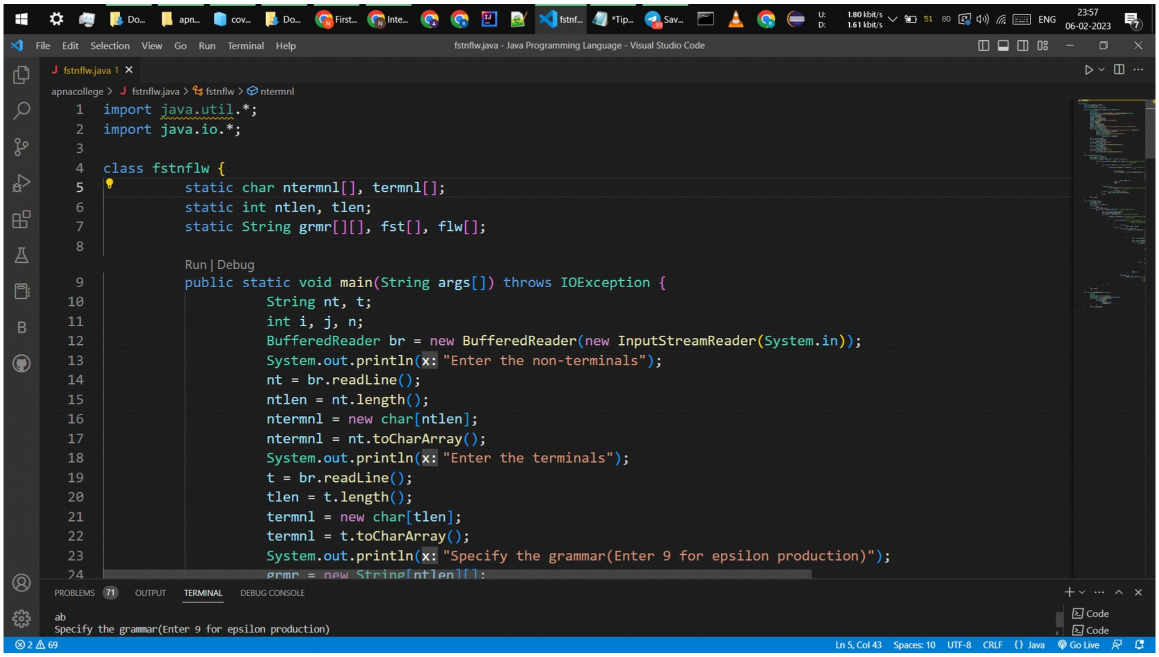
GAURAV A D12A 02 SPCC LAB - 03

CODE :



