Programming Fundamentals

Lab #2

Topics

- Object instantiation
- Using existing classes (e.g. String, Random, Math, DecimalFormat)
- Pseudorandom number generation
- String methods, formatting
- Using a debugger
- Using conditional statements
- Constructing conditions and Boolean expressions

Concepts

new keyword
dot operator
method invocation
object reference variables
Strings – indexes, methods
Java packages
pseudorandom number generation, seed value
using static methods
formatting output
if, if-else, else statements
relational operators: ==, !=, <, >, etc.
Boolean operators: !, &&, ||
block statements
switch, break, default

Exercise 1

Modify the `AgeGuess` program from the last lab to do the following:

- Declare a new `int` variable `age`
- Initialize `age` to a random integer between 0 and 100 (inclusive)
- Asks the user for a guess, save the guess into the `ageGuess` variable
- Display the user guess and the correct answer

MyProgram.java | *AgeGuess2.java | AgeGuess.java

MyFirstProject/src/AgeGuess.java

```
1  //*************************************************
2  //  Java                 Author: Trac
3  //                       Date: July 16, 2020
4  //*************************************************************
5
6  import java.util.Scanner;
7  import java.util.Random;
8
9  public class AgeGuess2 {
10 ///This program prompts user to guess the age and saves to ageGuess variable
11 // Then displays the users guess and actual age
12
13    public static void main(String[] args) {
14
15        String name;
16        int ageGuess;
17        int age;
18
19        Scanner scan = new Scanner(System.in);
20        Random gen = new Random();
21        age = gen.nextInt(100) + 1;  //generates random from 0-100
22
23        System.out.print("Enter your name: ");
24        name = scan.nextLine();
25
26        System.out.print("Guess the age of " + name + ": ");
27        ageGuess = scan.nextInt();
28
29        System.out.print("Nice guess, " + name + "'s" + " actual age is: " + age);
30
31        scan.close();
32
33
34    }
35
36 }
37
```

Problems | Javadoc | Declaration | Console

<terminated> AgeGuess2 [Java Application] C:\Program Files\Java\jdk-14.0.1\bin\javaw.exe (Jul 16, 2020, 9:36:16 PM – 9:36:24 PM)

```
Enter your name: Tracy
Guess the age of Tracy: 30
Nice guess, Tracy's actual age is: 32
```

Exercise 2

Write an application called `DistCalc` that reads the (x, y) coordinates for two points then computes the distance between them using the following formula:

$$dist = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Display the result with three decimal places to the screen.

FloatEqu.java | DistCalc.java | AgeGuessEx4.java

```
1  import java.util.Scanner;
2
3
4  //*************************************************************
5  //  Java                Author: Tracy
6  //                      Date: July 17, 2020
7  //*************************************************************
8
9  public class DistCalc {
10 //This program reads coordinates for two points then computes the distance between them
11
12    public static void main(String[] args) {
13
14        int x1;
15        int x2;
16        int y1;
17        int y2;
18        double dist;
19        String total;
20
21        Scanner scan = new Scanner(System.in);
22
23        System.out.print("Enter the number for X1: ");
24        x1 = scan.nextInt();
25
26        System.out.print("Enter the number for X2: ");
27        x2 = scan.nextInt();
28
29        System.out.print("Enter the number for Y1: ");
30        y1 = scan.nextInt();
31
32        System.out.print("Enter the number for Y2: ");
33        y2 = scan.nextInt();
34
35        dist = Math.sqrt(Math.pow(x2-x1,2) + Math.pow(y2-y1,2));
36
37          total = String.format("%.2f", dist);
38          System.out.println("Total distance between: " + total);
39
40          scan.close();
41
42
43      }
44
45 }
46
```

Console | Problems | Debug Shell

```
<terminated> DistCalc [Java Application] C:\Program Files\Java\jdk-14.0.1\bin\javaw.exe  (Jul 18, 2020, 12:19:47 AM – 12:20:01 AM)
Enter the number for X1: 5
Enter the number for X2: 4
Enter the number for Y1: 6
Enter the number for Y2: 2
Total distance between: 4.12
```

Exercise 3

Write an application called `UserNames` that reads the user's first and last name (separately), then prints a string composed of the first 4 letters of the user's last name, followed by the first letter of the user's first name, followed by a random number in the range of 10 to 99 (inclusive). You can assume the first name is at least one letter long and the last name is at least 4 letters.

