Name:________________________ Date: ___/___/___ Period: ____

Objective: The student will be able to write a simple program to perform basic arithmetic operations and mathematical sequences.

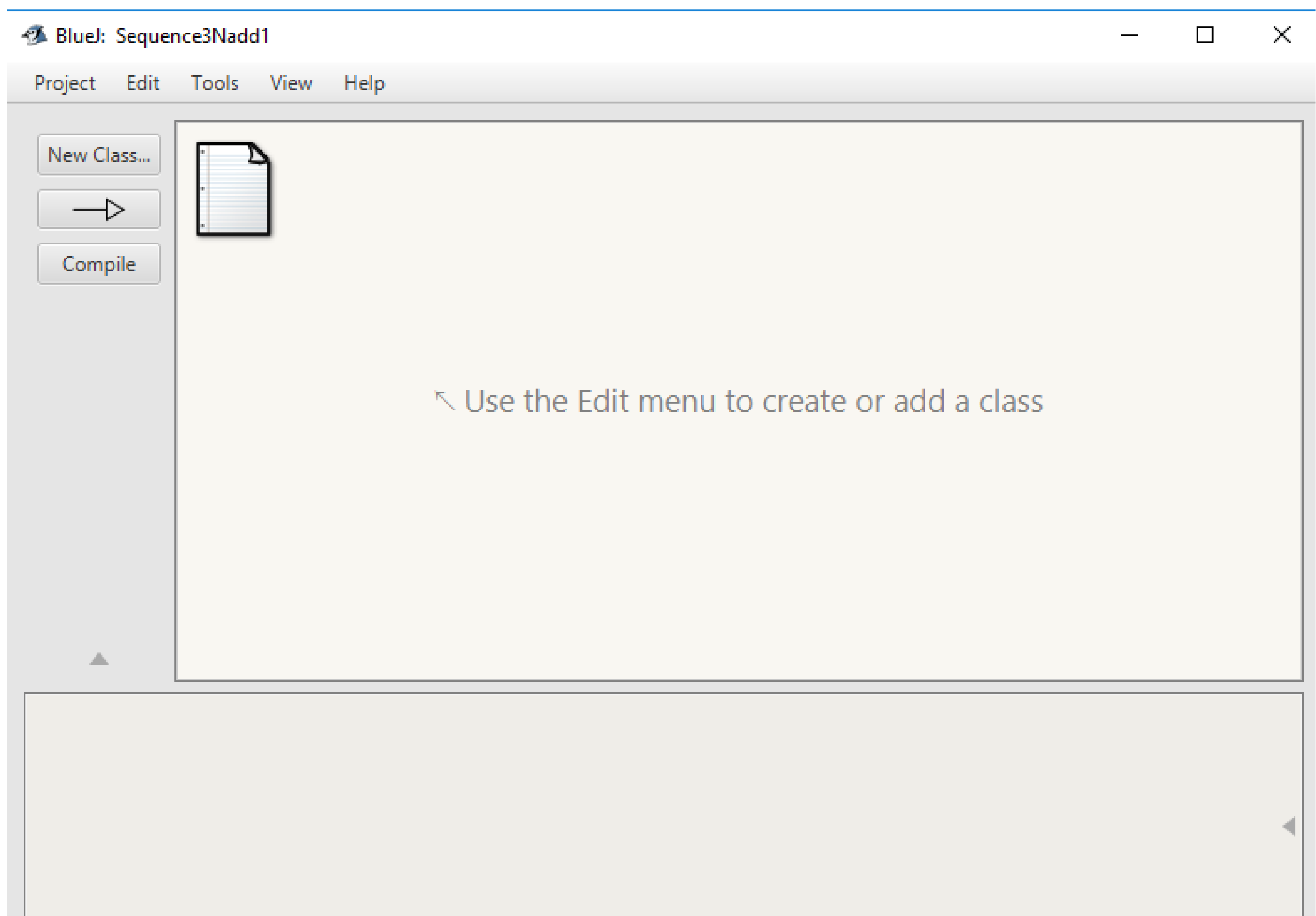
Directions: Perform the following steps.

Step 1: Start BlueJ.

Step 2: Click on New Project.

Step 3: Enter a Project Name. In this case Sequence3Nadd1. The project name and the class name will be the same so the first letter should be a capital letter.

Step 4: Click on New Class and enter Sequence3Nadd1.