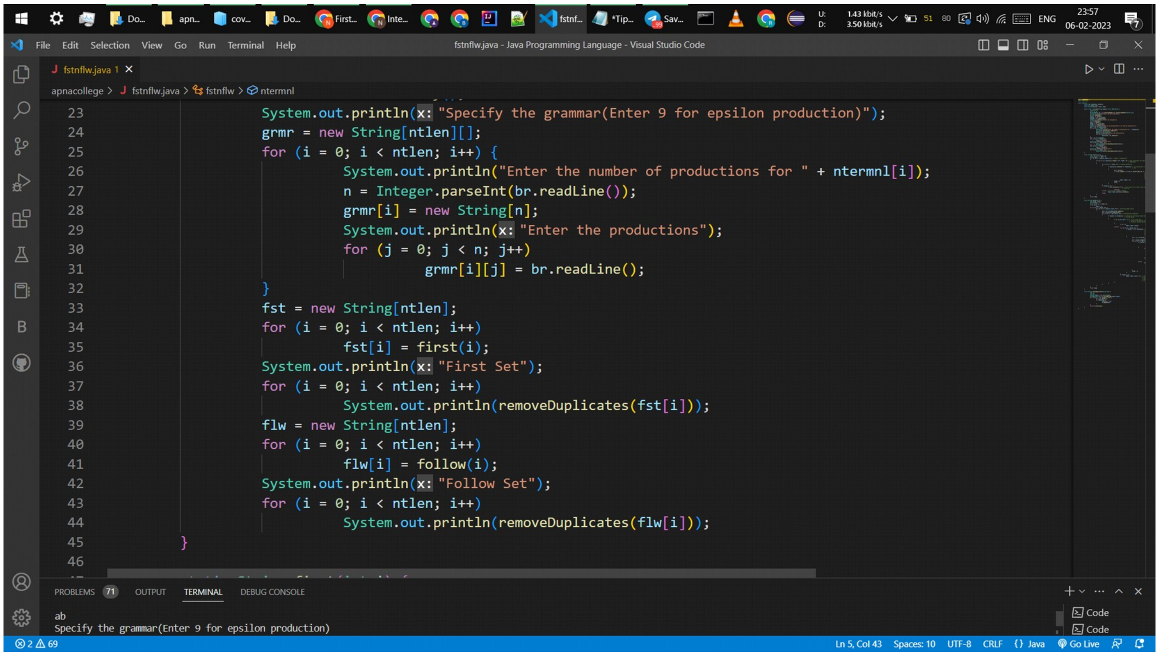
fstnflw.java - Java Programming Language - Visual Studio Code
apnacollege > fstnflw.java > fstnflw > ntermnl
Run | Debug
PROBLEMS 71
OUTPUT
TERMINAL
DEBUG CONSOLE
Ln 5, Col 43
Spaces: 10
UTF-8
CRLF
Java
Go Live

```java
import java.util.*;
import java.io.*;

class fstnflw {
          static char ntermnl[], termnl[];
          static int ntlen, tlen;
          static String grmr[][], fst[], flw[];

          public static void main(String args[]) throws IOException {
                    String nt, t;
                    int i, j, n;
                    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
                    System.out.println("Enter the non-terminals");
                    nt = br.readLine();
                    ntlen = nt.length();
                    ntermnl = new char[ntlen];
                    ntermnl = nt.toCharArray();
                    System.out.println("Enter the terminals");
                    t = br.readLine();
                    tlen = t.length();
                    termnl = new char[tlen];
                    termnl = t.toCharArray();
                    System.out.println("Specify the grammar(Enter 9 for epsilon production)");
                    grmr = new String[ntlen][];
```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```



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apnacollege > fstnflw.java > fstnflw > ntermnl
PROBLEMS 71
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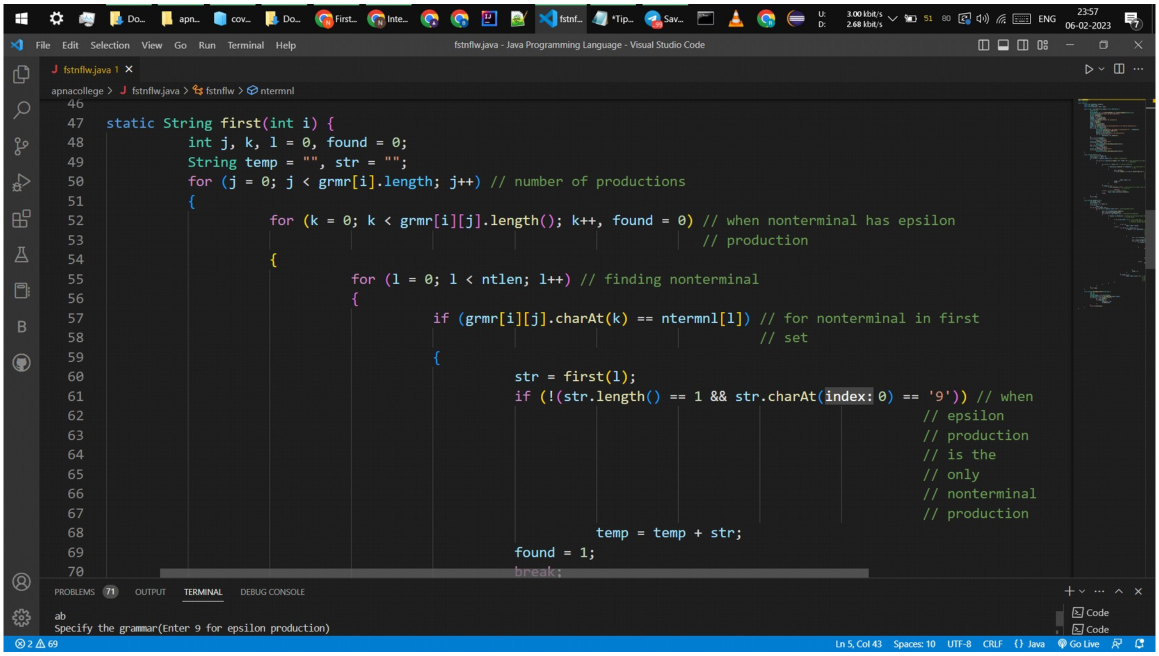
Go Live