UserNames.java | TimeComp.java | AgeGuess2.java

```
1
2  //*************************************************************
3  //  Java                Author: Tracy
4  //                      Date: July 14, 2020
5  //*************************************************************
6
7  import java.util.Random;
8
9  public class UserNames {
10 //This program displays first 4 characters of last name, first character of first name and a random number 10-99
11
12
13    public static void main(String[] args) {
14
15        String firstName = "John";
16        String lastName = "DeLaSalle";
17
18        int num;
19        int min = 10;
20        int max = 99;
21
22        // Random number between 10-99 inclusive
23        num = (int) ((Math.random() * (max - min + 1)) + min); // Random number between 10-99 inclusive
24
25        char chFirst = firstName.charAt(0);  // first letter of first name
26        String chLast = lastName.substring(0, 4);  // first four letters of last name
27
28        System.out.println("Results: " + chLast + chFirst + num);
29
30    }
31
32 }
33
```

Problems | Javadoc | Declaration | Console

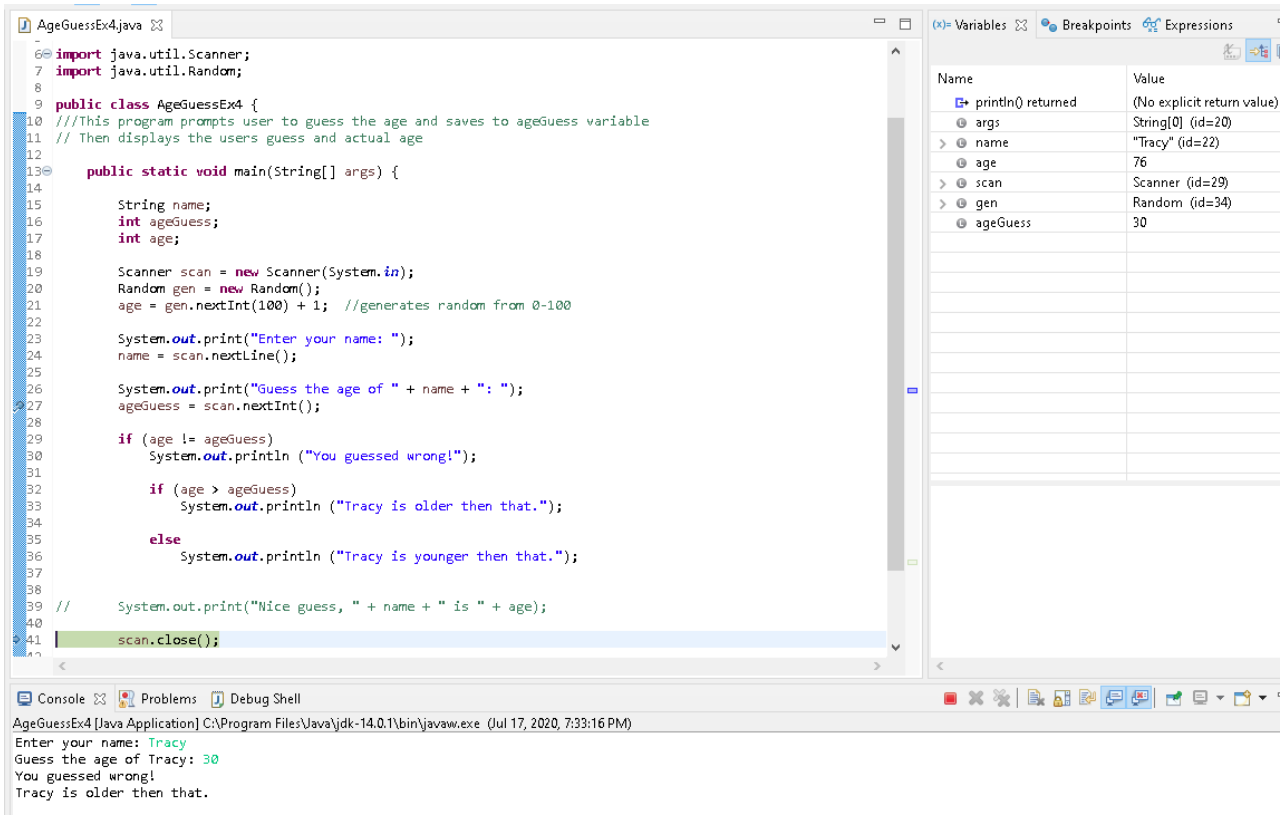
```
<terminated> UserNames [Java Application] C:\Program Files\Java\jdk-14.0.1\bin\javaw.exe  (Jul 17, 2020, 6:45:36 PM – 6:45:39 PM)
Results: DeLaJ48
```

