Programming Language Concepts :- Excercise 4

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1. Assume the below javaScript was interpreted using static - scoping rules. What is the value of x ~~defined~~ displayed by sub1? Under dynamic scoping rule what value of x is displayed in function sub1?

```
var x;
function sub1(){
    document.write("x= " + x + "<br>")
}
function sub2(){
    var x
    x=10
    sub1();
}
x=5
sub2();
```

Soln

In static scoping the scope of a variable is determined by its position in source code.

The javascript engine looks for variable declaration in current scope and if not found it looks in the ~~outer~~ parent.

- sub1 doesnt declare its own version of x so it looks for global scope. In global scope x is declared & initially set to undefined but later to 5.
- In sub2 a local variable x is declared to 10 & then sub1() is called for which x is in global space & hence the value of x in ~~space~~ sub1 in static scoping is 5.

→ In Dynamic scoping the runtime state of the program stack determin what variable you are reffering to.

Hence sub1() is called from sub2() it looks for most recent binding of x. Since sub2() has value of x which is 10. It is the value ~~printed~~ printed.

Summary

x = 5 for static scoping
x = 10 for dynamic scoping.

2. Into the following python program list all the variables, along with program units where they are ~~defined~~ declared that are visible in the bodies of sub1, sub2 & sub3. assuming static scoping is used.

```
x = 1
y = 3
z = 5

def sub1():
    a = 7
    y = 9
    z = 11

def sub2():
    global x
```

```
a = 13
x = 15
w = 17

def sub3():
    nonlocal a
    a = 19
    b = 21
    z = 23
```

Soln

sub1

Local : a = 7, y = 9, z = 1
Global : x = 1

Sub2

local : a = 13, w = 17
global : x = 15, y = 3, z = 5

Sub3

local : a = 19, b = 21, 2 = 23
global : x = 15, y = 3

3. Point 1:

a: definition 1
b: definition 2
c: definition 2
d: definition 2

Point 2:

a: definition 1
b: definition 2
c: definition 3
d: definition 3
e: definition 3

Point 3:

a: definition 1
b: definition 2
c: definition 2
d: definition 2

Point 4:

a: definition 1
b: definition 1
c: definition 1

4. Global variables are x, y and z.

Variables visible in sub1():

- Local to sub1():
  a, y (overriding global y), z (overriding global z)
- global:
  x.

Variables visible in sub2():

- Local to sub2():
  a, b, z (overriding the global z).
- global: x, y

Variables in sub3():

- Local:
  a, x (overriding global x), w
- global:
  y, z