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Snek Mini Programming Language Documentation

BSCS 3-4
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I. INTRODUCTION

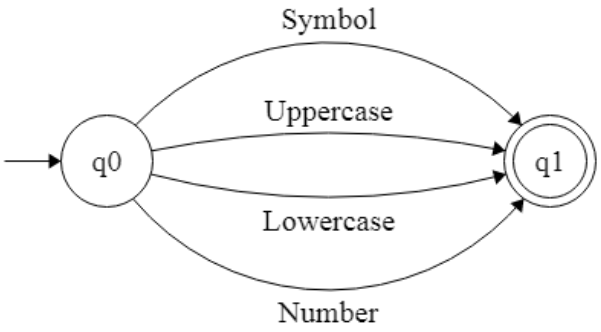
Snek is a newly conceptualized mini programming language designed by computer science students in Polytechnic University of the Philippines . This new programming language is heavily inspired by famous programming languages such as C and Python. It was mainly developed as a system programming language to perform basic functions. Main feature of Snek language is it has a simple set of keywords and clean style. Most notable part of Snek is its ability to distinguish reserved words from user-generated entities with the help of apostrophe (‘). These features make this programming language suitable for beginners. It emphasizes code readability and minimal learning curve for newcomers in the field of computer programming.

Snek has a programming paradigm which is almost similar to a structured language. Given that Snek is merely a mini language, fundamental instructions namely repetition, selection and sequence are at most tasks that can be performed.

II. SYNTACTIC ELEMENTS OF A LANGUAGE

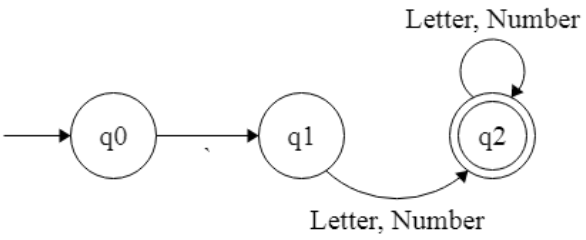
1. Character Set

<Character> → {Letter, Number, Symbol}
<Letter> → {uppercase, lower-case}
<Uppercase>→ {A…Z}
<Lowercase>→ {a…z}
<Number> → {0,1,2,3,4,5,6,7,8,9}
<Symbol> → { (,), {, }, !, =, >, <, |, /, ”, ,, + , - , %, *, ; ,. , :}



2. Identifiers

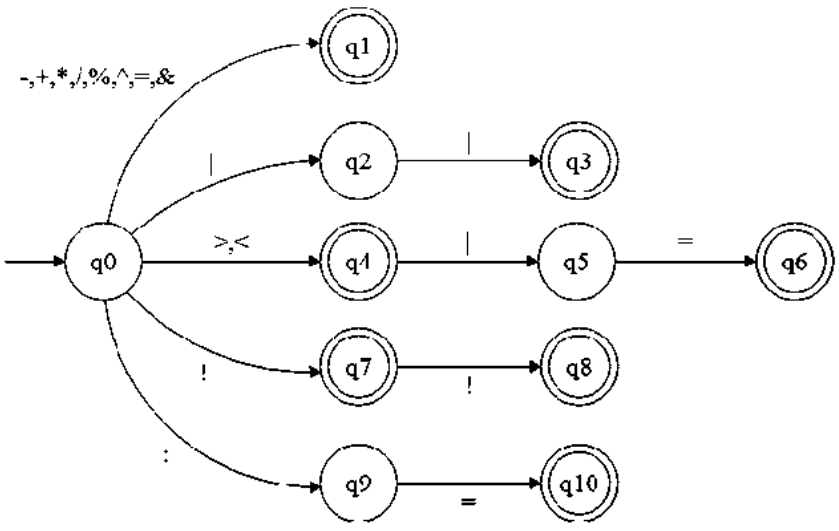
- Always starts with the symbol “ ` ”.
- Followed by series of letters or numbers
- It must be case sensitive.



3. Operation Symbols

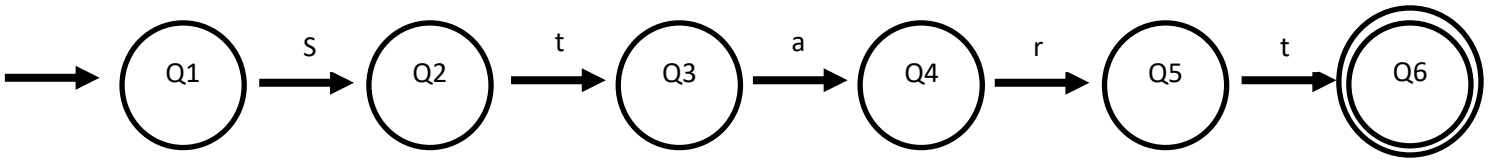
<Arithmetic> → {+, -, /, *, %, ^}
<Logic> → {| |, &, !}
<Relational> → {>, <, =, !!, >|=, <|=}
<Assignment>→ {:=}

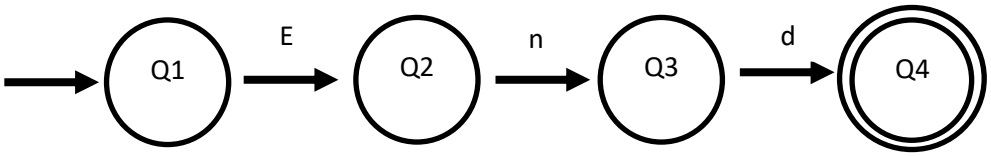
ARITHMETIC		LOGIC		RELATIONAL		ASSIGNMENT	
+	Addition	||	Logic or	<	Less than	:=	Takes
-	Subtraction	&	Logic and	>	Greater than		
/	Division	!	Logic not	=	Equal		
*	Multiplicatio n			<|=	Less than or equal		
^	Exponential			>|=	Greater than or equal		
				!!	Not equal		



4. Noise words

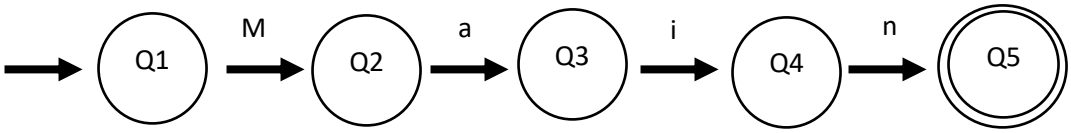
NOISE WORDS	DESCRIPTION
start Syntax: Main (start)	Indicates the start of the program
end Syntax: Main (end)	Indicates the start of the program





5. Keywords/ Reserved words

Keywords	Syntax	Description
Main	Main(start)	Starting point for program execution.
Outdis	outdis (“text”); outdis (“text” – identifier);	Is used to print string literals and values of the identifiers onto the output screen.
inscan	inscan identifier := value	Is used to read character, string, numeric data from keyboard.
integral	integral	Define numeric variables holding both positive and negative numbers.
decimal	decimal	Define numeric variables holding numbers with decimal points.
text	text	A character or sequence of characters
incase	incase(condition)	Statement is responsible for modifying the flow of execution of a program. incase statement is always used with a condition. The condition is evaluated first before executing any statement inside the body of incase. Statement evaluates the test expression inside the parenthesis ()
then	then {statements}	If the condition in incase will be evaluated as true, statements under “then” will be performed.
else	else {statements}	Will be executed if the condition/s in the incase block is/are not met.
amid	amid (condition)	Repeatedly executes a target statement as long as a given condition is true.
act	act {statements}	Similar to amid, except that it is guaranteed to execute at least one time.
forloop	Forloop (initialization; condition; arithmetic expression)	Used for executing a block of statements repeatedly until a given condition returns false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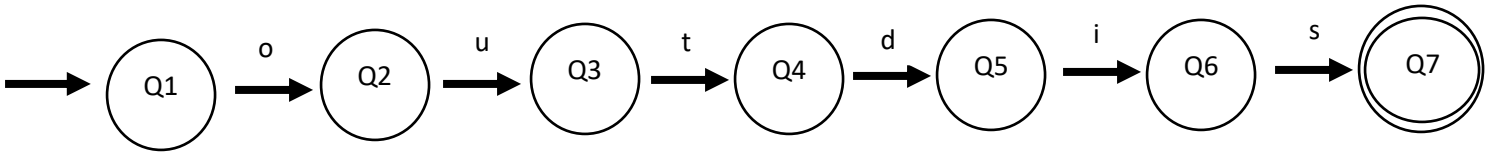
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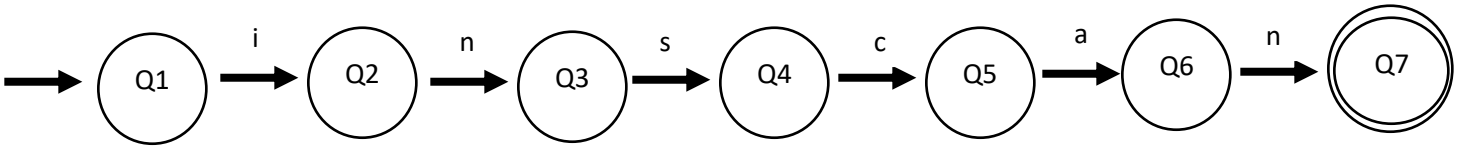
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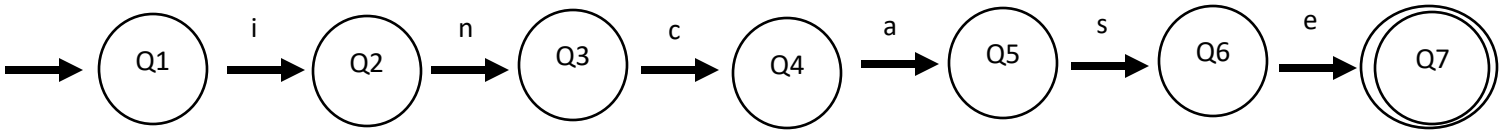
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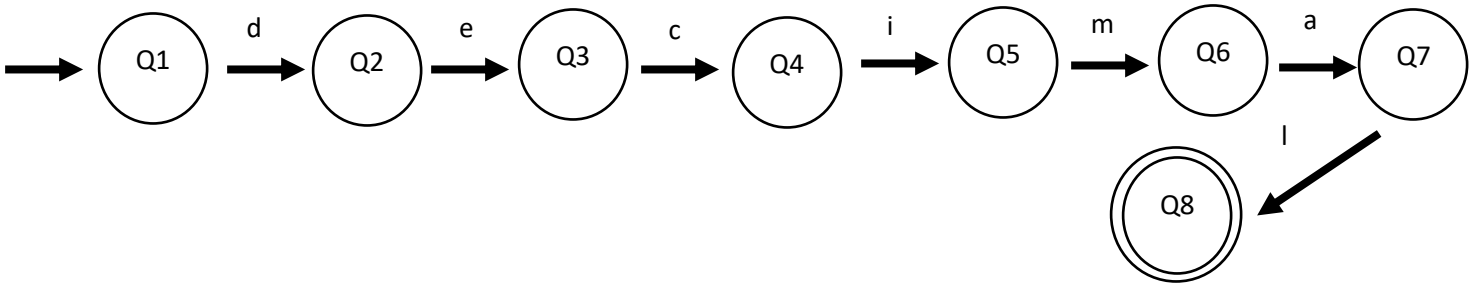
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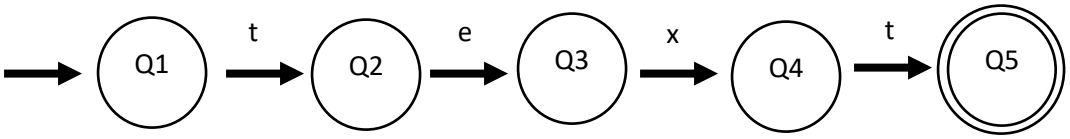
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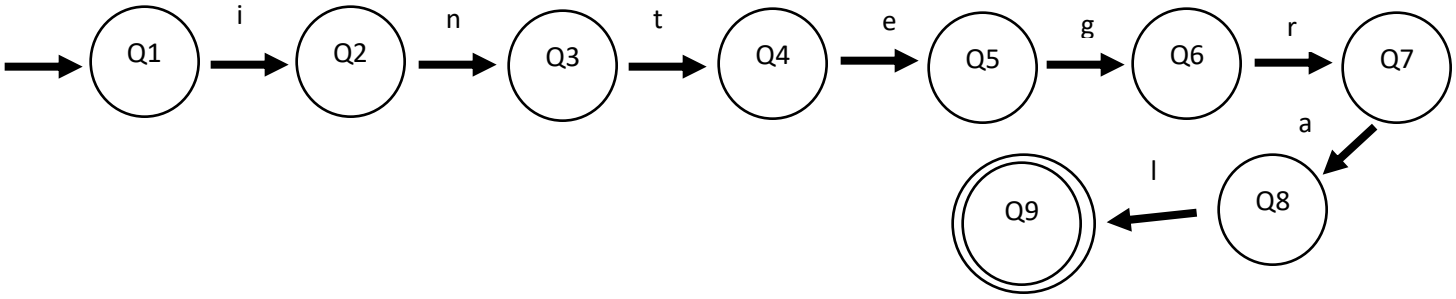
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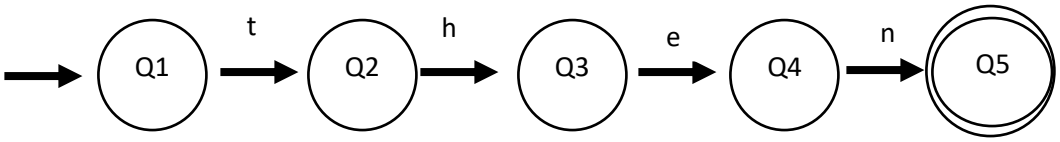
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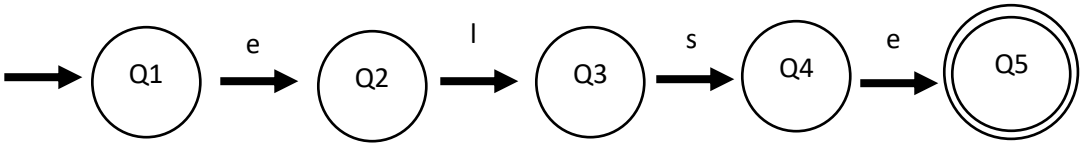
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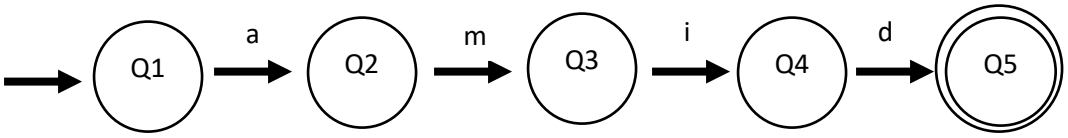
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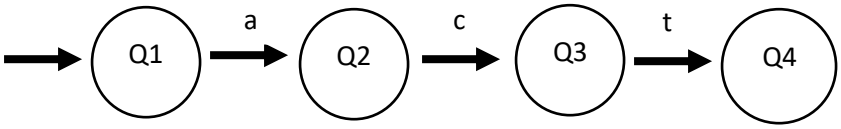
Q1
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6. Comments

- Comments are used to provide supplementary information making it easier to understand the source code of the computer program. The comments are generally ignored by the interpreter.
- One line comment should start with the symbol “>>”, followed by any combinations of letters and numbers, ends in next line
- Multiple line comment should start with the symbol “>>” and end with “<<”
- All the strings after this symbol “>>” would be ignored by the compiler and starts to be recognized again after “<<” for multiple lines and end of line for single line comment

Comment Style	Syntax	Sample
Line comments – delimit a region of source code for a single line only. The symbol “>>” indicate the beginning of a comment. A newline character indicates the end of a line comment.	>>	>> This is a line comment
Block comments – delimit a region of source code which may span multiple lines. The symbol “ >>” indicate the beginning and the symbol “<< “ for the end of the block comment.	>> <<	>>This is a Block comment <<

7. Blanks
    - The use of blank spaces can improve the style of a program. It improves the readability of a program. A blank space is required between consecutive words in a program line.
    - Blank space does not correspond to a visible mark, but it actually occupies an area on a page. When the lexical analyzer encounters a blank space, it indicates the end of a lexeme thus, the lexical analyzer will look up for that certain lexeme from the list.

8. Delimiters and Braces

DELIMITERS	DESCRIPTION	SAMPLE
;	Semicolons are used to identify the end of line in a line of code	Integral ‘a;
{}	Curly Brackets are used to signify a block of code	Main(START){ …… }Main(END)
“”	Double quotes are used to identify String Literals	outdis(“Random”);
,	Commas are used to separate data data fields	outdis(“text” ~ var ~ “text, ‘var);
()	Open and Closed Parenthesis are used as a field for parameters, String Literals, etc.	outdis(“Text”);
>><< >>	Double Angle Brackets are used for representing comments	>>Multiple-line comment<< >>One line comment

9. Expression

9.1 Arithmetic Expression

Precedence	Operators	Order of Evaluation	Example	Result
4	()	If the parentheses are nested, expression in the innermost pair is evaluated first. If there is several pair of parentheses on the same level, they are evaluated from left to right.	((3+2)*(8/2)) 5 * 4 20	20
3	^	If there are no parentheses in the expression, this will always be evaluated first	6/3+2^2 6/3+ 4 6/3+ 4 2 + 4 6	6
2	*, / %	If there are several on the same level, they are evaluated from left to right.	10%7*6/9 3 *6/9 18/9 2	2
1	+, -	If there are several on the same level, they are evaluated from left to right.	2+3-1-2+10 5 -1-2+10 4 -2+10 2 +10 12	12

Example combination of all arithmetic operators

((45-12*2) + (20/5%1) * 3^2) → Inner parentheses first, left to right
((45- 24)) + (20/5%1) * 3^2) → * has a higher precedence
(21 + (20/5%1) * 3^2) → First inner parentheses has been evaluated
(21 + (4 %1) * 3^2) → All operators on the second inner parentheses is on the same level of precedence, left to right
(21 + 0 * 3^2) → Second inner parentheses has been evaluated
(21 + 0 * 9) → ^ has the highest precedence among all the remaining operators
(21 + 0) → * has higher precedence than +
20 → Done evaluating all operators

9.2 Relational Expression

Precedence	Operators	Order of Evaluation	Example	Result
Equal priority	< > >|= <|= = !!	Can only have one relational operator in a pair of parentheses. Relational expressions can only be performed through logical operator. It doesn't matter what relational expression is evaluated first, it will always result to the same answer.	(2 > 4) & (5 < 10) || (4 !! 3) false & (5 < 10) || (4 !! 3) false & true || (4 !! 3) false & true || true false || true true (2 > 4) & (5 < 10) || (4 !! 3) (2 > 4) & (5 < 10) || true false & (5 < 10) || true false & true || true false || true true	true

9.3 Logical expression

Precedence	Operators	Order of Evaluation	Example	Result
4	!	Highest precedence among all operators.	(2>1) & !(6=2) || (5<10) (2>1) & !(false) || (5<10) (2>1) & true || (5<10) true & true || (5<10) true || (5<10) true || true true	true
3	()	If the parentheses are nested, expression in the innermost pair is evaluated first. If there is several pair of parentheses on the same level, they are evaluated from left to right. Relational expressions being evaluated by the logical operator should always be enclosed in parentheses.	(((9 < 2) || (6 >|= 2)) & (4=1)) ((false || (6 >|= 2)) & (4=1)) ((false || true) & (4=1)) ((false || true) & (4=1)) (true & (4=1)) (true & false) false	false
2	&	After all the expressions inside parentheses have been evaluated, this will always be evaluated first if there are other logical operators on the same level pair of parentheses. If all are the same operators on the same level, it will be evaluated from left to right.	((6 > 4) || (1 < 10) & (2 >|=5)) (true || true & false) (true || false) true	true
	||	Last to be evaluated. Left to right evaluation also if same operators on the same level pair of parentheses.	((6 > 4) || (1 < 10) & (2 >|=5)) (true || true & false) (true || false) true	true

Example combination of all logical operators

(((8 >|= 4) || (30 < 8) & (2 >|=5)) & !((3 >6)) → logic not to be evaluated first
(((8 >|= 4) || (30 < 8) & (2 >|=5)) & !(false)) → perform the expression inside
(((8 >|= 4) || (30 < 8) & (2 >|=5)) & true) → invert its value
((true || false & false) & true) → parentheses on the same level evaluated
((true || false) & true) → & has higher precedence but || is inside parentheses
(true & true) → & is last to be evaluated since it is outside the parentheses
true which has higher precedence

9.4 All expressions

Precedence	Operators	Order of Evaluation	Example
6	!	Highest precedence on all operators.	X = 5 Y = 2 Z = 3 (y = x + 3) > 10 || 2= Z & (2+Y <|= X & !(Z = Y + X*2 > 20)) (y = x + 3) > 10 || 2= Z & (2+Y <|= X & !(Z = Y + 10 > 20)) (y = x + 3) > 10 || 2= Z & (2+Y <|= X & !(Z = 12 > 20)) X = 5 Y = 2 Z =12 (y = x + 3) > 10 || 2= Z & (2+Y <|= X & !(12 > 20)) (y = x + 3) > 10 || 2= Z & (2+Y <|= X & !false) (y = x + 3) > 10 || 2= Z & (2+Y <|= X & true) (y = 8) > 10 || 2= Z & (2+Y <|= X & true) X = 5 Y = 8 Z =12 8 > 10 || 2= Z & (2+Y <|= X & true) 8 > 10 || 2= Z & (10 <|= X & true) 8 > 10 || 2= Z & (false & true) 8 > 10 || 2= Z & false false || 2= Z & false false || false & false false || false **false**
5	()	If the parentheses are nested, expression in the innermost pair is evaluated first. If there is several pair of parentheses on the same level, they are evaluated from left to right.	
4	Arithmetic Operators	Precedence of arithmetic operators are also applied.	
3	Relational Operators	Precedence of relational operators is also applied.	
2	Logical Operators	Precedence of logical operators is also applied.	
1	=	Lowest precedence among all operator hence, last to be evaluated	

- In an expression, operator with the highest precedence is grouped with its operands first, then the next highest operator will be grouped with its operands and so on. If there are several operators of the same precedence, they will be examined left to right.
- All expression should always start with either a brace(parenthesis only), symbol " ' " (for variable/identifier), numbers (for constant values)
  Example:
  - ('x + 3)
  - 'x * 3
  - 3 / 'x
- Every opening braces should have its corresponding close braces
  - (('Y + 'X – 3) > 5)
- First operand which can be letters or numbers will be followed by an operator and ends with another operand composed of letters or numbers, or can also end with braces to partner its corresponding open brace.
  - 'Y % 4
  - ('Y > 'X) && ('Z <|= 'X)
- It can only start with an operator in logic expression using the operator "!" followed by a relational expression or logical expression which inverts their resulting logical value – true or false.
  - !(4 < 5)
- Arithmetic operators cannot perform operation between relational expressions and logic expressions. Only for letters/numbers
  - (3 > 4) +(6 < 4) → wrong
  - (3 > 4 && 6 =2) - ('X < 4 || 3 >|= 'Y) → wrong
- Relational operator cannot perform operation between logic expressions
  - (3 > 4 && 6 =2) >|= ('X < 4 || 3 >|= 'Y) → wrong
- Logic operator can only perform logic and relational expressions
  - (Y > X) && (Z <|=X)
  - (Y > X) || (Z <|=X && 3 > 4)
  - ! ('X = 2)
  - !('X + 3) →

10.Statements

Syntax	Example
Comment	
>> <character> one line	>> uno is life
>> <character> two or more lines <<	>> This code block computes for the total price <<
Declaration	
<data_type> <identifier>;	integral `a;
Data type	
<data_type> <identifier>;	integral `catNumber;
<data_type> <identifier>;	decimal `average;
<data_type> <identifier>;	text `studentName;
Declaration plus initialization/assignment	
<data_type> <identifier> <assignment_operator> literal_value;	decimal `dogNumber := 32.3;
<data_type> <identifier> <assignment_operator> “string_literal_value”;	text `dogName := “Manny”;
<data_type> <identifier> <assignment_operator> <identifier>;	Integral `tigerNumber := `lionNumber;
<data_type> <identifier> <assignment_operator> <arithmetic_expression>;	decimal `mouseNumber := 32*2+3;
Initialization/assignment (assigning of initial value separated from the declaration)	
<identifier> <assignment_operator> literal_value;	`dogNumber := 3;
<identifier> <assignment_operator> “string_literal_value”;	`catName := “Chico”;
<identifier> <assignment_operator> <identifier>;	`tigerNumber := `dogNumber;
<identifier> <assignment_operator> <arithmetic_expression>;	`mouseNumber := 2+10/5;
Assignment (assigning of new value to a variable with a value already)	
<identifier> <assignment_operator> literal_value;	`deerNumber := 13;
<identifier> <assignment_operator> “string_literal_value”;	`catName := “elChoco”;
<identifier> <assignment_operator> <identifier>;	`birdNumber := `eagleNumber;
<identifier> <assignment_operator> <arithmetic_expression>;	`average := 2+10/5;
Input	
inscan <identifier> <assignment_operator> literal_value;	inscan a := 28;
inscan <identifier> <assignment_operator> “string_literal_value”;	inscan b := “Argentina”;
Output	

Syntax	Example	Output
outdis (“string_literal_value”);	outdis (“text”);	text
outdis (“string_literal_value” ~<identifier>~ “string_literal_value”, `<identifier>);	x = "This"; outdis("that" ~ x ~ "there", 'x);	thatThisther
outdis(<identifier>);	x=1; outdis(x);	1
Conditional		
incase, then, else		

incase(condition) then{statements}	incase(x=3) then{
	y:= “cat”;
	z:= 3;
	x:= z+1;
	}	

Incase(condition) then{statements} else{statements}	incase(x=3) then{
	y:= “cat”;
	z:= 3;
	x:= z+1;
	} else { y:= “dog”;
	z:= 4;
	x:= z+2;
	}	

Loop/iteration		
amid, act		
amid(condition){statements}	amid(x=z) { y:= zebra integral total := 1+2+3+4; x:=x+1;}	

act{statements}amid(condition);	act
	{y:= zebra
	integral total := 1+2+3+4;
	x:=x+1;}
	amid(x=z);	

for		
forloop (initialization; condition; arithmetic expression){statements}	forloop (integral x:=0;x<|=10;x:=x+1) {:= zebra integral total := 1+2+3+4;}	

III. Design Issues

Upon constructing Snek programming language, drawbacks and potential downsides to the implemented structural design have been anticipated by Snek developers. These drawbacks are:

- Readability for identifiers with extensive use of numbers or only use numbers.
- Lacks capital letters for keywords/reserved words and basic syntax.
- Case Sensitive, same name with different capital letters would result in different meanings.
- Identifiers do not support the usage of symbols.
- Has no support for switches.
- Does not support terminating keywords and relies on symbols and brackets.
- Indentations don't affect code structure, could potentially result in messy code blocks.
- Very few syntactic sugar and syntactic salt.
- Built to avoid overly verbose code.
- Potentially too terse.
- Has no candy grammar feature.
- Lacks support for abstraction.
- Lacks support for extensibility.