LATEX OUTPUT FOR GRAMMAR

Purpose: Our DSL is meant as a way to simplify creating graphical latex entries and as such doesn't require any latex knowledge. Below are some of the features as well as examples using them (**NOTE IF COPY PASTING, must replace "" with the standard non google doc quotation mark**)

Our Grammar	LaTeX Output
Comments: ● Any text between /* */ ● Doesnt get evaluated /* look at this text that wont get evaluated Even if it is many lines */	
Text: ● Started by TEXT and contain any string between quotation marks ● Have formatting options including Bold, Underline, Heading, Italics TEXT(Bold, Underline){"this is my text"}	this is my text \documentclass[]{article} \usepackage{amsmath} \usepackage{tikz} \usetikzlibrary{graphs,automata} \title{Document} \begin{document} \textbf{\underline{this is my text}} \end{document}

Functions:
- Functions can have any name without spaces, they also have input parameters which are the mutable variables that the inputs get assigned to
- Any statements can go in the function declarations apart from other function declarations
- To call a function use CALL(fn_name, param1, param2,.... etc)

```
&x = [0, 1, 2]
&y = 8
FUNCTION hello_world (&x, &y)
{
  MATRIX ROW: 3, COL:3 (&x, &y)
  {
   &x + 1 |
   4, 5, 6 |
   7, &y, 9 |
  }
  TEXT (Bold, Italics)
  {
   "Hello World"
  }
}


CALL (hello_world, &x, &y)
```

```
\[\begin{bmatrix}
1.0 & 2.0 & 3.0\\
4.0 & 5.0 & 6.0\\
7.0 & 8.0 & 9.0\\
\end{bmatrix}\]
\textbf{\textit{Hello World}}
```

$$\begin{bmatrix} 1.0 & 2.0 & 3.0 \\ 4.0 & 5.0 & 6.0 \\ 7.0 & 8.0 & 9.0 \end{bmatrix}$$

Hello World

Tables:
- Tables only contain quoted text or a mutable variable
- Can define size through using ROW:#,COL# or COL:#,ROW#
- TOPHEADER has a list of text for the headers, if declared must match the column count
- LEFTHEADER defines text for the left headers, must match the number of rows

```
TABLE ROW:3,COL:3
TOPHEADER: ("Table", "Row", "Header")
LEFTHEADER: ("Table", "Column", "Header")
{
 "this", "goes", "inside" |
 "the", "table", "content" |
 "it", "is", "text" |
}
```

```
\begin{center}
\begin{tabular}{|l|c|c|c|}
\hline
&\textbf{Table}&\textbf{Row}&\textbf{Header}\\
\hline
\textbf{Table}&this&goes&inside\\
\hline
\textbf{Column}&the&table&content\\
\hline
\textbf{Header}&it&is&text\\
\hline
\end{tabular}
\end{center}
```

	Table	Row	Header
Table	this	goes	inside
Column	the	table	content
Header	it	is	text

Matrices:
- You can define the size of the matrices using ROW, COL like tables above. Matrices can either be filled in completely with equations (which get evaluated), by one single equation filling the matrix, one equation filling the whole row, or one mutable variable containing an array being expanded to fit a whole row.

```
MATRIX
ROW: 3,
COL: 3
 {
  7 + 16, 2 - 8, 8 * 2 |
  8 / 2, 3 ^ 2 , 2 * log( 10 ) |
  sqrt( 4 ), x, 0.234 |
 }
```

```
\[\begin{bmatrix}
23.0 & -6.0 & 16.0\\
4.0 & 9.0 & 2.0 \cdot (  \log( 10.0 ) )\\
 \sqrt{ 4.0 } & x & 0.234\\
\end{bmatrix}\]
\[\begin{bmatrix}
5.0 & 5.0 & 5.0\\
5.0 & 5.0 & 5.0\\
5.0 & 5.0 & 5.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
1.0 & 2.0 & 3.0 & 4.0\\
2.0 & 4.0 & 6.0 & 8.0\\
2.0 & 2.0 & 2.0 & 2.0\\
52.0 & 3.0 & 1.0 & 4.0\\
\end{bmatrix}\]
```

```
&a = 4
MATRIX ROW: 3, COL: 3 (&a)
{
  &a + 1
}
```

$$\begin{bmatrix} 23.0 & -6.0 & 16.0 \\ 4.0 & 9.0 & 2.0 \cdot (\log(10.0)) \\ \sqrt{4.0} & x & 0.234 \end{bmatrix}$$

$$\begin{bmatrix} 5.0 & 5.0 & 5.0 \\ 5.0 & 5.0 & 5.0 \\ 5.0 & 5.0 & 5.0 \end{bmatrix}$$

```
&b = [1, 2, 3, 4]
MATRIX ROW: 4, COL: 4 (&b)
{
  &b |
  2 * &b |
  2, 2, 2, 2 |
  52, 3 , 1, 4 |
}
```

$$\begin{bmatrix} 1.0 & 2.0 & 3.0 & 4.0 \\ 2.0 & 4.0 & 6.0 & 8.0 \\ 2.0 & 2.0 & 2.0 & 2.0 \\ 52.0 & 3.0 & 1.0 & 4.0 \end{bmatrix}$$

