1 Exercises

Exercise 1. Consider the following recursive function:

```
def mystery(a, b):
    if b == 0:
        return 0
    if a == 0:
        return mystery(b - 1, a)
    return b + mystery(b, a - 1)
```

a. What is the value returned by the call mystery(10, 0)?

b. What is the value returned by the call mystery(0, 10)?

c. What is the value returned by the call mystery(3, 7)?

d. What is the value returned by the call mystery(10, 3)?

- e. What is the value returned by the call mystery(200, 300)?
- f. What does the function mystery() compute in general about a and b?

Exercise 2. Consider the function $S(n) = 1^2 + 2^2 + 3^2 + \dots + n^2$, where n is a positive integer.

- a. What is the value of S(5)?
- b. Provide a recursive definition for S(n).
- c. Implement a function s(n) using recursion, such that it computes and returns S(n)
- d. Trace the function call $s(\mathfrak{s}).$

2 Solutions

Solution 1.

a. o

- b. \boldsymbol{o}
- C. 21
- d. 30

e. 60000

f. The product *ab*.

Solution 2.

```
a. 55
b. S(n) = \begin{cases} n^2 + S(n-1) & \text{if } n > 1, \text{ and} \\ 1 & \text{if } n = 1. \end{cases}
c.
```

```
def S(n):
    if n == 1:
        return 1
    return n * n + S(n - 1)
```

d.

S(5)
S(4)
S(3)
S(2)
S(1)
return 1
return 2 * 2 + 1 = 5
return $3 * 3 + 5 = 14$
return 4 * 4 + 14 = 30
return 5 * 5 + 30 = 55