

C6 Strings, Arrays, ArrayLists, Dates, and Lambdas Java 8 Associate

1Z0-808

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0. CERTIFICATION SUMMARY

CERTIFICATION OBJECTIVES

- Create and Manipulate Strings
- Manipulate Data Using the `StringBuilder` Class and Its Methods
- Create and Use Calendar Data
- Declare, Instantiate, Initialize, and Use a One-Dimensional Array
- Declare, Instantiate, Initialize, and Use a Multidimensional Array
- Declare and Use an `ArrayList`
- Use Wrapper Classes
- Use Encapsulation for Reference Variables
- Use Simple Lambda Expressions

The most important thing to remember about `Strings` is that `String` objects are **immutable** «se usan una vez, permanecen en memoria para siempre», but references to `Strings` are not!.

Because `StringBuilder`'s methods are not thread-safe, they tend to run faster than `StringBuffer` methods, so choose `StringBuilder` whenever threading is not an issue. Both `StringBuffer` and `StringBuilder` objects can have their value changed over and over without your having to create new objects.

Similar to `Strings`, all of the **calendar classes** we studied create immutable objects. In addition, these classes use factory methods exclusively to create new objects. The keyword `new` cannot be used with these classes.

`ArrayLists` are like arrays with superpowers that allow them to grow and shrink dynamically and to make it easy for you to insert and delete elements at locations of your choosing within the list. `ArrayLists` cannot hold primitives, and that if you want to make an `ArrayList` filled with a given type of primitive values, you use "**wrapper**" classes to turn a primitive value into an object that represents that value. "autoboxing".

The basic idea of lambdas is that you can pass a bit of code from one method to another. The `Predicate` interface is one of many "functional interfaces" provided in the Java 8 API.

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1. Using String and StringBuilder (OCA Objectives 9.2 and 9.1)

- `String` objects are immutable, and `String` reference variables are not.
- If you create a new `String` without assigning it, it will be lost to your program.
- If you redirect a `String` reference to a new `String`, the old `String` can be lost.
- `String` methods use zero-based indexes, except for the second argument of `substring()`.
- The `String` class is `final`—it cannot be extended.
- When the JVM finds a `String` literal, it is added to the `String` literal pool.
- Strings have a *method* called `length()`—arrays have an *attribute* named `length`.
- `StringBuilder` objects are mutable—they can change without creating a new object.
- `StringBuilder` methods act on the invoking object, and objects can change without an explicit assignment in the statement.
- Remember that chained methods are evaluated from left to right.
- `String` methods to remember: `charAt()`, `concat()`, `equalsIgnoreCase()`, `length()`, `replace()`, `substring()`, `toLowerCase()`, `toString()`, `toUpperCase()`, and `trim()`.
- `StringBuilder` methods to remember: `append()`, `delete()`, `insert()`, `reverse()`, and `toString()`.

