Name:_____ _____ CS 139 – Act07A – Logical Expression/String Equivalence

Boolean expressions, String equivalence, and problem solving with if statements.

Objectives

At the end of this exercise, students will:

- Practice with evaluating Boolean expressions
- Understand how Strings are compared
- Use logical operators in decision structures
- Be prepared to do more complex coding involving decision structures

Getting ready

1. **All team members - record your notes on your own response sheet**.
2. Hand in each individual paper.

Part 1 – Logical operators

Logical operators take boolean operands. In other words, the logical operators are used to compare two boolean values.

In Java the logical operators are:

Logical Operator	Meaning
&&	And (and at the same time)
||	Or (one or the other)
!	Not (negation or reversal)

Truth tables help us evaluate the logical operators. To read the table, look at the table for the && operator. If both operands are true, the result is true. If either operand is false the result is false. NOTE: Memorize the truth tables.

&&	true	false
true	**true**	**false**
false	**false**	**false**

||	true	false
true	**true**	**true**
false	**true**	**false**

!	true	false
	false	true

Examples: !true is false
true && false is false
3 > 12 || 13 == 12 is true

1. BOARD: Evaluating logical expressions. Using the variables, types, and values in the chart below, evaluate each expression and write your result as true or false. You may use a calculator.

Variable	Data type	value
blue	char	'b'
red	char	'R'
yes	boolean	true
no	boolean	false
hiVal	int	999
loVal	int	-999
code	char	'@'
grade	double	89.5
amount	double	50.00

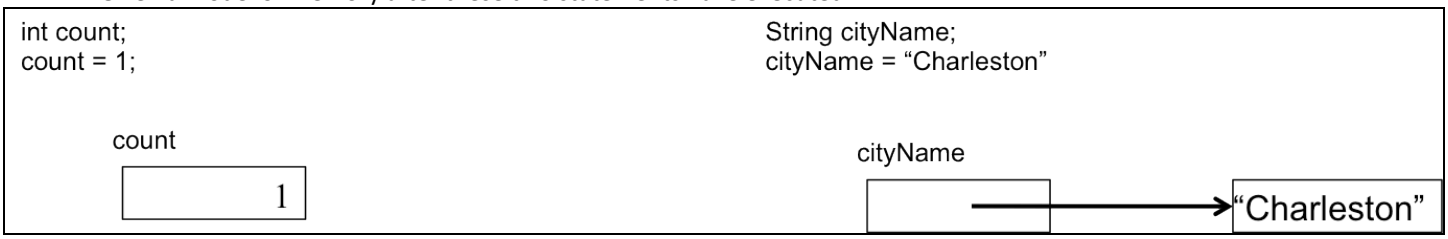
Expression	Result
a. (blue > red) && yes	
b. (blue <= red) || no	
c. (yes == no) || (code > blue)	
d. yes || no	
e. no && true	
f. !(yes && no)	
g. (yes || (no && (blue > red))) || (grade <= 100)	
h. (amount <= hiVal) && (amount >= loVal)	
i. (amount <= hiVal) || (amount >= loVal)	
j. ((amount + 10000) <= hiVal) || (amount >= loVal)	
k. (code < red) || no	

Part 2 Comparing Strings – Memory models of reference types

```
int count;
count = 3;

String cityName;
cityName = Charleston;
```

2. Given a model of memory after these two statements have executed:

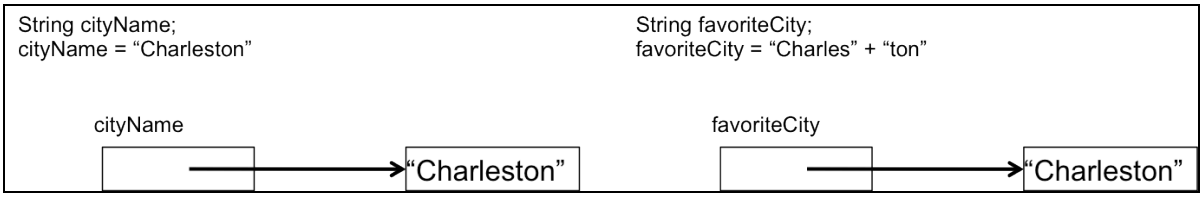


how are these two data types (int and String) fundamentally different?

3. What will the model look like if we add in the declaration, `String favoriteCity;` and the assignment, `favoriteCity = "Charleston";` (Hint, there is only one "Charleston" object since "Charleston" is a literal and will be used in both cases.) Draw the change on the model above.

4. What will the model look like if we add in the declaration, `int total`; and the assignment, `total = 1;` Show your models to the instructor before moving on.
5. An int is an example of a primitive type in Java. A String is an example of a reference type in Java. Provide your own definition of primitive data type and reference data type in the space below.

6. The two Strings, "Charleston" and "Charles" + "ton" result in two different objects in Java. If we draw the memory model, it would look like this:



7. What do you think the result of cityName == favoriteCity will be? (Hint, what do you think is being compared?)

Part 3 Comparing Strings – Correctly comparing values of reference types

The code below illustrates the correct way to compare two objects for equality.

```
/**
   This program correctly compares two String objects using
   the equals method.
*/

public class StringCompare
{
   public static void main(String [] args)
   {
      String name1 = "Mark";
      String name2 = "Ma" + "rk";
      String name3 = "Mary";

      // Compare "Mark" and "Mark"
      if (name1.equals(name2))
      {
         System.out.println(name1 + " and " + name2 +
          " are the same.");
      }
      else
      {
         System.out.println(name1 + " and " + name2 +
          " are the NOT the same.");
      }

      // Compare "Mark" and "Mary"
      if (name1.equals(name3))
      {
         System.out.println(name1 + " and " + name3 +
          " are the same.");
      }
      else
      {
         System.out.println(name1 + " and " + name3 +
          " are the NOT the same.");
      }
   }
}
```

8. Reference types have a method called, `equals`, that lets us compare those types. For `String`s, the method returns `true` if the two `String`s contain the same characters in the same order and `false` otherwise. You see an example of method calls to `equals` in this example.
9. So, when we run this code, what would you expect to be displayed by the `System.out.println` calls?

10. If we want to compare two strings, but don't care about the case of the letters, you can also use `equalsIgnoreCase` which returns `true` if the characters are the same regardless of case. So "`abc`"`.equalsIgnoreCase("ABC")` will return `true`.
11. READ Chapter 3.6 for more information about comparing Strings.
12. Do the Checkpoint 3.20 and 3.22.

3.20

3.22

13. Optional (you should read about the compareTo method in this same section). Do Checkpoint 3.21.

3.21

Part 4 Problem solving using logical operators

Individually, write code to solve Programming Problem #8. Then compare your answers.

14. Thought questions; be prepared to discuss in class.
    a. Did everyone in the group solve the problem in the same way?
    b. If not, will all correctly determine the discount?
    c. Is any one solution better than another in this case?