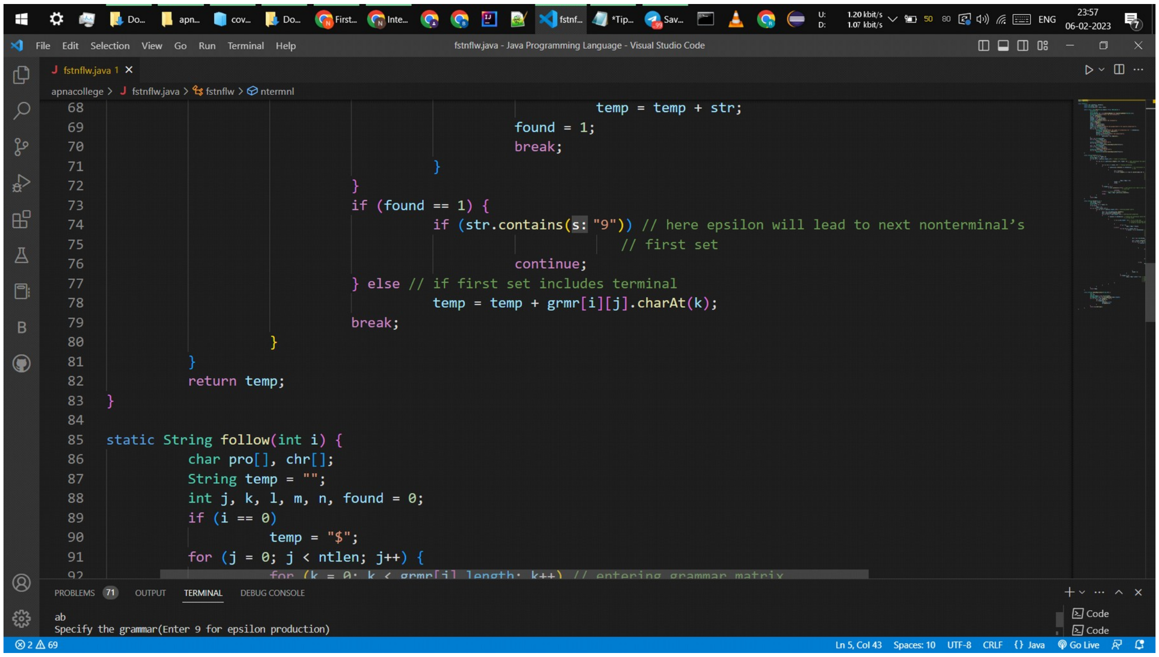
```java
                    System.out.println("Specify the grammar(Enter 9 for epsilon production)");
                    grmr = new String[ntlen][];
                    for (i = 0; i < ntlen; i++) {
                              System.out.println("Enter the number of productions for " + ntermnl[i]);
                              n = Integer.parseInt(br.readLine());
                              grmr[i] = new String[n];
                              System.out.println("Enter the productions");
                              for (j = 0; j < n; j++)
                                        grmr[i][j] = br.readLine();
                    }
                    fst = new String[ntlen];
                    for (i = 0; i < ntlen; i++)
                              fst[i] = first(i);
                    System.out.println("First Set");
                    for (i = 0; i < ntlen; i++)
                              System.out.println(removeDuplicates(fst[i]));
                    flw = new String[ntlen];
                    for (i = 0; i < ntlen; i++)
                              flw[i] = follow(i);
                    System.out.println("Follow Set");
                    for (i = 0; i < ntlen; i++)
                              System.out.println(removeDuplicates(flw[i]));
          }

