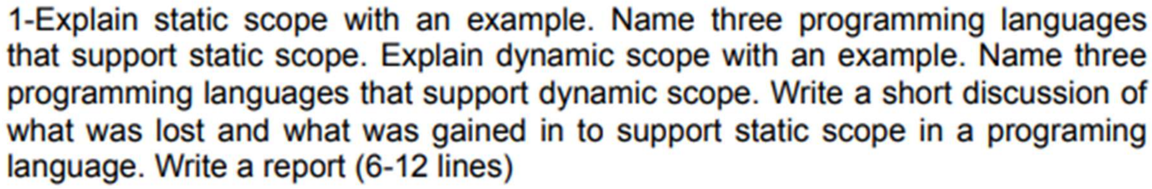
Karan Sahu, kxs190007, cs4337.503
Assignment 5


1-Explain static scope with an example. Name three programming languages that support static scope. Explain dynamic scope with an example. Name three programming languages that support dynamic scope. Write a short discussion of what was lost and what was gained in to support static scope in a programing language. Write a report (6-12 lines)

In static scoping a variable always refers to its top level environment. This is a property of the program text and unrelated to the run time call stack. ... In contrast, dynamic scope requires the programmer to anticipate all possible dynamic contexts.

Java, C, and C++ are languages that support static scope.

Lisp, bash, and powershell are languages that support dynamic scope

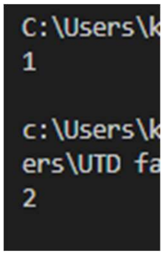
The ability to understand read the code easily is gained. It is easier to see what variable is going to be used just by looking at the code.

A negative to the static scope is that it makes testing and debugging harder due to the difficulty controlling static variables.

Report:

The static program has a global variable x as 2. There is also a local variable x, as 1, in the check function which is called by main. The StaticTest() function returns x. Since this is a static program the StaticTest() returns the global variable x as 2. This happens because it is independent of the runtime.

The dynamic program is designed the same as the static function but assumes that it is dynamic. Since it is dynamic the DynamicTest() will return x as 1, since it was called from the test function. This is because the dynamic compiler searches the most current block.

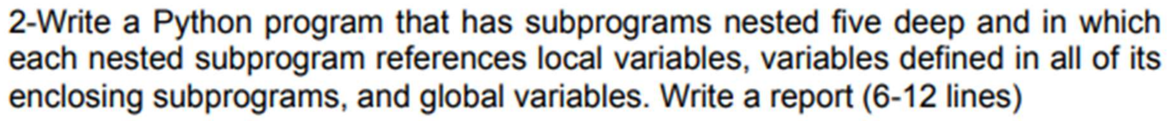


```
C:\Users\k
1

c:\Users\k
ers\UTD fa
2
```

Top is dynamic bottom is static

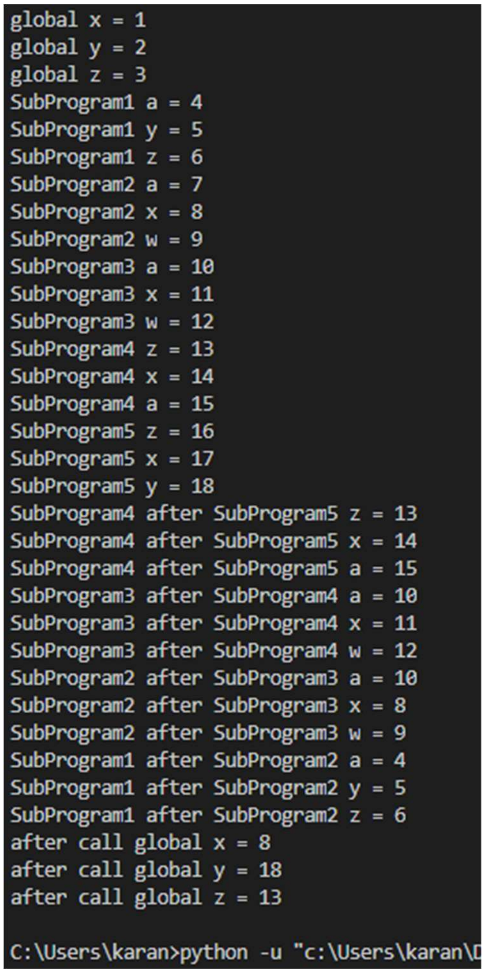
Karan Sahu, kxs190007, cs4337.503
Assignment 5



