

CSC236 – Tutorial 8: Program Correctness : Take Two

Exercise 1: Finding a Variant

Consider the following function.

```
def mystery(a, b):  
    '''Pre: a >= 0, b >= 0  
    '''  
    while a >= 0 and b >= 0:  
        if a < b:  
            a, b = b, a  
        else:  
            a = a - 1  
    return a
```

1. Is a a variant for the above loop?
2. Is $a+b$ a variant for the above loop?
3. State and prove a variant for the above loop.

Exercise 2: GCD Again

Let's mess with the GCD example from lecture again. For each of the following, give a full correctness argument if the code is correct; otherwise, show where a correctness argument would fail.

```
def gcd1(a, b):  
    '''  
    Pre: a and b are integers >= 1, and a >= b  
    Post: returns the greatest common divisor of a and b  
    '''  
    if b == 1: # removed a == 1 disjunct  
        return 1  
    elif a % b == 0:  
        return b  
    else:  
        return gcd1(b, a % b)
```

```
def gcd2(a, b):  
    '''  
    Pre: a and b are integers >= 1, and a >= b  
    Post: returns the greatest common divisor of a and b  
    '''  
    if b == 0:  
        return a  
    else:  
        return gcd2(b, a % b)
```