```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```


fstnflw.java - Java Programming Language - Visual Studio Code
fstnflw.java 1
apnacollege > fstnflw.java > fstnflw > ntermnl
PROBLEMS 71
OUTPUT
TERMINAL
DEBUG CONSOLE
Ln 5, Col 43
Spaces: 10
UTF-8
CRLF
Java
Go Live

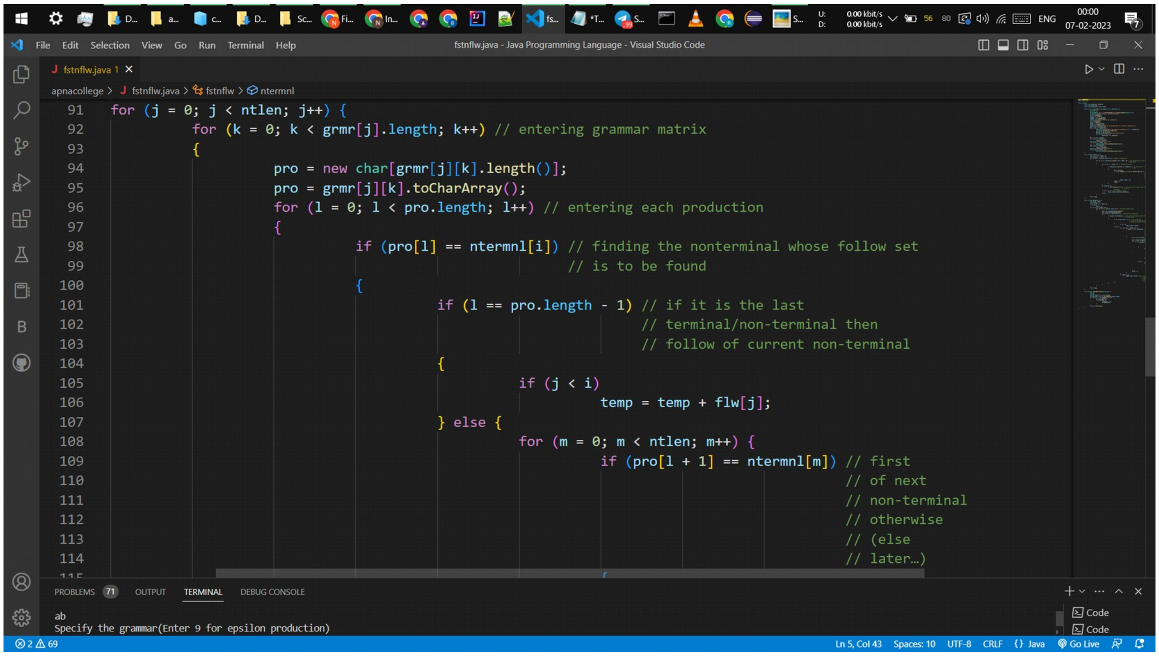
```java
static String first(int i) {
          int j, k, l = 0, found = 0;
          String temp = "", str = "";
          for (j = 0; j < grmr[i].length; j++) // number of productions
          {
                    for (k = 0; k < grmr[i][j].length(); k++, found = 0) // when nonterminal has epsilon
                                                                         // production
                    {
                              for (l = 0; l < ntlen; l++) // finding nonterminal
                              {
                                        if (grmr[i][j].charAt(k) == ntermnl[l]) // for nonterminal in first
                                                                                // set
                                        {
                                                  str = first(l);
                                                  if (!(str.length() == 1 && str.charAt(index: 0) == '9')) // when
                                                                                                    // epsilon
                                                                                                    // production
                                                                                                    // is the
                                                                                                    // only
                                                                                                    // nonterminal
                                                                                                    // production
                                                            temp = temp + str;
                                                  found = 1;
                                                  break;
```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```


fstnflw.java - Java Programming Language - Visual Studio Code
fstnflw.java 1
apnacollege > fstnflw.java > fstnflw > ntermnl
PROBLEMS 71
OUTPUT
TERMINAL
DEBUG CONSOLE
Ln 5, Col 43
Spaces: 10
UTF-8
CRLF
Java
Go Live

