

### Programming Assignment 3 Grading Rubric

The rubric below will be applied to Programming Assignment 3.

Criteria	Notes	MaxPts	Earned Pts
Author Comments		6	6
Informational Comment		6	1
Program Formatting		6	6
Meets I/O/ Specification	N/A	12	12
Program Produces Correct Answers	dimensions in transpose copy loop assignment reversed	40	36
Program Compilation	misspelled package name method & class should be public — Fixed to compile	30	25
Total Points per program		100	86

```
// Prof Pitts: wrong package name; Java convention is to use all lower case
// in package name. I specified matrix as the package name.
//package Matrix;
package matrix;

// Author: Raja Pragnesh Reddy Nandyala

// Assignment: Programming Assignment 3

// Instructor: Prof Dave Pitts

// Date: 3/19/2016

// Prof Pitts: class Matrix must be public to be seen outside of the package
// The main class of a file should be public
// class Matrix {
public class Matrix {
    private double[][] array;

    // constructor with rows and columns are given to the array2D and throws an
    // exception if array length and rows & column not matching
// Prof Pitts: the constructor should be public; otherwise it can not be
// used by classes outside the package
// Matrix(int numRows, int numCols, double[][] array2D) throws IllegalArgumentException
    public Matrix(int numRows, int numCols, double[][] array2D) throws IllegalArgumentException {
        if (numRows != array2D.length)
            throw new IllegalArgumentException("hope you do not like to copy the data, rows mismatched..!");

        for (int i = 0; i < array2D.length; i++)
            if (numCols != array2D[i].length) {
                throw new IllegalArgumentException("hope you do not like to copy the data, column mismatched..!");
            }

        array = new double[array2D.length][array2D[0].length];

        for (int row = 0; row < numRows; row++)
            for (int column = 0; column < numCols; column++) {
                array[row][column] = array2D[row][column];
            }
    }

    // creating a zero matrix and initializing to zero
    public Matrix(int numRows, int numCols) {
        array = new double[numRows][numCols];
    }

    public double[][] getArray() {
        double[][] tempArray = new double[array.length][array[0].length];
        for (int i = 0; i < array.length; i++) {
            for (int j = 0; j < array[0].length; j++) {
                tempArray[i][j] = array[i][j];
            }
        }
        return tempArray;
    }
}
```

```
    }

    public double getElement(int row, int col) throws IllegalArgumentException {
        // to read particular element from given array if out of range like zero
        // or greater than limit values
        // are entered then this throws a exception
        if ((array.length >= row && array[0].length >= col && row > 0 && col >
0)) {
            return array[row - 1][col - 1];

        } else {
            // when exception is occurred else block is executed
            throw new IllegalArgumentException("enter row and column with i
n range");
        }
    }

    public void setElement(int row, int col, double newV) throws IllegalArgumentExc
eption {
        if (array.length >= row && array[0].length >= col && row > 0 && col > 0
) {
            array[row - 1][col - 1] = newV;
        } else {
            throw new IllegalArgumentException(" enter row and column with
in range");
        }
    }

    // Prof Pitts: this should be a public method otherwise it can not be seen
    // outside the class
    // Matrix add(Matrix m) throws IllegalArgumentException {
    public Matrix add(Matrix m) throws IllegalArgumentException {
        if ((this.array.length != m.array.length) || (this.array[0].length != m
.array[0].length))
            throw new IllegalArgumentException("both columns and rows are n
ot matched");

        Matrix sum = new Matrix(m.array.length, m.array[0].length);

        for (int i = 0; i < array.length; i++) {
            for (int j = 0; j < array[0].length; j++) {
                sum.array[i][j] = this.array[i][j] + m.array[i][j];
            }
        }
        return sum;
    }

    // Prof Pitts: this should be a public method otherwise it can not be seen
    // outside the class
    // Matrix subtract(Matrix m) throws IllegalArgumentException {
    public Matrix subtract(Matrix m) throws IllegalArgumentException {
        if ((this.array.length != m.array.length) || (this.array[0].length != m
.array[0].length))
            throw new IllegalArgumentException("both columns and rows are n
ot matched");

        Matrix subtract = new Matrix(m.array.length, m.array[0].length);
        for (int i = 0; i < array.length; i++) {
            for (int j = 0; j < array[0].length; j++) {
                subtract.array[i][j] = this.array[i][j] - m.array[i][j]
```

