REPORT ON MINI-PROJECT-3
SERVICE ORIENTED
ARCHITECTURES
COURSE ID - ITM 566

Semester	Prepared By	Reviewer
Spring 2013	KUMARAN RAMANUJAM (A20295341)	Jeffery Kimont

Part 1 Project Description:

A web service Java project is to be developed that creates a server - client web service. The client is expected to generate two random 4x4 jama matrices A and B with the help of Jama Library. The client should submit requests to the webservices for the following operations to be conducted on these matrices A & B,

1) addition
2) subtraction
3) multiplication
4) divideL
5) divideR

Eventually response are captured from the client side and displayed in the JSP page.

Installation, Compile and Runtime Requirements:

Required items	Description
Java SE	Version - 1.7.0_06
JDK	JDK 7u7 +
Platform	Mac 0S
Command line tool	Terminal

Expected Result:

- Jama library is to be added to the client and server.
- Web services are constructed to perform add, subtract, multiply, divideL, divideR.
- Wsdl file is generated and copied to server location.
- Web service client is to be created on Client location using the wsdl file of the webservices that constructs the interface (connection) between the client and server.
- Now two 4x4 matrices A and B should be created with randomly filled values using Jama library.
- The soap web services are called from the client for each operation which responds with result.
- JSP page in the client interface are created to place a request capture the response and eventually display them.