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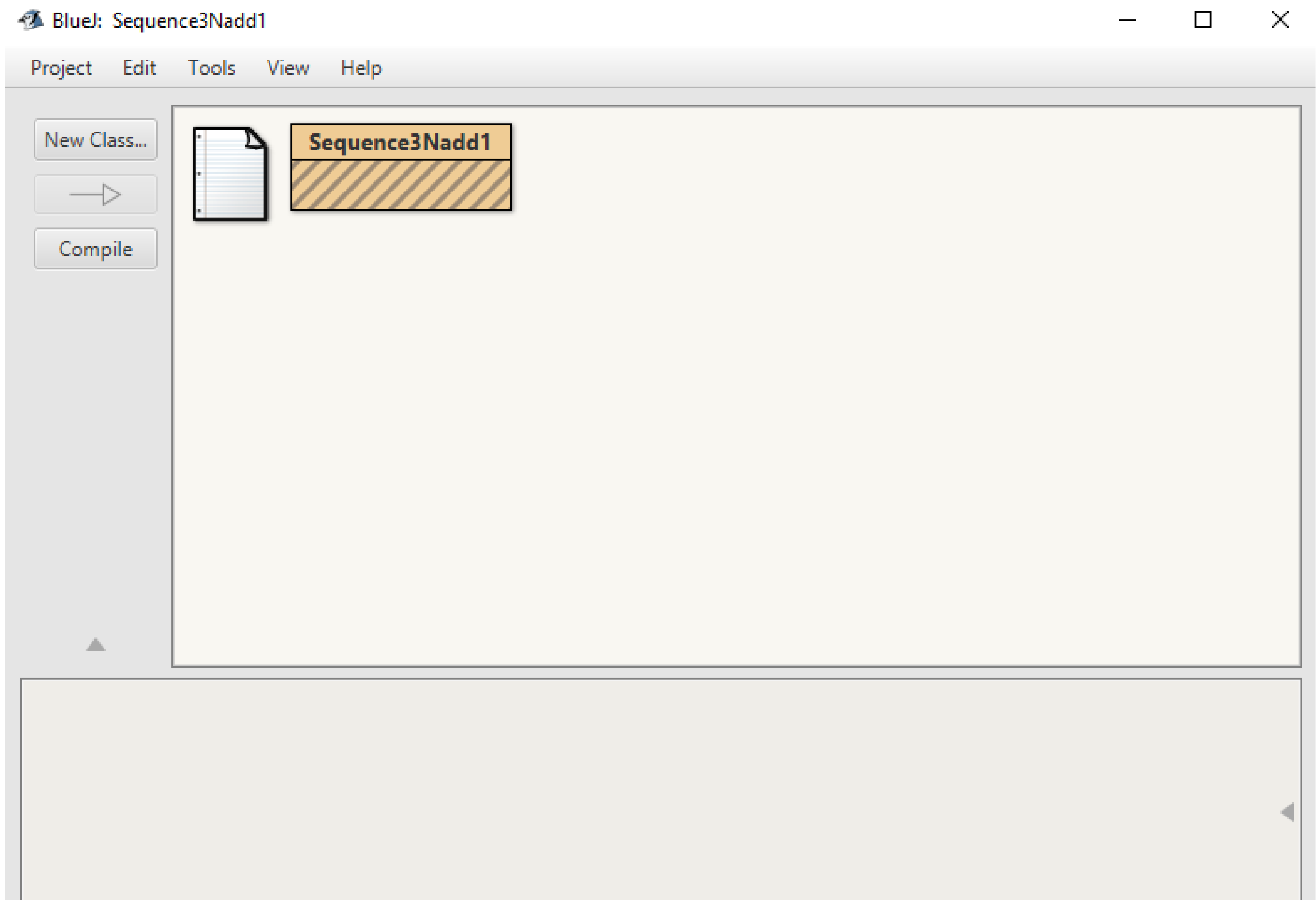

Step 5: Double click on the Sequence3Nadd1 box to start the editor.

Step 6: Press Control-A to select all text in the editor screen. Press the Backspace key to remove this text.

Step7: Enter the program code shown. When declaring public class Sequence3Nadd1 do not press the backspace key after entering the closing brace "}", this will lock the editor. Once you put in the closing brace and hit the enter key you can go back and edit any errors without any problems. (It is a program bug with BlueJ).

```
public class Sequence3Nadd1
{
   // Program to print out the sequence 3N+1 starting from a positive
   // integer specified by the user. It also counts the number of
   // terms in the sequence, and prints out that number.
   // Mr. Ellsworth    Period: 0   November 11, 2017

   public static void main(String[] args)
```

```
{
   // Declare Variables

   int N;            // for computing terms in the sequence
   int counter;      // for counting the terms

   // Input Section

   System.out.print("Starting point for sequence: ");
   N = TextIO.getlnInt();

   // Processing Section

   while (N <= 0)
   {
      System.outprintln("The starting point must be positive.");
      System.out.print("Please try again: ");
      N = TextIO.getlnInt();
   } // end of while

   // At this point, we know that N > 0

   count = 0;
   while(N != 1)
   {
      if (N % 2 == 0)
      N = N / 2;
      else
      N = 3 * N + 1;
      System.out.println(N);
      counter = counter + 1;
   } // end of while
```

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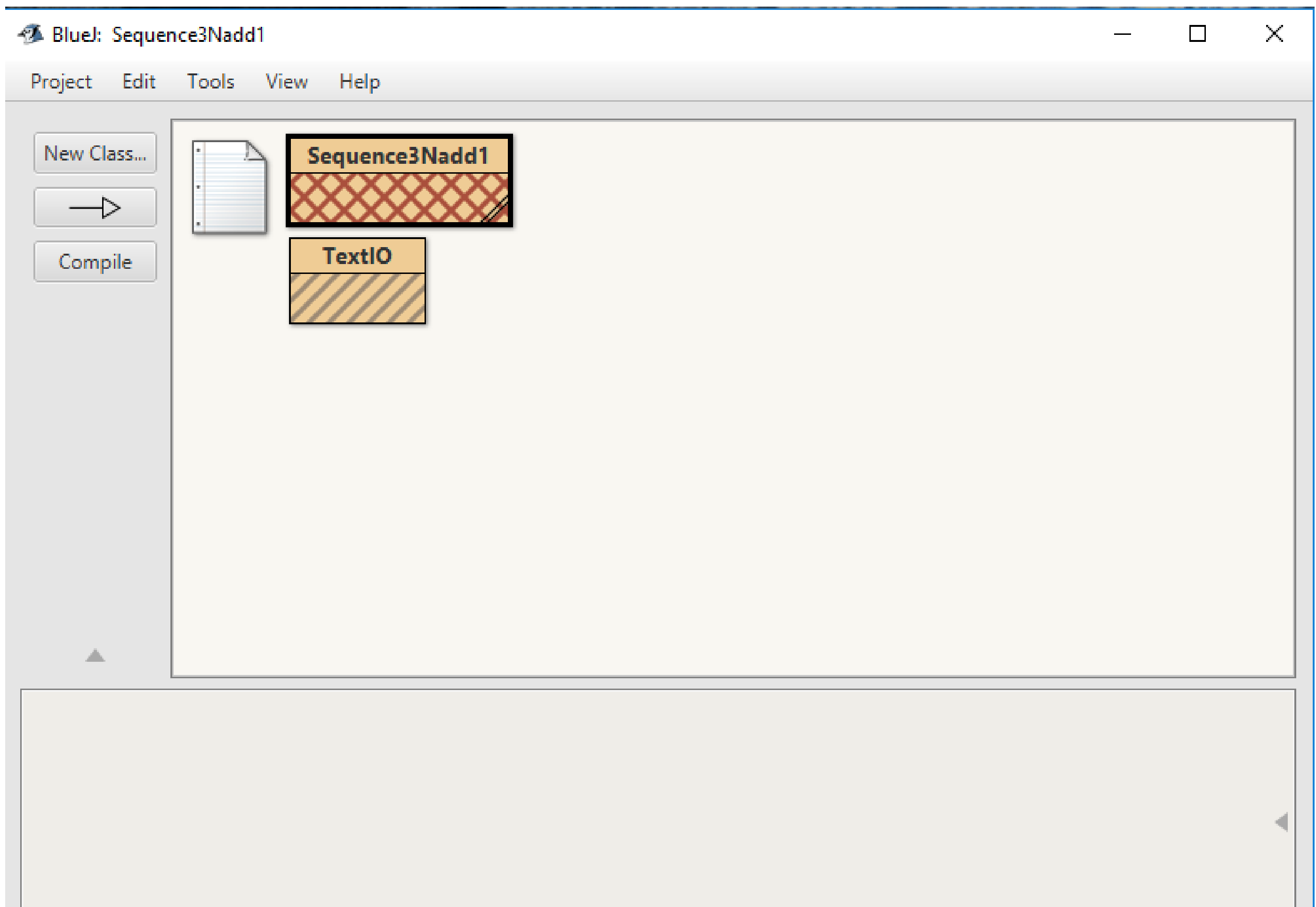
```
        // Output Section

        System.out.println();
        System.out.print("There were ");
        System.out.print(counter);
        System.out.println(" terms in the sequence.");
    } // end of main
} // end of class Sequence3Nadd1
```

