

CMSC 150: Introduction to Computing
Tracing Assignment #9

Name: _____

Please indicate all output for each of the following. If there is an error, please indicate the specific syntax or runtime exception to the best of your ability. If a display of the memory is requested, please show work when tracing the memory, e.g., scratching through prior values or function calls. If no memory is used or no output is shown, write “None”. If there is a never ending loop, write “Infinite Loop” in the output.

1. (2 points)

```
def f(i, n):  
    if i == n:  
        return n  
    return f(i+1, n) * i  
  
print(f(1, 5))
```

Output:

2. (2 points)

```
def f(n, x):  
    if abs(n - x*x) <= 0:  
        return x  
    else:  
        return f(n, (x+n/x)/2)  
  
print(f(2, 2))
```

Output:

3. (2 points)

```
def f(s):  
    return fr(s, 0, chr(256))  
def fr(s, i, c):  
    if i == len(s):  
        return c  
    if s[i] != ' ' and \  
        ord(s[i]) < ord(c):  
        return fr(s, i+1, s[i])  
    else:  
        return fr(s, i+1, c)  
  
print(f("A MAN A PLAN PANAMA"))
```

Output:

4. (2 points)

```
def f(l):
    return fh(l, 0, len(l))

def fh(l, i, j):
    if i >= j - 1:
        return l[i]
    m = (i + j) // 2
    a = fh(l, i, m)
    b = fh(l, m, j)
    return a if a > b else b

print(f([1, 9, 2, 8]))
```

Output:

5. (2 points)

```
def f(a):
    if a == 0:
        return True
    return g(a-1)

def g(b):
    if b == 0:
        return False
    return f(b - 1)

print(f(23), f(124))
```

Output:

6. (1 point) Bonus.

```
def f(e, i, j):
    if 0 <= i < len(e) and \
        0 <= j < len(e[0]):
        if e[i][j] == 'a':
            return 0
        e[i][j] = 'a'
        a = f(e, i-1, j)
        b = f(e, i+1, j)
        c = f(e, i, j-1)
        d = f(e, i, j+1)
        return a + b + c + d
    return 1

e = [ \
    ['a', 'b', 'a', 'a', 'a'], \
    ['a', 'b', 'a', 'b', 'b'], \
    ['b', 'b', 'b', 'b', 'a'], \
    ['a', 'b', 'a', 'b', 'a'], \
    ['a', 'a', 'b', 'a', 'a'] \
]

print(f(e, 3, 3))
```

Output: