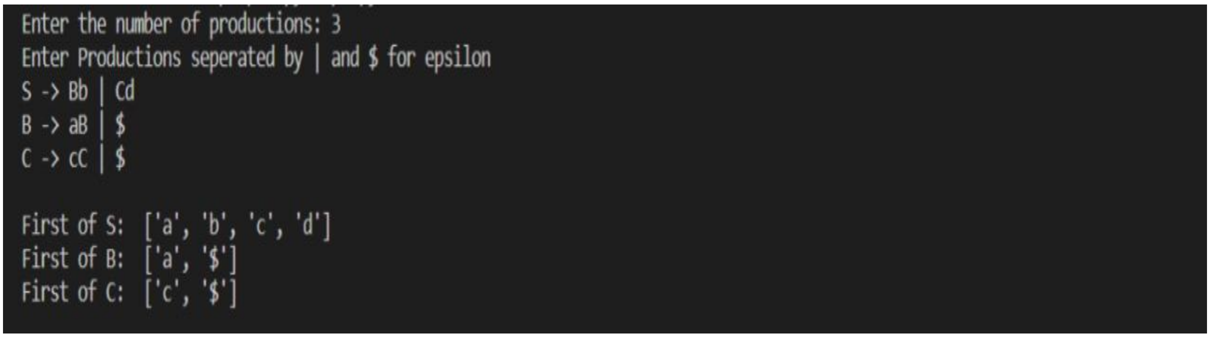
COMPUTE FIRST FOR THE GIVEN GRAMMAR

```
import sys
sys.setrecursionlimit(60)


def first(string):
    first_ = set()
    if string in non_terminals:
        alternatives = productions_dict[string]


        for alternative in alternatives:
            first_2 = first(alternative)
            first_ = first_ |first_2


    elif string in terminals:
        first_ = {string}


    elif string=='' or string=='@':
        first_ = {'@'}


    else:
        first_2 = first(string[0])
        if '@' in first_2:
            i = 1
            while '@' in first_2:


                first_ = first_ | (first_2 - {'@'})
                if string[i:] in terminals:
                    first_ = first_ | {string[i:]}
                    break
                elif string[i:] == '':
                    first_ = first_ | {'@'}
                    break
                first_2 = first(string[i:])
                first_ = first_ | first_2 - {'@'}
                i += 1
        else:
            first_ = first_ | first_2

    return  first_


no_of_terminals=int(input("Enter no. of terminals: "))


terminals = []


print("Enter the terminals :")
for _ in range(no_of_terminals):
    terminals.append(input())


no_of_non_terminals=int(input("Enter no. of non terminals: "))


non_terminals = []


print("Enter the non terminals :")
```

```
for _ in range(no_of_non_terminals):
    non_terminals.append(input())

starting_symbol = input("Enter the starting symbol: ")

no_of_productions = int(input("Enter no of productions: "))

productions = []

print("Enter the productions:")
for _ in range(no_of_productions):
    productions.append(input())

productions_dict = {}

for nT in non_terminals:
    productions_dict[nT] = []

for production in productions:
    nonterm_to_prod = production.split("->")
    alternatives = nonterm_to_prod[1].split("/")
    for alternative in alternatives:
        productions_dict[nonterm_to_prod[0]].append(alternative)

FIRST = {}

for non_terminal in non_terminals:
    FIRST[non_terminal] = set()


for non_terminal in non_terminals:
    FIRST[non_terminal] = FIRST[non_terminal] | first(non_terminal)


print("FIRST",FIRST)


print("{: ^20}{: ^20}".format('Non Terminals','First',))
for non_terminal in non_terminals:
    print("{: ^20}{: ^20}".format(non_terminal,str(FIRST[non_terminal]),))
```

OUTPUT



```
Enter the number of productions: 3
Enter Productions seperated by | and $ for epsilon
S -> Bb | Cd
B -> aB | $
C -> cC | $

First of S:  ['a', 'b', 'c', 'd']
First of B:  ['a', '$']
First of C:  ['c', '$']
```