For Loop:
- We have exclusive for loops that iterate over the variable after the loop. Start and end states can be any equation, but must evaluate to a number (ie. no symbols). The variable gets updated automatically

```
LOOP &i FROM 0 TO  2
 {
   MATRIX ROW: 2, COL: 2 (&i)
   {
     &i ^ 2, &i * 2 |
     &i + 1, &i + 2 |
   }
 }
```

```
\[\begin{bmatrix}
0.0 & 0.0\\
1.0 & 2.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
1.0 & 2.0\\
2.0 & 3.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
4.0 & 4.0\\
3.0 & 4.0\\
\end{bmatrix}\]
```

$$\begin{bmatrix} 0.0 & 0.0 \\ 1.0 & 2.0 \end{bmatrix}$$

$$\begin{bmatrix} 1.0 & 2.0 \\ 2.0 & 3.0 \end{bmatrix}$$

$$\begin{bmatrix} 4.0 & 4.0 \\ 3.0 & 4.0 \end{bmatrix}$$

Graphs & DFA:
- We provide features including: defining a list of nodes with their names and specifying if they are start nodes (Node1(S)) or Accept nodes (Node1(A))
- We also allow you to define a connection from one node name to another using one of the following connections (<-, ->, <->, --). As well as labels for the connections within a bracket

```
GRAPH
{
 NODES:
 {
   Node1, Node2, Node3
 },
 CONNECTIONS:
 {
   Node1 -> Node2, Node1 <-> (p) Node3
 }
}
```

```
GRAPH
{
 NODES:
 {
   1 (SA), 2, 3, 4
 },
 CONNECTIONS:
 {
   1 -> (F) 2 , 2 ->(O) 3 , 3 -> (O) 4, 4 -> (D) 1
 }
}
```

```
\begin{tikzpicture}[node distance={2cm},
thick, state/.style = {draw, circle}]
\node[state] (Node1) {Node1};
\node[state] (Node2) [right of=Node1]
{Node2};
\node[state] (Node3) [right of=Node2]
{Node3};
\path[->] (Node1) edge[bend right = 40]
(Node2);
\path[<->] (Node1) edge[bend right = 34]
node[below = 0.1cm] {p} (Node3);
\end{tikzpicture}
```

```
\begin{tikzpicture}[node distance={2cm},
thick, state/.style = {draw, circle}]
\node[state,initial left,accepting] (1) {1};
\node[state] (2) [right of=1] {2};
\node[state] (3) [right of=2] {3};
\node[state] (4) [right of=3] {4};
\path[->] (1) edge[bend right = 39]
node[below = 0.1cm] {F} (2);
\path[->] (2) edge[bend right = 38]
node[below = 0.1cm] {O} (3);
\path[->] (3) edge[bend right = 30]
node[below = 0.1cm] {O} (4);
\path[->] (4) edge[bend right = 30]
node[below = 0.1cm] {D} (1);
\end{tikzpicture}
```
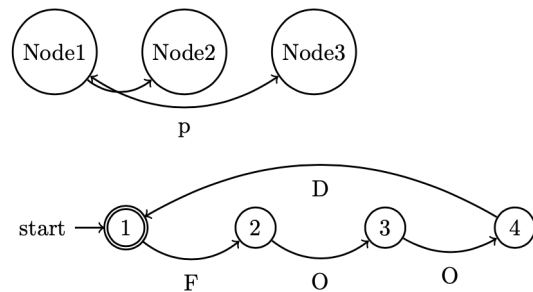
```
&numArray = [0, 1, 2]
&equation = sqrt(7) + 4

FUNCTION matrixTen (&numArray,
&equation)
 {
  LOOP &i FROM 1 TO 10
  {
   MATRIX
   ROW: 3, COL: 3 (&numArray, &equation,
&i)
   {
    &numArray + &i |
    4, 5, 6 |
    &equation, 8, 9 |
   }
  }
 }

FUNCTION exampleTable ()
 {
  TEXT(Bold, Underline)
  {
   "Table"
  }
  TABLE
  ROW:3, COL:3
  TOPHEADER: ("Table", "Row", "Header")
  LEFTHEADER: ("Table", "Column",
"Header")
  {
   "this", "goes", "inside" |
   "the", "table", "content" |
   "it", "is", "text" |
  }
 }


/* This is the beginning of the document */
TEXT(Italics)
{
 "Hello World"
}

CALL(exampleTable)

TEXT(Bold, Underline)
{
 "Blah blah blah"
}
```

