```
divya@Meraki:~/Documents/CD_Project/symbol$ lex lex.l
divya@Meraki:~/Documents/CD_Project/symbol$ yacc -d parse.y
divya@Meraki:~/Documents/CD_Project/symbol$ gcc lex.yy.c y.tab.c
divya@Meraki:~/Documents/CD_Project/symbol$ cat program1.java
public class a{
        public static void main(String []args)
        {
                int a=3;
                int b=a+4;
                if(a>0)
                {
                        a=a-2;
                }
                else
                {a=a+3;}

        }
}divya@Meraki:~/Documents/CD_Project/symbol$ ./a.out program1.java
Successful parsing
divya@Meraki:~/Documents/CD_Project/symbol$ cat symbol_table.txt

Symbol table
Name      Value     Type      Scope     lineno     size
a         3         int       1         4          4
b         7         int       1         5          4
divya@Meraki:~/Documents/CD_Project/symbol$ gedit parse.y
divya@Meraki:~/Documents/CD_Project/symbol$ clear
```

```
divya@Meraki:~/Documents/CD_Project/symbol$ cat program1.java
public class a{
        public static void main(String []args)
        {
                int a=3;
                int b=a+4;
                if(a>0)
                {
                        a=a-2;
                }
                else
                {a=a+3;}


        }
}divya@Meraki:~/Documents/CD_Project/symbol$ ./a.out program1.java
Successful parsing
divya@Meraki:~/Documents/CD_Project/symbol$ cat symbol_table.txt
```

```
Symbol table
Name        Value       Type        Scope       lineno      size
 a            3         int          1           4          4
 b            7         int          1           5          4
```

```
divya@Meraki:~/Documents/CD_Project/symbol$ cat program2.java
public class a{
        public static void main(String []args)
        {
                 a=3;
                int b=a+4;
                if(a>0)
                {
                        a=a-2;
                }

                a=a+3;


        }
}divya@Meraki:~/Documents/CD_Project/symbol$ ./a.out program2.java
Variable a not declared at line 4
Variable a not declared at line 5
Variable a not declared at line 6
Variable a not declared at line 8
Variable a not declared at line 8
Variable a not declared at line 11
Variable a not declared at line 11
```

Successful parsing
divya@Meraki:~/Documents/CD_Project/symbol$ cat program3.java
public class a{
        public static void main(String []args)
        {
                int a=3;
                int a=5;
                int b=a+4;
                if(a>0)
                {
                        a=a-2;
                }

                a=a+3;

        }
}divya@Meraki:~/Documents/CD_Project/symbol$ ./a.out program3.java
Variable a already declared
Successful parsing
divya@Meraki:~/Documents/CD_Project/symbol$ cd ..
divya@Meraki:~/Documents/CD_Project$ cd AST/
divya@Meraki:~/Documents/CD_Project/AST$ lex lex.l
divya@Meraki:~/Documents/CD_Project/AST$ yacc -d parse.y
divya@Meraki:~/Documents/CD_Project/AST$ gcc lex.yy.c y.tab.c
divya@Meraki:~/Documents/CD_Project/AST$ ./a.out program1.java

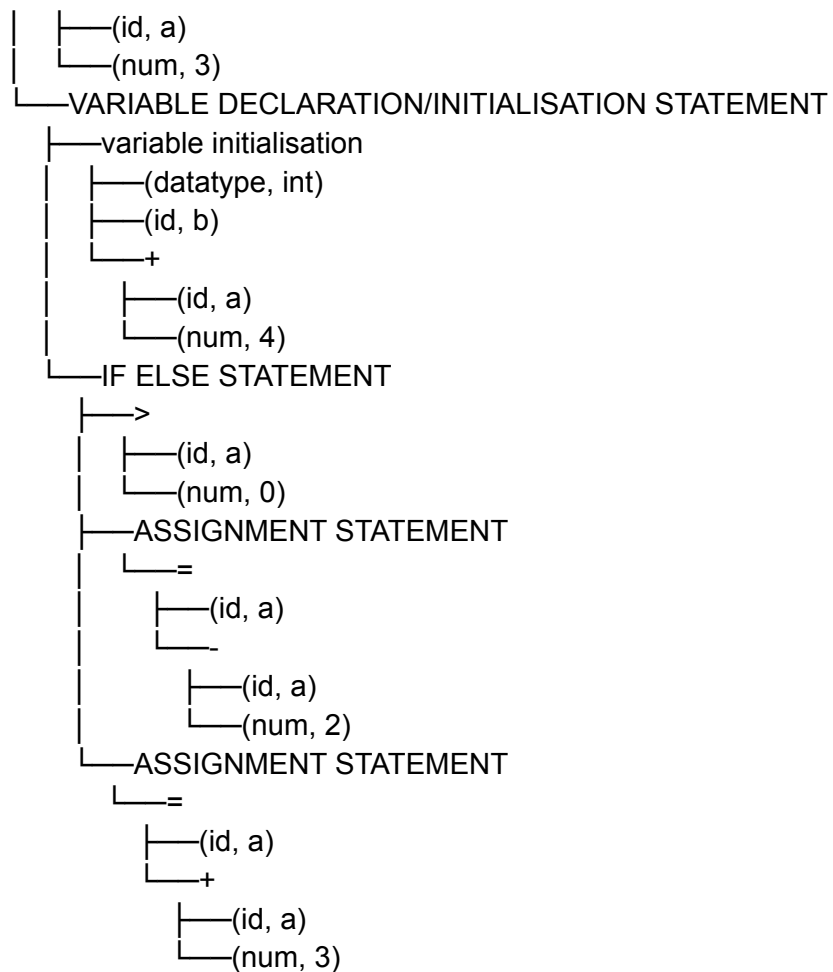Parsing successful
AST generated
divya@Meraki:~/Documents/CD_Project/AST$ cat AST2.txt
Abstract Syntax Tree
└──CLASS DECLARATION
   ├──modifier
   │ └──(access modifier, public)
   ├──(classname, a)
   └──CLASS BODY
      └──METHOD DECLARATION
         ├──modifier
         │ ├──(access modifier, public)
         │ └──(access modifier, static)
         ├──(datatype, void)
         ├──(datatype, String)
         └──VARIABLE DECLARATION/INITIALISATION STATEMENT
            ├──variable initialisation
            │ ├──(datatype, int)

```
|   ├──(id, a)
|   └──(num, 3)
└──VARIABLE DECLARATION/INITIALISATION STATEMENT
    ├──variable initialisation
    |   ├──(datatype, int)
    |   ├──(id, b)
    |   └──+
    |       ├──(id, a)
    |       └──(num, 4)
    └──IF ELSE STATEMENT
        ├──>
        |   ├──(id, a)
        |   └──(num, 0)
        ├──ASSIGNMENT STATEMENT
        |   └──=
        |       ├──(id, a)
        |       └──-
        |           ├──(id, a)
        |           └──(num, 2)
        └──ASSIGNMENT STATEMENT
            └──=
                ├──(id, a)
                └──+
                    ├──(id, a)
                    └──(num, 3)
```

```
divya@Meraki:~/Documents/CD_Project/AST$ cd ..
divya@Meraki:~/Documents/CD_Project$ cd ICG/
divya@Meraki:~/Documents/CD_Project/ICG$ lex lex.l
divya@Meraki:~/Documents/CD_Project/ICG$ yacc -d parse.y
divya@Meraki:~/Documents/CD_Project/ICG$ gcc lex.yy.c y.tab.c
divya@Meraki:~/Documents/CD_Project/ICG$ cat program1.java
public class a{
        public static void main(String []args)
        {
                int a=3;
                int b=a+4;
                if(a>0)
                {
                        a=a-2;
                }
                else
                {a=a+3;}
```

```
        }
}divya@Meraki:~/Documents/CD_Project/ICG$ ./a.out program1.java
Parsing successful
divya@Meraki:~/Documents/CD_Project/ICG$ cat icg1.txt
a = 3
T1 = a + 4
b = T1
T2 = a > 0
if T2 goto L1
else goto LABEL1
L1:T3 = a - 2
a = T3
goto L3
LABEL1:T4 = T3 + 3
a = T4
L3:divya@Meraki:~/Documents/CD_Project/ICG$ cd ..
divya@Meraki:~/Documents/CD_Project$ cd CodeOptimization/
divya@Meraki:~/Documents/CD_Project/CodeOptimization$ cat sample.txt
e=2
t1=12*4
t2=5/e
t6=4*i
t7=4*i
t8=4*j
t9=a[t8]
a[t7]=t9
t10=4*j
a[t10]=x
t6=4*1
k=t6
t7=k+2
t8=4*2
x=3
y=x
z=y+3
divya@Meraki:~/Documents/CD_Project/CodeOptimization$ python3 optimize.py sample.txt
>opt_icg.txt
divya@Meraki:~/Documents/CD_Project/CodeOptimization$ cat opt_icg.txt
e=2
t1=48
t2=5/e
t6=4*i
t7=t6
t8=4*j
```

```
t9=a[t8]
a[t7]=t9
t10=t8
a[t10]=3
t6=4
k=t7
t7=k+2
t8=8
x=3
y=3
z=6
```

divya@Meraki:~/Documents/CD_Project/CodeOptimization$ python3 optimize.py sample.txt
>opt_icg.txt
divya@Meraki:~/Documents/CD_Project/CodeOptimization$ cat sample.txt

```
e=2
t1=12*4
t2=5/e
t6=4*i
t7=4*i
t8=4*j
t9=a[t8]
a[t7]=t9
t10=4*j
a[t10]=x
t6=4*1
k=t6
t7=k+2
a=k+2
t8=4*2
x=3
y=x
z=y+3
```

divya@Meraki:~/Documents/CD_Project/CodeOptimization$ cat opt_icg.txt

```
e=2
t1=48
t2=5/e
t6=4*i
t7=t6
t8=4*j
t9=a[t8]
a[t7]=t9
t10=t8
a[t10]=3
t6=4
```

```
k=t7
t7=k+2
a=t7
t8=8
x=3
y=3
z=6
```