2-Write a Python program that has subprograms nested five deep and in which each nested subprogram references local variables, variables defined in all of its enclosing subprograms, and global variables. Write a report (6-12 lines)

Report:

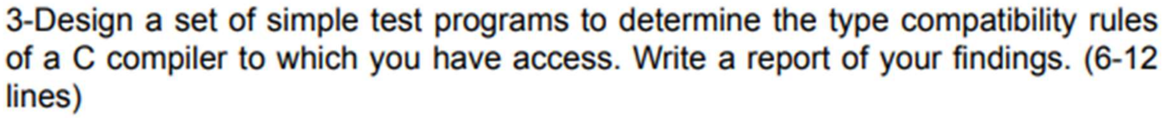
This program has subprograms nested five deep. It obviously starts out in the most outer shell of the program and keeps going deeper into the sub programs. There are global variables declared and local variables in the functions. This programs demonstrates how the variables are manipulated based on what part of the program your in and how you define your varibles and prints variables along the way to show what’s happening. Global variables are read only unless declared global within the subprogram shown in subprogram1(no change) subprogram2 change to global. Non local allows to manipulate the previous variable shown in the last subprogram shown in subprogram 2 and 3(nonlocal is used in 3). This program refrences local variables, global variables and variables defined inall of its enclosing programs



```
global x = 1
global y = 2
global z = 3
SubProgram1 a = 4
SubProgram1 y = 5
SubProgram1 z = 6
SubProgram2 a = 7
SubProgram2 x = 8
SubProgram2 w = 9
SubProgram3 a = 10
SubProgram3 x = 11
SubProgram3 w = 12
SubProgram4 z = 13
SubProgram4 x = 14
SubProgram4 a = 15
SubProgram5 z = 16
SubProgram5 x = 17
SubProgram5 y = 18
SubProgram4 after SubProgram5 z = 13
SubProgram4 after SubProgram5 x = 14
SubProgram4 after SubProgram5 a = 15
SubProgram3 after SubProgram4 a = 10
SubProgram3 after SubProgram4 x = 11
SubProgram3 after SubProgram4 w = 12
SubProgram2 after SubProgram3 a = 10
SubProgram2 after SubProgram3 x = 8
SubProgram2 after SubProgram3 w = 9
SubProgram1 after SubProgram2 a = 4
SubProgram1 after SubProgram2 y = 5
SubProgram1 after SubProgram2 z = 6
after call global x = 8
after call global y = 18
after call global z = 13

C:\Users\karan>python -u "c:\Users\karan\
```

Karan Sahu, kxs190007, cs4337.503
Assignment 5



3-Design a set of simple test programs to determine the type compatibility rules of a C compiler to which you have access. Write a report of your findings. (6-12 lines)

Report:

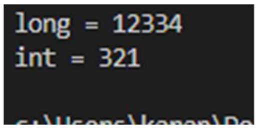
There are 2 different demonstrations in this program, the narrowing and the widening

Narrowing:

We demonstrate a narrowing by converting a double(x) to a long(y). This is explicit because it needs a specific function to be cast to convert. Since double carrys more size and detail than long this is a narrowing which caused a loss of information in this case decimal values

Widening:

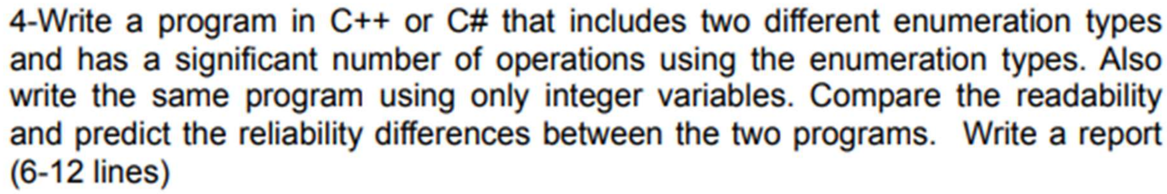
We demonstrate a widening by converting a short a into an int b. This is implicit because there doesent need to be any type of cast to convert. Since it goes from a thing with less size to more size this is a widening.



```
long = 12334
int = 321

c:\Users\karan\D
```

