Activity 9: Strings

Internally, the library class `java.lang.String` stores an array of characters. It also provides a variety of useful methods for comparing, manipulating, and searching text in general.

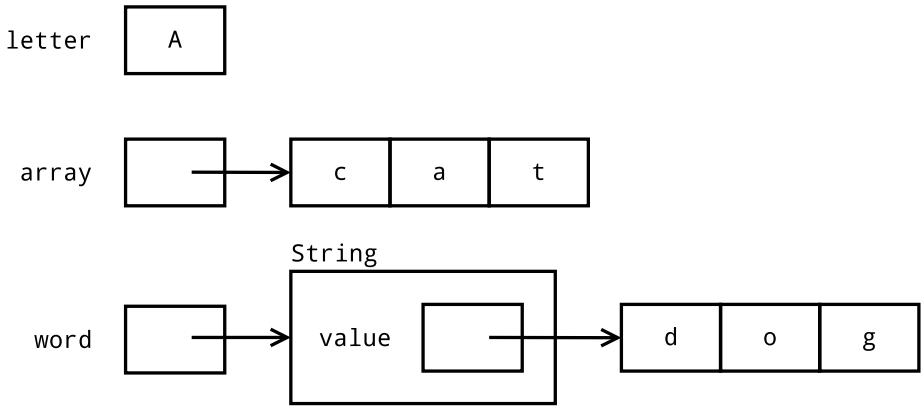
Model 1 Character Arrays

The primitive type `char` is used to store a single character, which can be a letter, a number, or a symbol. In contrast, the reference type `String` *encapsulates* an array of characters.

```
char letter;
letter = 'A';

char[] array;
array = new char[]
        {'c', 'a', 't'};

String word;
word = "dog";
```



Questions (15 min) Start time: _____

1. How is the syntax of character literals and string literals different?

2. What is the index of `'d'` in the string above? What is the index of `'g'`? In general, what is the index of the last character of a string?

3. Based on the diagram, what does it mean for a class to encapsulate data? How do you access data inside of a class?

4. Why can you use the `String` class in Java programs without having to import it first?

5. What is the value of a `char` variable? What is the value of an array variable? What is the value of a `String` variable?

6. Draw a memory diagram for the given code. (List the name of each variable next to a box containing its value.)

```
String str;
str = "Hi!";

char let;
let = 'X';

int num;
num = -1;

double foo;
foo = num;

String hmm;
hmm = str;
```

7. Recall that the == operator compares the *value* of two variables. What does it mean for two `char` variables to be ==? What does it mean for two `String` variables to be ==?

8. How could you determine whether two character arrays have the same contents? In other words, how does the `Arrays.equals` method work internally?

Model 2 String Methods

Method	Returns	Description
`charAt(int)`	`char`	Returns the char value at the specified index of `this` string.
`indexOf(String)`	`int`	Returns the index within `this` string of the first occurrence of the specified substring.
`length()`	`int`	Returns the length of `this` string.
`substring(int, int)`	`String`	Returns a new string that is a substring of `this` string (from `beginIndex` to `endIndex - 1`).
`toUpperCase()`	`String`	Returns a copy of `this` string with all the characters converted to upper case.

Each method listed above is non-`static`. That is, they have an implicit parameter named `this` that is passed automatically. (Note: There are many other `String` methods not listed above.)

Questions (25 min) Start time: _____

9. If `str` contains the string `"hello world"`, then what is the return value of the following method calls?

a) `str.charAt(8)`

b) `str.indexOf("wo")`

c) `str.length()`

d) `str.substring(4, 7)`

e) `str.toUpperCase()`

10. Explain what precedes the `.` (dot) operator in the expressions above. What does it have to do with the keyword `this` in the model?

11. How many arguments does each method call in #9 have? (Hint: None of them have zero.)

a)

b)

c)

d)

e)

12. To compare strings, you must use either the `String.equals` or `String.compareTo` method. Predict the output of the following code.

```
String name1 = "Mark";
String name2 = "Ma" + "rk";
String name3 = "Mary";

// compare name1 and name2
if (name1 == name2) {
    System.out.println("name1 and name2 are identical");
} else {
    System.out.println("name1 and name2 are NOT identical");
}

// compare "Mark" and "Mark"
if (name1.equals(name2)) {
    System.out.println("name1 and name2 are equal");
} else {
    System.out.println("name1 and name2 are NOT equal");
}

// compare "Mark" and "Mary"
if (name1.equals(name3)) {
    System.out.println("name1 and name3 are equal");
} else {
    System.out.println("name1 and name3 are NOT equal");
}
```

13. What is the difference between *identical* and *equal* in the previous question?

14. Discuss the `stringMatch` problem on the next page. What three `String` methods will you need to solve it? (If you have time during the activity, complete the method.)

15. Discuss the `stringYak` problem on the next page. What two `String` methods will you need to solve it? (If you have time during the activity, complete the method.)

[CodingBat] Given two strings, return the number of positions where they contain the same substring of length two. So `"xxcaazz"` and `"xxbaaz"` yields 3, since the `"xx"`, `"aa"`, and `"az"` substrings appear in the same place in both strings.

```
public int stringMatch(String a, String b) {









}
```

[CodingBat] Suppose the string `"yak"` is unlucky. Given a string, return a version where all the `"yak"` are removed, but the `'a'` can be any character. The `"yak"` strings will not overlap.

```
stringYak("yakpak") → "pak"
stringYak("pakyak") → "pak"
stringYak("yak123ya") → "123ya"

public String stringYak(String str) {









}
```