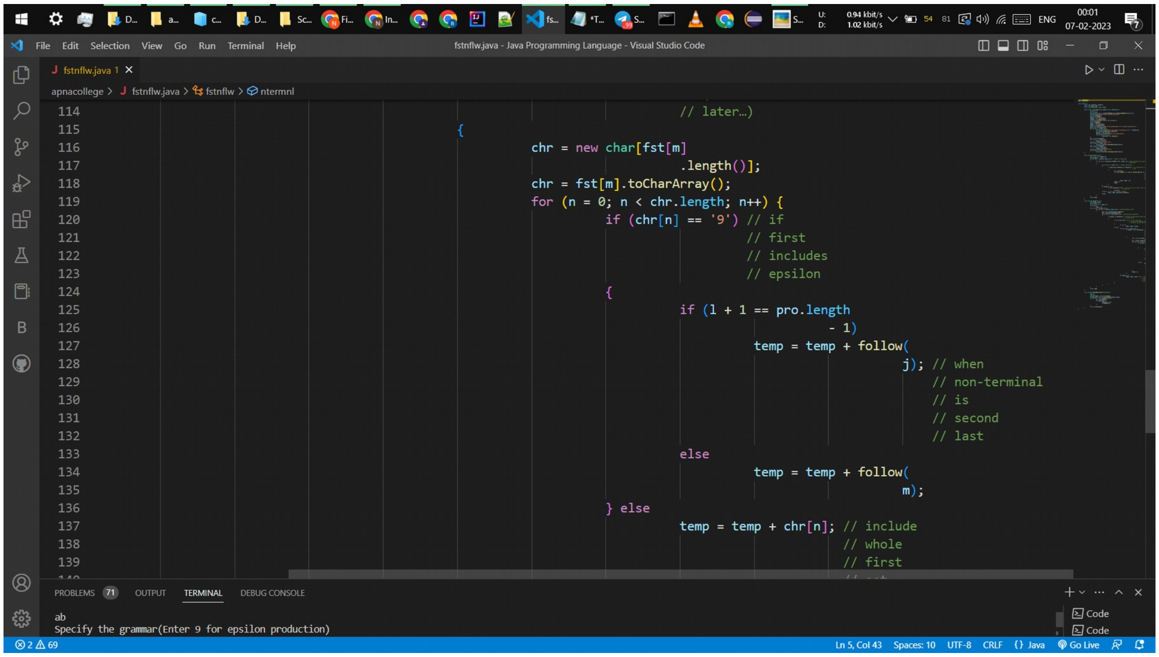
```java
                                                            temp = temp + str;
                                                  found = 1;
                                                  break;
                                        }
                              }
                              if (found == 1) {
                                        if (str.contains(s: "9")) // here epsilon will lead to next nonterminal’s
                                                               // first set
                                                  continue;
                              } else // if first set includes terminal
                                        temp = temp + grmr[i][j].charAt(k);
                              break;
                    }
          }
          return temp;
}

static String follow(int i) {
          char pro[], chr[];
          String temp = "";
          int j, k, l, m, n, found = 0;
          if (i == 0)
                    temp = "$";
          for (j = 0; j < ntlen; j++) {
                    for (k = 0; k < grmr[j].length; k++) // entering grammar matrix
```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```