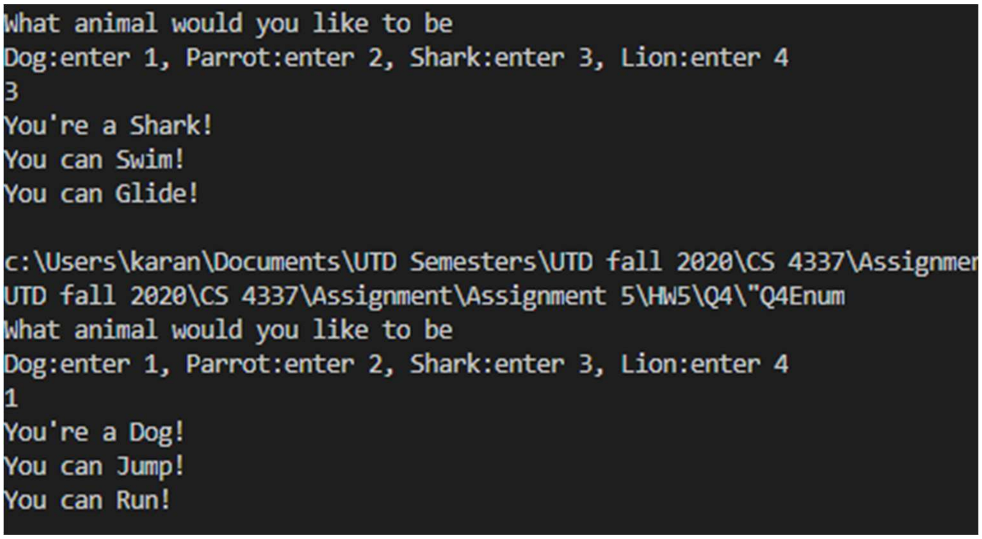
Karan Sahu, kxs190007, cs4337.503
Assignment 5


4-Write a program in C++ or C# that includes two different enumeration types and has a significant number of operations using the enumeration types. Also write the same program using only integer variables. Compare the readability and predict the reliability differences between the two programs. Write a report (6-12 lines)

Enums increase readability because instead of numbers to label you use meaningful words so you can identify what it represents immediately. Since the readability goes up the reliability goes up because less chance of error even tho you can implement the same thing without enums.

Report:

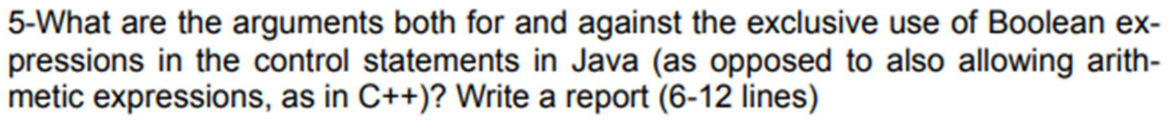
In my Program I made one that uses enums and one that doesent as the problem says. It baisically allows you to choose an animal and tells you the abilitys you have. One program labels the animals and abilitys with enums saying the actual animal name and ability instead of a number. The other one obviously uses numbers. Although they do the same thing I did like the enumeration one better because when I just looked at a number I had to look through my code to check what it meant but with the enumeration even though it’s the same result increased the readability of the code which makes up for the slightly extra time it took to make.


```
What animal would you like to be
Dog:enter 1, Parrot:enter 2, Shark:enter 3, Lion:enter 4
3
You're a Shark!
You can Swim!
You can Glide!

c:\Users\karan\Documents\UTD Semesters\UTD fall 2020\CS 4337\Assignmen
UTD fall 2020\CS 4337\Assignment\Assignment 5\HW5\Q4\"Q4Enum
What animal would you like to be
Dog:enter 1, Parrot:enter 2, Shark:enter 3, Lion:enter 4
1
You're a Dog!
You can Jump!
You can Run!
```

Both have same output

Karan Sahu, kxs190007, cs4337.503
Assignment 5



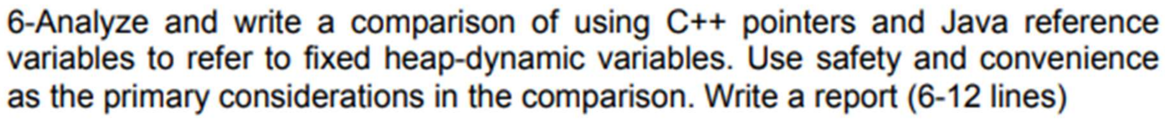
5-What are the arguments both for and against the exclusive use of Boolean expressions in the control statements in Java (as opposed to also allowing arithmetic expressions, as in C++)? Write a report (6-12 lines)

Advantages:

One advantage of the exclusive use of Boolean expressions in the control statements in java is it makes the code more reliable because since java does not allow all types to be used for comparison it will have less room for error. Only allowing Boolean means less ways of messing up

Disadvantages:

One disadvantage of the exclusive use of Boolean expressions in the control statements in java is usablility and writablility. Since you are given less options in what you can do obvisiouly there is going to be an easier time writing control statements in say C++ over something like Java increasing usability. Writability might go down in java because you would need to write more for the same thing.



6-Analyze and write a comparison of using C++ pointers and Java reference variables to refer to fixed heap-dynamic variables. Use safety and convenience as the primary considerations in the comparison. Write a report (6-12 lines)

C++

A. Convivence
    a. Well in some ways the convenience goes up for the C++ because it allows you to do more things and have more freedom.

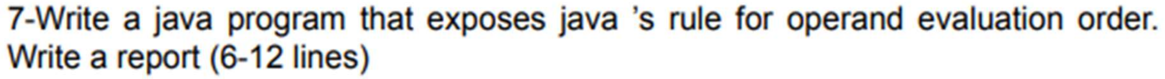
B. Dangers
    a. Coming with this extra freedom comes the danger. Since you have more freedom to do things your also more capable to emss things up making it more dangerous to use if you don’t know what your doing.

Java

A. Convience
    a. The convience in java come from the lack of freedom surprisingly. It allows you to be less worried about things going wrong due to the restrictions in plave

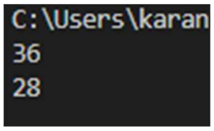
B. Dangers
    a. There is always gonna be some dangers as a programmer for things to mess up but for pointers in java relative to C++ due to the fixed dynamic heap.

Karan Sahu, kxs190007, cs4337.503
Assignment 5

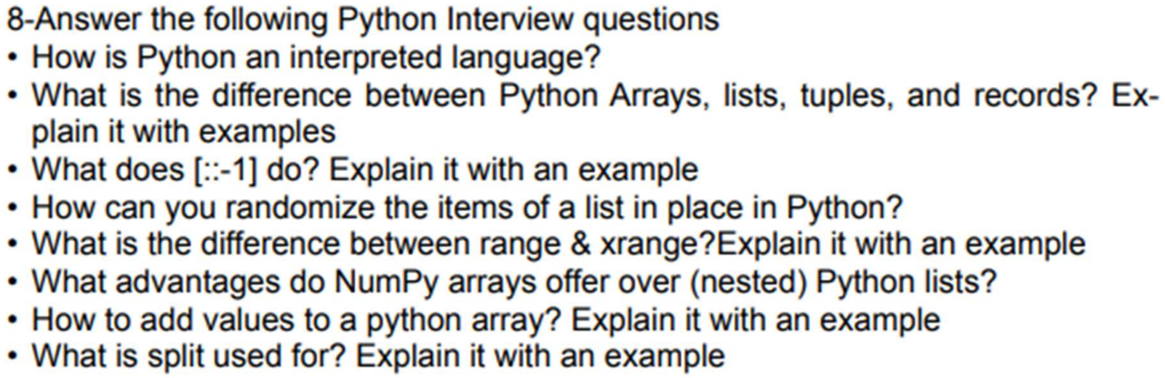


7-Write a java program that exposes java 's rule for operand evaluation order. Write a report (6-12 lines)

This Java program demonstrates the rules for operand evaluation order. I have created a Add method that takes two numbers and adds them. In the main method we have a * b + (a+b) * Add(c,a) and a * b + (a+b) * Add(c,a) where a = 2, b = 3, and c = 4. Java will call the method before any other operation. So even tho generally you woudent do the Add first since it's a function it goes first resulting in those 2 statements having different results. One being 28 the other 36. This exposes the rules for operand evaluation order by giving 2 different answers with the same supposed equation.



```
C:\Users\karan
36
28
```



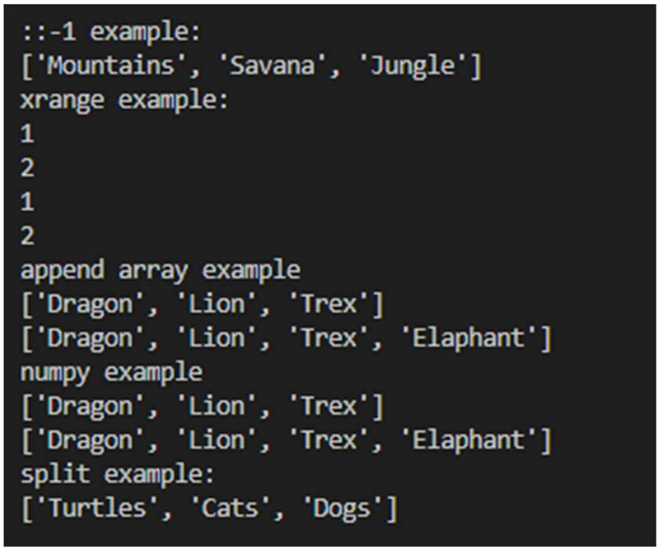
8-Answer the following Python Interview questions

- How is Python an interpreted language?
- What is the difference between Python Arrays, lists, tuples, and records? Explain it with examples
- What does [::-1] do? Explain it with an example
- How can you randomize the items of a list in place in Python?
- What is the difference between range & xrange?Explain it with an example
- What advantages do NumPy arrays offer over (nested) Python lists?
- How to add values to a python array? Explain it with an example
- What is split used for? Explain it with an example

- Python is interpreted language because the Python code is translated into more primitive type code. It will turn the Python code into machine code. Then the code will run from this machine code not the direct python source code.
- Arrays, List, Tuples, Records
  i) Arrays – Arrays are a predefined size and must have memory allocated to them. They are defined with brackets []
  ii) List – List are like arrays but dynamic. They can grow in size with having to specifically allocate more memory manually. They are defined with brackets []
  iii) Tuples – Tuples are kind of like list but they cannot be changed once they are created. They are defined with parenthesis ()
  iv) Records – They are list with a key value pair. So a specific key will give a specific value.They are define with curly braces{}
- [::-1] will print list in reverse order

Karan Sahu, kxs190007, cs4337.503
Assignment 5

- You can randomize a list in place with the shuffle() method
- Range will output a list object. Xrange is different because the object will be of type xrange. Both use the start stop and step parameters.
- Using Numpy arrays offers benefits because of the specific amount of memory allocated to the array. The array will use less memory giving a better runtime than list. This gives a boost to the programs speed
- To add values to a python array you use the append method
- The split method will take a string a split it up into a list with a given splitting point



```
::-1 example:
['Mountains', 'Savana', 'Jungle']
xrange example:
1
2
1
2
append array example
['Dragon', 'Lion', 'Trex']
['Dragon', 'Lion', 'Trex', 'Elaphant']
numpy example
['Dragon', 'Lion', 'Trex']
['Dragon', 'Lion', 'Trex', 'Elaphant']
split example:
['Turtles', 'Cats', 'Dogs']
```