Step 8: Add a new class to your project named TextIO.



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Step 9: Add the following code to the TextIO class. It is a lot of code so if you can copy this class from another project you should. The class handles I/O in a better way than the Scanner class.

```
import java.io.*;
import java.util.IllegalFormatException;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

import javax.swing.JFileChooser;
import javax.swing.JOptionPane;

//* TextIO provides a set of static methods for reading and writing text.
public class TextIO
{
    /**
     * The value returned by the peek() method when the input is at end-of-file.
     * (The value of this constant is (char)0xFFFF.)
     */
    public final static char EOF = (char)0xFFFF;

    /**
     * The value returned by the peek() method when the input is at end-of-line.
     * The value of this constant is the character '\n'.
     */
    public final static char EOLN = '\n';          // The value returned by peek() when at end-of-line.



    /**
     * After this method is called, input will be read from standard input (as it
     * is in the default state).  If a file or stream was previously the input source, that file
     * or stream is closed.
     */
```

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```
public static void readStandardInput() {
   if (readingStandardInput)
      return;
   try {
      in.close();
   }
   catch (Exception e) {
   }
   emptyBuffer();  // Added November 2007
   in = standardInput;
   inputFileName = null;
   readingStandardInput = true;
   inputErrorCount = 0;
}

/**
 * After this method is called, input will be read from inputStream, provided it
 * is non-null.  If inputStream is null, then this method has the same effect
 * as calling readStandardInput(); that is, future input will come from the
 * standard input stream.
 */
public static void readStream(InputStream inputStream) {
   if (inputStream == null)
      readStandardInput();
   else
      readStream(new InputStreamReader(inputStream));
}

/**
 * After this method is called, input will be read from inputStream, provided it
 * is non-null.  If inputStream is null, then this method has the same effect
 * as calling readStandardInput(); that is, future input will come from the
```

```
 * standard input stream.
 */
public static void readStream(Reader inputStream) {
   if (inputStream == null)
      readStandardInput();
   else {
      if ( inputStream instanceof BufferedReader)
         in = (BufferedReader)inputStream;
      else
         in = new BufferedReader(inputStream);
      emptyBuffer();  // Added November 2007
      inputFileName = null;
      readingStandardInput = false;
      inputErrorCount = 0;
   }
}

/**
 * Opens a file with a specified name for input.  If the file name is null, this has
 * the same effect as calling readStandardInput(); that is, input will be read from standard
 * input.  If an
 * error occurs while trying to open the file, an exception of type IllegalArgumentException
 * is thrown, and the input source is not changed.  If the file is opened
 * successfully, then after this method is called, all of the input routines will read
 * from the file, instead of from standard input.
 */
public static void readFile(String fileName) {
   if (fileName == null) // Go back to reading standard input
      readStandardInput();
   else {
      BufferedReader newin;
      try {
```

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```
            newin = new BufferedReader( new FileReader(fileName) );
        }
        catch (Exception e) {
            throw new IllegalArgumentException("Can't open file \"" + fileName + "\" for input.\n"
                    + "(Error :" + e + ")");
        }
        if (! readingStandardInput) { // close current input stream
            try {
                in.close();
            }
            catch (Exception e) {
            }
        }
        emptyBuffer();  // Added November 2007
        in = newin;
        readingStandardInput = false;
        inputErrorCount = 0;
        inputFileName = fileName;
    }
}

/**
 * Puts a GUI file-selection dialog box on the screen in which the user can select
 * an input file.  If the user cancels the dialog instead of selecting a file, it is
 * not considered an error, but the return value of the subroutine is false.
 * If the user does select a file, but there is an error while trying to open the
 * file, then an exception of type IllegalArgumentException is thrown.  Finally, if
 * the user selects a file and it is successfully opened, then the return value of the
 * subroutine is true, and  the input routines will read from the file, instead of
 * from standard input.   If the user cancels, or if any error occurs, then the
 * previous input source is not changed.
 * <p>NOTE: Calling this method starts a GUI user interface thread, which can continue
```

```
 * to run even if the thread that runs the main program ends.  If you use this method
 * in a non-GUI program, it might be necessary to call System.exit(0) at the end of the main()
 * routine to shut down the Java virtual machine completely.
 */
public static boolean readUserSelectedFile() {
   if (fileDialog == null)
      fileDialog = new JFileChooser();
   fileDialog.setDialogTitle("Select File for Input");
   int option = fileDialog.showOpenDialog(null);
   if (option != JFileChooser.APPROVE_OPTION)
      return false;
   File selectedFile = fileDialog.getSelectedFile();
   BufferedReader newin;
   try {
      newin = new BufferedReader( new FileReader(selectedFile) );
   }
   catch (Exception e) {
      throw new IllegalArgumentException("Can't open file \"" + selectedFile.getName() + "\" for input.\n"
                    + "(Error :" + e + ")");
   }
   if (!readingStandardInput) { // close current file
      try {
         in.close();
      }
      catch (Exception e) {
      }
   }
   emptyBuffer();  // Added November 2007
   in = newin;
   inputFileName = selectedFile.getName();
   readingStandardInput = false;
   inputErrorCount = 0;
```

```
    return true;
}

/**
 * After this method is called, output will be written to standard output (as it
 * is in the default state).  If a file or stream was previously open for output, it
 * will be closed.
 */
public static void writeStandardOutput() {
    if (writingStandardOutput)
        return;
    try {
        out.close();
    }
    catch (Exception e) {
    }
    outputFileName = null;
    outputErrorCount = 0;
    out = standardOutput;
    writingStandardOutput = true;
}


/**
 * After this method is called, output will be sent to outputStream, provided it
 * is non-null.  If outputStream is null, then this method has the same effect
 * as calling writeStandardOutput(); that is, future output will be sent to the
 * standard output stream.
 */
public static void writeStream(OutputStream outputStream) {
    if (outputStream == null)
        writeStandardOutput();
```