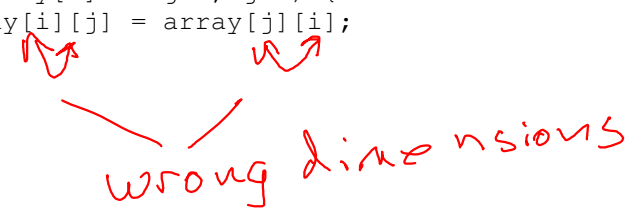
```
;
    }

    }
    return subtract;
}

public String toString() {
    StringBuilder concat = new StringBuilder();
    for (int i = 0; i < array.length; i++) {
        for (int j = 0; j < array[0].length; j++) {
            concat.append(array[i][j]).append(" ");
        }
        concat.append("\n");
    }
    return concat.toString();
}

// Prof Pitts: wrong definition for the transpose method. It should be lower case
// public Matrix transpose()
// public Matrix Transpose() {
//     public Matrix transpose() {

        Matrix Transpose = new Matrix(array[0].length, array.length);
        for (int i = 0; i < array.length; i++) {
            for (int j = 0; j < array[0].length; j++) {
                Transpose.array[i][j] = array[j][i];
            }
        }
        return Transpose;
    }
}
```



wrong dimensions

```
// Prof Pitts: wrong package name. Java package names are lower case by
// convention. I specified the package name matrix.
// package Matrix;
package matrix;

// Author: Raja Pragnesh Reddy Nandyala

// Assignment: Programming Assignment 3

// Instructor: Prof Dave Pitts

// Date: 3/19/2016
public class SquareMatrix extends Matrix{
public SquareMatrix(int rc, double [][] array2D)throws IllegalArgumentException{
    super(rc,rc,array2D);
}
public SquareMatrix(int rc){
    super(rc,rc);
}
}
```

Caught exception java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..! creating 20x30 matrix with 2x3 array  
java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..!

at matrix.Matrix.<init>(Matrix.java:29)  
at MatrixDriver.main(MatrixDriver.java:26)

Caught exception java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..! creating -1x30 matrix with 2x3 array  
java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..!

at matrix.Matrix.<init>(Matrix.java:29)  
at MatrixDriver.main(MatrixDriver.java:34)

Caught exception java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..! creating m5x62; should not  
java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..!

at matrix.Matrix.<init>(Matrix.java:29)  
at MatrixDriver.main(MatrixDriver.java:79)

Caught exception java.lang.IllegalArgumentException: hope you do not like to copy the data, rows mismatched..! creating m5x63; should not

m2x31:

1.0 2.0 3.0  
1.0 2.0 3.0

m2x32:

1.0 1.0 1.0  
1.0 1.0 1.0

m2x33:

0.0 0.0 0.0  
0.0 0.0 0.0

m5x61:

0.0 0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0 0.0

m5x62:

null

m5x63:

null

m4x41:

1.0 2.0 3.0 4.0  
1.0 2.0 3.0 4.0  
1.0 2.0 3.0 4.0  
1.0 2.0 3.0 4.0

m4x42:

1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0

m4x43:

0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0

m2x2s1:

2.0 3.0

3.0 2.0

m2x2s2:

1.0 1.0

1.0 1.0

m2x2s3:

0.0 0.0

0.0 0.0

m2x2ns1:

1.0 1.0

1.0 1.0

m3x2:

0.0 0.0

0.0 0.0

0.0 0.0

m6x5:

0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0

Caught exception java.lang.ArrayIndexOutOfBoundsException: 2 m2x31 transpose; should not

java.lang.ArrayIndexOutOfBoundsException: 2

at matrix.Matrix.transpose(Matrix.java:138)

at MatrixDriver.main(MatrixDriver.java:292)

Caught exception java.lang.ArrayIndexOutOfBoundsException: 2 m2x32 transpose; should not

java.lang.ArrayIndexOutOfBoundsException: 2

at matrix.Matrix.transpose(Matrix.java:138)

at MatrixDriver.main(MatrixDriver.java:300)

Caught exception java.lang.ArrayIndexOutOfBoundsException: 2 m2x33 transpose; should not

java.lang.ArrayIndexOutOfBoundsException: 2

at matrix.Matrix.transpose(Matrix.java:138)

at MatrixDriver.main(MatrixDriver.java:308)

Caught exception java.lang.ArrayIndexOutOfBoundsException: 5 m5x61 transpose; should not

java.lang.ArrayIndexOutOfBoundsException: 5

at matrix.Matrix.transpose(Matrix.java:138)

at MatrixDriver.main(MatrixDriver.java:316)

