

Chapter 8: Inheritance

Multiple Choice Questions:

- 1) The process of inheritance should establish a(n) _____ relationship.
 - a) is-a
 - b) has-a
 - c) static
 - d) not-a
 - e) none of the above

- 2) The original class that is used to derive a new class using inheritance is called _____.
 - a) a superclass
 - b) a parent class
 - c) a base class
 - d) all of the above
 - e) neither a, b, nor c

- 3) _____ occurs when a child class defines a method with the same signature as a method in the parent class.
 - a) Overloading
 - b) Overriding
 - c) Overwhelming
 - d) Substituting
 - e) A child class cannot define a method with the same signature as a parent class method.

- 4) In order for derived classes to have access to encapsulated data members and methods of superclasses, the data members and methods should be declared using the _____ modifier.
 - a) private
 - b) public
 - c) protected
 - d) final
 - e) static

- 5) A child class can access private members of a parent class by
- a) using `super` in front of the member name
 - b) using the member name directly
 - c) using `this` in front of the member name
 - d) using the public accessor and mutator methods defined in the parent class
 - e) A child class cannot access private members of a parent class.
- 6) When a variable declared in a subclass has the same name as a variable declared in a superclass, it is called a _____ variable.
- a) final
 - b) shadow
 - c) static
 - d) dead
 - e) this is not allowed in Java
- 7) A(n)_____ class represents a generic concept in a class hierarchy.
- a) super
 - b) abstract
 - c) interface
 - d) shadow
 - e) generic
- 8) A class declared as `final` _____.
- a) cannot be changed.
 - b) cannot have subclasses.
 - c) cannot have superclasses.
 - d) has several abstract methods.
 - e) cannot be used in a program.

- 9) Which of the following key words indicates a method that cannot be overridden in a derived class?
- a) `super`
 - b) `final`
 - c) `extends`
 - d) `inherits`
 - e) `expands`
- 10) To invoke a parent's constructor in a subclass, we use the _____ method.
- a) `abstract`
 - b) `construct`
 - c) `parent`
 - d) `super`
 - e) `extends`
- 11) Which of the following statements is *not* a general inheritance practice that you should keep in mind in the design of a program?
- a) Derived classes should have an “is-a” relationship with the parent classes.
 - b) Use the `final` key word when defining parent classes.
 - c) Avoid shadowing inherited variables when possible.
 - d) Define abstract classes to specify a common class interface for concrete derived classes.
 - e) All of these are general inheritance practices that should be considered when designing a program.
- 12) All Java classes are subclasses of the _____ class.
- a) `String`
 - b) `java.lang`
 - c) `Java`
 - d) `Class`
 - e) `Object`

13) When designing a class hierarchy, it is important that common features be _____.

- a) higher in the class hierarchy.
- b) lower in the class hierarchy.
- c) near the middle of the class hierarchy.
- d) in abstract classes.
- e) in the `Object` class.

14) Which of the following methods are included in every class created in Java by inheritance?

- a) `next`
- b) `toString`
- c) `compareTo`
- d) `charAt`
- e) none of the above

15) Of the classes below, the one that is most likely to be declared abstract is _____.

- a) `Bat`
- b) `Squirrel`
- c) `Animal`
- d) `Iguana`
- e) `Parrot`

True/False Questions:

- 1) A parent class object must be created before objects of a child class can be created.
- 2) Private members of a parent class are inherited by child classes.
- 3) Java supports multiple inheritance.
- 4) In Java, a subclass can only extend one parent class.
- 5) A child class is allowed to define a method with the same name and parameter list as a method in the parent class.
- 6) A child class is allowed to declare a variable with the same name as one that is contained in the parent class.
- 7) An abstract class must contain abstract methods.
- 8) It makes sense to declare most `abstract` classes as `final`.
- 9) It is possible to derive a class from an abstract class without overriding all of the parents abstract methods.
- 10) Inheritance should not be considered in the software design process.

Short Answer Questions:

- 1) Explain why inheritance is useful.
- 2) Compare and contrast the `private` visibility modifier to the `protected` visibility modifier. Why is the `protected` visibility modifier a better choice in an inheritance hierarchy?
- 3) Suppose we create a subclass from a class that has a method called `someMethod`. If we override `someMethod` in the subclass, is it possible to access the superclass's version of `someMethod`? If so, how?
- 4) Can a class be a parent of more than one subclass? Can a class be a child of more than one parent? Explain.
- 5) Explain the relevance of the `Object` class to the Java programming language.
- 6) What is an abstract class, and why might it be useful in an inheritance hierarchy?
- 7) Explain how a subclass can access its parent classes private instance variables and methods.
- 8) A programmer tries to create a subclass of `String` called `MyString`. When the programmer compiles her new class, the compiler produces the following message:


```
MyString.java:1: cannot inherit from final java.lang.String
public class MyString extends String {
                        ^
1 error
```


Explain the cause of this error.
- 9) Draw a hierarchy of `Animals`. The hierarchy should include the following entities: `Animal`, `Reptile`, `Mammal`, `Bear`, `Human`, `Iguana`, and `Dolphin`. Note that an `Iguana` is a `Reptile`, a `Bear` is a `Mammal`, a `Human` is a `Mammal`, and a `Dolphin` is a `Mammal`.

Answer:

- 10) Consider a software system that will implement the following classes: `Student`, `Professor`, `StaffMember`, `ContractWorker`. List some common attributes of these classes. What would be a good abstract class from which these classes may be extended via inheritance?
- 11) Explain what it means for a child class to override a method in a parent class. Why might this be useful?
- 12) Why is it considered a good practice to override the `toString` and `equals` methods?
- 13) Describe the behavior of the `toString` method and the `equals` method of the `Object` class.
- 14) What does it mean for a class to be declared as `final`? What does it mean for a method to be declared as `final`?
- 15) What is a shadow variable?