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```
    else
        writeStream(new PrintWriter(outputStream));
}

/**
 * After this method is called, output will be sent to outputStream, provided it
 * is non-null.  If outputStream is null, then this method has the same effect
 * as calling writeStandardOutput(); that is, future output will be sent to the
 * standard output stream.
 */
public static void writeStream(PrintWriter outputStream) {
    if (outputStream == null)
        writeStandardOutput();
    else {
        out = outputStream;
        outputFileName = null;
        outputErrorCount = 0;
        writingStandardOutput = false;
    }
}


/**
 * Opens a file with a specified name for output.  If the file name is null, this has
 * the same effect as calling writeStandardOutput(); that is, output will be sent to standard
 * output.  If an
 * error occurs while trying to open the file, an exception of type IllegalArgumentException
 * is thrown.  If the file is opened successfully, then after this method is called,
 * all of the output routines will write to the file, instead of to  standard output.
 * If an error occurs, the output destination is not changed.
 * <p>NOTE: Calling this method starts a GUI user interface thread, which can continue
 * to run even if the thread that runs the main program ends.  If you use this method
```

```
 * in a non-GUI program, it might be necessary to call System.exit(0) at the end of the main()
 * routine to shut down the Java virtual machine completely.
 */
public static void writeFile(String fileName) {
   if (fileName == null)  // Go back to reading standard output
      writeStandardOutput();
   else {
      PrintWriter newout;
      try {
         newout = new PrintWriter(new FileWriter(fileName));
      }
      catch (Exception e) {
         throw new IllegalArgumentException("Can't open file \"" + fileName + "\" for output.\n"
                       + "(Error :" + e + ")");
      }
      if (!writingStandardOutput) {
         try {
            out.close();
         }
         catch (Exception e) {
         }
      }
      out = newout;
      writingStandardOutput = false;
      outputFileName = fileName;
      outputErrorCount = 0;
   }
}

/**
 * Puts a GUI file-selection dialog box on the screen in which the user can select
 * an output file.  If the user cancels the dialog instead of selecting a file, it is
```

```
 * not considered an error, but the return value of the subroutine is false.
 * If the user does select a file, but there is an error while trying to open the
 * file, then an exception of type IllegalArgumentException is thrown.  Finally, if
 * the user selects a file and it is successfully opened, then the return value of the
 * subroutine is true, and  the output routines will write to the file, instead of
 * to standard output.  If the user cancels, or if an error occurs, then the current
 * output destination is not changed.
 */
public static boolean writeUserSelectedFile() {
   if (fileDialog == null)
      fileDialog = new JFileChooser();
   fileDialog.setDialogTitle("Select File for Output");
   File selectedFile;
   while (true) {
      int option = fileDialog.showSaveDialog(null);
      if (option != JFileChooser.APPROVE_OPTION)
         return false;  // user canceled
      selectedFile = fileDialog.getSelectedFile();
      if (selectedFile.exists()) {
         int response = JOptionPane.showConfirmDialog(null,
               "The file \"" + selectedFile.getName() + "\" already exists.  Do you want to replace it?",
               "Replace existing file?",
               JOptionPane.YES_NO_OPTION, JOptionPane.WARNING_MESSAGE);
         if (response == JOptionPane.YES_OPTION)
            break;
      }
      else {
         break;
      }
   }
   PrintWriter newout;
   try {
```

```
            newout = new PrintWriter(new FileWriter(selectedFile));
        }
        catch (Exception e) {
            throw new IllegalArgumentException("Can't open file \"" + selectedFile.getName() + "\" for
output.\n"
                                + "(Error :" + e + ")");
        }
        if (!writingStandardOutput) {
            try {
                out.close();
            }
            catch (Exception e) {
            }
        }
        out = newout;
        writingStandardOutput = false;
        outputFileName = selectedFile.getName();
        outputErrorCount = 0;
        return true;
    }


    /**
     * If TextIO is currently reading from a file, then the return value is the name of the file.
     * If the class is reading from standard input or from a stream, then the return value is null.
     */
    public static String getInputFileName() {
        return inputFileName;
    }


    /**
     * If TextIO is currently writing to a file, then the return value is the name of the file.
```

```
 * If the class is writing to standard output or to a stream, then the return value is null.
 */
public static String getOutputFileName() {
   return outputFileName;
}



// ************************** Output Methods *********************************

/**
 * Write a single value to the current output destination, using the default format
 * and no extra spaces.  This method will handle any type of parameter, even one
 * whose type is one of the primitive types.
 */
public static void put(Object x) {
   out.print(x);
   out.flush();
   if (out.checkError())
      outputError("Error while writing output.");
}

/**
 * Write a single value to the current output destination, using the default format
 * and outputting at least minChars characters (with extra spaces added before the
 * output value if necessary).  This method will handle any type of parameter, even one
 * whose type is one of the primitive types.
 * @param x The value to be output, which can be of any type.
 * @param minChars The minimum number of characters to use for the output.  If x requires fewer
 * then this number of characters, then extra spaces are added to the front of x to bring
 * the total up to minChars.  If minChars is less than or equal to zero, then x will be printed
 * in the minimum number of spaces possible.
 */
```

