Assignment-1

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Solution Model:

-Part 1:

-Hercules emulator for emulating Mainframe on Windows, running MVS3.8 OS and Vista TN3270 command line.

-I found more resources for running Cobol, so generating 5 $\sin^2 x$ values, where x= [1,5] from Cobol program.

-Send these values to the frontend.

-Part 2:

- For N-tier architecture, I used 2 tier Model-Controller architecture using NodeJS and SQLite3 using JavaScript, a 3rd Generation language.

-I stored values of cos x from [1,5] (model) and upon request by the frontend for individual values, extract it from the database and square it to get $\cos^2 x$. Send this value to the frontend.

-Part 3:

- I used React Native to create an app, which I ran on Android emulator.

- For microservices, I am using websockets to connect to the node server and planned to use FTP for data transmission to Mainframe.

- I designed it as such to have a button, upon pressing which:

i) It sends data 1,2,3,4,5 on a channel to NodeJS server at an interval of 1 second each. After each data packet emit, it receives the $\cos^2 x$ value for 1,2,3,4 &5, which it displays.

ii) Then it sends request to mainframe, and all the values are received at once. Display these on screen.

iii) Sum the values for x=1,2,3,4 &5. Averaging the result, we get the desired value, 1.

The repository has been hosted on GitHub at https://github.com/zed-shawn/EDA

1. **Code Blocks:**
    a) **COBOL code with JCL:**

```
000001 //SINEVAL  JOB (COBOL),
000002 //             'Ali Zeeshan',MSGCLASS=H,
000003 //            CLASS=A,
000004 //             REGION=8M,TIME=1440,
000005 //             MSGLEVEL=(1,1)
000006 //STEP01 EXEC PROG=SINVAL
000007 //STEPLIB DD DSN=CUST.PR.LOADLIB,DISP=SHR
000008 //SYSPRINT DD SYSOUT=*
000009 //SYSOUT DD SYSOUT=A
000010 //SYSIN DD DUMMY

000014    30  IDENTIFICATION DIVISION.
000017    40  PROGRAM-ID.  'SINVAL'
000018    50 ***

000020    70  DATA DIVISION.
000021    80  WORKING-STORAGE SECTION.
000022    90      01 VAL1 PIC S9(2)V9(2) VALUE 1.00.
000023   100      01 VAL2 PIC S9(2)V9(2) VALUE 2.00.
000024   110      01 VAL3 PIC S9(2)V9(2) VALUE 3.00.
000025   120      01 VAL4 PIC S9(2)V9(2) VALUE 4.00.
000026   130      01 VAL5 PIC S9(2)V9(2) VALUE 5.00.
000027   140      01 RES1 PIC S9(1)V9(10).
000028   150      01 RES2 PIC S9(1)V9(10).
000029   160      01 RES3 PIC S9(1)V9(10).
000030   170      01 RES4 PIC S9(1)V9(10).
000031   180      01 RES5 PIC S9(1)V9(10).
000032   190 ***
000033   200  PROCEDURE DIVISION.
000034   210      COMPUTE RES1= FUNCTION SIN(VAL1)
000035   220      MULTIPLY RES1 BY RES1.
000036   230      DISPLAY '1,'RES1.
000037   240
000038   250      COMPUTE RES2= FUNCTION SIN(VAL2)
000039   260      MULTIPLY RES2 BY RES2.
000040   270      DISPLAY '2,'RES2.
000041   280
000042   290      COMPUTE RES3= FUNCTION SIN(VAL3)
000043   300      MULTIPLY RES3 BY RES3.
000044   310      DISPLAY '3,'RES3.
000045   320
000046   330      COMPUTE RES4= FUNCTION SIN(VAL4)
000047   340      MULTIPLY RES4 BY RES4.
000048   350      DISPLAY '4,'RES4.
000049   360
000050   370      COMPUTE RES5= FUNCTION SIN(VAL5)
000051   380      MULTIPLY RES5 BY RES5.
```

```
000052   390      DISPLAY '5,'RES5.
000054   410      STOP RUN.
```

