Solution to Practice Problems: String Problems

0. All Primitive Data Types

Answer the following questions about the primitive data types:

a. What types of values can legally be assigned to a `short` variable without a type conversion? What about to a `long` variable? A `double` variable?

shorts can be assigned only byte and short values. longs can be assigned all discrete types except booleans: longs, ints, shorts, chars, and bytes. doubles can be assigned all primitive types except booleans: floats, longs, ints, shorts, chars, and bytes.

b. How many bits are needed to store each primitive data type? How many bytes?

booleans: 1 bit. bytes: 8 bits, 1 byte. chars: 16 bits, 2 bytes. shorts: 16 bits, 2 bytes. ints: 32 bits, 4 bytes. longs: 64 bits, 8 bytes. floats: 32 bits, 4 bytes. doubles: 64 bits, 8 bytes.

c. How many different values can be stored in each of the primitive data types?

$2^{\text{number of bits for the data type}}$

d. What is the value of this expression: `(char) ('r' + 1)`

's'

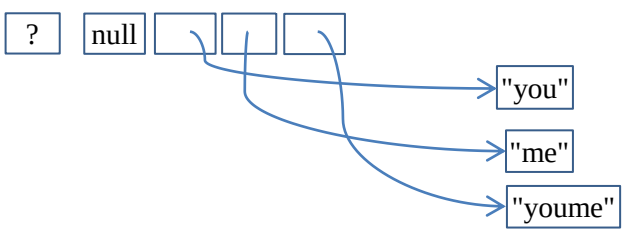
e. Name as many differences between a String variable and a char variable as you can.

1) Strings are references, chars are not.
2) Strings are object types, chars are primitive types
3) Strings can hold between 0 and any number of characters. char variables hold exactly 1 character.
4) adding an int and a char creates an int value (first typecasting the char to an int). adding an int and a String does String concatenation.
5) Strings have methods, like length() and indexOf(). chars (like all primitive types) have no methods.
6) There's probably more, but I can't think of any right now.

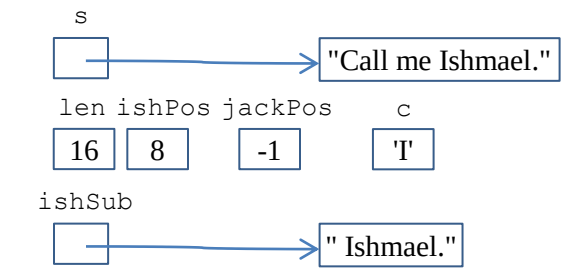
1. Tracing Code with Strings

Show what is stored in memory at the end of each of these programs.

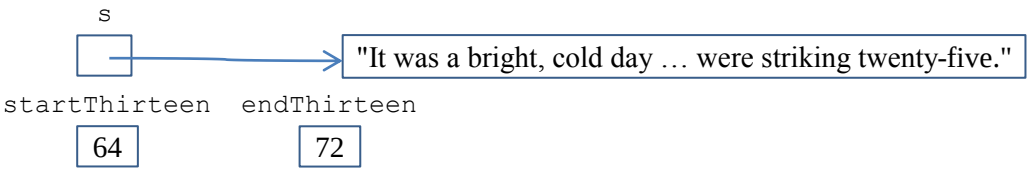
```
public class String-Assignments {
  public static void main(String [] args) {
    String s;
    String t = null;
    String u = "you";
    String v = new String("me");
    String w = u + v;
  }
}
```



```
public class String-Commands {
  public static void main(String [] args) {
    String s = "Call me Ishmael.";
    int len = s.length();
    int ishPos = s.indexOf("Ish");
    int jackPos = s.indexOf("Jack");
    String ishSub = s.substring(ishPos, len);
    char c = s.charAt(ishPos);
  }
}
```

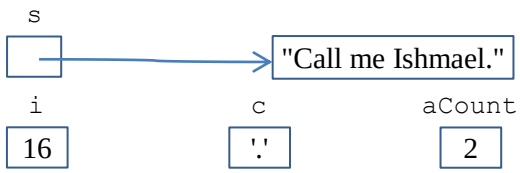



```
// Here is an example that removes a portion of a String,
// and inserts a replacement
public class String-Insert-Delete {
  public static void main(String [] args) {
    String s = "It was a bright cold day in April, " +
               "and the clocks were striking thirteen.";
    int startThirteen = s.indexOf("thirteen");
    int endThirteen = startThirteen + "thirteen".length();
    s = s.substring(0, startThirteen)
        + "twenty-five"
        + s.substring(endThirteen, s.length());
  }
}
```

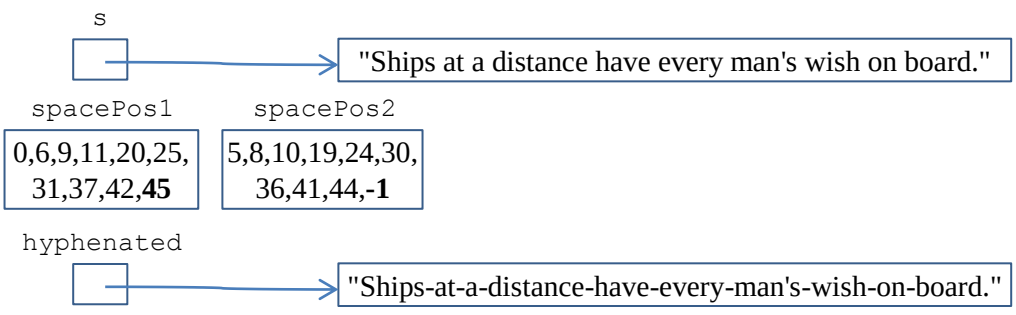



```
// Here is a typical example of a loop used to
// process a String.
// In this example, the loop visits each character
// in the String once.
```

```
public class String-Processing {
  public static void main(String [] args) {
    String s = "Call me Ishmael.";
    int aCount = 0;
    for(int i=0; i<s.length(); i++) {
      char c = s.charAt(i);
      if(c == 'a') {
        aCount++;
      }
    }
  }
}
```




```
// Here is an example that repeatedly loops through the String,
// processing one word at a time.
public class String-Processing {
  public static void main(String [] args) {
    String s = "Ships at a distance have every man's wish on board.";
    int spacePos1 = 0;
    int spacePos2 = s.indexOf(" ");
    String hyphenated = "";
    while(spacePos2>=0) {
      String word = s.substring(spacePos1,spacePos2);
      hyphenated = hyphenated + word + "-";
      spacePos1 = spacePos2 + 1;
      spacePos2 = s.indexOf(" ", spacePos1);
    }
    if(spacePos1<s.length()) {
      hyphenated = hyphenated + s.substring(spacePos1, s.length());
    }
  }
}
```



2. Repeat-X and Sum Algorithms with Strings

Write a short Java program to solve each of the following problems. Each one will involve a String, plus a Repeat-X or an accumulate algorithm (and maybe more than one) --- it's up to you to figure out how!

1. Read a String from the keyboard, and count how many letter 's' or 'S' are in the String that the user enters.

```
import java.util.Scanner;
public class CountSs {
  public static void main(String [] args) {
    Scanner kb = new Scanner(System.in);
    String str = kb.next();
    int numS = 0;
    for(int i=0; i<str.length(); i++) {
      char c = str.charAt(i);
      if(c == 's' || c == 'S') {
        numS++;
      }
    }
    System.out.println(numS + " s's and S's in your String");
  }
}
```

2. Read 10 Strings from the keyboard, and compute their total length.

```
public class SumLengths {
  public static void main(String [] args) {
    Scanner kb = new Scanner(System.in);
    int totalLength = 0;
    for(int i=0; i<10; i++) {
      String str = kb.next();
      totalLength = totalLength + str.length();
    }
    System.out.println("Your strings have total length = " + totalLength);
  }
}
```