1. Primitives vs. Objects

In the first example, the student is thinking a little too literally about the expressions they’ve written, seeing them as what they want them to mean as opposed to what they in fact do mean. The problem lies in the comparison:

   (name == "Q")

The correct English translation of this statement is: compare the address of the object name to the address of the constant string "Q". In other words, name is a reference to a String object. Since name was read in from the user, this comparison will always return false, as it cannot be the same underlying object as the constant string "Q". If we actually want to compare the values held in those String objects, we should write:

   name.equals("Q")

For comparing values, the == operator should only be used with primitive types, such as int, double, boolean, and char. Variables that represent objects (like String) are always references (addresses of some location in memory).

In the second example the code actually works as intended. In the expression:

   (name.charAt(0) == 'Q')

we are using the == operator to compare the primitive type char. Since we are comparing primitives (and not object references), the == operator is comparing actual char values rather than memory addresses. This works just as we would want it to.

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2. Data structure design

```java
/*
 * File: ExpandableArray.java
 * ---------------------
 * This class provides methods for working with an array that expands
 * to include any positive index value supplied by the caller.
 */

public class ExpandableArray {

    /**
     * Creates a new expandable array with no elements.
     */
    public ExpandableArray() {
        array = new Object[0]; // Allows us to check length of array
        // even when no elements exist
    }

    /**
     * Sets the element at the given index position to the specified.
     * value. If the internal array is not large enough to contain that
     * element, the implementation expands the array to make room.
     */
    public void set(int index, Object value) {
        if (index >= array.length) {
            // Create a new array that is large enough
            Object[] newArray = new Object[index + 1];

            // Copy all the existing elements into new array
            for (int i = 0; i < array.length; i++) {
                newArray[i] = array[i];
            }

            // Keep track of the new array in place of the old array
            array = newArray;
        }
        array[index] = value;
    }

    /**
     * Returns the element at the specified index position, or null if
     * no such element exists. Note that this method never throws an
     * out-of-bounds exception; if the index is outside the bounds of
     * the array, the return value is simply null.
     */
    public Object get(int index) {
        if (index >= array.length) return null;
        return array[index];
    }

    /* Private instance variable */
    private Object[] array;
}
```