

Functions that return values

So far, we only know pass information to a function using arguments. This handout shows you how a function can give information back to the caller.

Suppose we have a function to compute the average of three numbers:

```
def average(a, b, c):
    avg = (a + b + c)/3
    print("The average of your numbers is", avg)

def main():
    x = int(input("Give me a number: "))
    y = int(input("Give me a number: "))
    z = int(input("Give me a number: "))
    average(x, y, z)
```

main()

Pretend we're computing grades for a class that has three homework assignments and three tests. The final graded in the class is weighted so that 75% of the final grade is from the test average and 25% is from the homework average.

We'd like to write a program to use our average function to take the averages of the test and homework grades, and then weight those averages appropriately to compute a final course grade.

```
def average(a, b, c):
    avg = (a + b + c)/3
    print("The average of your numbers is", avg)

def main():
    test1 = int(input("Give me the first test grade: "))
    test2 = int(input("Give me the second test grade: "))
    test3 = int(input("Give me the third test grade: "))
    average(test1, test2, test3)
    hw1 = int(input("Give me the first HW grade: "))
    hw2 = int(input("Give me the second HW grade: "))
    hw3 = int(input("Give me the third HW grade: "))
    average(hw1, hw2, hw3)
    # some code here to weight the test average by 0.75
    # and the quiz average by 0.25 and combine them.
```

main()

The problem with the program above is we have no way to get the "avg" variable out of the average function. We'd like to do the following:

```
final_grade = 0.75 * (avg from the first call to average) + 0.25 * (avg from the 2nd call)
```

However, we know that avg is a local variable to the average () function, so there's no way to access it from main (). Furthermore, even if we could, how would we distinguish between the avg variable from the average of the test grades, and the avg variable from the average of the homework grades?

Defining a function to return a value

Functions may return *one* value to the place from which they were called. This value may be a literal or a variable.

```
def name_of_function(argument1, argument2, ...):  
    statement  
    [ more statements if you want ]  
    return value  
    # in real code, replace "value" above with a variable or a literal
```

The only new syntax here is the **return** keyword. Whenever Python encounters a line of code that says "**return** something," the function immediately ends, and the "something" is sent back to the place where the function was called.

Capturing the return value

When you call a function that returns a value, if you want to use that value later (as you probably do), you need to "capture" it. The easiest way to do this is to use a variable assignment statement:

```
some_variable = name_of_function(blah, blah, ...)
```

Whenever Python sees a line like the one above, Python calls the function as it normally would, but when the function returns its value (whatever that value is), it is saved into the variable `some_variable`. The end result is now the code that called the function can use the value that the function calculated, because you have your own copy of it now.

Here's how you'd write the new grade program:

```
# Notice that we've moved the printing from average to main.  
def average(a, b, c):  
    avg = (a + b + c)/3  
    return avg  
  
def main():  
    test1 = int(input("Give me the first test grade: "))  
    test2 = int(input("Give me the second test grade: "))  
    test3 = int(input("Give me the third test grade: "))  
    test_avg = average(test1, test2, test3)  
    print("Your test average is", test_avg)  
  
    hw1 = int(input("Give me the first HW grade: "))  
    hw2 = int(input("Give me the second HW grade: "))  
    hw3 = int(input("Give me the third HW grade: "))  
    hw_avg = average(hw1, hw2, hw3)  
    print("Your homework average is", hw_avg)  
  
    final_grade = 0.75 * test_avg + 0.25 * hw_avg  
    print("Your final grade is", final_grade)  
  
main()
```