Code from web services -

```
@WebMethod(operationName = "add")
public String add(@WebParam(name = "a") String a, @WebParam(name =
"b") String b) {
        Matrix x = str2Mat(a);
        Matrix y = str2Mat(b);
        Matrix z = x.plus(y);
        return mat2Str(z);
    }


@WebMethod(operationName = "subtract")
public String subtract(@WebParam(name = "a") String a, @WebParam(name
= "b") String b) {
        Matrix x = str2Mat(a);
        Matrix y = str2Mat(b);
        Matrix z = x.minus(y);
        return mat2Str(z);
    }
@WebMethod(operationName = "multiply")
```

```java
public String multiply(@WebParam(name = "a") String a, @WebParam(name
= "b") String b) {
        Matrix x = str2Mat(a);
        Matrix y = str2Mat(b);
        Matrix z = x.times(y);
        return mat2Str(z);
    }
@WebMethod(operationName = "divideL")
public String divideL(@WebParam(name = "a") String a, @WebParam(name
= "b") String b) {
        Matrix x = str2Mat(a);
        Matrix y = str2Mat(b);
        Matrix z = x.arrayLeftDivide(y);
        return mat2Str(z);
    }
@WebMethod(operationName = "divideR")
public String divideR(@WebParam(name = "a") String a, @WebParam(name
= "b") String b) {
        Matrix x = str2Mat(a);
        Matrix y = str2Mat(b);
        Matrix z = x.arrayRightDivide(y);
        return mat2Str(z);
    }
```
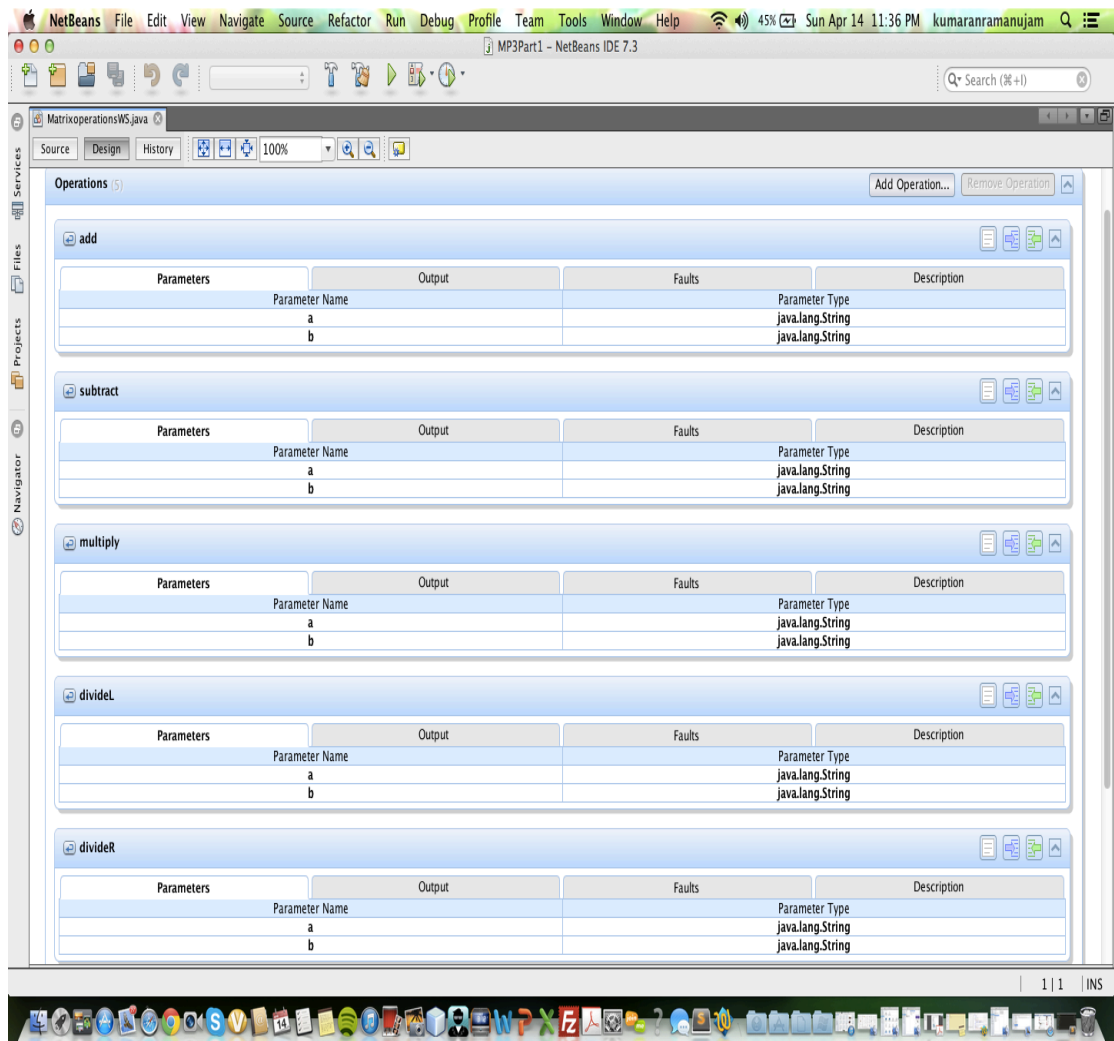
Code from client –

```java
String c = "";
    if (request.getParameter("Operation").equals("add")) {
      c = port.add(sbA.toString(), sbB.toString());
    }
    else if (request.getParameter("Operation").equals("subtract")) {
      c = port.subtract(sbA.toString(), sbB.toString());
    }
    else if (request.getParameter("Operation").equals("multiply")) {
      c = port.multiply(sbA.toString(), sbB.toString());
    }
     else if (request.getParameter("Operation").equals("divideL")) {
      c = port.divideL(sbA.toString(), sbB.toString());
    }
    else if (request.getParameter("Operation").equals("divideR")) {
      c = port.divideR(sbA.toString(), sbB.toString());
    }
```
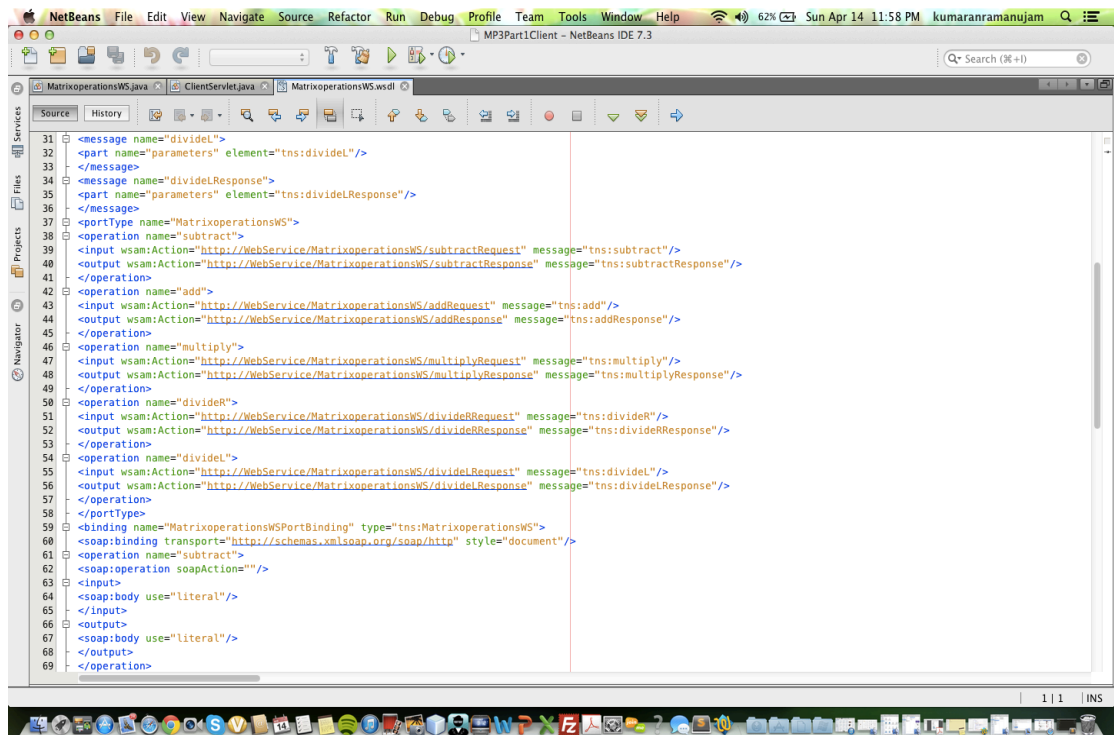
Screen Shot:

