S310-025
SUN Certified Programmer For JAVA 2 Platform
version: 6.10.04

Study Notes

Declarations and Access Control

Write code that declares, constructs, and initializes arrays of any base type using any of the permitted forms both for declaration and for initialization.

Declare classes, inner classes, methods, instance variables, static variables, and automatic (method local) variables making appropriate use of all permitted modifiers (such as public, final, static, abstract, and so forth). State the significance of each of these modifiers both singly and in combination, and state the effect of package relationships on declared items qualified by these modifiers.

What is modifier?

Modifier is a Java keyword that affects the behavior of the feature it precedes. Java has a number of modifiers, which are listed in the following table:

Keyword	Meaning
final	It defines a constant feature.
private	It specifies that a feature can be accessed only by code in the same class.
protected	It specifies that a feature can be accessed only by code in a subclass or the same package.
public	It specifies that a feature can be accessed by any other class.
static	It specifies that a feature belongs to the class in which it is declared, and not to the individual instances of that class.
transient	It specifies that a feature is not part of the persistent state of the class.
volatile	It specifies that a feature can change unexpectedly.

abstract	It specifies that a feature is somehow incomplete and needs further information before use.
synchronized	It ensures that only one thread can access a method or object, at a particular time.
native	Only methods can be declared as native. The native modifier specifies that the body of the method is defined elsewhere in a library, entirely outside the Java Virtual Machine.

Note: A feature of a class includes the class itself, or a method, variable, or inner class defined in that class.

What is inner class?

An inner class is one that can be defined within the scope of an expression or another class. It has access to the variables and methods of its enclosing class. Therefore, it does not need to save a reference to that class.

The class in which the inner class is defined is known as the enclosing class. An inner class can extend any other class, which is not defined as final.

An inner class can be defined as private, default, public, or protected.

What are wrapper classes?

Wrapper classes are used to convert primitive datatypes into object types. These classes are contained in the java.lang package. The following wrapper classes are defined in the java.lang package:

- Boolean
- Character
- Double
- Float
- Integer
- Long
- Short
- Byte

What is abstract class?

An abstract class is a class that is partially implemented. It provides design convenience. An abstract class is made up of one or more abstract methods that are declared but left unimplemented. An abstract class may also contain non-abstract methods.

What is abstract method?

An abstract method is a method that is not defined in the class in which it is declared. Instead, the method definition is deferred to one or more subclasses. An abstract method only has a semicolon after the method name and parenthetical argument list. The subclasses provide the body of the abstract method.

Syntax:

[public] [abstract] < return_type > < method_name > (args_list);

What is native method?

A native method is one for which the body of the method is defined elsewhere, entirely outside the Java Virtual Machine, in a library. Only methods can be declared as native. Native code is written in a non-Java language, typically C or C++, and compiled for a single target machine type. It violates the concept of platform independence in Java.

Syntax:
native void methodName();

For a given class, determine if a default constructor will be created, and if so, state the prototype of that constructor.

What is default constructor?

A constructor with an empty argument list is known as a default constructor. If a class is constructed without specifying any explicit constructor, the compiler automatically generates a default constructor. The name of the default constructor is the same as the class name. The access mode of the default constructor depends on the access mode of the class, i.e., if the class is public, the default constructor will also be public.

State the legal return types for any method given the declarations of all related methods in this or parent classes.

What is method overriding?

Method overriding is a way of changing the behavior of an existing base class method. When a class declares a method whose type signature is same as the type signature of a method declared by one of its superclasses, it is known as method overriding.

Flow Control and Exception Handling

Write code using if and switch statements and identify legal argument types for these statements.

What is a switch statement?

A switch statement is Java's multiple selection statement. It is used to select one of the several alternative paths in program execution. The switch statement takes an argument that must be of byte, short, int, or char data type . No two case constants, for a switch statement, can have identical values.

Write code using all forms of loops including labeled use of break and continue, and state the values taken by loop control variables during and after loop execution.

What is a break statement?

A break statement is used to abort the execution of a loop . It may be used with or without a label. When it is used without a label, it aborts the execution of the innermost switch, for, do, or while statement enclosing the break statement. When used with a label, the break statement aborts the execution of any enclosing statement matching the label.

What is a continue statement?

A continue statement is used to alter the execution of for, do, and while statements. It may be used with or without a label. When used without a label, it causes the statement block of the innermost for, do, or while statement to terminate and the loop's boolean expression to be re-evaluated to determine whether the next loop repetition should take place. When used with a label, the continue statement transfers control to an enclosing for, do, or while statement matching the label.

Write code that makes proper use of exceptions and exception handling clauses (try, catch, finally) and declares methods and overriding methods that throw exceptions.

What is exception?

Exception is an object that is generated at runtime. It describes a problem encountered during the execution of a program.

What is checked exception?

An exception other than RuntimeException and its subclasses are known as checked exception.