```
public static void put(Object x, int minChars)  {
    if (minChars <= 0)
        out.print(x);
    else
        out.printf("%" + minChars + "s", x);
    out.flush();
    if (out.checkError())
        outputError("Error while writing output.");
}

/**
 * This is equivalent to put(x), followed by an end-of-line.
 */
public static void putln(Object x) {
    out.println(x);
    out.flush();
    if (out.checkError())
        outputError("Error while writing output.");
}

/**
 * This is equivalent to put(x,minChars), followed by an end-of-line.
 */
public static void putln(Object x, int minChars) {
    put(x,minChars);
    out.println();
    out.flush();
    if (out.checkError())
        outputError("Error while writing output.");
}

/**
```

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```
 * Write an end-of-line character to the current output destination.
 */
public static void putln() {
    out.println();
    out.flush();
    if (out.checkError())
        outputError("Error while writing output.");
}

/**
 * Writes formatted output values to the current output destination.  This method has the
 * same function as System.out.printf(); the details of formatted output are not discussed
 * here.  The first parameter is a string that describes the format of the output.  There
 * can be any number of additional parameters; these specify the values to be output and
 * can be of any type.  This method will throw an IllegalArgumentException if the
 * format string is null or if the format string is illegal for the values that are being
 * output.
 */
public static void putf(String format, Object... items) {
    if (format == null)
        throw new IllegalArgumentException("Null format string in TextIO.putf() method.");
    try {
        out.printf(format,items);
    }
    catch (IllegalFormatException e) {
        throw new IllegalArgumentException("Illegal format string in TextIO.putf() method.");
    }
    out.flush();
    if (out.checkError())
        outputError("Error while writing output.");
}
```

```
// ************************** Input Methods ********************************

/**
 * Test whether the next character in the current input source is an end-of-line.  Note that
 * this method does NOT skip whitespace before testing for end-of-line -- if you want to do
 * that, call skipBlanks() first.
 */
public static boolean eoln() {
   return peek() == '\n';
}

/**
 * Test whether the next character in the current input source is an end-of-file.  Note that
 * this method does NOT skip whitespace before testing for end-of-line -- if you want to do
 * that, call skipBlanks() or skipWhitespace() first.
 */
public static boolean eof()  {
   return peek() == EOF;
}

/**
 * Reads the next character from the current input source.  The character can be a whitespace
 * character; compare this to the getChar() method, which skips over whitespace and returns the
 * next non-whitespace character.  An end-of-line is always returned as the character '\n', even
 * when the actual end-of-line in the input source is something else, such as '\r' or "\r\n".
 * This method will throw an IllegalArgumentException if the input is at end-of-file (which will
 * not ordinarily happen if reading from standard input).
 */
public static char getAnyChar() {
   return readChar();
}
```

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```
/**
 * Returns the next character in the current input source, without actually removing that
 * character from the input.  The character can be a whitespace character and can be the
 * end-of-file character (specified by the constant TextIO.EOF).An end-of-line is always returned
 * as the character '\n', even when the actual end-of-line in the input source is something else,
 * such as '\r' or "\r\n".  This method never causes an error.
 */
public static char peek() {
   return lookChar();
}

/**
 * Skips over any whitespace characters, except for end-of-lines.  After this method is called,
 * the next input character is either an end-of-line, an end-of-file, or a non-whitespace character.
 * This method never causes an error.  (Ordinarily, end-of-file is not possible when reading from
 * standard input.)
 */
public static void skipBlanks() {
   char ch=lookChar();
   while (ch != EOF && ch != '\n' && Character.isWhitespace(ch)) {
      readChar();
      ch = lookChar();
   }
}

/**
 * Skips over any whitespace characters, including for end-of-lines.  After this method is called,
 * the next input character is either an end-of-file or a non-whitespace character.
 * This method never causes an error. (Ordinarily, end-of-file is not possible when reading from
 * standard input.)
 */
private static void skipWhitespace() {
```

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```
    char ch=lookChar();
    while (ch != EOF && Character.isWhitespace(ch)) {
        readChar();
        if (ch == '\n' && readingStandardInput && writingStandardOutput) {
            out.print("? ");
            out.flush();
        }
        ch = lookChar();
    }
}

/**
 * Skips whitespace characters and then reads a value of type byte from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
 */
public static byte getlnByte() {
    byte x=getByte();
    emptyBuffer();
    return x;
}

/**
 * Skips whitespace characters and then reads a value of type short from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
 */
public static short getlnShort() {
    short x=getShort();
    emptyBuffer();
```

```
    return x;
}

/**
 * Skips whitespace characters and then reads a value of type int from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
 */
public static int getlnInt() {
    int x=getInt();
    emptyBuffer();
    return x;
}

/**
 * Skips whitespace characters and then reads a value of type long from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
 */
public static long getlnLong() {
    long x=getLong();
    emptyBuffer();
    return x;
}

/**
 * Skips whitespace characters and then reads a value of type float from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
```

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```
 */
public static float getlnFloat() {
   float x=getFloat();
   emptyBuffer();
   return x;
}

/**
 * Skips whitespace characters and then reads a value of type double from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
 */
public static double getlnDouble() {
   double x=getDouble();
   emptyBuffer();
   return x;
}

/**
 * Skips whitespace characters and then reads a value of type char from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  Note that the value
 * that is returned will be a non-whitespace character; compare this with the getAnyChar() method.
 * When using standard IO, this will not produce an error.  In other cases, an error can occur if
 * an end-of-file is encountered.
 */
public static char getlnChar() {
   char x=getChar();
   emptyBuffer();
   return x;
}
```

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```
/**
 * Skips whitespace characters and then reads a value of type boolean from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  When using standard IO,
 * this will not produce an error; the user will be prompted repeatedly for input until a legal value
 * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
 * <p>Legal inputs for a boolean input are: true, t, yes, y, 1, false, f, no, n, and 0; letters can be
 * either upper case or lower case. One "word" of input is read, using the getWord() method, and it
 * must be one of these; note that the "word"  must be terminated by a whitespace character (or end-of-file).
 */
public static boolean getlnBoolean() {
   boolean x=getBoolean();
   emptyBuffer();
   return x;
}

/**
 * Skips whitespace characters and then reads one "word" from input, discarding the rest of
 * the current line of input (including the next end-of-line character, if any).  A word is defined as
 * a sequence of non-whitespace characters (not just letters!).   When using standard IO,
 * this will not produce an error.  In other cases, an IllegalArgumentException will be thrown
 * if an end-of-file is encountered.
 */
public static String getlnWord() {
   String x=getWord();
   emptyBuffer();
   return x;
}

/**
 * This is identical to getln().
 */
public static String getlnString() {
```