Web Service in server side:

Generated XML for the web service:

```
31  <message name="divideL">
32    <part name="parameters" element="tns:divideL"/>
33  </message>
34  <message name="divideLResponse">
35    <part name="parameters" element="tns:divideLResponse"/>
36  </message>
37  <portType name="MatrixoperationsWS">
38  <operation name="subtract">
39    <input wsam:Action="http://WebService/MatrixoperationsWS/subtractRequest" message="tns:subtract"/>
40    <output wsam:Action="http://WebService/MatrixoperationsWS/subtractResponse" message="tns:subtractResponse"/>
41  </operation>
42  <operation name="add">
43    <input wsam:Action="http://WebService/MatrixoperationsWS/addRequest" message="tns:add"/>
44    <output wsam:Action="http://WebService/MatrixoperationsWS/addResponse" message="tns:addResponse"/>
45  </operation>
46  <operation name="multiply">
47    <input wsam:Action="http://WebService/MatrixoperationsWS/multiplyRequest" message="tns:multiply"/>
48    <output wsam:Action="http://WebService/MatrixoperationsWS/multiplyResponse" message="tns:multiplyResponse"/>
49  </operation>
50  <operation name="divideR">
51    <input wsam:Action="http://WebService/MatrixoperationsWS/divideRRequest" message="tns:divideR"/>
52    <output wsam:Action="http://WebService/MatrixoperationsWS/divideRResponse" message="tns:divideRResponse"/>
53  </operation>
54  <operation name="divideL">
55    <input wsam:Action="http://WebService/MatrixoperationsWS/divideLRequest" message="tns:divideL"/>
56    <output wsam:Action="http://WebService/MatrixoperationsWS/divideLResponse" message="tns:divideLResponse"/>
57  </operation>
58  </portType>
59  <binding name="MatrixoperationsWSPortBinding" type="tns:MatrixoperationsWS">
60    <soap:binding transport="http://schemas.xmlsoap.org/soap/http" style="document"/>
61  <operation name="subtract">
62    <soap:operation soapAction=""/>
63  <input>
64    <soap:body use="literal"/>
65  </input>
66  <output>
67    <soap:body use="literal"/>
68  </output>
69  </operation>
```
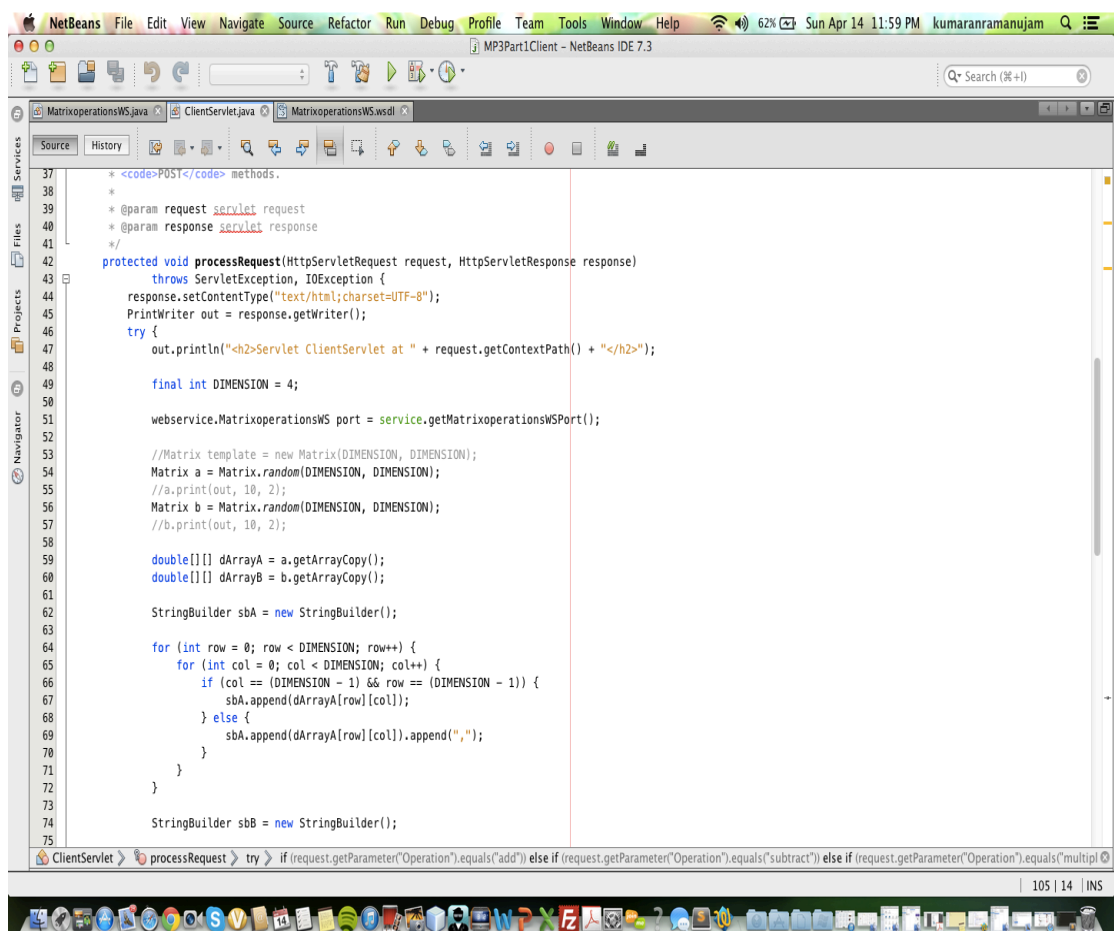
Servlet from client :

```
37      * <code>POST</code> methods.
38      *
39      * @param request servlet request
40      * @param response servlet response
41      */
42     protected void processRequest(HttpServletRequest request, HttpServletResponse response)
43             throws ServletException, IOException {
44         response.setContentType("text/html;charset=UTF-8");
45         PrintWriter out = response.getWriter();
46         try {
47             out.println("<h2>Servlet ClientServlet at " + request.getContextPath() + "</h2>");
48
49             final int DIMENSION = 4;
50
51             webservice.MatrixoperationsWS port = service.getMatrixoperationsWSPort();
52
53             //Matrix template = new Matrix(DIMENSION, DIMENSION);
54             Matrix a = Matrix.random(DIMENSION, DIMENSION);
55             //a.print(out, 10, 2);
56             Matrix b = Matrix.random(DIMENSION, DIMENSION);
57             //b.print(out, 10, 2);
58
59             double[][] dArrayA = a.getArrayCopy();
60             double[][] dArrayB = b.getArrayCopy();
61
62             StringBuilder sbA = new StringBuilder();
63
64             for (int row = 0; row < DIMENSION; row++) {
65                 for (int col = 0; col < DIMENSION; col++) {
66                     if (col == (DIMENSION - 1) && row == (DIMENSION - 1)) {
67                         sbA.append(dArrayA[row][col]);
68                     } else {
69                         sbA.append(dArrayA[row][col]).append(",");
70                     }
71                 }
72             }
73
74             StringBuilder sbB = new StringBuilder();
75
```