b) NodeJS code:

```
const express = require("express");
const socket = require("socket.io");
const sqlite3 = require("sqlite3").verbose();

const PORT = 5000;
const app = express();
const server = app.listen(PORT, function () {
  console.log(`Listening on port ${PORT}`);
  console.log(`http://localhost:${PORT}`);
});

app.use(express.static("public"));

app.get("/", function (req, res) {
  res.render("index", {});
});

// Socket setup
const io = socket(server);

io.on("connection", function (socket) {
  console.log("Made socket connection");

  socket.on("values", (data) => {
    console.log(data);
    searchAndEmit(data);
  });
});

let db = new sqlite3.Database("./cos_val.db", sqlite3.OPEN_READONLY, (err) => {
  if (err) {
    console.error(err.message);
  }
  console.log("Connected to the the database.");
});

const searchAndEmit = (number) => {
  let query = `SELECT value FROM Cos WHERE key = ${number}`;

  db.all(query, [], (err, rows) => {
    if (err) {
      throw err;
    }
    rows.forEach((row) => {
      console.log(row.value);
      sqVal= Math.pow(row.value, 2)
      var appendData = {
```

```
        number: number,
        value: sqVal,
      };

      let sentData = JSON.stringify(appendData);
      io.emit("values", sentData);
    });
  });
};
```

c) React Native code:

```
import React, { useEffect, useState } from "react";
import { StyleSheet, Text, View, Button, FlatList } from "react-native";
import io from "socket.io-client";

const socket = io("http://192.168.0.101:5000", {
  transports: ["websocket"],
  reconnection: false,
});

try {
  socket.on("connect", () => {
    if (socket.connected === true) {
      console.log("Connected to Node Server");
    } // true
  });
} catch (error) {
  console.log("Could not connect", error);
}

class DataPacket {
  constructor(number, value) {
    this.number = number;
    this.value = value;
  }
}

export default function App() {
  const [cosineValue, setCosineValue] = useState([
    {
      number: "Value of X",
      value: "Value of cos^2 x",
    },
  ]);
  const pressHandler = () => {
    console.log("press handler");
    setCosineValue(() => [
      {
        number: "Value of X",
        value: "Value of cos^2 x",
      },
```

```
  ]);
  socket.emit("values", 1);
  setTimeout(() => {
    socket.emit("values", 2);
  }, 300);
  setTimeout(() => {
    socket.emit("values", 3);
  }, 600);
  setTimeout(() => {
    socket.emit("values", 4);
  }, 900);
  setTimeout(() => {
    socket.emit("values", 5);
  }, 1200);
};

useEffect(() => {
  socket.on("values", (data) => {
    console.log(data);
    const receivedMessage = JSON.parse(data);
    const newDataPacket = new DataPacket(
      receivedMessage.number.toString(),
      receivedMessage.value.toString()
    );
    setCosineValue((cosineValue) => [...cosineValue, newDataPacket]);
    console.log(newDataPacket);
  });
}, []);

const renderValues = (itemData) => {
  return (
    <View style={styles.renderTile}>
      <View style={styles.tileComponent}>
        <Text>{itemData.item.number}</Text>
      </View>
      <View style={styles.tileComponent}>
        <Text>{itemData.item.value}</Text>
      </View>
    </View>
  );
};

return (
  <View style={styles.container}>
    <View style={styles.headerBox}>
      <Text style={styles.headingText}>
        Testing the expression sin^2 x + cos^2 x=1
      </Text>
      <Button title="Initiate the Test" color="red" onPress={pressHandler} />
    </View>
    <View>
      <FlatList
        renderItem={renderValues}
```

```
          data={cosineValue}
          keyExtractor={(item, index) => item.number}
        />
      </View>
    </View>
  );
}
```

2. **A) Experience with 3 gen of code:**

Mainframe: This was the most difficult by far. It took me a lot of time to realize what Mainframe and MVS are, and to setup and navigate them. Working with COBOL and JCL was also new. But the most difficult to plan was how to receive and send data from the outside world, as the documentation for mainframes are very rare, and often in languages of the expert. I had planned to use FTP to communicate with the frontend, but unfortunately, I couldn't reach that stage as I had some error in my JCL header of the code, which caused runtime failure.

JavaScript: I have been working with JS for some time now, so it was already familiar. For things which are new, like FTP, documentation was easy to find and use.

I did not use any other language, as JavaScript is from the same generation as Java (which was suggested to use), and the frontend part was also done using JavaScript.