Hello World

Table

	Table	**Row**	**Heade**
Table	this	goes	inside
Column	the	table	conten
Header	it	is	text

Blah blah blah

$$\begin{bmatrix} 1.0 & 2.0 & 3.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 2.0 & 3.0 & 4.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 3.0 & 4.0 & 5.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 4.0 & 5.0 & 6.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 5.0 & 6.0 & 7.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 6.0 & 7.0 & 8.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 7.0 & 8.0 & 9.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 8.0 & 9.0 & 10.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 9.0 & 10.0 & 11.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

$$\begin{bmatrix} 10.0 & 11.0 & 12.0 \\ 4.0 & 5.0 & 6.0 \\ \sqrt{7.0}+(4.0) & 8.0 & 9.0 \end{bmatrix}$$

Table

	Table	**Row**	**Header**
Table	this	goes	inside
Column	the	table	content
Header	it	is	text

```
\documentclass[]{article}
\usepackage{amsmath}
```

CALL (matrixTen, &numArray, &equation) CALL(exampleTable)	\usepackage{tikz} \usetikzlibrary{graphs,automata} \title{Document} \begin{document} \textit{Hello World} \textbf{\underline{Table}} \begin{center} \begin{tabular}{|l|c|c|c|} \hline &\textbf{Table}&\textbf{Row}&\textbf{Header}\\ \hline \textbf{Table}&this&goes&inside\\ \hline \textbf{Column}&the&table&content\\ \hline \textbf{Header}&it&is&text\\ \hline \end{tabular} \end{center} \textbf{\underline{Blah blah blah}} \[\begin{bmatrix} 1.0 & 2.0 & 3.0\\ 4.0 & 5.0 & 6.0\\ \sqrt{ 7.0 } + (4.0) & 8.0 & 9.0\\ \end{bmatrix}\] \[\begin{bmatrix} 2.0 & 3.0 & 4.0\\ 4.0 & 5.0 & 6.0\\ \sqrt{ 7.0 } + (4.0) & 8.0 & 9.0\\ \end{bmatrix}\] \[\begin{bmatrix} 3.0 & 4.0 & 5.0\\ 4.0 & 5.0 & 6.0\\ \sqrt{ 7.0 } + (4.0) & 8.0 & 9.0\\ \end{bmatrix}\] \[\begin{bmatrix} 4.0 & 5.0 & 6.0\\ 4.0 & 5.0 & 6.0\\ \sqrt{ 7.0 } + (4.0) & 8.0 & 9.0\\ \end{bmatrix}\] \[\begin{bmatrix} 5.0 & 6.0 & 7.0\\ 4.0 & 5.0 & 6.0\\ \sqrt{ 7.0 } + (4.0) & 8.0 & 9.0\\ \end{bmatrix}\]

```
\[\begin{bmatrix}
6.0 & 7.0 & 8.0\\
4.0 & 5.0 & 6.0\\
 \sqrt{ 7.0 } + ( 4.0 ) & 8.0 & 9.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
7.0 & 8.0 & 9.0\\
4.0 & 5.0 & 6.0\\
 \sqrt{ 7.0 } + ( 4.0 ) & 8.0 & 9.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
8.0 & 9.0 & 10.0\\
4.0 & 5.0 & 6.0\\
 \sqrt{ 7.0 } + ( 4.0 ) & 8.0 & 9.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
9.0 & 10.0 & 11.0\\
4.0 & 5.0 & 6.0\\
 \sqrt{ 7.0 } + ( 4.0 ) & 8.0 & 9.0\\
\end{bmatrix}\]
\[\begin{bmatrix}
10.0 & 11.0 & 12.0\\
4.0 & 5.0 & 6.0\\
 \sqrt{ 7.0 } + ( 4.0 ) & 8.0 & 9.0\\
\end{bmatrix}\]
\textbf{\underline{Table}}

\begin{center}
\begin{tabular}{|l|c|c|c|}
\hline
&\textbf{Table}&\textbf{Row}&\textbf{Header}\
\
\hline
\textbf{Table}&this&goes&inside\\
\hline
\textbf{Column}&the&table&content\\
\hline
\textbf{Header}&it&is&text\\
\hline
\end{tabular}
\end{center}

\end{document}
```