Garbage Collection

State the behavior that is guaranteed by the garbage collection system, and write code that explicitly makes objects eligible for collection.

What is garbage collection?

Garbage collection is a feature in Java that automatically reclaims the memory resources used by an object . If an object is no longer referenced by any variable, it becomes eligible for garbage collection. Java Virtual Machine (JVM) controls garbage collection.

What is finalize() method?

finalize() method is defined in the Object class. Classes override this method to perform a cleanup operation prior to garbage collection. An object's finalize() method can be invoked only once by the garbage collector.

The finalize() method does not make an object unreachable. The garbage collector invokes the finalize() method only when it determines that the object has become unreachable.

Language Fundamentals

Identify correctly constructed source files, package declarations, import statements, class declarations (of all forms including inner classes), interface declarations and implementations (for java.lang.Runnable or other interface described in the test), method declarations (including the main method that is used to start execution of a class), variable declarations and identifiers.

What is a constructor?

A constructor is a special type of method. It initializes an object immediately upon creation. It has the same name as the class in which it resides. The constructor is automatically called immediately after the object is created, before the new operator completes. Constructors can be marked as public, protected, and private.

Constructors have no explicit return type, not even void.

What is main() method?

main() method is the entry point for Java applications. Every Java application program must include the main() method. The interpreter starts the execution of the program from the main() method. A Java application can have any number of classes but only one of them includes the main() method that initiates the execution.

The signatures for the main() method are as follows:
- public static void main (String args[])
- public static void main (String[] args)
- public static void main (String []args)

where, the keyword public is an access specifier that declares the main() method as unprotected making it accessible to all other classes.

The keyword static makes the method static, so that it may be executed without constructing an instance of the corresponding class.

The args array contains any argument that the user might enter on the command line.

State the correspondence between index values in the argument array passed to a main method and command line arguments. Identify all Java Programming Language keywords and correctly constructed identifiers.

State the effect of using a variable or array element of any kind when no explicit assignment has been made to it.

State the range of all primitive data types and declare literal values for String and all primitive types using all permitted formats, bases, and representations.

Operators and Assignments

Determine the result of applying any operator, including assignment operators, instanceof, and casts to operands of any type, class, scope, or accessibility, or any combination of these.

What is bitwise complement?

Bitwise complement (~) is a unary operator that performs bitwise negation of an integer value. It inverts all binary 0s to 1s and vice-versa.

Note: Bitwise negation means that each bit in a number is toggled.

Tip for bitwise complement.

Integer numbers are stored in memory as a series of binary bits, each of which has a value of 0 or 1. A number is considered negative if the highest-order bit in the number is set to 1. Bitwise complement flips all the bits in a number and reverses the sign of the number.

What is casting?

Casting is the process of converting a value of a specific data type into another data type.

Java allows two types of casting.

Type	Description
Implicit	Implicit casting is used to convert a smaller data type into a larger data type.
Explicit	Explicit casting is used to covert a larger data type into a smaller data type.

The following table shows casts that do not require explicit casting:

From	To
byte	short, char, int, long, float, double
short	int, long, float, double
char	int, long, float, double
int	long, float, double
long	float, double
float	double

The syntax for casting is as follows:

type variable1 = (type) variable2;

where, variable2 is the variable whose data type is to be changed. The type specifies the data type to which variable2 is to be converted and variable1 is the variable that will store the converted data.

Determine the result of applying the boolean equals (Object) method to objects of any combination of the classes java.lang.String, java.lang.Boolean and java.lang.Object.

What is equals() method?

equals() method is defined in the java.lang.Object class. This method checks whether or not the instances refer to the same object. equals() method is used to test the equality of objects.

In an expression involving the operators &, |, &&, ||, and variables of known values state which operands are evaluated and the value of the expression.

What is a short-circuit operator?

The && and || operators are known as Java short-circuit operators. These operators perform short-circuit operations.

The && operator performs a logical "AND" on the operands and only evaluates its second operand if the first operand is true. If the first operand is false, there is no need to evaluate the second operand.

The || operator performs a logical "OR" and only evaluates its second operand if the first operand is false.

Note: A short-circuit operation does not evaluate the second operand if the evaluation of the first operand determines the result of the operation.

Determine the effect upon objects and primitive values of passing variables into methods and performing assignments or other modifying operations in that method.

What is Double class?

Double is a wrapper class for the primitive data type double. If an instance is created for a value that is already contained by a previously created instance then, instead of creating a new instance, it will refer to the same object.

Overloading, Overriding, Runtime Type, and Object Orientation

State the benefits of encapsulation in object oriented design and write code that implements tightly encapsulated classes and the relationships "is a" and "has a".

What is encapsulation?

Encapsulation is the process of packaging an object's data together with its methods. It hides the implementation details from other objects. The internal portion of an object has more limited visibility than the external portion. The best approach to encapsulation is to make the data private and make the accessors and mutators public.

What is "is a" relationship?

The "is a" relationship implies that one class extends another class, or that one class is a kind of another class.

What is "has a" relationship?

The "has a" relationship implies that a class owns a reference to different objects.

Write code to invoke overridden or overloaded methods and parental or overloaded constructors; and describe the effect of invoking these methods.

What is super()?

super() is a method used by a subclass to call the constructor of its immediate superclass. The super() method can only be called from the constructor of a subclass. The call to the super() method must be the first statement inside the constructor of a subclass.

Write code to construct instances of any concrete class including normal top level classes, inner classes, static inner classes, and anonymous inner classes.

Threads

Write code to define, instantiate, and start new threads using both java.lang.Thread and java.lang.Runnable.

What is a thread?

A thread is a sequence of execution within a process. It does not have its own address space, but uses the memory and other resources of the process in which it executes. The logic for the thread is contained in the run() method.

New threads of execution are created when new Thread objects are created. The new thread starts executing after the start() method of the Thread instance has been called. The run() method is where the thread starts execution and the start() method creates and launches the new thread.

Recognize conditions that might prevent a thread from executing.

Write code using synchronized, wait, notify, or notifyAll, to protect against concurrent access problems and to communicate between threads. Define the interaction between threads and between threads and object locks when executing synchronized, wait, notify, or notifyAll.

What is start()?

start() is a method of the Thread class. It is used to call and start the run() method.

What is stop()?

stop() is a method of the Thread class. It is used to bring a thread to dead state.

What is run()?

run() is a method of the Thread class and the Runnable interface. It makes up the entire body of a thread. It is the only method in which a thread's behavior can be implemented. The return type of the run() method must be void.

What is notify() method?

notify() is a method of the Object class. It causes a (randomly chosen) thread that is waiting for an object, to be moved from the waiting state to the ready state.

What is notifyAll()?

notifyAll is a method of the Object class. It causes all the threads that called the wait() method on the same object, to be moved from the waiting state to the ready state. The thread with the highest priority is executed first.

What is wait() method?

wait() is a static method of the Thread class. The wait() method provides a way for a shared object to pause a thread when it becomes unavailable to that thread.

What is yield()?

yield() is a static method of the Thread class. A call to the yield() method causes the currently executing thread to move to the Ready state, if the scheduler is willing to run another thread in place of the yielding thread.

What is object lock?

Object lock is a flag used to implement exclusivity between threads. One object lock exists for every object instance in JVM, and each lock is associated with either its owning object or a single thread.

What is synchronization?

Synchronization is a process through which multiple threads share access to common objects. Java coordinates the actions of multiple threads using synchronized methods and statements.

The java.awt Package

Write code using component, container, and LayoutManager classes of the java.awt package to present a GUI with specified appearance and resize behavior, and distinguish the responsibilities of layout managers from those of containers.

What is layout manager?

Layout manager is an instance of any class that implements the LayoutManager interface. Each layout manager keeps track of a list of components by their names . The layout manager is notified each time a component is added to the container. Whenever a container is resized, the layout manager is used to position each of the components within it.

The current layout manager for a container can be changed by using the setLayout() method.

What is FlowLayout?

FlowLayout is a Java layout manager. In FlowLayout, each component has its preferred or natural size. The components placed in the container flow from left to right in a horizontal row, as wide as the container allows. FlowLayout does not have horizontal or vertical dimension constraints .

What is BorderLayout?

BorderLayout is a Java layout manager. BorderLayout uses five regions north, south, east, west, and center. It places one component in each region. It constrains at least one dimension of all components it contains. The north and south regions give their components their preferred height, but force them to the full width of the container. The east and west regions give their components their preferred width, but force their height to fill the vertical gap between north and south regions. The center region makes its component take up the remaining space.

Write code to implement listener classes and methods, and in listener methods, extract information from the event to determine the affected component, mouse position, nature, and time of the event. State the event classname for any specified event listener interface in the java.awt.event package.

The java.lang Package

Write code using the following methods of the java.lang.Math class: abs, ceil, floor, max, min, random, round, sin, cos, tan, sqrt.

Describe the significance of the immutability of String objects.

The java.util Package

- Make appropriate selection of collection classes/interfaces to suit specified behavior requirements.

The java.io Package

- Write code that uses objects of the file class to navigate a file system.

- Write code that uses objects of the classes InputStreamReader and OutputStreamWriter to translate between Unicode and either platform default or ISO 8859-1 character encoding and Distinguish between conditions under which platform default encoding conversion should be used and conditions under which a specific conversion should be used.

- Write appropriate code to read, write and update files using FileInputStream, FileOutputStream, and RandomAccessFile objects.

- Describe the permanent effects on the file system of constructing and using FileInputStream, FileOutputStream, and RandomAccessFile objects.