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# SCHOOL OF ADVANCED TECHNOLOGY

### ICT - Applications & Programming

### Computer Engineering Technology – Computing Science



A11

Language Specification

Lab Professor / Lab Session:

[Paulo Saosa/ 011]

Team:

[Yijia Xu] - Id: [041061204]

Language Name [Lana]

***This template is suggested (not mandatory) to answer A11 Specification.***

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| **Part**  **1** | **Language User Reference** |

**EXPLANATION**

*The purpose of this assignment is to invent a new computer language.*

* *This language can have the syntax and structure of your choosing.*
* *Option 1: Adapt the ‘Sofia language to be Go compatible (see* <https://go.dev/>*).*
* *Option 2: Define a* ***DSL*** *– Proper to solve specific problems (ex: science, economy, music, etc.)..*

*This is going to be a basic language. There's a lot of functionality that we'll be skipping over, while we implement the basics. You will need to tell me those basics, of course. In this document, I'm going to explain the steps of what to do with a bit of detail.*

* 1. **User Manual**

**Element 1: Name / Extension**

*Name your language*

* *Lana*

*What is the filename extension of your language?*

* *.lan*

*What is your language patterned after, or what is it similar to?*

* *It is a Python-like language.*

**Element 2 – Comments**

*Comments:*

* *Multiline: /\* \*/*
* *Single line: //*

**Element 3 – Keywords**

*Keywords*

* *break func case struct else package const if type range continue for import return var*

**Element 4 – Datatypes**

*Datatypes:*

* *Integer: int*
* *Float: float64*
* *String: string*

**Element 5 – Variables**

*[Variables: How would a programmer define variables that can hold integer numbers (numbers with no decimal point), floating point numbers (numbers with a decimal point) or text (ie: strings in Java). This is element 1. Consider if you want to flag the variables in a special way, like SOFIA or BASIC, or not, like C or Java.]*

* *Define variables as a datatype following a string of literals, ex: string name, int total, float64 sum*
* *Define constant: ex: const int MAX\_SIZE*

**Element 6 – Methods / Functions**

*Methods:*

*func(arguments) (return\_datatype1, return\_datatype2…)*

* *Ex: func() , func(x int) (int) , func(a, \_ int, z float32) (int, float)*

**Element 7 - Commands**

* ***Attribution / assignment****: How does your language let a programmer assign a value to a variable? (Will you allow casting? If so, how will it work?) How will your language handle math, and will it allow strings to be concatenated (merged)?*

*My language will assign value by using “=” operator.*

*e.g. message = “Hello, world!”*

*It will allow casting, but it must be explicitly declared.*

*e.g. float64 float\_value = 1.2; int value = (int)float\_value*

*It handles math by using some math operators, such as + - \* / %*

*e.g. sum = sum + mark;*

*It will allow strings to be concatenated. (concatenated by “+” operator)*

*e.g. message = “Hello” + “ “ + “World”*

* ***Selection****: How does your language do if-style logic? (Optional: Do you want to do some kind of switch/case as well?). You will need to explain how "conditionals" work in your language. How do you write Boolean operations, such as "or", "and", "not", and other conditions, such as less than, greater than, etc?*

***My language does if****-style logic by using “if”, “else”, “else if”.*

*if conditional-expression {*

*statement1*

*}*

*else if conditional-expression {*

*Statement2*

*}*

*else conditional-expression {*

*Statement3*

*……*

*};*

*(if the condition is true, then execute the following statements, else jump to the next condition.)*

*Boolean operators:*

* + *equalsTo “==”*
  + *OR “|” e.g. if (sum==0 | number==1) …*
  + *AND “&” e.g. if (a!=0 & b!=0) …*
  + *NOT “!”*
  + *Less than: “<”*
  + *greater than: “>”*
* ***Interaction****: How will your code handle looping? (You can do one or more of a for-style loop, a while/do loop, etc.)*

*Forloop is used for handling looping.*

*e.g. for a < b {*

*a \*= 2;*

*}*

* ***Input****: How does your program get input from the keyboard? (Strings are easiest.)*

*My program gets input by calling input functions*

*e.g. scanf(“some messages…”)*

* ***Output****: What would a programmer type to put output on the screen? What sort of variables or data will your code take?*

*The program will output by calling output function(s).*

*e.g. print(“some messages…”);*

*print(num);*

*The output function can take integers, floats, and string.*

* ***Functions****: [Function definition: parameters and returning types]*
  + *What will be the syntax for making a function or subroutine?*

*func(arguments) (return\_datatype1, return\_datatype2…)*

* + *How will it take parameters?*

*Functions can be non-parameterized or parameterized. Parameters must be explicitly declared in the brackets following the function name.*

*e.g. func complexF1() ( float64, float64) {*

*return -7.0, -4.0*

*}*

* + *How will it return results?*

*Functions return results by using “return” statement following by all value(s) needed to be returned.*

*e.g. return num1, num2*

**Element 7 – Proper elements**

*[Include specific features / elements to be included in your language]*

* *What you could include / modify? Think about new datatypes / structures / commands, etc.*
* *Note: Do not share this info (it is supposed to be your proper elements in the language.*

*Import could be optional for default I/O*

*Users can customize and define datatypes by using “type”*

*e.g.*

*type Vertex struct {*

*X int*

*Y int*

*}*

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| **Part**  **2** | **Language Comparison** |

**Comparing with C language**

**Differences**

|  |  |  |
| --- | --- | --- |
|  | [Explanation]  Returning values: In Lana, functions could return multiple data. In C, functions could only return one value.  Memory allocation: C language supports memory allocation operations. |  |

**Advantages / Disadvantages (in comparison with C)**

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| --- | --- | --- |
|  | [Explanation]  Advantage:  Functions in Lana could return multiple data.  Disadvantage:  In Lana, there are no pointers. Users cannot access or allocate memory location. However, C language supports memory allocation operations. |  |

**Comparing with another language**

**Language Name: Java**

**Differences**

|  |  |  |
| --- | --- | --- |
|  | [Explanation]  Object-Oriented Programming: Lana is not OOP supported.  Customizing datatypes: In Lana, users can use “type” to define specific datatypes. |  |

**Advantages / Disadvantages (in comparison with this second language)**

|  |  |  |
| --- | --- | --- |
|  | [Explanation]  Advantage:   * Users in Lana can customize and define datatypes.   Disadvantage:   * Lana doesn’t support object-oriented programming. Java supports all OOP features like classes, objects, inheritance, polymorphism, and encapsulation. |  |

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| **Part**  **3** | **Architectural Questions** |

**Advantages**

*[What's the goal of your language? Are you trying to make something simple, fun, complicated? My personal language, Chambly, is based around being useful to scientists. (You can just make something up here, honestly. Think about it a little bit, have a little fun.)]*

* *Lana is a simple and user-friendly programming language. It is memory-efficient and has powerful mathematical features. It is used for scientists doing statistical analysis.*

**Strategy: C Implementation**

*[How your language can be implemented in C – ex: datatypes]*

* *In plain English, or maybe even some high-level pseudocode, how are you going to parse your language? You will be writing a compiler for your language, so these are some things you need to think about.*
* *Datatypes:*
  + *int: lana\_datatype = “int”*
  + *float64: lana\_datatype = “float”*
  + *string: lana\_datatype = “char[]”*

***Note 1: C Datatypes***

*Remember that you are implementing your language in ANSI C. For this reason, you cannot create arbitrarily your language (from scratch). You need to use what is already provided by C Compiler. For this reason, think about using and defining the language obeying the datatypes.*

*[Your ideas about how to identify elements from language]*

* *Consider your "write to the console" command as an example. How will your compiler detect it? How will it sort out what to write to the console? What if there's some literal text (ie: "this is going to get printed") instead of variables?*

pseudocode:

if token.type=="keyword" and token.value=="print"

then token = token.next;

if token.type==symbol and token.value=='('

then token = token.next;

if token.type==symbol and token.value=='"'

then token = token.next;

if token.type == "string" or token.type = “variable”

then print token.value;

token = token.next;

if token.type==symbol and token.value=='"'

then token = token.next;

if token.type == "symbol" and token.value == ")":

then token = token.next;

if token == ";"

then exit();

else

report error: no semicolon

*[Your ideas about how to identify scope (ex: blocks between conditionals or functions)]*

* *How do you mark a block of code? If I use your loop logic, how do I control what portion of code gets looped through? In C, you might use { and }. In Python, the indentation is what matters. How does it work in your language?*
* *I will use curly braces { and } to mark a block of code.*

*e.g. for i = 1 to 100 {*

*# Code blocks here*

*}*

**FINAL SUGGESTIONS**

*Here some ideas to think about your language....*

* *Don't make this assignment harder than it needs to be on yourself. Focus on making the syntax for your language that meets our requirements. Worry about extra features later.*
* *Don’t worry if your new language winds up having really difficult parts. You'll be allowed to change your language as you go along, as long as you make "patch notes" to explain those changes. We'll tell you about this later.*
* *There's a marking key at the end of* ***CST8152\_Compilers\_F23-A11\_AnswerTemplate*** *that should steer you along for grades. Focus your efforts on where you'll get the best results.*
* *Finally, think about creating an “master-piece”: until now, you have used several languages. And if you have conditions to define yours, how it could be?*

**References**

*[Include eventual references used here]*

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|  | * ***NOTE****: Even if you use any AI tool (ex: ChatGPT), report here, including the references used.* |

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