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```
        return getln();
    }

    /**
     * Reads all the characters from the current input source, up to the next end-of-line.  The end-of-line
     * is read but is not included in the return value.  Any other whitespace characters on the line are retained,
     * even if they occur at the start of input.  The return value will be an empty string if there are
     * no characters before the end-of-line.  When using standard IO, this will not produce an error.
     * In other cases, an IllegalArgumentException will be thrown if an end-of-file is encountered.
     */
    public static String getln() {
        StringBuffer s = new StringBuffer(100);
        char ch = readChar();
        while (ch != '\n') {
            s.append(ch);
            ch = readChar();
        }
        return s.toString();
    }

    /**
     * Skips whitespace characters and then reads a value of type byte from input.  Any additional characters on
     * the current line of input are retained, and will be read by the next input operation.  When using standard
IO,
     * this will not produce an error; the user will be prompted repeatedly for input until a legal value
     * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
     */
    public static byte getByte()   {
        return (byte)readInteger(-128L,127L);
    }

    /**
     * Skips whitespace characters and then reads a value of type short from input.  Any additional characters on
```

```
     * the current line of input are retained, and will be read by the next input operation.  When using standard
IO,
     * this will not produce an error; the user will be prompted repeatedly for input until a legal value
     * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
     */
    public static short getShort() {
        return (short)readInteger(-32768L,32767L);
    }

    /**
     * Skips whitespace characters and then reads a value of type int from input.  Any additional characters on
     * the current line of input are retained, and will be read by the next input operation.  When using standard
IO,
     * this will not produce an error; the user will be prompted repeatedly for input until a legal value
     * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
     */
    public static int getInt()     {
        return (int)readInteger(Integer.MIN_VALUE, Integer.MAX_VALUE);
    }

    /**
     * Skips whitespace characters and then reads a value of type long from input.  Any additional characters on
     * the current line of input are retained, and will be read by the next input operation.  When using standard
IO,
     * this will not produce an error; the user will be prompted repeatedly for input until a legal value
     * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
     */
    public static long getLong()   {
        return readInteger(Long.MIN_VALUE, Long.MAX_VALUE);
    }

    /**
     * Skips whitespace characters and then reads a single non-whitespace character from input.  Any additional
characters on
```

```
    * the current line of input are retained, and will be read by the next input operation.  When using standard
IO,
    * this will not produce an error.  In other cases, an IllegalArgumentException will be thrown if an end-of-file
    * is encountered.
    */
   public static char getChar() {
      skipWhitespace();
      return readChar();
   }

   /**
    * Skips whitespace characters and then reads a value of type float from input.  Any additional characters on
    * the current line of input are retained, and will be read by the next input operation.  When using standard
IO,
    * this will not produce an error; the user will be prompted repeatedly for input until a legal value
    * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
    */
   public static float getFloat() {
      float x = 0.0F;
      while (true) {
         String str = readRealString();
         if (str == null) {
            errorMessage("Floating point number not found.",
                  "Real number in the range " + (-Float.MAX_VALUE) + " to " + Float.MAX_VALUE);
         }
         else {
            try {
               x = Float.parseFloat(str);
            }
            catch (NumberFormatException e) {
               errorMessage("Illegal floating point input, " + str + ".",
                     "Real number in the range " +  (-Float.MAX_VALUE) + " to " + Float.MAX_VALUE);
               continue;
```

```
                }
                if (Float.isInfinite(x)) {
                    errorMessage("Floating point input outside of legal range, " + str + ".",
                            "Real number in the range " +  (-Float.MAX_VALUE) + " to " + Float.MAX_VALUE);
                    continue;
                }
                break;
            }
        }
        inputErrorCount = 0;
        return x;
    }

    /**
     * Skips whitespace characters and then reads a value of type double from input.  Any additional characters on
     * the current line of input are retained, and will be read by the next input operation.  When using standard IO,
     * this will not produce an error; the user will be prompted repeatedly for input until a legal value
     * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
     */
    public static double getDouble() {
        double x = 0.0;
        while (true) {
            String str = readRealString();
            if (str == null) {
                errorMessage("Floating point number not found.",
                        "Real number in the range " + (-Double.MAX_VALUE) + " to " + Double.MAX_VALUE);
            }
            else {
                try {
                    x = Double.parseDouble(str);
                }
```

```
            catch (NumberFormatException e) {
               errorMessage("Illegal floating point input, " + str + ".",
                     "Real number in the range " + (-Double.MAX_VALUE) + " to " + Double.MAX_VALUE);
               continue;
            }
            if (Double.isInfinite(x)) {
               errorMessage("Floating point input outside of legal range, " + str + ".",
                     "Real number in the range " + (-Double.MAX_VALUE) + " to " + Double.MAX_VALUE);
               continue;
            }
            break;
         }
      }
      inputErrorCount = 0;
      return x;
   }

   /**
    * Skips whitespace characters and then reads one "word" from input. Any additional characters on
    * the current line of input are retained, and will be read by the next input operation.  A word is defined as
    * a sequence of non-whitespace characters (not just letters!).   When using standard IO,
    * this will not produce an error.  In other cases, an IllegalArgumentException will be thrown
    * if an end-of-file is encountered.
    */
   public static String getWord() {
      skipWhitespace();
      StringBuffer str = new StringBuffer(50);
      char ch = lookChar();
      while (ch == EOF || !Character.isWhitespace(ch)) {
         str.append(readChar());
         ch = lookChar();
      }
```

```
        return str.toString();
    }

    /**
     * Skips whitespace characters and then reads a value of type boolean from input.  Any additional characters on
     * the current line of input are retained, and will be read by the next input operation.  When using standard IO,
     * this will not produce an error; the user will be prompted repeatedly for input until a legal value
     * is input.  In other cases, an IllegalArgumentException will be thrown if a legal value is not found.
     * <p>Legal inputs for a boolean input are: true, t, yes, y, 1, false, f, no, n, and 0; letters can be
     * either upper case or lower case. One "word" of input is read, using the getWord() method, and it
     * must be one of these; note that the "word"  must be terminated by a whitespace character (or end-of-file).
     */
    public static boolean getBoolean() {
        boolean ans = false;
        while (true) {
            String s = getWord();
            if ( s.equalsIgnoreCase("true") || s.equalsIgnoreCase("t") ||
                    s.equalsIgnoreCase("yes")  || s.equalsIgnoreCase("y") ||
                    s.equals("1") ) {
                ans = true;
                break;
            }
            else if ( s.equalsIgnoreCase("false") || s.equalsIgnoreCase("f") ||
                    s.equalsIgnoreCase("no")  || s.equalsIgnoreCase("n") ||
                    s.equals("0") ) {
                ans = false;
                break;
            }
            else
                errorMessage("Illegal boolean input value.",
                "one of:  true, false, t, f, yes, no, y, n, 0, or 1");
```

```
        }
        inputErrorCount = 0;
        return ans;
    }

    // ***************** Everything beyond this point is private implementation detail *******************

    private static String inputFileName;  // Name of file that is the current input source, or null if the source is not a file.
    private static String outputFileName; // Name of file that is the current output destination, or null if the destination is not a file.

    private static JFileChooser fileDialog; // Dialog used by readUserSelectedFile() and writeUserSelectedFile()

    private final static BufferedReader standardInput = new BufferedReader(new InputStreamReader(System.in));  // wraps standard input stream
    private final static PrintWriter standardOutput = new PrintWriter(System.out);  // wraps standard output stream

    private static BufferedReader in = standardInput;  // Stream that data is read from; the current input source.
    private static PrintWriter out = standardOutput;   // Stream that data is written to; the current output destination.

    private static boolean readingStandardInput = true;
    private static boolean writingStandardOutput = true;

    private static int inputErrorCount;  // Number of consecutive errors on standard input; reset to 0 when a successful read occurs.
    private static int outputErrorCount;  // Number of errors on standard output since it was selected as the output destination.

    private static Matcher integerMatcher;  // Used for reading integer numbers; created from the integer Regex Pattern.
    private static Matcher floatMatcher;   // Used for reading floating point numbers; created from the floatRegex Pattern.
```

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```
    private final static Pattern integerRegex = Pattern.compile("(\\+|-)?[0-9]+");
    private final static Pattern floatRegex = Pattern.compile("(\\+|-)?(([0-9]+(\\.[0-9]*)?)|(\\.[0-
9]+))((e|E)(\\+|-)?[0-9]+)?");

    private static String buffer = null;  // One line read from input.
    private static int pos = 0;           // Position of next char in input line that has not yet been processed.

    private static String readRealString() {   // read chars from input following syntax of real numbers
        skipWhitespace();
        if (lookChar() == EOF)
            return null;
        if (floatMatcher == null)
            floatMatcher = floatRegex.matcher(buffer);
        floatMatcher.region(pos,buffer.length());
        if (floatMatcher.lookingAt()) {
            String str = floatMatcher.group();
            pos = floatMatcher.end();
            return str;
        }
        else
            return null;
    }

    private static String readIntegerString() {  // read chars from input following syntax of integers
        skipWhitespace();
        if (lookChar() == EOF)
            return null;
        if (integerMatcher == null)
            integerMatcher = integerRegex.matcher(buffer);
        integerMatcher.region(pos,buffer.length());
        if (integerMatcher.lookingAt()) {
            String str = integerMatcher.group();
            pos = integerMatcher.end();
```

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```
            return str;
        }
        else
            return null;
    }

    private static long readInteger(long min, long max) {  // read long integer, limited to specified range
        long x=0;
        while (true) {
            String s = readIntegerString();
            if (s == null){
                errorMessage("Integer value not found in input.",
                        "Integer in the range " + min + " to " + max);
            }
            else {
                String str = s.toString();
                try {
                    x = Long.parseLong(str);
                }
                catch (NumberFormatException e) {
                    errorMessage("Illegal integer input, " + str + ".",
                            "Integer in the range " + min + " to " + max);
                    continue;
                }
                if (x < min || x > max) {
                    errorMessage("Integer input outside of legal range, " + str + ".",
                            "Integer in the range " + min + " to " + max);
                    continue;
                }
                break;
            }
        }
```

```
    inputErrorCount = 0;
    return x;
}


private static void errorMessage(String message, String expecting) {  // Report error on input.
    if (readingStandardInput && writingStandardOutput) {
            // inform user of error and force user to re-enter.
        out.println();
        out.print("  *** Error in input: " + message + "\n");
        out.print("  *** Expecting: " + expecting + "\n");
        out.print("  *** Discarding Input: ");
        if (lookChar() == '\n')
            out.print("(end-of-line)\n\n");
        else {
            while (lookChar() != '\n')    // Discard and echo remaining chars on the current line of input.
                out.print(readChar());
            out.print("\n\n");
        }
        out.print("Please re-enter: ");
        out.flush();
        readChar();  // discard the end-of-line character
        inputErrorCount++;
        if (inputErrorCount >= 10)
            throw new IllegalArgumentException("Too many input consecutive input errors on standard input.");
    }
    else if (inputFileName != null)
        throw new IllegalArgumentException("Error while reading from file \"" + inputFileName + "\":\n"
                + message + "\nExpecting " + expecting);
    else
        throw new IllegalArgumentException("Error while reading from inptu stream:\n"
                + message + "\nExpecting " + expecting);
```

