1. FIRST

```c
#include<stdio.h>
#include<ctype.h>
void FIRST(char[],char );
void addToResultSet(char[],char);
int numOfProductions;
char productionSet[10][10];
int main()
{
 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]);
 }
 do
 {
 printf("\n Find the FIRST of :");
 scanf(" %c",&c);
 FIRST(result,c); //Compute FIRST; Get Answer in 'result' array
 printf("\n FIRST(%c)= { ",c);
 for(i=0;result[i]!='\0';i++)
 printf(" %c ",result[i]); //Display result
 printf("}\n");
 printf("press 'y' to continue : ");
 scanf(" %c",&choice);
 }
 while(choice=='y'||choice =='Y');
}
/*
 *Function FIRST:
 *Compute the elements in FIRST(c) and write them
 *in Result Array.
 */
void FIRST(char* Result,char c)
```

```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 ? e is a production, then add e 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 e 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 e found, no need to check next element
```

```c
        if(!foundEpsilon)
        break;
        j++;
        }
        }
        }
        }
        return ;
        }
        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';
        }
```
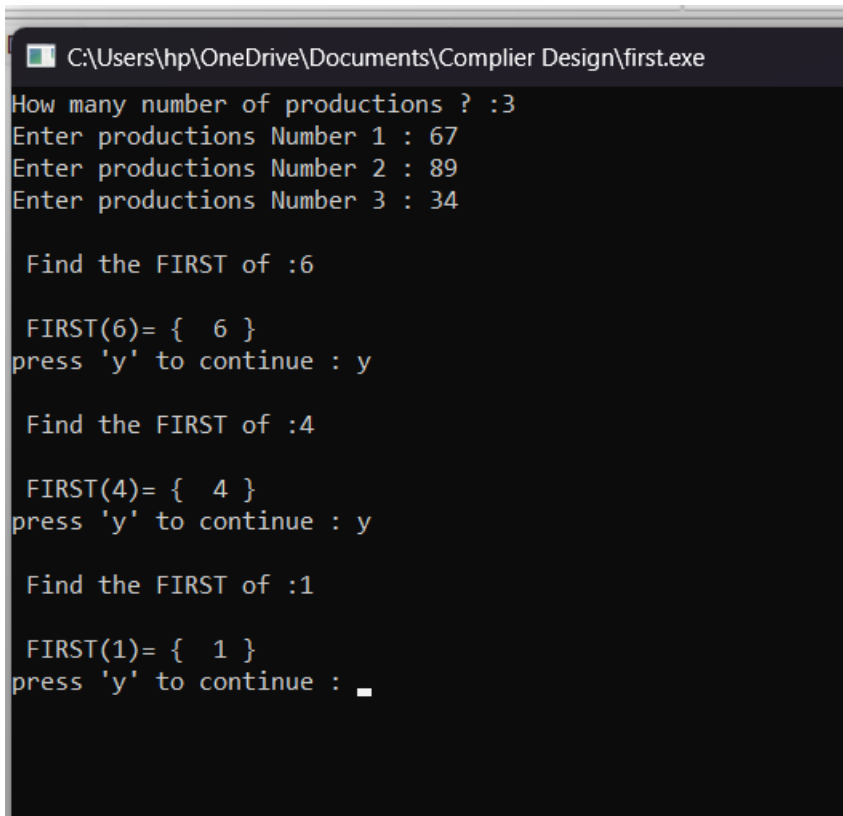
Output:


```
C:\Users\hp\OneDrive\Documents\Complier Design\first.exe

How many number of productions ? :3
Enter productions Number 1 : 67
Enter productions Number 2 : 89
Enter productions Number 3 : 34

 Find the FIRST of :6

 FIRST(6)= {  6 }
press 'y' to continue : y

 Find the FIRST of :4

 FIRST(4)= {  4 }
press 'y' to continue : y

 Find the FIRST of :1

 FIRST(1)= {  1 }
press 'y' to continue : _
```