Design of JSP Page:

RESPONSE THROUGH TEST SERVICE

subtract Method invocation

Method parameter(s)

Type	Value
java.lang.String	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1
java.lang.String	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1

Method returned

java.lang.String : **"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"**

SOAP Request

```xml
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/">
    <S:Header/>
    <S:Body>
        <ns2:subtract xmlns:ns2="http://WebService/">
            <a>1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1</a>
            <b>1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1</b>
        </ns2:subtract>
    </S:Body>
</S:Envelope>
```

SOAP Response

```xml
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/">
    <S:Body>
        <ns2:subtractResponse xmlns:ns2="http://WebService/">
            <return>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</return>
        </ns2:subtractResponse>
    </S:Body>
</S:Envelope>
```

add Method invocation

Method parameter(s)

Type	Value
java.lang.String	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1
java.lang.String	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1

Method returned

java.lang.String : **"2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0"**

SOAP Request

```xml
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/">
    <S:Header/>
    <S:Body>
        <ns2:add xmlns:ns2="http://WebService/">
            <a>1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1</a>
            <b>1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1</b>
        </ns2:add>
    </S:Body>
</S:Envelope>
```
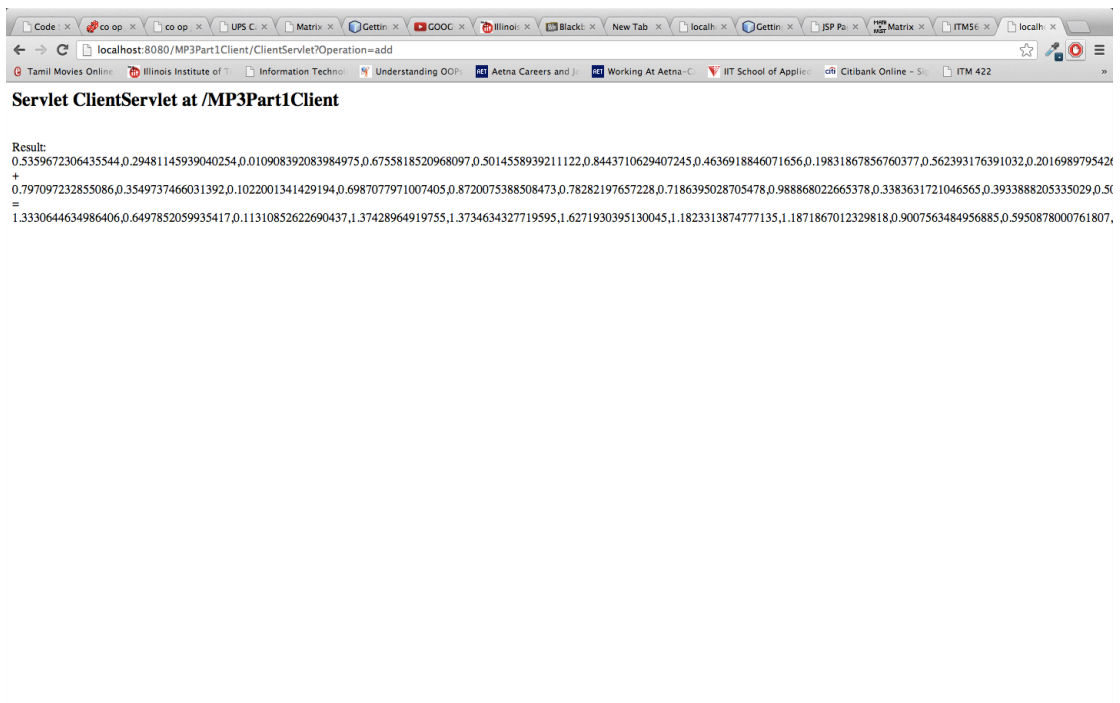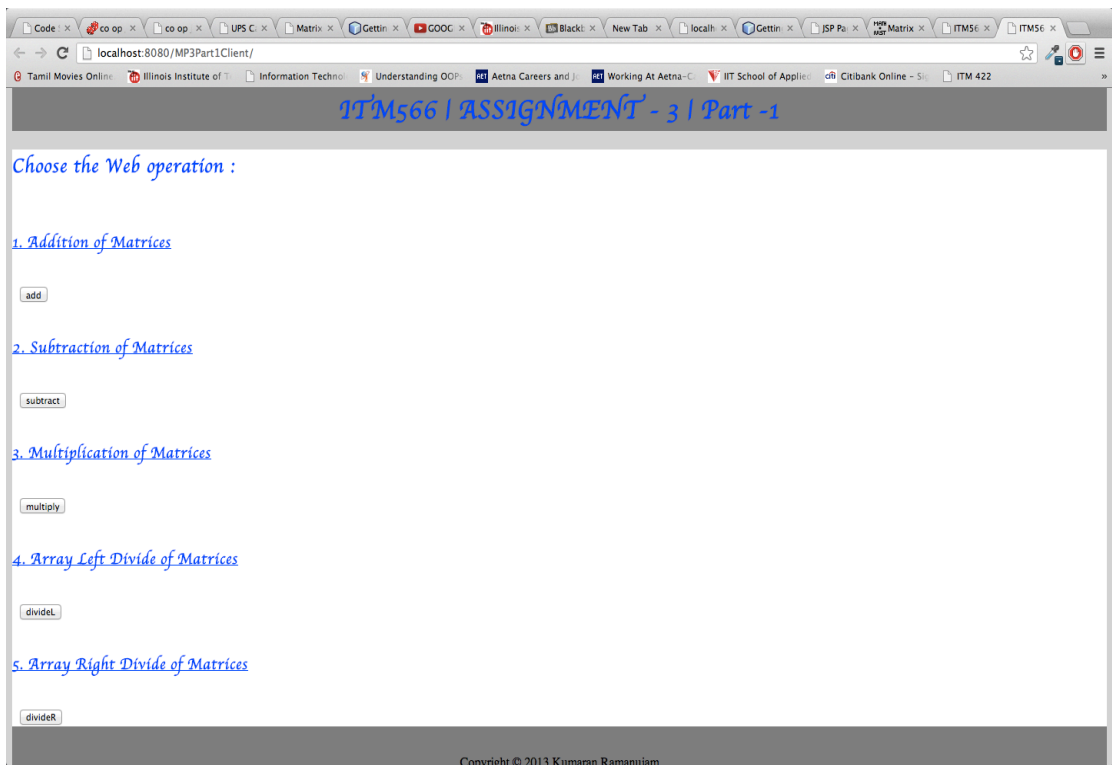
SOAP Response

```xml
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/">
    <S:Body>
        <ns2:addResponse xmlns:ns2="http://WebService/">
            <return>2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0</return>
        </ns2:addResponse>
    </S:Body>
</S:Envelope>
```

