Objectives:
1. Administer Midterm Exam
2. Initial Description of Project
   - Students should now focus on Design Phase
   - A second session is scheduled to answer implementation questions

Midterm Exam

1. Which of these data types are signed integrals?
   A. char, byte, and short
   B. byte, short, int, and long
   C. char, short, and long

2. What is the size of an int?
   A. 32 bytes
   B. 16 bits
   C. 32 bits
   D. 16 bytes

3. Consider the following line of code:
   char x[]=new char[10];
   After execution, what is value of x[0]?
   A. 0
   B. ‘\u0000’
   C. null

4. What are the two integral data types for representing floating point numbers?

5. True or False: All Operands are evaluated left to right.

6. Consider the following line of code:
   int x=7;
   int y=4;
   int z=7/4;
   After execution what is value of z?
   A. 1.75
   B. 0
   C. 1
   D. 2

7. Please select the true statement for ! operator
   A. The ! operator inverts the value of a boolean expression
   B. The ! operator inverts the bit pattern of an integral expression.
   C. Both A and B
   D. None of the above

8. Which two of these arithmetic operations can result in an ArithmeticException?
   A. Multiplication: *
   B. Division: /
   C. Modulo: %
   D. Addition: +
   E. Subtraction: -

9. Please select the operators which perform bit shifts of the binary representation of the integral types
   A. <<
10. A class variable is declared using following modifiers
   A. protected
   B. private
   C. public
   D. static

11. True or False: An unary operator operates on a single value?

12. What type of loop is guaranteed to be executed once?

13. If word1 is “Bob” and word2 is “Barb”, what does the expression below return?
   0 < word1.compareTo(word2)?

14. Write a statement that sets boolean variable ok to true if the value of the variable number
    is less than or equal to 10.

15. True or False? Comparing strings using == and != is legal, but you do not get the answer
    you expect.

16. Write a count-controlled loop that prints your name 1000 times.

17. Write a Java if statement that assigns the larger of the values num1 and num2 to the
    variable larger:

18. Design a program to calculate $a^n$. You can demonstrate your design in pseudocode or
    Java.

**Initial Project Description**

You will write a program that implements a guessing game.

The program will select a random number from 1 to 10. The user gets three guesses. If
the user guesses the correct number, the program writes a winning message and exits. If
the user guesses incorrectly, the program outputs "cold" when the guess is 3 or more
away from the correct answer, "warm" when the guess is 2 away, and "hot" when the
guess is 1 away. If the user fails to guess the number after three tries, the program writes
a failure message and exits.

Example Execution and output:

```
$ java GuessingGame
I am thinking of a number from 1 to 10.
You must guess what it is in three tries.
Enter a guess:
1
cold
3
warm
5
RIGHT!
You have won the game.
$ java GuessingGame
I am thinking of a number from 1 to 10.
```
You must guess what it is in three tries.
Enter a guess:
1
cold
5
warm
9
WRONG!
The correct number was 7.
You have lost the game.

You'll need to implement two classes: GuessingGame (in GuessingGame.java) and GuessingGameTest (in GuessingGameTest.java). The following is the skeleton:

class GuessingGame
{
    private int myGuess;

    GuessingGame()
    {
        // initialize myGuess instance field
    }

    public void start() throws IOException
    {
        // body
    }

    // any more methods you need
}

// Driver program
class GuessingGameTest
{
    public static void main(String[] args) throws IOException
    {
        GuessingGame newGame = new GuessingGame();

        newGame.start();
    }
}

Project Solution

GuessingGame.java
import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.IOlException;
import java.util.Random;

/ Implements the Game
class GuessingGame {
  private int myGuess;

  GuessingGame() {
    Random generator = new Random();
    int randomNumber = generator.nextInt(10);
    // this generates a random number between 0 and 9 (both inclusive)
    myGuess = randomNumber + 1;
    // since we want between 1 and 10 (both inclusive)
  }

  public void start() throws IOException {
    BufferedReader console = new BufferedReader(
      new InputStreamReader(System.in));

    System.out.println("I am thinking of a number from 1 to 10.");
    System.out.println("You must guess what it is in three tries.");
    System.out.println("Enter a guess:");

    String input = "";
    int diff = -1;
    for (int i = 1; i <= 3; i++) {
      input = console.readLine();
      diff = diffGuess(Integer.parseInt(input));

      if (diff == 0) {
        System.out.println("RIGHT!");
        System.out.println("You have won the game!");
        return;
      } else if (i < 3) {
        if (diff >= 3) {
          System.out.println("cold");
        } else if (diff == 2) {
          System.out.println("warm");
        } else if (diff == 1) {
          System.out.println("hot");
        } else {
          System.out.println("WRONG");
          System.out.println("The correct number was " + myGuess);
          System.out.println("You have lost the game. Next time think!");
        }
      }
    }

    // Give the difference from my guess
}
public int diffGuess(int yourGuess) {
    return Math.abs(yourGuess - myGuess);
}

GuessingGameTest.java

import java.io.IOException;

class GuessingGameTest {
    public static void main(String[] args) throws IOException {
        GuessingGame newGame = new GuessingGame();
        newGame.start();
    }
}

Assignment:
Write a program that calculates the final letter grade of a student. The program should take three test grades as input from the user. The program should take the best of the first two test grades plus the third test grade to determine the final grade. If this sum is greater than or equal to 90, the student gets an A; 80 but less than 90, B; 70 but less than 80, C; 60 but less than 70, D; or less than 60, F.

Example Output:
Enter the score for test one.
50
Enter the score for test two.
60
Enter the score for test three.
55
final grade is: A for 115

Solution:
// Program calculates the final grade.

import java.io.*;

public class FinalGrade
{
    public static void main(String[] args) throws IOException
    {
        BufferedReader inData;
        inData =
        new BufferedReader(new InputStreamReader(System.in));

        int grade1;
        int grade2;
        int grade3;
        int maxgrade;
        int finalgrade;

        // Prompt for and read in scores
        System.out.println("Enter the score for test one.");
        grade1 = Integer.parseInt(inData.readLine());
        System.out.println("Enter the score for test two.");
        grade2 = Integer.parseInt(inData.readLine());
        maxgrade = Math.max(grade1, grade2);
        System.out.println("Enter the score for test three.");
        grade3 = Integer.parseInt(inData.readLine());
        finalgrade = maxgrade + grade3;

        if(finalgrade >= 90)
        System.out.println(" final grade is: A for " + finalgrade);
        else if (finalgrade < 90 && finalgrade >= 80)
        System.out.println(" final grade is: B for " + finalgrade);
    }
}
else if (finalgrade<80 && finalgrade>=70)
    System.out.println("finalgrade is: C for" + " " + finalgrade);
else if (finalgrade<70 && finalgrade>=60)
    System.out.println("finalgrade is: D for" + " " + finalgrade);
else if (finalgrade<60)
    System.out.println("finalgrade is: F for" + " " + finalgrade);
}