**The Scope of a Variable**

Consider a function that calculates the area of a rectangle:

def area(l, w): # calculates the area of a rectangle

a = l \* w

return a

print (area(3,4)) # calls the area function

The function calculates the area, assigns it to the variable “a”, and returns the answer. When the function is called, the area is printed out. What if we print the original variable “a”?

def area(l, w): # calculates the area of a rectangle

a = l \* w

return a

print (a)

We get the following error message:

NameError: name 'a' is not defined

The problem is that the variable “a” is “known” only inside the function it is defined. In fact, so are the variables l and w.

A variable is only defined within the code block it was created in. The ***scope*** of a variable is the ‘living space’ or ‘lifetime’ of that variable. Once a code block ends, that variable is discarded and no longer can be referenced – we say it has “***gone out of scope***”.

In the example above, variable “a” is called a ***local*** ***variable***. It is only known locally (in the function). Local variables are usually needed to do a calculation inside a function, and then are discarded.

A variable can have “***global*** scope” if it is defined outside the function, say at the beginning of the program.

The level of indentation is the easiest way to spot the scope of a variable.

Here are some examples:

a = 10 # global variable

print (a)

def func(b): # variable b is set here

print (b) # local variable

print (a) # ok

return

print (a) # ok

print (b) # not ok

This program will not run. It produces the error:

File "c:\some math.py", line 8, in <module>

builtins.NameError: name 'b' is not defined

Line 8 is the last line in the program. On that line, the variable “b” cannot be printed because it is not defined. The variable b is only defined inside the function and goes "out of scope" once we leave the function.

Functions are independent programs from your main code. The variables within your function are not known within the main program or other functions.

***Keywords***: ***scope, local variable, global variable, out of scope***