Exercise 4

a) Modify the `AgeGuess` program from Ex. 1 by adding a conditional statement (if statement) to print out "You guessed wrong!" if the `age` and `ageGuess` variables are different. Remember that "not equal to" comparison is done using the NOT (`!=`) relational operator. Check to make sure the program runs without errors.

b) Add a nested if statement so that when the answer is wrong print out "older", if the age guess was less than the actual age, and "younger", otherwise. Check to make sure the program runs without errors.

c) Use the debugger (hit F11 in Eclipse) to run the program multiple times and check to make sure each of the different messages gets displayed. Remember to put a breakpoint first (CTRL+SHIFT+b).



Exercise 5

Make a Java program called `FloatEqu.java` and implement the following:

➢ Declare a `double` variable and initialize it to `(1.0/10) * (1.0/10)`
Declare another `double` variable and initialize it to `(1.0/100)`
Insert an `if … else` statement and print out "EQUAL" if both variables are equal (use ==) and "NOT EQUAL" otherwise. Run the program and check the output. Is it what you would expect?

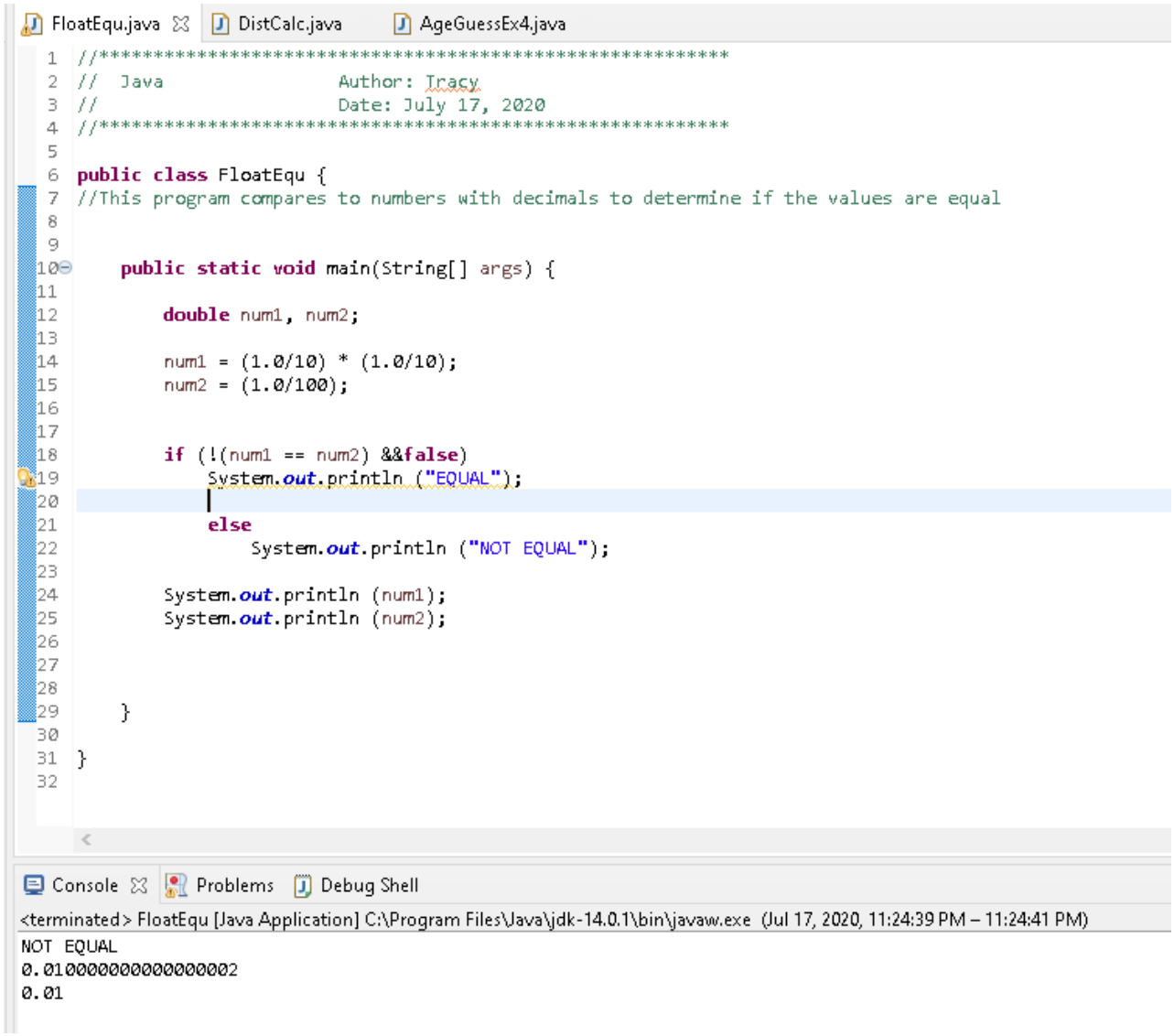
FloatEqu.java | DistCalc.java | AgeGuessEx4.java

```
1  //*************************************************************
2  //  Java                Author: Tracy
3  //                      Date: July 17, 2020
4  //*************************************************************
5
6  public class FloatEqu {
7  //This program compares to numbers with decimals to determine if the values are equal
8
9
10     public static void main(String[] args) {
11
12         double num1, num2;
13
14         num1 = (1.0/10) * (1.0/10);
15         num2 = (1.0/100);
16
17
18         if (num1 == num2)
19             System.out.println ("EQUAL");
20
21             else
22                 System.out.println ("NOT EQUAL");
23
24         System.out.println (num1);
25         System.out.println (num2);
26
27
28
29     }
30
31 }
32
```

