Aayush Shah
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Compiler Construction

Practical 3

Find First() and Follow() of a grammer

• **Code :**

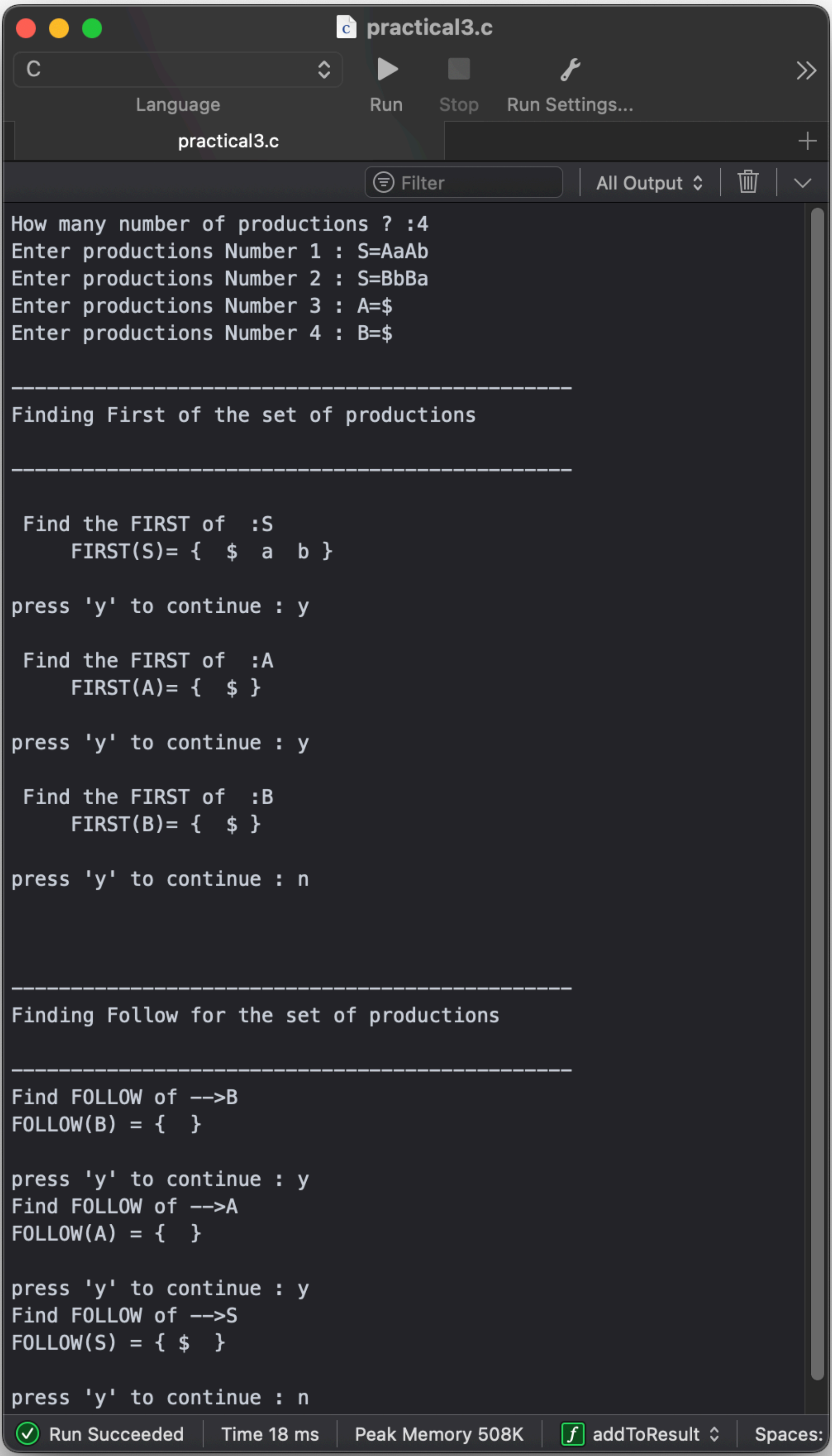
```
#include<stdio.h>
#include<string.h>
#include<ctype.h>
void FIRST(char[],char );
void addToResultSet(char[],char);
int numOfProductions;
char productionSet[10][10];
int n,m=0,p,i=0,j=0;
char a[10][10],followResult[10];
void follow(char c);
void first(char c);
void addToResult(char);

void first_util()
{
    int i;
    char choice;
    char c;
    char result[20];
    printf("How many number of productions ? :");
    scanf(" %d",&numOfProductions);
    for(i=0;i<numOfProductions;i++)//read production
string eg: E=E+T
    {
        printf("Enter productions Number %d : ",i+1);
        scanf(" %s",productionSet[i]);
    }
```

```
printf("\n-------------------------------------------------------
\n");
    printf("Finding First of the set of productions \n");

printf("\n-------------------------------------------------------
\n");

    do
    {
        printf("\n Find the FIRST of  :");
        scanf(" %c",&c);
        FIRST(result,c); //Compute FIRST; Get Answer in
'result' array
        printf("\t FIRST(%c)= { ",c);
        for(i=0;result[i]!='\0';i++)
            printf(" %c ",result[i]);       //Display
result

        printf("}\n\n");
        printf("press 'y' to continue : ");
        scanf(" %c",&choice);
    }
    while(choice=='y'||choice =='Y');
}

void follow_util()
{
    int i;
    char choice;
    char c,ch;
    /*printf("Enter the no.of productions: ");
    scanf("%d", &n);
    printf(" Enter %d productions\nProduction with
multiple terms should be give as separate productions
\n", n);
    for(i=0;i<n;i++)
      scanf("%s%c",a[i],&ch);
        // gets(a[i]);*/

    printf("\n");
printf("\n-----------------------------------------------
\n");
    printf("Finding Follow for the set of productions 
\n");

printf("\n-----------------------------------------------
\n");
     do
     {
         m=0;
         printf("Find FOLLOW of -->");
         scanf(" %c",&c);
         follow(c);
         printf("FOLLOW(%c) = { ",c);
         for(i=0;i<m;i++)
            printf("%c ",followResult[i]);

         printf(" }\n\n");
         printf("press 'y' to continue : ");
         scanf(" %c",&choice);
     }
     while(choice=='y'||choice =='Y');
}


int main()
{
    first_util();
    printf("\n");
    follow_util();
    return 0;
}


/*
 *Function FIRST:
 *Compute the elements in FIRST(c) and write them
 *in Result Array.
 */
void FIRST(char* Result,char c)
{
    int i,j,k;
    char subResult[20];
    int foundEpsilon;
    subResult[0]='\0';
    Result[0]='\0';
    //If X is terminal, FIRST(X) = {X}.
    if(!(isupper(c)))
    {
        addToResultSet(Result,c);
               return ;
    }
    //If X is non terminal
    //Read each production
    for(i=0;i<numOfProductions;i++)
    {
//Find production with X as LHS
        if(productionSet[i][0]==c)
        {
        //If X → ε is a production, then add ε to
FIRST(X).
            if(productionSet[i][2]=='$')
addToResultSet(Result,'$');
                        //If X is a non-terminal, and X →
Y1 Y2 … Yk
                        //is a production, then add a to