```
}

private static char lookChar() {  // return next character from input
    if (buffer == null || pos > buffer.length())
        fillBuffer();
    if (buffer == null)
        return EOF;
    else if (pos == buffer.length())
        return '\n';
    else
        return buffer.charAt(pos);
}

private static char readChar() {  // return and discard next character from input
    char ch = lookChar();
    if (buffer == null) {
        if (readingStandardInput)
            throw new IllegalArgumentException("Attempt to read past end-of-file in standard input???");
        else
            throw new IllegalArgumentException("Attempt to read past end-of-file in file \"" + inputFileName
+ "\".");
    }
    pos++;
    return ch;
}

private static void fillBuffer() {    // Wait for user to type a line and press return,
    try {
        buffer = in.readLine();
    }
    catch (Exception e) {
        if (readingStandardInput)
            throw new IllegalArgumentException("Error while reading standard input???");
```

```
        else if (inputFileName != null)
            throw new IllegalArgumentException("Error while attempting to read from file \"" + inputFileName
+ "\".");
        else
            throw new IllegalArgumentException("Errow while attempting to read form an input stream.");
    }
    pos = 0;
    floatMatcher = null;
    integerMatcher = null;
}

private static void emptyBuffer() {   // discard the rest of the current line of input
    buffer = null;
}

private static void outputError(String message) {  // Report an error on output.
    if (writingStandardOutput) {
        System.err.println("Error occurred in TextIO while writing to standard output!!");
        outputErrorCount++;
        if (outputErrorCount >= 10) {
            outputErrorCount = 0;
            throw new IllegalArgumentException("Too many errors while writing to standard output.");
        }
    }
    else if (outputFileName != null){
        throw new IllegalArgumentException("Error occurred while writing to file \""
                + outputFileName+ "\":\n   " + message);
    }
    else {
        throw new IllegalArgumentException("Error occurred while writing to output stream:\n   " + message);
    }
}
```

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```
} // end of class TextIO
```

Step 8: Click on the Compile button and the program will be compiled. If there are any errors correct the errors and compile the program again.

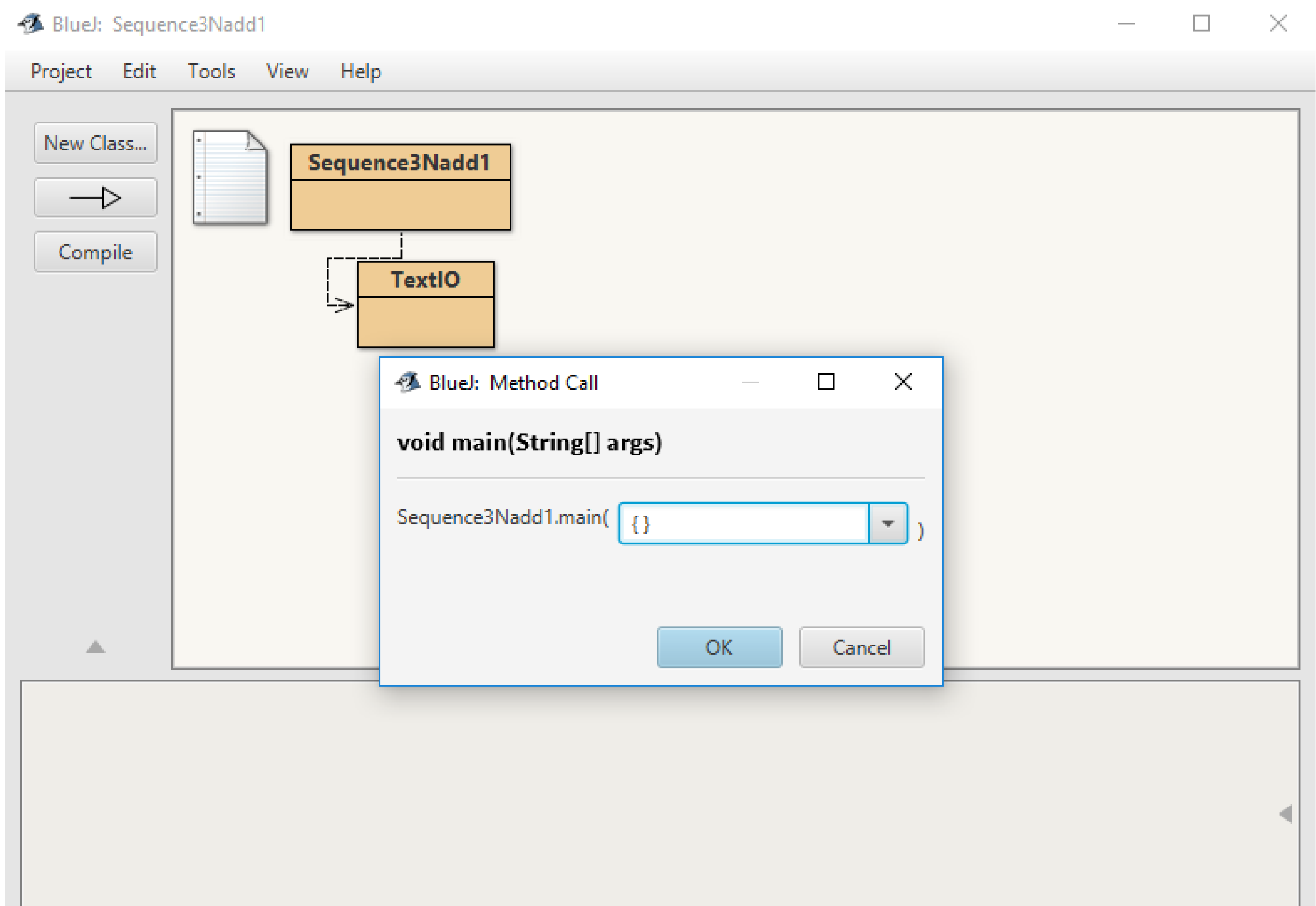
Step 9: Minimize the editor by click on the "_" button in the upper right hand corner of the screen.

Step 10: Right click on the Sequence3Nadd1 box and a drop down menu will appear.

Step 11: Click on void main(String[ ] args) to start the program.

Step 12: Click on the OK button to run the program.

Step 13: A BlueJ Terminal Window will open and you will see the output displayed.



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Output: