the main method of the program.
- The Scanner class allows you to read input from the keyboard.
- The Coin class represents a single coin that can be flipped.

Program Example (continued)

The while loop performs *input validation*

The for loop flips the coin as many times as was specified

Summary

- You can use one of several development environments to create Java programs.
- Java code is compiled and translated into bytecode before it is executed.
- A program may contain syntax errors, which will be caught by compiler.
- Logic errors cannot be caught by a compiler.
- A constructor is used to set up a newly created object.
- The Java API is a library of classes that we can use in any Java program.
- Encapsulation: the concept that each object should manage its own data and prevent explicit external modifications.
- The toString method is called automatically when an object is printed.