B) Differences between the systems:

Mainframe is a legacy system, so naturally it is hard to get started with initially. However, I was thoroughly impressed by its resource management efficiency, and the failsafe measures implemented on mainframes. It can be seen why mainframes are still used by corporate giants.

On the other hand, node and react are modern frameworks, which can be implemented on any scale. However, I feel the uptime and reliability of data is higher in the case of mainframes, as they are precisely designed for those applications.

C) Difficulties faced & possible solutions:

1. Error with JCL:

   - I was not able to execute COBOL program in mainframe, as I faced error with JCL header. I compiled the COBOL code on windows, and it compiled with correct values.

   Solution:

   Better understanding of JCL, as it was mostly a syntax or library error.

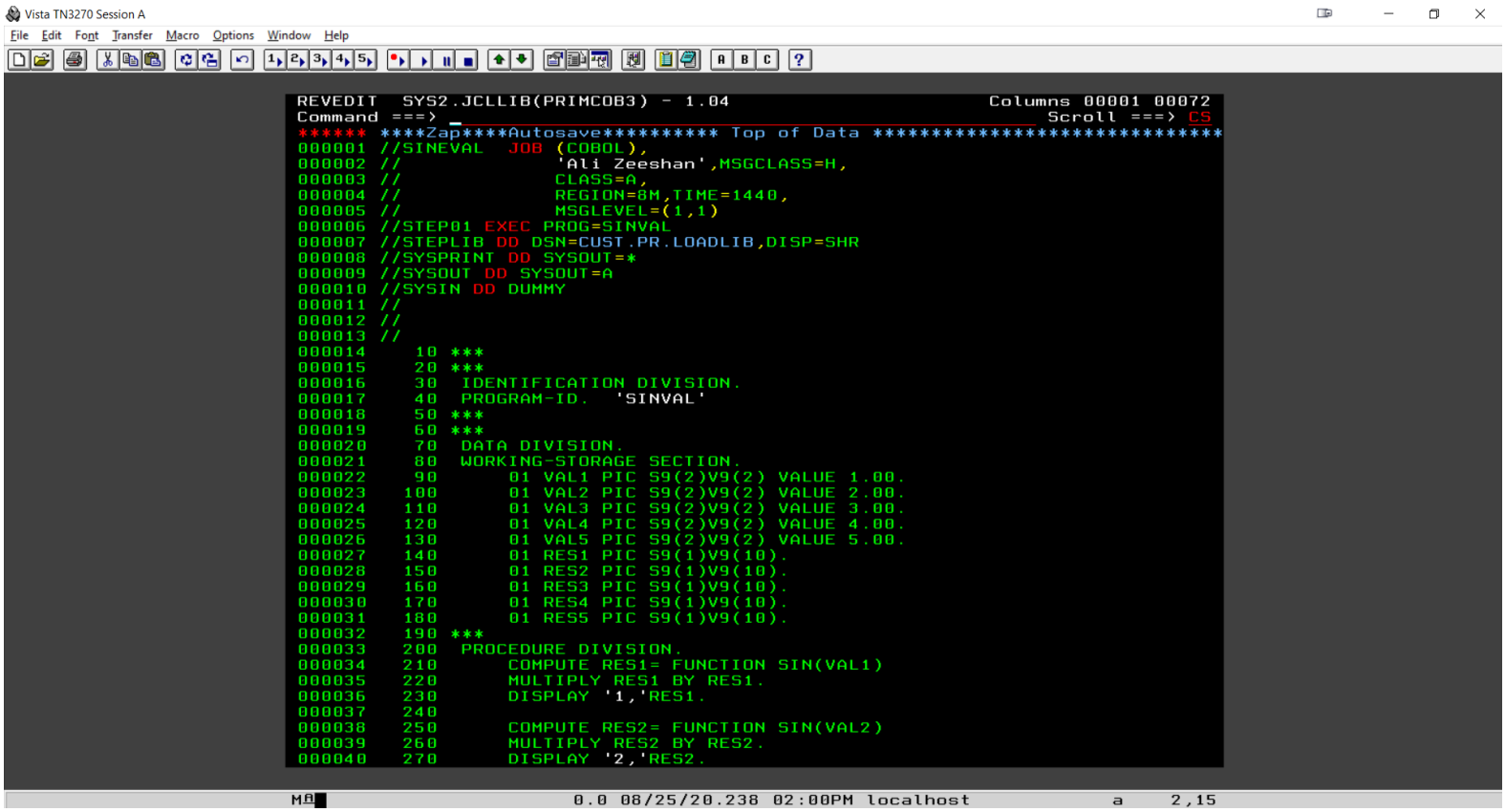
2. Connectivity with Mainframe:

   - It was a major confusion as to how to network data with mainframe. I was able to find two methods- FTP & virtual Ethernet ports. I planned to go via the FTP route but couldn't reach the stage. I am unsure if I would've been able to implement the connection.

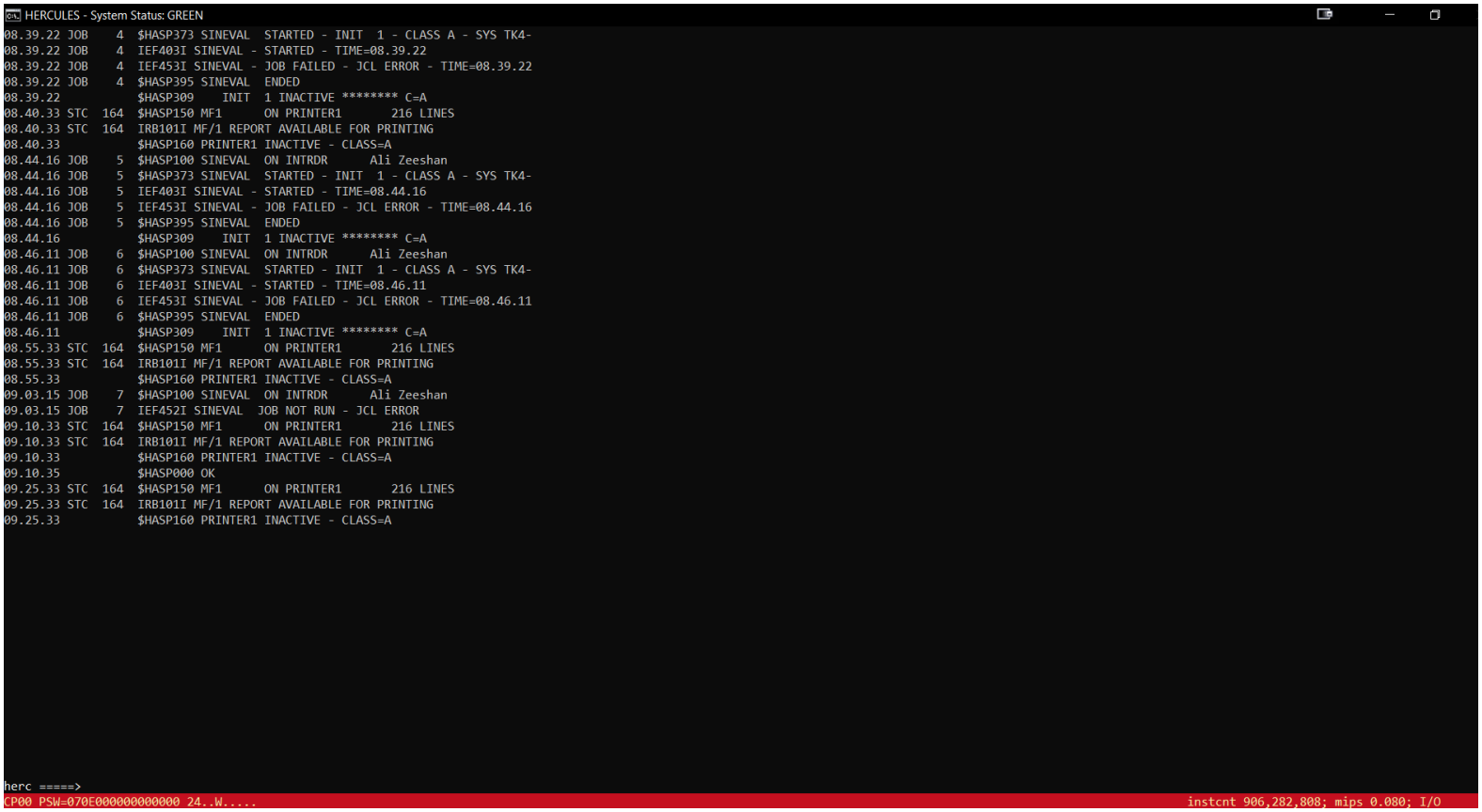
   Solution:

   More worktime with mainframe, help from mainframe forums.