1.1. The String Class

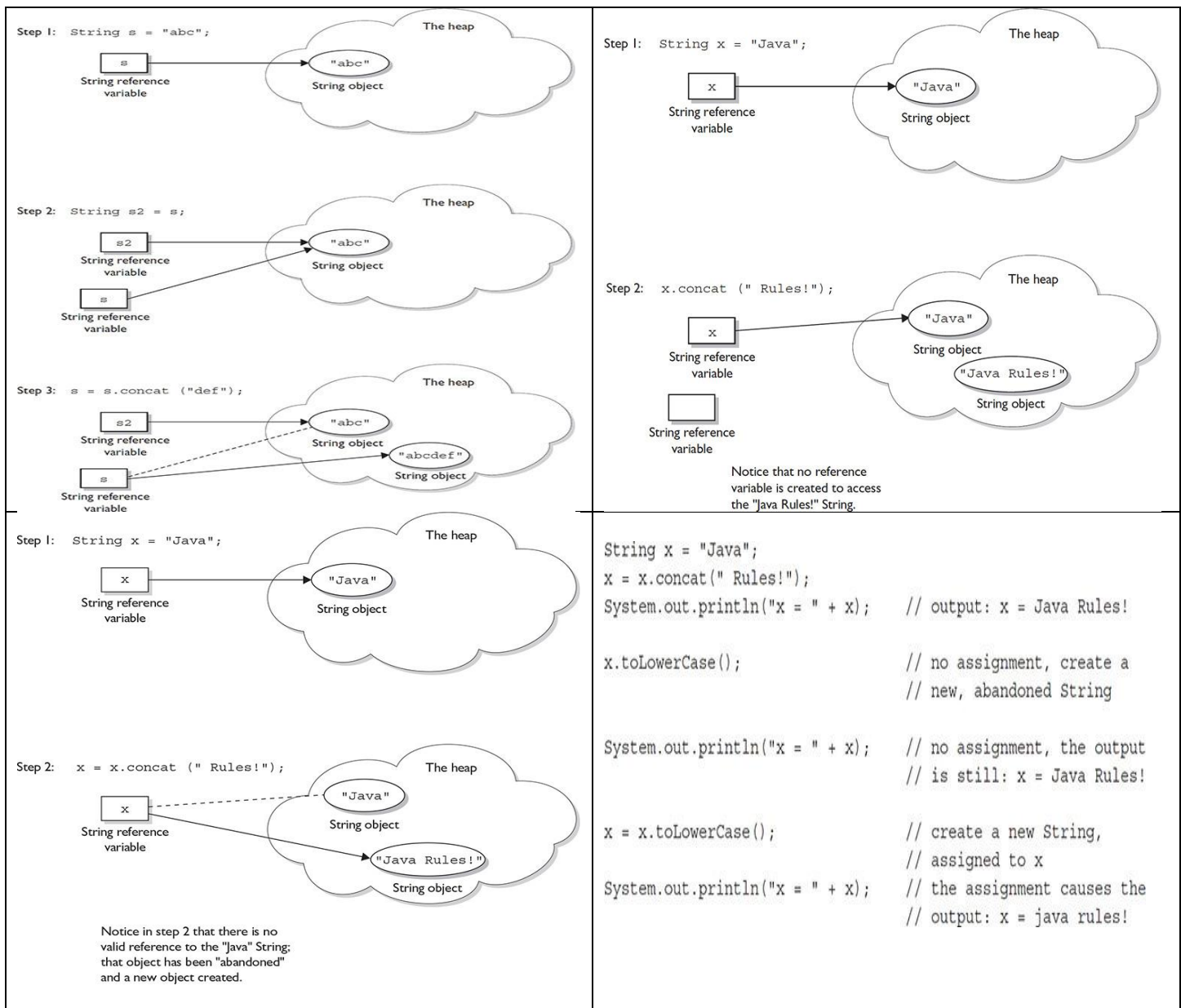


Figure 6-1 String objects and their reference variables

<pre>String s1 = "spring "; String s2 = s1 + "summer "; s1.concat("fall "); s2.concat(s1); s1 += "winter "; System.out.println(s1 + " : " + s2);</pre>	<p>What is the output?</p> <p>how many String objects and</p> <p>how many reference variables were created prior to the println statement?</p> <p>two reference variables: s1 and s2</p> <p>A total of eight String objects were created</p>
<pre>"spring ", "summer " (lost), "spring summer ", "fall " (lost), "spring fall " (lost), "spring summer spring " (lost), "winter " (lost), "spring winter " (at this point "spring " is lost)</pre>	

Important Methods in the String Class

The following methods are some of the more commonly used methods in the `String` class, and they are also the ones you're most likely to encounter on the exam.

charAt() Returns the character located at the specified index

concat() Appends one string to the end of another (+ also works)

equalsIgnoreCase() Determines the equality of two strings, ignoring case

length() Returns the number of characters in a string

replace() Replaces occurrences of a character with a new character

substring() Returns a part of a string

toLowerCase() Returns a string, with uppercase characters converted to lowercase

toString() Returns the value of a string

toUpperCase() Returns a string, with lowercase characters converted to uppercase

trim() Removes whitespace from both ends of a string

```
public char charAt(int index)
public String concat(String s)
public boolean equalsIgnoreCase(String s)
public int length()
public String replace(char old, char new)
public String substring(int begin) and
public String substring(int begin, int end)
public String toLowerCase()
public String toString()
public String toUpperCase()
public String trim()
```

```
//      01234567890
String x ="UNIVERSIDAD";
System.out.println(x.substring(6, 10)); // no incluye el 10

System.out.println(x.replace("SIDA", "vih"));
```

1.2. The StringBuilder Class

The `java.lang.StringBuilder` class should be used when you have to make a lot of modifications to strings of characters. **Prefer `StringBuilder` to `StringBuffer`.**

Important Methods in the `StringBuilder` Class

```
public StringBuilder append(String s)
public StringBuilder delete(int start, int end)
public StringBuilder insert(int offset, String s)
public StringBuilder reverse()
public String toString()
```

“chained methods.”

```
result = method1().method2().method3();
```

```
StringBuilder sb = new StringBuilder("123456789");
sb.delete(0, 3); // sin tocar el limite superior
```

```
>>
```

2. Working with Calendar Data (OCA Objective 9.3)

- On the exam all the objects created using the calendar classes are immutable, but their reference variables are not.
- If you create a new calendar object without assigning it, it will be lost to your program.
- If you redirect a calendar reference to a new calendar object, the old calendar object can be lost.
- All of the objects created using the exam's calendar classes must be created using factory methods (e.g., `from()`, `now()`, `of()`, `parse()`); the keyword `new` is not allowed.
- The `until()` and `between()` methods perform complex calculations that determine the amount of time between the values of two calendar objects.
- The `DateTimeFormatter` class uses the `parse()` method to parse input Strings into valid calendar objects.
- The `DateTimeFormatter` class uses the `format()` method to format calendar objects into beautifully formed Strings.