Caught exception java.lang.NullPointerException m5x62 transpose; should not

java.lang.NullPointerException

at MatrixDriver.main(MatrixDriver.java:324)

Caught exception java.lang.NullPointerException m5x63 transpose; should not

java.lang.NullPointerException

at MatrixDriver.main(MatrixDriver.java:332)

Transpose of m4x41:

1.0 1.0 1.0 1.0

2.0 2.0 2.0 2.0

3.0 3.0 3.0 3.0

4.0 4.0 4.0 4.0

Transpose of m4x42:

1.0 1.0 1.0 1.0

1.0 1.0 1.0 1.0

1.0 1.0 1.0 1.0

1.0 1.0 1.0 1.0

Transpose of m4x43:

0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0

Transpose of m2x2s1:

2.0 3.0  
3.0 2.0

Transpose of m2x2s2:

1.0 1.0  
1.0 1.0

Transpose of m2x2s3:

0.0 0.0  
0.0 0.0

Transpose of m2x2ns1:

1.0 1.0  
1.0 1.0

Caught exception java.lang.ArrayIndexOutOfBoundsException: 2 m3x2 transpose; should not  
java.lang.ArrayIndexOutOfBoundsException: 2

at matrix.Matrix.transpose(Matrix.java:138)

at MatrixDriver.main(MatrixDriver.java:396)

Caught exception java.lang.ArrayIndexOutOfBoundsException: 5 m6x5 transpose; should not  
java.lang.ArrayIndexOutOfBoundsException: 5

at matrix.Matrix.transpose(Matrix.java:138)

at MatrixDriver.main(MatrixDriver.java:404)

Displaying m2x2s1

[2.0, 3.0]

[3.0, 2.0]

Display results from getElement:

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-2,-2) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-2,-1) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-2,0) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-2,1) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-2,2) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-2,3) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-1,-2) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-1,-1) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-1,0) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-1,1) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-1,2) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range  
for m2x2s1.getElement(-1,3) correct throw of exception

Caught exception java.lang.IllegalArgumentException: enter row and column with in range



```
for m2x2s1.getElement(0,-2) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(0,-1) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(0,0) unexpected throw of exceptions
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(0,1) unexpected throw of exceptions
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(0,2) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(0,3) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(1,-2) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(1,-1) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(1,0) unexpected throw of exceptions
m2x2s1[1][1] = 2.0
m2x2s1[1][2] = 3.0
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(1,3) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(2,-2) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(2,-1) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(2,0) correct throw of exception
m2x2s1[2][1] = 3.0
m2x2s1[2][2] = 2.0
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(2,3) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(3,-2) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(3,-1) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(3,0) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(3,1) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(3,2) correct throw of exception
Caught exception java.lang.IllegalArgumentException: enter row and column with in range
for m2x2s1.getElement(3,3) correct throw of exception
Display of m2x2s1 before setElement used:
2.0 3.0
3.0 2.0

Setting m2x2s1[-2][-2] = -4
Caught exception java.lang.IllegalArgumentException: enter row and column with in rang
e for m2x2s1.setElement(-2,-2,-4) correct throw of exception
Setting m2x2s1[-2][-1] = -3
Caught exception java.lang.IllegalArgumentException: enter row and column with in rang
e for m2x2s1.setElement(-2,-1,-3) correct throw of exception
Setting m2x2s1[-2][0] = -2
Caught exception java.lang.IllegalArgumentException: enter row and column with in rang
e for m2x2s1.setElement(-2,0,-2) correct throw of exception
Setting m2x2s1[-2][1] = -1
Caught exception java.lang.IllegalArgumentException: enter row and column with in rang
e for m2x2s1.setElement(-2,1,-1) correct throw of exception
Setting m2x2s1[-2][2] = 0
Caught exception java.lang.IllegalArgumentException: enter row and column with in rang
e for m2x2s1.setElement(-2,2,0) correct throw of exception
Setting m2x2s1[-2][3] = 1
```

Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-2,3,1) correct throw of exception  
Setting m2x2s1[-1][-2] = -3  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-1,-2,-3) correct throw of exception  
Setting m2x2s1[-1][-1] = -2  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-1,-1,-2) correct throw of exception  
Setting m2x2s1[-1][0] = -1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-1,0,-1) correct throw of exception  
Setting m2x2s1[-1][1] = 0  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-1,1,0) correct throw of exception  
Setting m2x2s1[-1][2] = 1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-1,2,1) correct throw of exception  
Setting m2x2s1[-1][3] = 2  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(-1,3,2) correct throw of exception  
Setting m2x2s1[0][-2] = -2  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(0,-2,-2) correct throw of exception  
Setting m2x2s1[0][-1] = -1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(0,-1,-1) correct throw of exception  
Setting m2x2s1[0][0] = 0  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(0,0,0) unexpected throw of exceptions  
Setting m2x2s1[0][1] = 1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(0,1,1) unexpected throw of exceptions  
Setting m2x2s1[0][2] = 2  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(0,2,2) correct throw of exception  
Setting m2x2s1[0][3] = 3  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(0,3,3) correct throw of exception  
Setting m2x2s1[1][-2] = -1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(1,-2,-1) correct throw of exception  
Setting m2x2s1[1][-1] = 0  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(1,-1,0) correct throw of exception  
Setting m2x2s1[1][0] = 1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(1,0,1) unexpected throw of exceptions  
Setting m2x2s1[1][1] = 2  
Setting m2x2s1[1][2] = 3  
Setting m2x2s1[1][3] = 4  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(1,3,4) correct throw of exception  
Setting m2x2s1[2][-2] = 0  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(2,-2,0) correct throw of exception  
Setting m2x2s1[2][-1] = 1  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(2,-1,1) correct throw of exception  
Setting m2x2s1[2][0] = 2  
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(2,0,2) correct throw of exception  
Setting m2x2s1[2][1] = 3  
Setting m2x2s1[2][2] = 4

```
Setting m2x2s1[2][3] = 5
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(2,3,5) correct throw of exception
Setting m2x2s1[3][-2] = 1
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(3,-2,1) correct throw of exception
Setting m2x2s1[3][-1] = 2
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(3,-1,2) correct throw of exception
Setting m2x2s1[3][0] = 3
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(3,0,3) correct throw of exception
Setting m2x2s1[3][1] = 4
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(3,1,4) correct throw of exception
Setting m2x2s1[3][2] = 5
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(3,2,5) correct throw of exception
Setting m2x2s1[3][3] = 6
Caught exception java.lang.IllegalArgumentException: enter row and column with in range for m2x2s1.setElement(3,3,6) correct throw of exception
Display of m2x2s1 after setElement used:
2.0 3.0
3.0 4.0

m2x31 + m2x32 = 2.0 3.0 4.0
2.0 3.0 4.0

m2x32 + m2x31 = 2.0 3.0 4.0
2.0 3.0 4.0

Correctly caught exception java.lang.IllegalArgumentException: both columns and rows are not matched m2x32 + m5x61
java.lang.IllegalArgumentException: both columns and rows are not matched
    at matrix.Matrix.add(Matrix.java:90)
    at MatrixDriver.main(MatrixDriver.java:504)
Correctly caught exception java.lang.IllegalArgumentException: both columns and rows are not matched m2x32 + m3x2
java.lang.IllegalArgumentException: both columns and rows are not matched
    at matrix.Matrix.add(Matrix.java:90)
    at MatrixDriver.main(MatrixDriver.java:512)
m4x42 + m4x41 = 2.0 3.0 4.0 5.0
2.0 3.0 4.0 5.0
2.0 3.0 4.0 5.0
2.0 3.0 4.0 5.0

Correctly caught exception java.lang.IllegalArgumentException: both columns and rows are not matched m4x42 + m2x2s1
java.lang.IllegalArgumentException: both columns and rows are not matched
    at matrix.Matrix.add(Matrix.java:90)
    at MatrixDriver.main(MatrixDriver.java:528)
m2x2s2 + m2x2s1 = 3.0 4.0
4.0 5.0

m2x2s2 + m2x2ns1 = 2.0 2.0
2.0 2.0

Correctly caught exception java.lang.NullPointerException m5x62 + m6x5
java.lang.NullPointerException
    at MatrixDriver.main(MatrixDriver.java:552)
m4x41 - m4x42 = 0.0 1.0 2.0 3.0
0.0 1.0 2.0 3.0
0.0 1.0 2.0 3.0
```

0.0 1.0 2.0 3.0

Correctly caught exception java.lang.IllegalArgumentException: both columns and rows are not matched m4x41 - m3x2

java.lang.IllegalArgumentException: both columns and rows are not matched

at matrix.Matrix.subtract(Matrix.java:108)

at MatrixDriver.main(MatrixDriver.java:567)