Console | Problems | Debug Shell

```
<terminated> FloatEqu [Java Application] C:\Program Files\Java\jdk-14.0.1\bin\javaw.exe  (Jul 17, 2020, 11:22:48 PM – 11:22:50 PM)
NOT EQUAL
0.010000000000000002
0.01
```

❖ Modify the program by adding a conditional statement to determine if the variables are approximately equal, using the approach discussed in the lecture.



Exercise 6

Make a program called `NumDisplay.java` that prompts the user enter a number between 0 and 9 and then display the corresponding word (i.e. "zero" for 0, "one" for 1, etc.). Use a `switch` statement to do this. Include a default case that lets the user know they entered a wrong number.

```java
//*************************************************************
//  Java                Author: Tracy
//                      Date: July 16, 2020
//*************************************************************

import java.util.Scanner;

public class NumDisplay {
//This program prompts user to enter a number between 0-9 and then displays the corresponding word


    public static void main(String[] args) {

        System.out.print("Enter at number between 0 and 9: ");

        int numGuess;
        Scanner scan = new Scanner(System.in);
        numGuess = scan.nextInt();

        //switch statement allows a variable to be tested for equality against a list of values found in the Case be
         switch (numGuess) {


         case 0:
                System.out.println("Zero");
                break;

         case 1:
                System.out.println("One");
                break;

         case 2:
                System.out.println("Two");
                break;

         case 3:
                System.out.println("Three");
                break;
```

```
39
40          case 4:
41                  System.out.println("Four");
42                  break;
43
44          case 5:
45                  System.out.println("Five");
46                  break;
47
48          case 6:
49                  System.out.println("Six");
50                  break;
51
52          case 7:
53                  System.out.println("Seven");
54                  break;
55
56          case 8:
57                  System.out.println("Eight");
58                  break;
59
60          case 9:
61                  System.out.println("Nine");
62                  break;
63
64          default:
65                  System.out.println("Invalid number");
66              scan.close();
67                  break;
68
69          }
70
71      }
72
73  }
74
```

Console Problems Debug Shell

<terminated> NumDisplay [Java Application] C:\Program Files\Java\jdk-14.0.1\bin\javaw.exe (Jul 17, 2020, 8:58:03 PM – 9:00:44 PM)

```
Enter at number between 0 and 9: 2
Two
```

Console Problems Debug Shell

<terminated> NumDisplay [Java Application] C:\Program Files\Java\jdk-14.0.1\bin\javaw.exe (Jul 17, 2020, 9:04:02 PM – 9:04:07 PM)

```
Enter at number between 0 and 9: 12
Invalid number
```