National Institute of Technology, Manipur

# COMPILERS AND SYSTEM PROGRAMMING LAB
# ( CS364 )

## LAB RECORD BOOK


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PROGRAM:1 DATE:26/02/21 Page:1

AIM: Write a program to print tokens for input string using the pattern given as :

| Pattern | Token |
|---|---|
| identifier | ID |
| number | NUM |
| if | IF |
| else | ELSE |
| then | THEN |
| while | WHILE |
| < | RELOP |
| > | RELOP |
| ( | BRACKET |
| ) | BRACKET |

# PROGRAM:

```
%{
#include<stdio.h>
#include<string.h>
ID, NUM, IF, THEN, ELSE, WHILE,
RELOP, BRACKET;
%}
letter [A-Z,a-z]
```

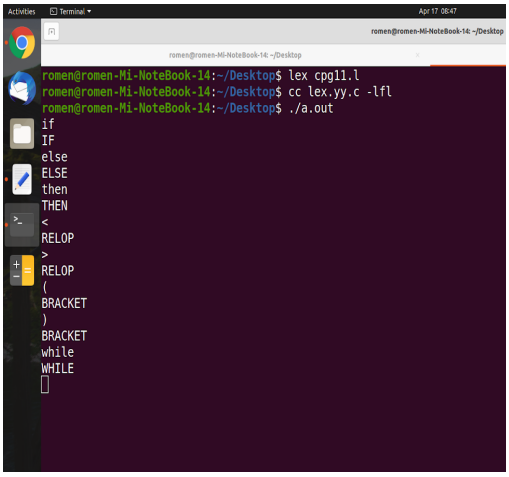


```
digit [0-9]
id {letter}({letter}{digit})*
%%
{id}     {printf("ID"); return(ID);}
{numb}    {printf("NUM");return(NUM);}
if      {printf("IF");}
else    {printf("ELSE");}
then    {printf("THEN");}
while   {printf("RELOP");}
"&gt;"  {printf("RELOP");}
"("     {printf("BRACKET");}
")"     {printf("BRACKET");}
%%
int main(void)
```

```
{
yylex();
return 0;
}
int yywrap()
{
}
```



# OUTPUT:



# PROGRAM:2

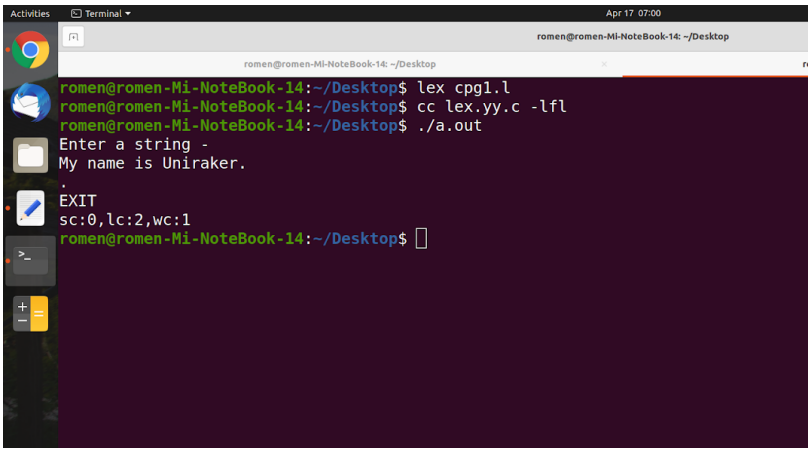
AIM : To write a lex program to count the number of line, space and words.

LEX CODE:

```
%{
#include<stdio.h>
int lc=0,sc=0,wc=0;
%}
%%
"" sc++;
\n lc++;
"EXIT" return 0;
[a-z A-Z 0-9][a-z A-Z 0-9]* wc++;
%%
int yywrap(void)
{
return 1;
}
int main()
{
printf("Enter a string -\n");
yylex();
printf("sc:%d,lc:%d,wc:%d\n",sc,lc,wc);
return 0;

}
```

OUTPUT:


Activities
Terminal
Apr 17 07:00
romen@romen-Mi-NoteBook-14: ~/Desktop
romen@romen-Mi-NoteBook-14: ~/Desktop
romen@romen-Mi-NoteBook-14:~/Desktop$ lex cpg1.l
romen@romen-Mi-NoteBook-14:~/Desktop$ cc lex.yy.c -lfl
romen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
Enter a string -
My name is Uniraker.
.
EXIT
sc:0,lc:2,wc:1
romen@romen-Mi-NoteBook-14:~/Desktop$

DATE:19/03/21
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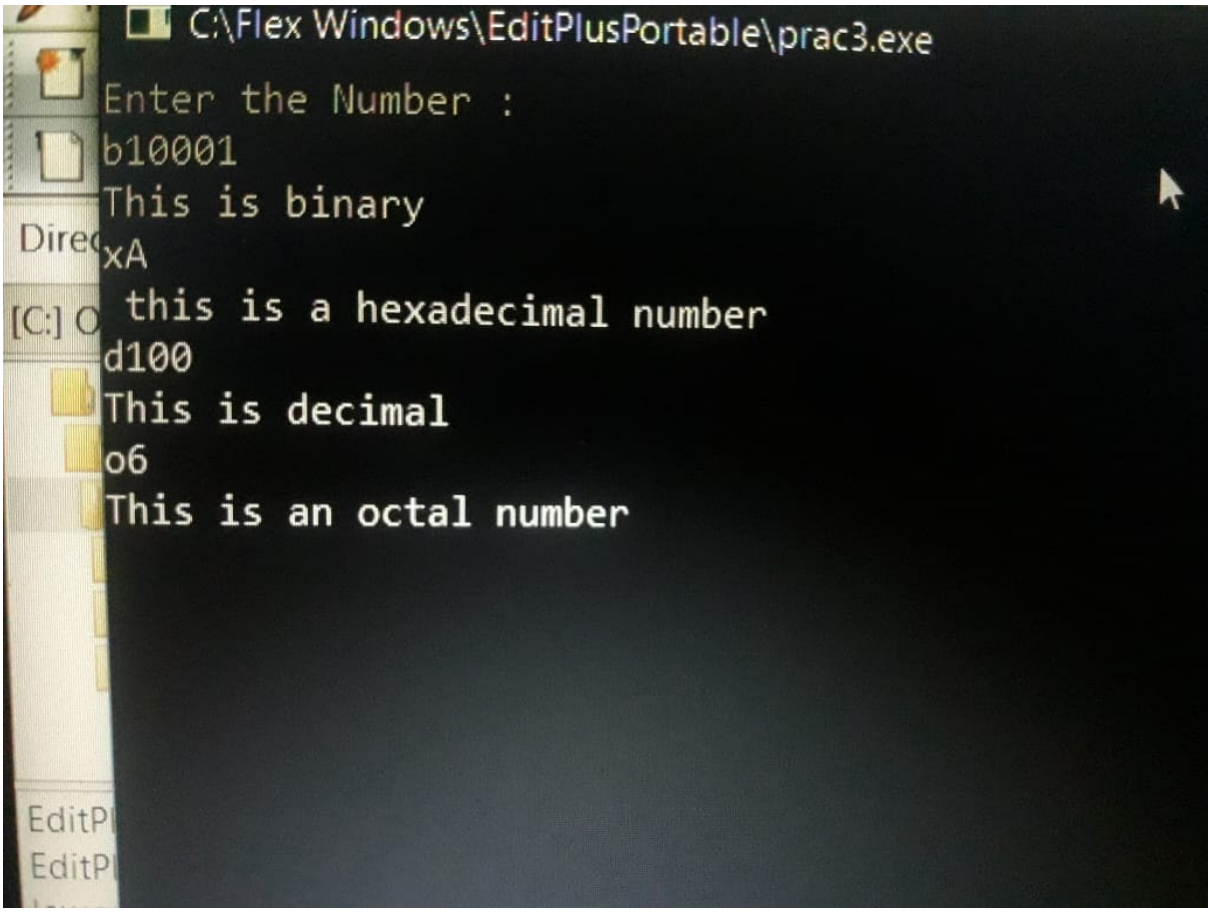
PROGRAM:3

AIM: To write a Lex program which can recognise hex, octal, binary and decimal numbers.

LEX CODE:

```
%{
#include<stdio.h>
%}
%%
[0][b|B][0|1][0|1]* printf("this is a binary number");
[0-9][0-9]* printf("this is a decimal number");
[0][0-7][0-7]* printf("this is an octal number");
[0][x|X][0-9A-F][0-9A-F]* printf("this is a hexadecimal
number");
%%
int yywrap(void)
{
 return 1;
}
int main()
{
printf("Enter a number :\n");
yylex();
return 0;
}
```

OUTPUT:


C:\Flex Windows\EditPlusPortable\prac3.exe
Enter the Number :
b10001
This is binary
xA
this is a hexadecimal number
d100
This is decimal
o6
This is an octal number

DATE:09/04/21
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PROGRAM:4

AIM: To write a Yaac program which recognizes sound and place with definition.

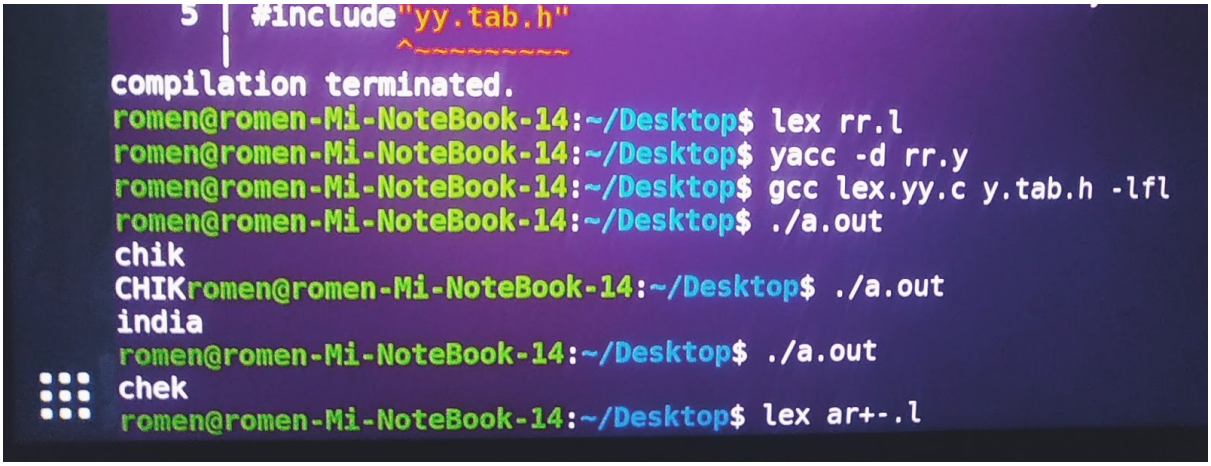
LEX CODE:

```
%{
#include<stdio.h>
#include<ctype.h>
#include<stdlib.h>
#include"y.tab.h"
extern int yylval;
%}
%%
"chik" {printf("CHIK");return(CHIK);}
"chek" {printf("CHEK"); return(CHEK);}
"india" {printf("INDIA"); return(INDIA);}
%%
int main()
{
yylex();
return 0;
}
int yywrap()
{
}
```

PARSER CODE:

```
%{
#include<stdio.h>
#include<ctype.h>
#include<stdlib.h>
#include"lex.yy.c"
%}
%token CHIK CHEK INDIA
%%
rhyme : sound place
;
sound : CHIK CHEK
;
place : INDIA
;
%%
void yyerror(char *s)
{
 printf("% s is error", s);
 }
```

OUTPUT:


5 | #include"yy.tab.h"
^~~~~~~~~~
compilation terminated.
romen@romen-Mi-NoteBook-14:~/Desktop$ lex rr.l
romen@romen-Mi-NoteBook-14:~/Desktop$ yacc -d rr.y
romen@romen-Mi-NoteBook-14:~/Desktop$ gcc lex.yy.c y.tab.h -lfl
romen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
chik
CHIKromen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
india
romen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
chek
romen@romen-Mi-NoteBook-14:~/Desktop$ lex ar+-.l

DATE:10/04/21

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PROGRAM:5

AIM: To write a Yaac program which recognises arithmetic expressions involving + and - .

LEX CODE:

```
%{
#include<stdio.h>
#include "y.tab.h"
extern int yylval;
%}
%%
[0-9]+ {printf("Number\n"); return NUMBER;}
"+" {printf("Plus\n"); return PLUS;}
"-" {printf("Minus\n"); return MINUS;}
%%
int main()
{
yylex();
}
int yywrap()
{
return 1;
}
```

PARSER CODE:

```
%{
#include<stdio.h>
#include<ctype.h>
#include<stdlib.h>
#include "lex.yy.c"
%}
%token NUMBER PLUS MINUS
%%
exp: NUMBER PLUS NUMBER
| NUMBER MINUS NUMBER
| NUMBER PLUS exp
| NUMBER MINUS exp;
%%
void yyerror(char *s)
{
printf("%s is error",s);
}
```

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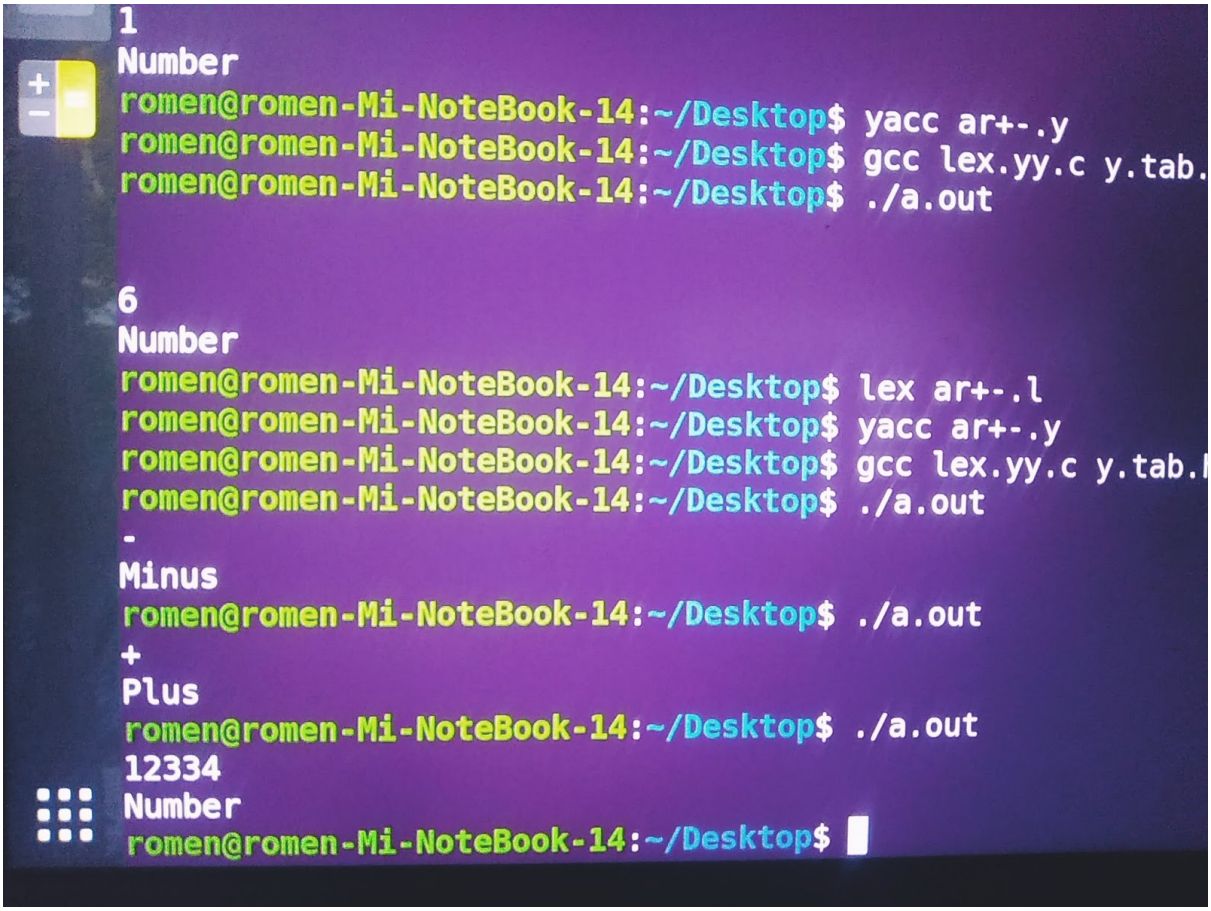
OUTPUT:



DATE:10/04/21

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PROGRAM:6

AIM : To write a Yacc program and corresponding lex program which recognize and calculate any statements According to

E->E+T/T
T->T*F/F
F->(E)| Digit

LEX CODE:

```
%{
#include<stdlib.h>
#include"y.tab.h"
extern int yylval;
%}
%%
[0-9]+ {
        yylval=atoi(yytext);
        return NUMBER;
        }
[\t] ;
\n return 0;
.  return yytext[0];
%%
```

```
int yywrap()
{
 return 1;
}
```

PARSER CODE:

```
%{
#include<stdio.h>
int flag=0;
void yyerror(char *s);
%}
%token NUMBER
%left'+'
%left'*'
%%
ArithmeticExpression:E {
printf("\nResult=%d\n,$$");
return 0;
}
E:E'+'E {$$=$1+$3;}
|E'*'E {$$=$1*$3;}
|NUMBER {$$=$1;}
;
%%
void main()
{
```

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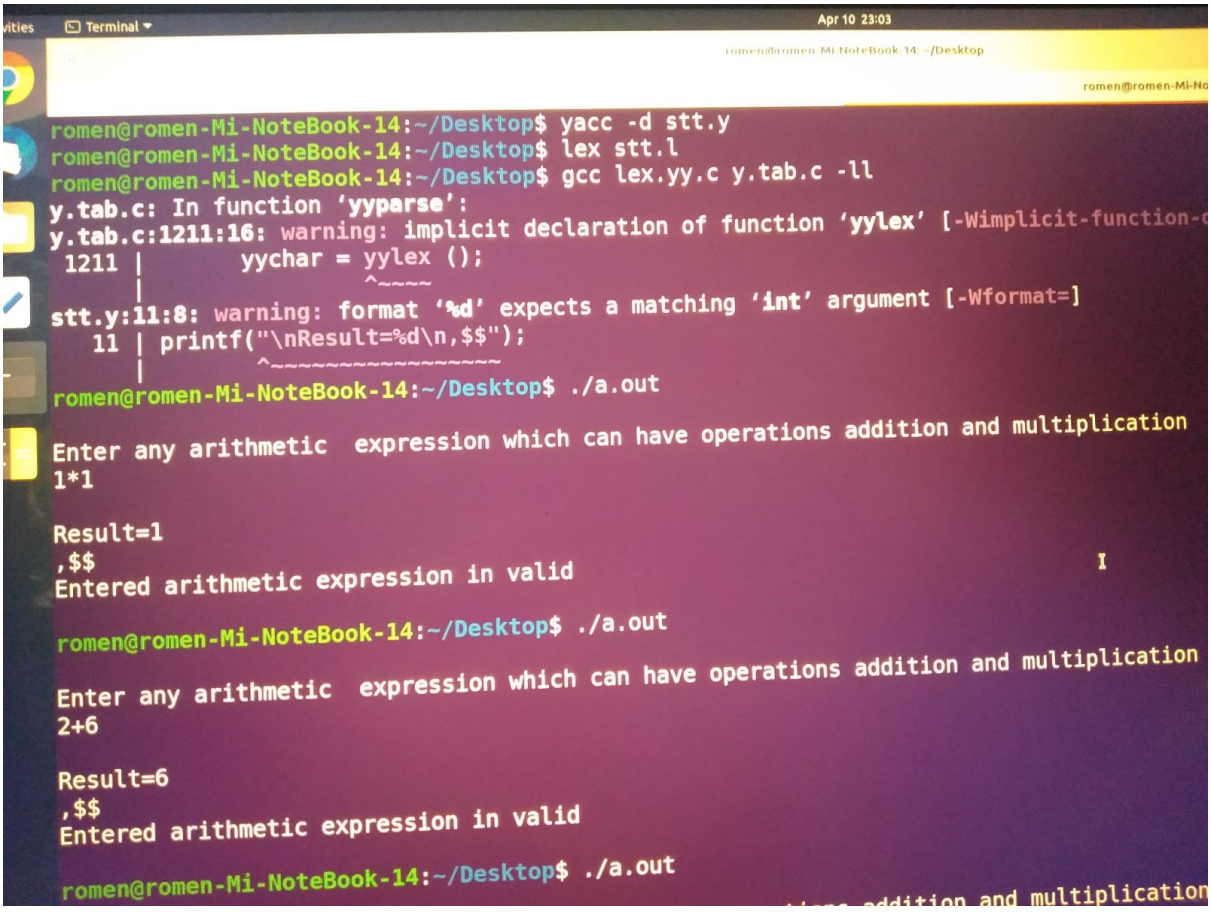
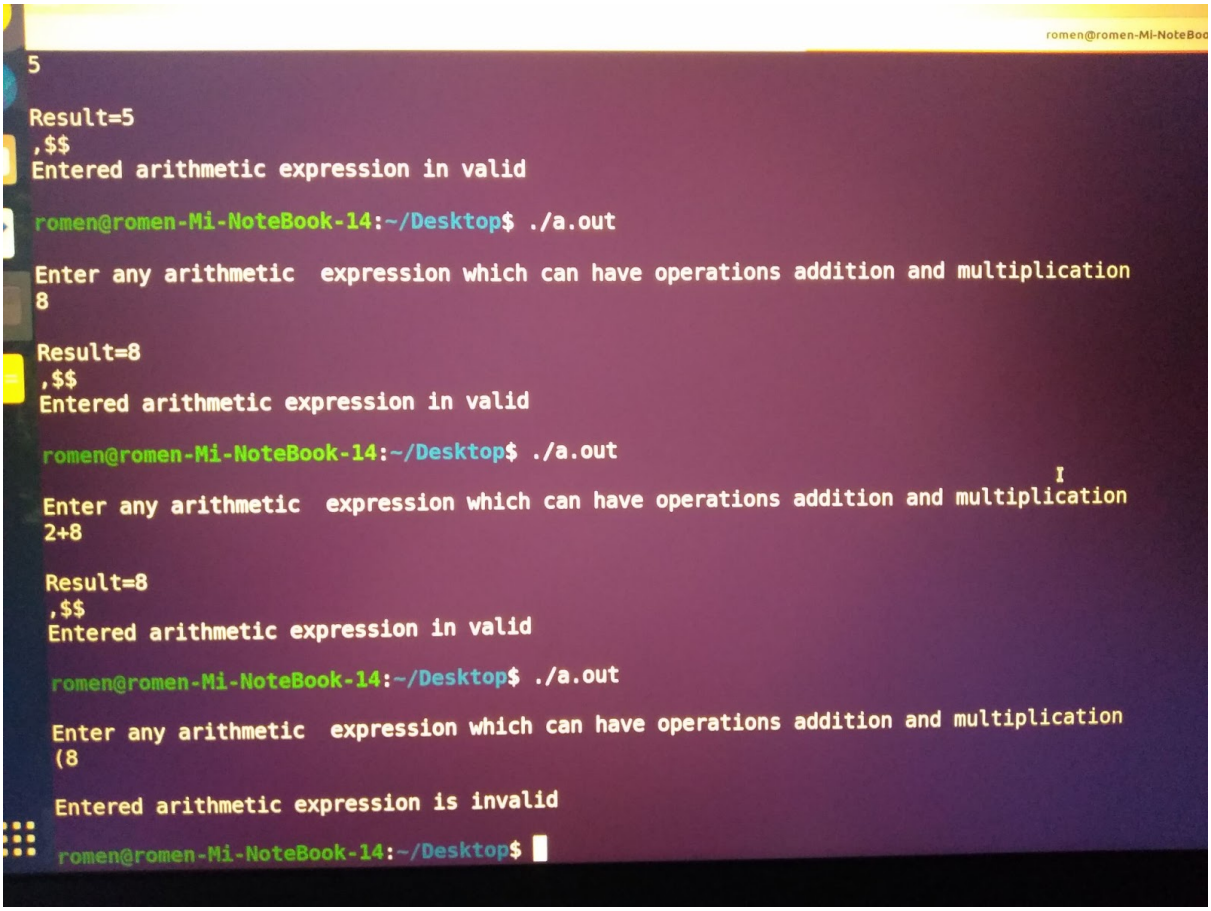
```
printf("\nEnter any arithmetic  expression which can
have operations addition and multiplication\n");
yyparse();
if(flag==0)
printf("\nEntered arithmetic expression in valid\n\n");
}
void yyerror(char *s)
{
printf("\nEntered arithmetic expression is invalid\n\n");
flag=1;
}
```

OUTPUT:



OUTPUT:


romen@romen-Mi-NoteBoo
5
Result=5
,$$
Entered arithmetic expression in valid
romen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
Enter any arithmetic expression which can have operations addition and multiplication
8
Result=8
,$$
Entered arithmetic expression in valid
romen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
Enter any arithmetic expression which can have operations addition and multiplication
2+8
Result=8
,$$
Entered arithmetic expression in valid
romen@romen-Mi-NoteBook-14:~/Desktop$ ./a.out
Enter any arithmetic expression which can have operations addition and multiplication
(8
Entered arithmetic expression is invalid
romen@romen-Mi-NoteBook-14:~/Desktop$

DATE:17/04/21

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AIM: “Data Science as a Career”-in Latex format

Latex code:

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage{graphicx}
\usepackage[labelfont=bf,skip=5pt,font=small]{,caption}
\usepackage{hyperref}

\begin{document}
    \pagenumbering{gobble}

    \begin{titlepage}
        \begin{center}
            \vspace*{1cm}
            \textbf{\Huge DATA SCIENCE AS A CAREER}\\
            \vspace{1cm}
            \textbf{MOIRANGTHEM ROMENKUMAR
SINGH}\\
            \textbf{Enroll No: 18103029}\\
            \textbf{3rd Year 6th Sem}\\
            \begin{figure}[h!]
                \centering
```

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```
\includegraphics[width=70mm]{nit colour logo.jpg}
        \end{figure}
        \vspace{2cm}
        \textbf{SUBMITTED TO:}\\
        Mrs. Kshetrimayum Merina Devi\\
        Technical Assistant, CSE
        \vspace{1cm}

        \textbf{\large DEPARTMENT OF COMPUTER
SCIENCE AND ENGINEERING}\\
        \textbf{\large NATIONAL INSTITUTE OF
TECHNOLOGY}\\
        \textbf{\large MANIPUR}\\
        April 2021
    \end{center}
\end{titlepage}

\tableofcontents



\newpage
\pagenumbering{arabic}
\section{What is data science?}
\begin{figure}
    \centering
    \includegraphics{ddatasciencw.jpg}
```

\end{figure}

Data science is the domain of study that deals with vast volumes of data using modern tools and techniques to find unseen patterns, derive meaningful information, and make business decisions. Data science uses complex machine learning algorithms to build predictive models.

The data used for analysis can be from multiple sources and present in various formats.

\section{Why Data Science?}

Data science or data-driven science enables better decision making, predictive analysis, and pattern discovery. It lets us:

a. Find the leading cause of a problem by asking the right questions\\
b. Perform exploratory study on the data\\
c. Model the data using various algorithms \\
d. Communicate and visualize the results via graphs, dashboards, etc.\\

\section{Prerequisites for Data Science}

Here are some of the technical concepts you should know about before starting to learn what is data science.

\subsection{ Machine Learning}

Machine learning is the backbone of data science. Data Scientists need to have a solid grasp on ML in addition to basic knowledge of statistics.
\subsection{Modeling}
Mathematical models enable you to make quick calculations and predictions based on what you already know about the data. Modeling is also a part of ML and involves identifying which algorithm is the most suitable to solve a given problem and how to train these models.
\subsection{Statistics}
Statistics are at the core of data science. A sturdy handle on statistics can help you extract more intelligence and obtain more meaningful results.

\subsection{Programming}
Some level of programming is required to execute a successful data science project. The most common programming languages are Python, and R. Python is especially popular because it’s easy to learn, and it supports multiple libraries for data science and ML.
\subsection{Databases}
A capable data scientist, you need to understand how databases work, how to manage them, and how to extract data from them.//
\section{Data Science Skills}

\begin{table}[h!]

```
\centering
\begin{tabular}{|c| c |c |}
 \hline
 Field  & Skill & Tools\\ [0.3ex]
 \hline\hline
Data Analysis&  R, Python,  & SAS, Jupyter, R Studio \\
& Statistics & MATLAB, Excel\\
\hline
  Data Warehousing & ETL, SQL, Hadoop,  &
Informatica/ Talend\\
  & Apache Spark&AWS Redshift\\
  \hline
  Data Visualization & R,  & Jupyter, Tableau, \\
  &Python libraries &Cognos, RAW\\
  \hline
  Machine Learning & Python, Algebra, &  Spark MLib,
Azure ML studio\\
  &ML Algorithms, Statistics & Azure ML studio\\[1ex]
 \hline
\end{tabular}
\caption{This table gives us  an idea of the skills and
tools used by people in different fields of data science}
\end{table}
\section{APPLICATIONS OF DATA SCIENCE}
```

Data science has found its applications in almost every industry.
\subsection{Healthcare}

Healthcare companies are using data science to build sophisticated medical instruments to detect and cure diseases.
\subsection{Gaming}
Video and computer games are now being created with the help of data science and that has taken the gaming experience to the next level.
\subsection{Image recognition}
Identifying patterns in images and detecting objects in an image is one of the most popular data science applications.
\subsection{Logistics}
Data Science is used by logistics companies to optimize routes to ensure faster delivery of products and increase operational efficiency.
\subsubsection{Fraud detection}
Banking and financial institutions use data science and related algorithms to detect fraudulent transactions.

\section{Data science as a career}

Over the last five years, the job vacancies for data science and its related roles have grown significantly. Glassdoor has named data scientist as the number one job in the United States as per its 2019 report. The U.S. Bureau of Labor Statistics predicts the rise of data science needs will create 11.5 million jobs by 2026.

There are several job roles that you can look for in the data science domain.

Some of the important job roles are:

Data Scientist
Machine Learning Engineer
Data Consultant
Data Analyst
According to Glassdoor, the average salary of a data scientist in the United States is USD 113,000 per annum and in India, it’s 907,000 Rupees per annum.
\section{References}
\href{https://www.simplilearn.com/tutorials/data-science-tutorial/what-is-data-science?source=sl_frs_nav_playlist_video_clicked}{DDatasxnce}

\hfill

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\end{document}

OUTPUT:

# DATA SCIENCE AS A CAREER

**MOIRANGTHEM ROMENKUMAR SINGH**
**Enroll No: 18103029**
**3rd Year 6th Sem**

**SUBMITTED TO:**
Mrs. Kshetrimayum Merina Devi
Technical Assistant, CSE

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**
**NATIONAL INSTITUTE OF TECHNOLOGY MANIPUR**
April 2021

# Contents

# 1 What is data science?

Data science is the domain of study that deals with vast volumes of data using modern tools and techniques to find unseen patterns, derive meaningful information, and make business decisions. Data science uses complex machine learning algorithms to build predictive models.

The data used for analysis can be from multiple sources and present in various formats.

# 2 Why Data Science?

Data science or data-driven science enables better decision making, predictive analysis, and pattern discovery. It lets us:

a. Find the leading cause of a problem by asking the right questions
b. Perform exploratory study on the data
c. Model the data using various algorithms
d. Communicate and visualize the results via graphs, dashboards, etc.

# 3 Prerequisites for Data Science

Here are some of the technical concepts you should know about before starting to learn what is data science.

## 3.1 Machine Learning

Machine learning is the backbone of data science. Data Scientists need to have a solid grasp on ML in addition to basic knowledge of statistics.

### 3.2 Modeling

Mathematical models enable you to make quick calculations and predictions based on what you already know about the data. Modeling is also a part of ML and involves identifying which algorithm is the most suitable to solve a given problem and how to train these models.

### 3.3 Statistics

Statistics are at the core of data science. A sturdy handle on statistics can help you extract more intelligence and obtain more meaningful results.

### 3.4 Programming

Some level of programming is required to execute a successful data science project. The most common programming languages are Python, and R. Python is especially popular because it's easy to learn, and it supports multiple libraries for data science and ML.

### 3.5 Databases

A capable data scientist, you need to understand how databases work, how to manage them, and how to extract data from them.//

## 4 Data Science Skills

| Field | Skill | Tools |
|---|---|---|
| Data Analysis | R, Python,<br>Statistics | SAS, Jupyter, R Studio<br>MATLAB, Excel |
| Data Warehousing | ETL, SQL, Hadoop,<br>Apache Spark | Informatica/ Talend<br>AWS Redshift |
| Data Visualization | R,<br>Python libraries | Jupyter, Tableau,<br>Cognos, RAW |
| Machine Learning | Python, Algebra,<br>ML Algorithms, Statistics | Spark MLib, Azure ML studio<br>Azure ML studio |

**Table 1:** This table gives us an idea of the skills and tools used by people in different fields of data science

## 5 APPLICATIONS OF DATA SCIENCE

Data science has found its applications in almost every industry.

### 5.1 Healthcare

Healthcare companies are using data science to build sophisticated medical instruments to detect and cure diseases.

### 5.2 Gaming

Video and computer games are now being created with the help of data science and that has taken the gaming experience to the next level.

### 5.3 Image recognition

Identifying patterns in images and detecting objects in an image is one of the most popular data science applications.

### 5.4 Logistics

Data Science is used by logistics companies to optimize routes to ensure faster delivery of products and increase operational efficiency.

#### 5.4.1 Fraud detection

Banking and financial institutions use data science and related algorithms to detect fraudulent transactions.

## 6 Data science as a career

Over the last five years, the job vacancies for data science and its related roles have grown significantly. Glassdoor has named data scientist as the number one job in the United States as per its 2019 report. The U.S. Bureau of Labor Statistics predicts the rise of data science needs will create 11.5 million jobs by 2026.

There are several job roles that you can look for in the data science domain. Some of the important job roles are:

Data Scientist Machine Learning Engineer Data Consultant Data Analyst According to Glassdoor, the average salary of a data scientist in the United States is USD 113,000 per annum and in India, it's 907,000 Rupees per annum.

## 7 References

DDatasxnce