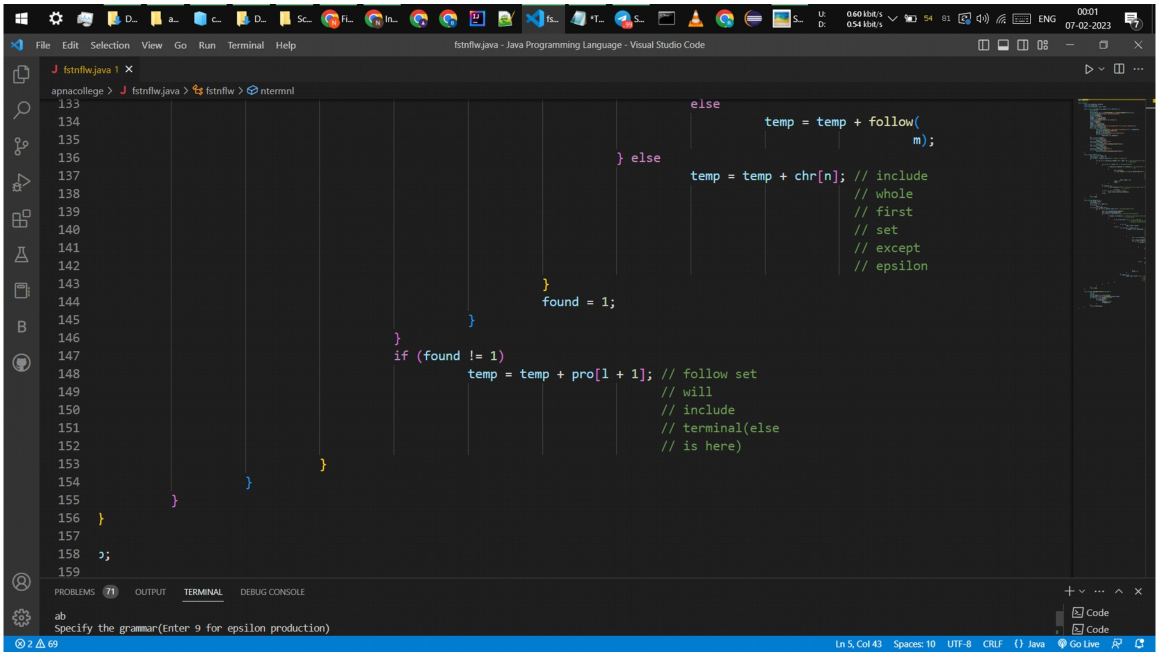
```java
for (j = 0; j < ntlen; j++) {
          for (k = 0; k < grmr[j].length; k++) // entering grammar matrix
          {
                    pro = new char[grmr[j][k].length()];
                    pro = grmr[j][k].toCharArray();
                    for (l = 0; l < pro.length; l++) // entering each production
                    {
                              if (pro[l] == ntermnl[i]) // finding the nonterminal whose follow set
                                                        // is to be found
                              {
                                        if (l == pro.length - 1) // if it is the last
                                                                 // terminal/non-terminal then
                                                                 // follow of current non-terminal
                                        {
                                                  if (j < i)
                                                            temp = temp + flw[j];
                                        } else {
                                                  for (m = 0; m < ntlen; m++) {
                                                            if (pro[l + 1] == ntermnl[m]) // first
                                                                                          // of next
                                                                                          // non-terminal
                                                                                          // otherwise
                                                                                          // (else
                                                                                          // later…)
```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```