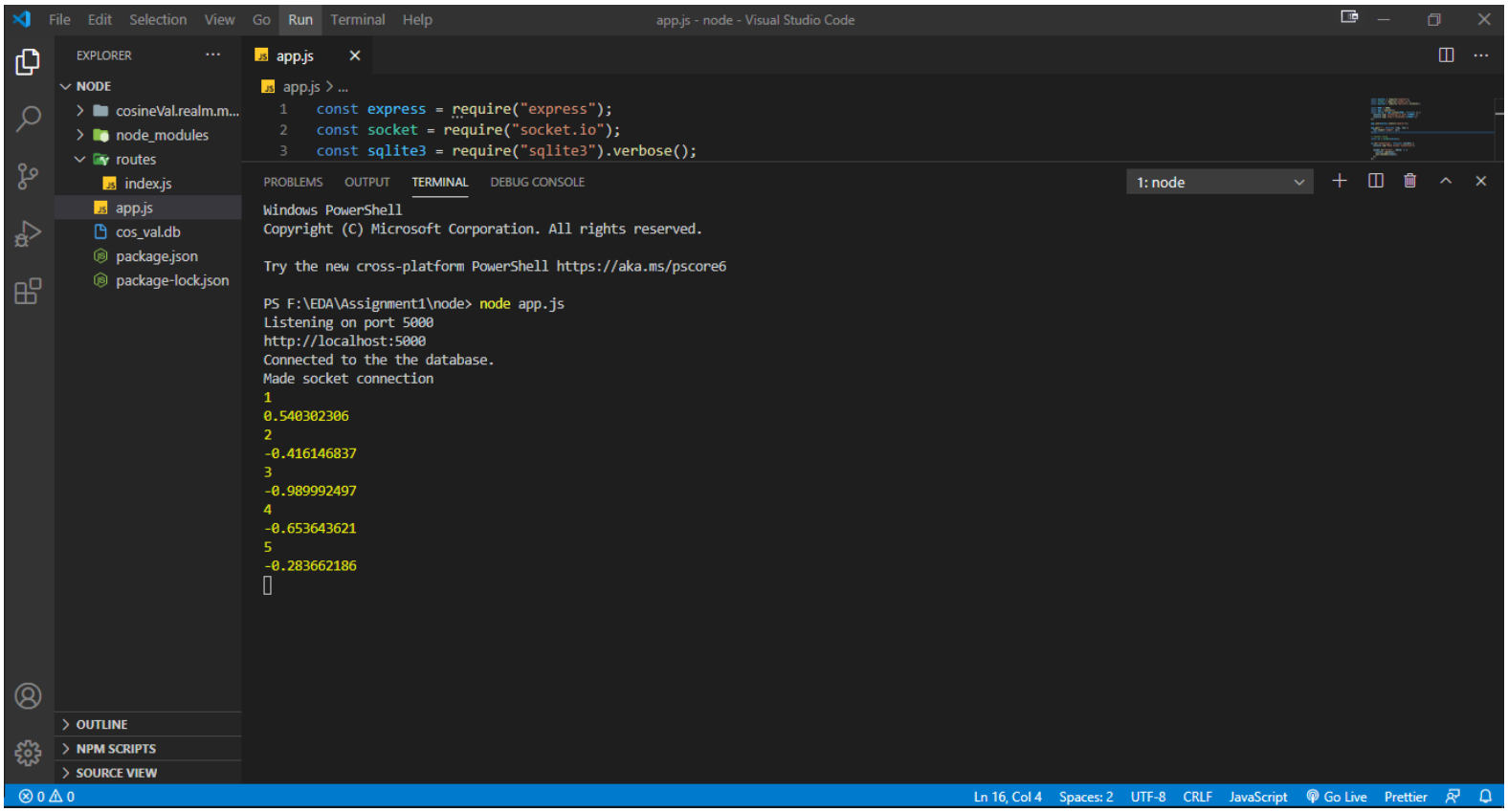
Screenshots:



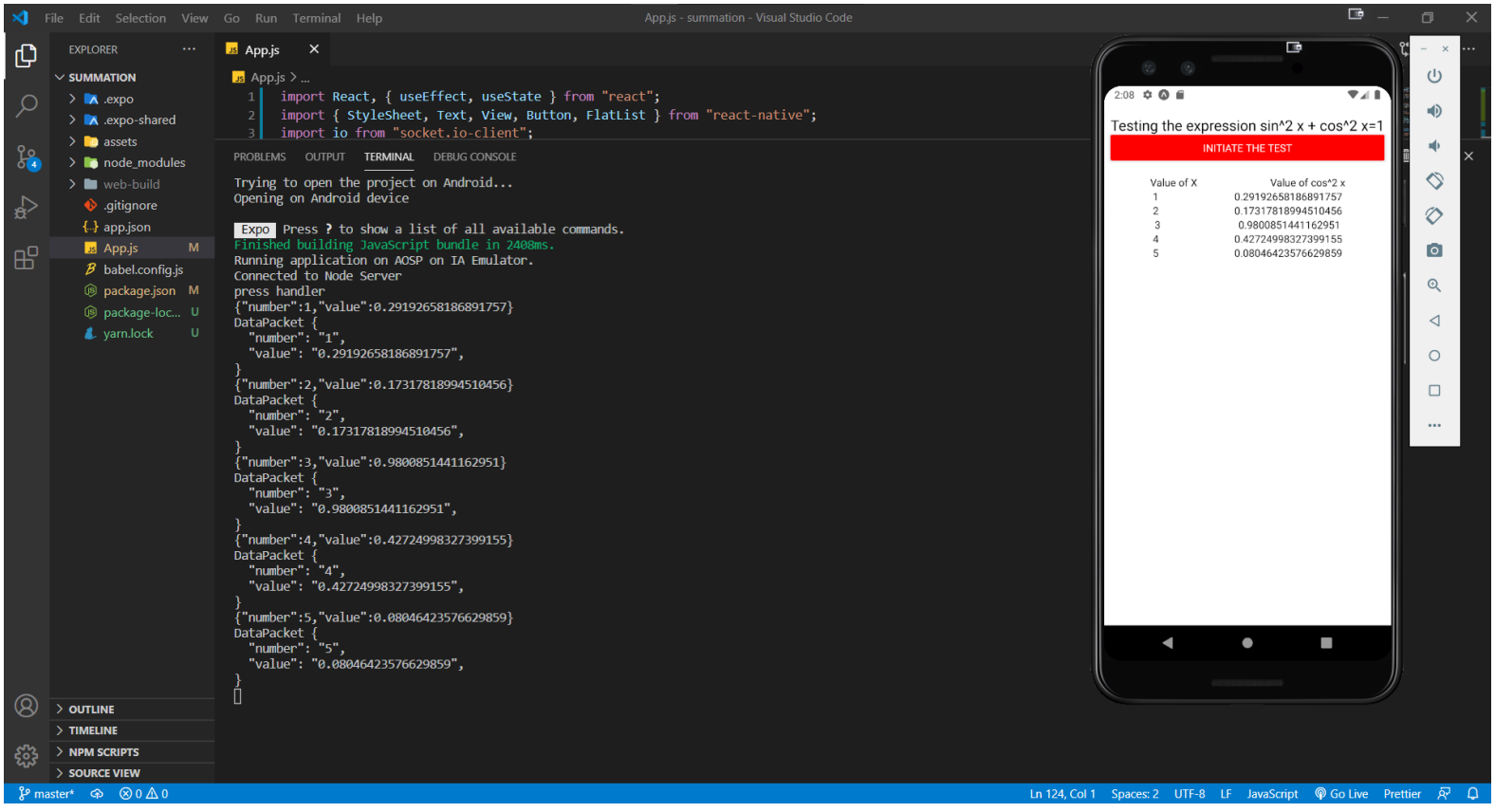
Cobol program on Vista 3270



Runtime error log on MVS



NodeJS server, emitting values of $\cos^2 x$



React Native log, with app running on Android emulator

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