FIRST(X)
                        //if for some i, a is in
FIRST(Yi),
                        //and ε is in all of FIRST(Y1),
…, FIRST(Yi-1).
                else
                      {
                        j=2;
                        while(productionSet[i][j]!='\0')
                        {
                        foundEpsilon=0;
                        FIRST(subResult,productionSet[i]
[j]);
                        for(k=0;subResult[k]!='\0';k++)

addToResultSet(Result,subResult[k]);
                         for(k=0;subResult[k]!='\0';k++)
                             if(subResult[k]=='$')
                             {
```

```
                                        foundEpsilon=1;
                                        break;
                                    }
                            //No ε found, no need to check
next element
                            if(!foundEpsilon)
                                break;
                            j++;
                        }
                    }
            }
}
    return ;
}
/* addToResultSet adds the computed
 *element to result set.
 *This code avoids multiple inclusion of elements
  */
void addToResultSet(char Result[],char val)
{
    int k;
    for(k=0 ;Result[k]!='\0';k++)
        if(Result[k]==val)
            return;
    Result[k]=val;
    Result[k+1]='\0';
}


void follow(char c)
{
    if(productionSet[0][0]==c)addToResult('$');

    for(i=0;i<n;i++)
        {
            for(j=2;j<strlen(productionSet[i]);j++)
            {
                if(productionSet[i][j]==c)
                {
                    if(productionSet[i][j+1]!
='\0')first(productionSet[i][j+1]);
                    if(productionSet[i][j+1]=='\0'&&c!
=productionSet[i][0])
```

```
                    follow(productionSet[i][0]);
                }
            }
        }
}

void first(char c)
{
      int k;

      if(!(isupper(c)))
        addToResult(c);
      for(k=0;k<n;k++)
      {
          if(a[k][0]==c)
          {
              if(a[k][2]=='$')
                follow(a[i][0]);
              else if(islower(a[k][2]))
                addToResult(a[k][2]);
              else first(a[k][2]);
          }
      }
}
void addToResult(char c)
{
    int i;
    for( i=0;i<=m;i++)
        if(followResult[i]==c)
            return;
   followResult[m++]=c;
}
```

output



```
How many number of productions ? :4
Enter productions Number 1 : S=AaAb
Enter productions Number 2 : S=BbBa
Enter productions Number 3 : A=$
Enter productions Number 4 : B=$

-----------------------------------------------
Finding First of the set of productions

-----------------------------------------------

 Find the FIRST of  :S
     FIRST(S)= {  $  a  b }

press 'y' to continue : y

 Find the FIRST of  :A
     FIRST(A)= {  $ }

press 'y' to continue : y

 Find the FIRST of  :B
     FIRST(B)= {  $ }

press 'y' to continue : n



-----------------------------------------------
Finding Follow for the set of productions

-----------------------------------------------
Find FOLLOW of -->B
FOLLOW(B) = {  }

press 'y' to continue : y
Find FOLLOW of -->A
FOLLOW(A) = {  }

press 'y' to continue : y
Find FOLLOW of -->S
FOLLOW(S) = { $  }

press 'y' to continue : n
```