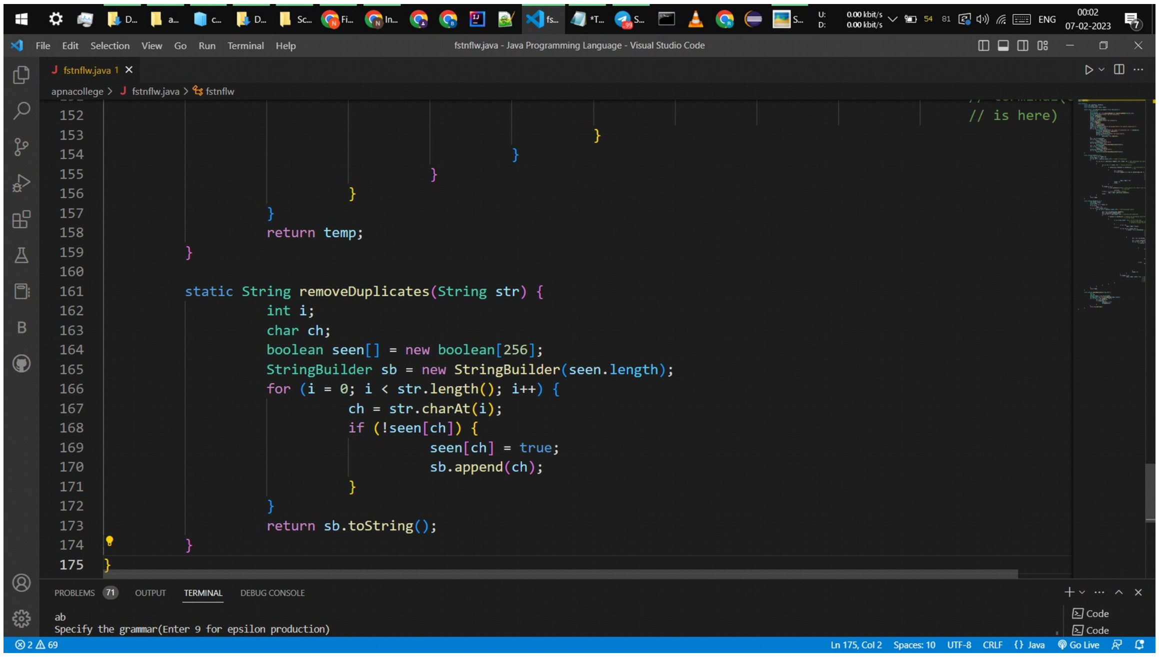
```java
                                                                                // later…)
                                                  {
                                                            chr = new char[fst[m]
                                                                                .length()];
                                                            chr = fst[m].toCharArray();
                                                            for (n = 0; n < chr.length; n++) {
                                                                      if (chr[n] == '9') // if
                                                                                         // first
                                                                                         // includes
                                                                                         // epsilon
                                                                      {
                                                                                if (l + 1 == pro.length
                                                                                                    - 1)
                                                                                          temp = temp + follow(
                                                                                                              j); // when
                                                                                                                  // non-terminal
                                                                                                                  // is
                                                                                                                  // second
                                                                                                                  // last
                                                                                else
                                                                                          temp = temp + follow(
                                                                                                              m);
                                                                      } else
                                                                                temp = temp + chr[n]; // include
                                                                                                      // whole
                                                                                                      // first
```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```


fstnflw.java - Java Programming Language - Visual Studio Code
File Edit Selection View Go Run Terminal Help
fstnflw.java 1
apnacollege > fstnflw.java > fstnflw > ntermnl
PROBLEMS 71 OUTPUT TERMINAL DEBUG CONSOLE
Ln 5, Col 43 Spaces: 10 UTF-8 CRLF Java Go Live

```
                                                                                else
                                                                                          temp = temp + follow(
                                                                                                              m);
                                                                      } else
                                                                                temp = temp + chr[n]; // include
                                                                                                      // whole
                                                                                                      // first
                                                                                                      // set
                                                                                                      // except
                                                                                                      // epsilon
                                                            }
                                                            found = 1;
                                                  }
                                        }
                                        if (found != 1)
                                                  temp = temp + pro[l + 1]; // follow set
                                                                            // will
                                                                            // include
                                                                            // terminal(else
                                                                            // is here)
                              }
                    }
          }
}

ɔ;
```