2.1. Factory Classes

Usually, when a class has no public constructors and provides at least one `public static` method that can create new instances of the class, that class is called a *factory class*, and any method that is invoked to get a new instance of the class is called a *factory method*.

If we use the `LocalDate` class as an example, we find the following `static` methods that create and return a new instance:

```
from()
now()           // three overloaded methods exist
of()           // two overloaded methods exist
ofEpochDay()
ofYearDay()
parse()        // two overloaded methods exist
```

Remember the exam's date and time classes use factory methods to create new objects.

2.2. Using and Manipulating Dates and Times \$\$ 467

2.3. Formatting Dates and Times

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3. Using Arrays (OCA Objectives 4.1 and 4.2)

- Arrays can hold primitives or objects, but the array itself is always an object.
- When you declare an array, the brackets can be to the left or right of the name.
- It is never legal to include the size of an array in the declaration.
- You must include the size of an array when you construct it (using `new`) unless you are creating an anonymous array.
- Elements in an array of objects are not automatically created, although primitive array elements are given default values.
- You'll get a `NullPointerException` if you try to use an array element in an object array if that element does not refer to a real object.
- Arrays are indexed beginning with zero.
- An `ArrayIndexOutOfBoundsException` occurs if you use a bad index value.
- Arrays have a `length` attribute whose value is the number of array elements.
- The last index you can access is always one less than the length of the array.
- Multidimensional arrays are just arrays of arrays.
- The dimensions in a multidimensional array can have different lengths.
- An array of primitives can accept any value that can be promoted implicitly to the array's declared type—for example, a `byte` variable can go in an `int` array.
- An array of objects can hold any object that passes the IS-A (or `instanceof`) test for the declared type of the array. For example, if `Horse` extends `Animal`, then a `Horse` object can go into an `Animal` array.

- If you assign an array to a previously declared array reference, the array you're assigning must be the same dimension as the reference you're assigning it to.
- You can assign an array of one type to a previously declared array reference of one of its supertypes. For example, a `Honda` array can be assigned to an array declared as type `Car` (assuming `Honda` extends `Car`).

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4. Using ArrayLists and Wrappers (OCA Objectives 9.4 and 2.5)

- `ArrayLists` allow you to resize your list and make insertions and deletions to your list far more easily than arrays.
- `ArrayLists` are ordered by default. When you use the `add()` method with no index argument, the new entry will be appended to the end of the `ArrayList`.
- For the OCA 8 exam, the only `ArrayList` declarations you need to know are of this form:

```
ArrayList<type> myList = new ArrayList<type>();  
List<type> myList2 = new ArrayList<type>(); // polymorphic  
List<type> myList3 = new ArrayList<>(); // diamond operator, polymorphic  
optional
```

- `ArrayLists` can hold only objects, not primitives, but remember that autoboxing can make it look like you're adding primitives to an `ArrayList` when, in fact, you're adding a wrapper object version of a primitive.
- An `ArrayList`'s index starts at 0.
- `ArrayLists` can have duplicate entries. Note: Determining whether two objects are duplicates is trickier than it seems and doesn't come up until the OCP 8 exam.
- `ArrayList` methods to remember: `add(element)`, `add(index, element)`, `clear()`, `contains(object)`, `get(index)`, `indexOf(object)`, `remove(index)`, `remove(object)`, and `size()`.

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5. Advanced Encapsulation (OCA Objective 6.5)

If you want to encapsulate mutable objects like `StringBuilders` or arrays or `ArrayLists`, you cannot return a reference to these objects; you must first make a copy of the object and return a reference to the copy.

Any class that has a method that returns a reference to a mutable object is breaking encapsulation.

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6. Using Simple Lambdas (OCA Objective 9.5)

Lambdas allow you to pass bits of code from one method to another. And the receiving method can run whatever complying code it is sent.

While there are many types of lambdas that Java 8 supports, for this exam, the only lambda type you need to know is the `Predicate`.

The `Predicate` interface has a single method to implement that's called `test()`, and it takes one argument and returns a `boolean`.

As the `Predicate.test()` method returns a `boolean`, it can be placed (mostly?) wherever a `boolean` expression can go, e.g., in `if`, `while`, `do`, and ternary statements.

`Predicate` lambda expressions have three parts: a single argument, an arrow (`->`), and an expression or code block.

A `Predicate` lambda expression's argument can be just a variable or a type and variable together in parentheses, e.g., `(MyClass m)`.

A `Predicate` lambda expression's body can be an expression that resolves to a `boolean`, OR it can be a block of statements (surrounded by curly braces) that ends with a `boolean`-returning `return` statement.

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