Lab 1-3: Java Basics

Variables

Questions

1. The term "instance variable" is another name for ___.
2. The term "class variable" is another name for ___.
3. A local variable stores temporary state; it is declared inside a ___.
4. A variable declared within the opening and closing parenthesis of a method signature is called a ____.
5. What are the eight primitive data types supported by the Java programming language?
6. Character strings are represented by the class ___.
7. An ___ is a container object that holds a fixed number of values of a single type.

Exercises

1. Create a small program that defines some fields. Try creating some illegal field names and see what kind of error the compiler produces. Use the naming rules and conventions as a guide.
2. In the program you created in Exercise 1, try leaving the fields uninitialized and print out their values. Try the same with a local variable and see what kind of compiler errors you can produce. Becoming familiar with common compiler errors will make it easier to recognize bugs in your code.

Operators

Questions

1. Consider the following code snippet.

   ```
   2. arrayOfInts[j] > arrayOfInts[j+1]
   ```

   Which operators does the code contain?

3. Consider the following code snippet.

   ```
   4. int i = 10;
   5. int n = i++%5;
   ```

   a. What are the values of `i` and `n` after the code is executed?

   b. What are the final values of `i` and `n` if instead of using the postfix increment operator (`i++`), you use the prefix version (`++i`))?

6. To invert the value of a `boolean`, which operator would you use?
7. Which operator is used to compare two values, `=` or `==` ?

8. Explain the following code sample: `result = someCondition ? value1 : value2;`

Exercises

1. Change the following program to use compound assignments:

```
class ArithmeticDemo {

     public static void main (String[] args){

          int result = 1 + 2; // result is now 3
          System.out.println(result);

          result = result - 1; // result is now 2
             System.out.println(result);

             result = result * 2; // result is now 4
             System.out.println(result);

             result = result / 2; // result is now 2
             System.out.println(result);

             result = result + 8; // result is now 10
             result = result % 7; // result is now 3
             System.out.println(result);

        }
   }

```

25. In the following program, explain why the value "6" is printed twice in a row:

```
   class PrePostDemo {
        public static void main(String[] args){
             int i = 3;
             i++;
             System.out.println(i);        // "4"
             ++i;
             System.out.println(i);        // "5"
             System.out.println(++i);      // "6"
             System.out.println(i++);      // "6"
             System.out.println(i);        // "7"
        }
}
```

Control Flow Statements

Questions

1. The most basic control flow statement supported by the Java programming language is the ___ statement.
2. The ___ statement allows for any number of possible execution paths.
3. The ___ statement is similar to the `while` statement, but evaluates its expression at the ___ of the loop.
4. How do you write an infinite loop using the `for` statement?
5. How do you write an infinite loop using the `while` statement?

Exercises

1. Consider the following code snippet.

```
2. if (aNumber >= 0)
3.     if (aNumber == 0) System.out.println("first string");
4. else System.out.println("second string");
5. System.out.println("third string");
```

   a. What output do you think the code will produce if `aNumber` is 3?
   b. Write a test program containing the previous code snippet; make `aNumber` 3. What is the output of the program? Is it what you predicted? Explain why the output is what it is; in other words, what is the control flow for the code snippet?
   c. Using only spaces and line breaks, reformat the code snippet to make the control flow easier to understand.
   d. Use braces, { and }, to further clarify the code.

Characters and Strings

Questions

1. What is the initial capacity of the following string builder?

```
2. StringBuilder sb = new StringBuilder("Able was I ere I saw Elba.");
```

3. Consider the following string:

```
4. String hannah = "Did Hannah see bees? Hannah did.";
```

   a. What is the value displayed by the expression `hannah.length()`?
   b. What is the value returned by the method call `hannah.charAt(12)`?
   c. Write an expression that refers to the letter `b` in the string referred to by `hannah`.

5. How long is the string returned by the following expression? What is the string?

```
6. "Was it a car or a cat I saw?".substring(9, 12)
```

7. In the following program, called ComputeResult, what is the value of `result` after each numbered line executes?

```
8. public class ComputeResult {
9.     public static void main(String[] args) {
10.          String original = "software";
11.          StringBuilder result = new StringBuilder("hi");
12.          int index = original.indexOf('a');
13.
14.  /*1*/   result.setCharAt(0, original.charAt(0));
15.  /*2*/   result.setCharAt(1, original.charAt(original.length()-1));
16.  /*3*/   result.insert(1, original.charAt(4));
17.  /*4*/   result.append(original.substring(1,4));
18.  /*5*/   result.insert(3, (original.substring(index, index+2) + "
   "));
19.
20.          System.out.println(result);
21.      }
22.  }
```

Exercises

1. Show two ways to concatenate the following two strings together to get the string `"Hi, mom."`:
2. `String hi = "Hi, ";`
3. `String mom = "mom.";`
4. Write a program that computes your initials from your full name and displays them.
5. An anagram is a word or a phrase made by transposing the letters of another word or phrase; for example, "parliament" is an anagram of "partial men," and "software" is an anagram of "swear oft." Write a program that figures out whether one string is an anagram of another string. The program should ignore white space and punctuation.