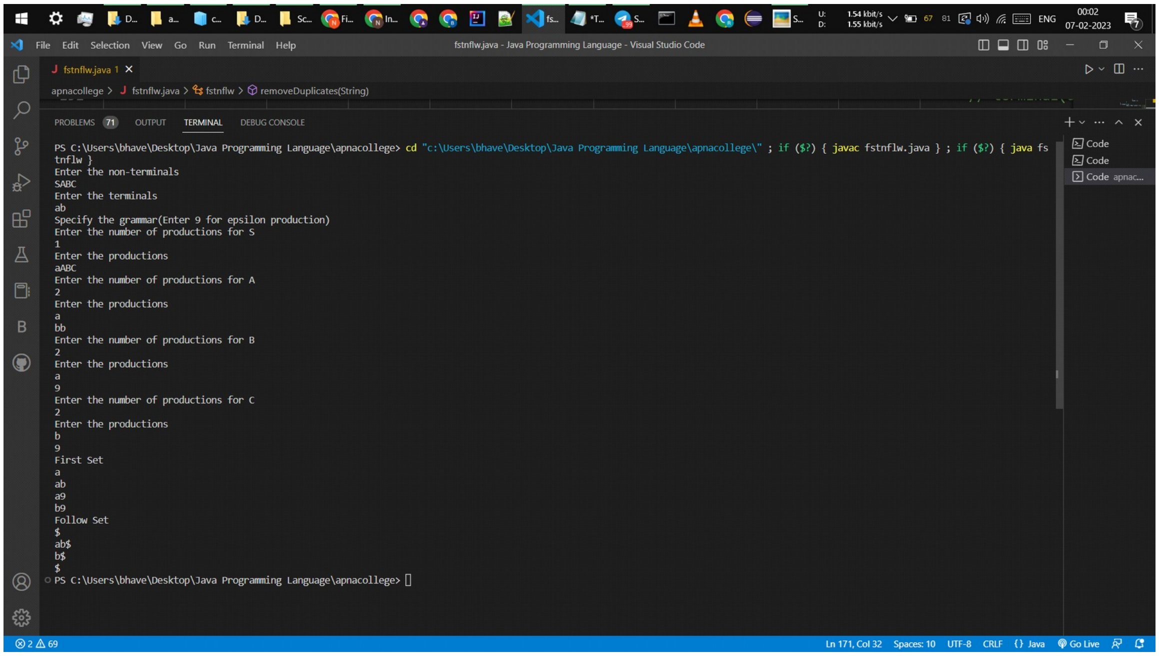
```
ab
Specify the grammar(Enter 9 for epsilon production)
```


fstnflw.java - Java Programming Language - Visual Studio Code
File Edit Selection View Go Run Terminal Help
fstnflw.java 1
apnacollege > fstnflw.java > fstnflw
PROBLEMS 71 OUTPUT TERMINAL DEBUG CONSOLE
Ln 175, Col 2 Spaces: 10 UTF-8 CRLF Java Go Live

```
                                                                                                          // is here)
                                                            }
                                                  }
                                        }
                              }
                    }
                    return temp;
          }

          static String removeDuplicates(String str) {
                    int i;
                    char ch;
                    boolean seen[] = new boolean[256];
                    StringBuilder sb = new StringBuilder(seen.length);
                    for (i = 0; i < str.length(); i++) {
                              ch = str.charAt(i);
                              if (!seen[ch]) {
                                        seen[ch] = true;
                                        sb.append(ch);
                              }
                    }
                    return sb.toString();
          }
}
```

```
ab
Specify the grammar(Enter 9 for epsilon production)
```

OUTPUT :



```
PS C:\Users\bhave\Desktop\Java Programming Language\apnacollege> cd "c:\Users\bhave\Desktop\Java Programming Language\apnacollege\" ; if ($?) { javac fstnflw.java } ; if ($?) { java fs
tnflw }
Enter the non-terminals
SABC
Enter the terminals
ab
Specify the grammar(Enter 9 for epsilon production)
Enter the number of productions for S
1
Enter the productions
aABC
Enter the number of productions for A
2
Enter the productions
a
bb
Enter the number of productions for B
2
Enter the productions
a
9
Enter the number of productions for C
2
Enter the productions
b
9
First Set
a
ab
a9
b9
Follow Set
$
ab$
b$
$
PS C:\Users\bhave\Desktop\Java Programming Language\apnacollege> 
```