RESPONSE THROUGH CLIENT WEB SERVICE

Servlet ClientServlet at /MP3Part1Client

Result:
0.08424224722700602,0.6795413825891113,0.05700177471830892,0.8999352138874173,0.7795831038843773,0.264836710459478,0.5394765689613188,0.5362382461292441,0.8556008305408423,0.22233606213830
+
0.6447176964677909,0.18837662452401338,0.8511978272016599,0.023172778771950675,0.971231505605992,0.3750753260115395,0.4633378305025968,0.6913060385665558,0.30583672950101526,0.224942095170
=
1.2676499498860294,0.8060526654296958,0.6937208041374238,1.020431042965142,1.2441508971971948,0.6788677720297952,1.399970272038473,0.5568581114296938,1.0816988508328713,0.5341261350024566,1

Servlet ClientServlet at /MP3Part1Client

Result:
0.25408139927780414,0.06720350316757828,0.48223563692836435,0.7772303507941426,0.1557233816892466,0.6864184023299165,0.6348660011831296,0.8136190407691688,0.9891373113912882,0.152337833635006
+
0.5101092686904581,0.21319491760079845,0.4589019095439918,0.0904881862177318,0.6969408698741959,0.14403068292447718,0.8360274315572567,0.23016678185651307,0.9379586195330037,0.07417402006495
=
0.49809209197534066,0.31522094393176375,1.050846873589084,8.589301910903357,0.22343844136641902,4.765778988146862,0.7593841747519858,3.534910790369317,1.0545639123011266,2.053789635529772,2

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