SUGGESTED SKILLS

1.A

Determine an appropriate program design to solve a problem or accomplish a task.

3.B

Write program code to define a new type by creating a class.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 11.3—Inheritance
- Classroom Resources >
  - Object-Oriented Design
  - An Introduction to Polymorphism in Java

TOPIC 9.1
Creating Superclasses and Subclasses

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.B

Create an inheritance relationship from a subclass to the superclass.

ESSENTIAL KNOWLEDGE

MOD-3.B.1

A class hierarchy can be developed by putting common attributes and behaviors of related classes into a single class called a superclass.

MOD-3.B.2

Classes that extend a superclass, called subclasses, can draw upon the existing attributes and behaviors of the superclass without repeating these in the code.

MOD-3.B.3

Extending a subclass from a superclass creates an "is-a" relationship from the subclass to the superclass.

MOD-3.B.4

The keyword `extends` is used to establish an inheritance relationship between a subclass and a superclass. A class can extend only one superclass.

TOPIC 9.2
Writing Constructors for Subclasses

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.B

Create an inheritance relationship from a subclass to the superclass.

ESSENTIAL KNOWLEDGE

MOD-3.B.5

Constructors are not inherited.

MOD-3.B.6

The superclass constructor can be called from the first line of a subclass constructor by using the keyword `super` and passing appropriate parameters.

MOD-3.B.7

The actual parameters passed in the call to the superclass constructor provide values that the constructor can use to initialize the object's instance variables.

MOD-3.B.8

When a subclass's constructor does not explicitly call a superclass's constructor using `super`, Java inserts a call to the superclass's no-argument constructor.

MOD-3.B.9

Regardless of whether the superclass constructor is called implicitly or explicitly, the process of calling superclass constructors continues until the `Object` constructor is called. At this point, all of the constructors within the hierarchy execute beginning with the `Object` constructor.

SUGGESTED SKILLS

3.B

Write program code to define a new type by creating a class.

5.A

Describe the behavior of a given segment of program code.

AVAILABLE RESOURCES

- Practice-It!: BJP4 Chapter 9: Inheritance and Interfaces—Self-Check 9.3
- Classroom Resources >
  - An Introduction to Polymorphism in Java
  - Gradebook Project

SUGGESTED SKILLS

3.B

Write program code to define a new type by creating a class.

5.D

Describe the initial conditions that must be met for a program segment to work as intended or described.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 11.8—Overriding vs Overloading
- Practice-It!: BJP4 Chapter 9: Inheritance and Interfaces—Exercises 9.4, 9.9
- Classroom Resources >
  - An Introduction to Polymorphism in Java
  - Gradebook Project

TOPIC 9.3
Overriding Methods

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.B

Create an inheritance relationship from a subclass to the superclass.

ESSENTIAL KNOWLEDGE

MOD-3.B.10

Method overriding occurs when a public method in a subclass has the same method signature as a public method in the superclass.

MOD-3.B.11

Any method that is called must be defined within its own class or its superclass.

MOD-3.B.12

A subclass is usually designed to have modified (overridden) or additional methods or instance variables.

MOD-3.B.13

A subclass will inherit all public methods from the superclass; these methods remain public in the subclass.

TOPIC 9.4
`super` Keyword

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.B

Create an inheritance relationship from a subclass to the superclass.

ESSENTIAL KNOWLEDGE

MOD-3.B.14

The keyword `super` can be used to call a superclass's constructors and methods.

MOD-3.B.15

The superclass method can be called in a subclass by using the keyword `super` with the method name and passing appropriate parameters.

SUGGESTED SKILLS

1.C

Determine code that would be used to interact with completed program code.

3.B

Write program code to define a new type by creating a class.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 11.9—Using Super to Call an Overridden Method
- Classroom Resources >
  - Gradebook Project
  - Inheritance and Polymorphism with Sudoku

SUGGESTED SKILLS

3.A
Write program code to create objects of a class and call methods.

5.B
Explain why a code segment will not compile or work as intended.

AVAILABLE RESOURCES

- Practice-It!: BJP4 Chapter 9: Inheritance and Interfaces—Self-Check 9.8, 9.10
- Classroom Resources > Gradebook Project

TOPIC 9.5
Creating References Using Inheritance Hierarchies

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.C

Define reference variables of a superclass to be assigned to an object of a subclass in the same hierarchy.

ESSENTIAL KNOWLEDGE

MOD-3.C.1

When a class S "is-a" class T, T is referred to as a superclass, and S is referred to as a subclass.

MOD-3.C.2

If S is a subclass of T, then assigning an object of type S to a reference of type T facilitates polymorphism.

MOD-3.C.3

If S is a subclass of T, then a reference of type T can be used to refer to an object of type T or S.

MOD-3.C.4

Declaring references of type T, when S is a subclass of T, is useful in the following declarations:

- Formal method parameters
- arrays — `T[]` *var* `ArrayList<T>` *var*

TOPIC 9.6
Polymorphism

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.D

Call methods in an inheritance relationship.

ESSENTIAL KNOWLEDGE

MOD-3.D.1

Utilize the `Object` class through inheritance.

MOD-3.D.2

At compile time, methods in or inherited by the declared type determine the correctness of a non-static method call.

MOD-3.D.3

At run-time, the method in the actual object type is executed for a non-static method call.

SUGGESTED SKILLS

3.A

Write program code to create objects of a class and call methods.

5.B

Explain why a code segment will not compile or work as intended.

AVAILABLE LAB

- Classroom Resources > AP Computer Science A: Celebrity Lab

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 11.15—Polymorphism
- Practice-It!: BJP4 Chapter 9: Inheritance and Interfaces—Self-Check 9.9

SUGGESTED SKILLS

1.C

Determine code that would be used to interact with completed program code.

3.B

Write program code to define a new type by creating a class.

AVAILABLE LAB

- Classroom Resources > AP Computer Science A: Celebrity Lab

AVAILABLE RESOURCE

- Java Quick Reference (see Appendix)

TOPIC 9.7
`Object` Superclass

Required Course Content

ENDURING UNDERSTANDING

MOD-3

When multiple classes contain common attributes and behaviors, programmers create a new class containing the shared attributes and behaviors forming a hierarchy. Modifications made at the highest level of the hierarchy apply to the subclasses.

LEARNING OBJECTIVE

MOD-3.E

Call `Object` class methods through inheritance.

ESSENTIAL KNOWLEDGE

MOD-3.E.1

The `Object` class is the superclass of all other classes in Java.

MOD-3.E.2

The `Object` class is part of the `java.lang` package

MOD-3.E.3

The following `Object` class methods and constructors—including what they do and when they are used—are part of the Java Quick Reference:

- `boolean equals(Object other)`
- `String toString()`

MOD-3.E.4

Subclasses of `Object` often override the `equals` and `toString` methods with class-specific implementations.