

## 1 Exercises

**Exercise 1.** Consider the following functions:

```
def f(x):  
    return x + 1  
  
def g(x):  
    return x ** 2  
  
def h(x):  
    return x % 5
```

- What does `f(5)` return?
- What does `g(f(5))` return?
- What does `h(g(f(5)))` return?
- What does `f(g(h(17)))` return?

**Exercise 2.** Consider the following function:

```
def f(x, y, n = 1):  
    return x ** n + y ** n
```

- What does `f(2, 3)` return?
- What does `f(2, 3, 2)` return?
- What does `f(n = 3, y = 2, x = 3)` return?

**Exercise 3.** What does the following code fragment write?

```
def duplicate(s):  
    return s + s  
  
s = 'Hello'  
s = duplicate(s)  
t = 'Bye'  
t = duplicate(duplicate(duplicate(t)))  
stdio.writeln(s + t)
```

**Exercise 4.** Consider the following code fragment:

```
a = list(filter(lambda x: x % 7 == 0, range(1, 28)))
```

- What is the value of `a`?
- What does `sum(a)` return?

**Exercise 5.** Consider the following code fragment:

```
import functools  
  
a = list(map(lambda x: x + 2, range(1, 6)))  
b = functools.reduce(lambda x, y: x + y, a)
```

- What is the value of `a`?
- What is the value of `b`?

**Exercise 6.** Consider the following program:

```
mystery.py

import stdio
import sys

def f(a = 1.0, b = 1.0, c = 1.0):
    return lambda x: a * x ** 2 + b * x + c

def main():
    a = float(sys.argv[1])
    b = float(sys.argv[2])
    c = float(sys.argv[3])
    x = float(sys.argv[4])
    stdio.writeln(f(a, b, c)(x))

if __name__ == '__main__':
    main()
```

- What does the program write in general?
- What does the program write when run with the command-line arguments  $a = 0$ ,  $b = 2$ ,  $c = 5$ , and  $x = 2$ ?
- What is the value of  $y$  in the following interactive Python session?

```
>_ ~/workspace/ipp/programs

>>> import mystery
>>> y = mystery.f()(3)
```

## 2 Solutions

### Solution 1.

- 6
- 36
- 1
- 5

### Solution 2.

- 5
- 13
- 35

### Solution 3. HelloHelloByeByeByeByeByeByeByeByeByeBye

### Solution 4.

- [7, 14, 21]
- 42

### Solution 5.

- [3, 4, 5, 6, 7]

b. 25

### Solution 6.

a. The program takes four floats  $a$ ,  $b$ ,  $c$ , and  $x$  as command-line arguments and writes the value of the quadratic equation  $ax^2 + bx + c$ .

b. 9.0

c. 13.0