

## Exercises for Week 4

### 4A. (Dictionaries)

Assume the following dictionary:

```
bag = {'apple': 6, 'pear': 2, 'plum': 3}
```

Evaluate the following expressions:

(a) `bag['pear']`

(b) `bag['kiwi']`

Execute the following statements:

(c) `bag['plum'] += 1`

(d) `bag['kiwi'] = 1`

### 4B. (Recursive functions)

Define recursive functions to do the following:

(a) `fib(n)` should return the  $n$ 'th Fibonacci number, using the definition:

$$\begin{aligned} \text{fib}(n) &= 1 && \text{if } n \leq 2 \\ \text{fib}(n) &= \text{fib}(n-1) + \text{fib}(n-2) && \text{if } n > 2 \end{aligned}$$

(b) `sum(ns)` should return the sum of the list of numbers `ns`, using the definition:

$$\begin{aligned} \text{sum}(ns) &= 0 && \text{if } ns \text{ is empty} \\ \text{sum}(ns) &= (\text{head of } ns) + \text{sum}(\text{tail of } ns) && \text{if } ns \text{ is non-empty} \end{aligned}$$

(The head of a list is its first element. The tail of a list consists of all its elements except the first.)

Can you define non-recursive functions to do the same things?

### 4C. (Files)

Assume the following text files:

```
f1 = open('...', 'r')
f0 = open('...', 'w')
```

(a) Write code to count the number of characters and lines in `f1`.

(b) Write code to copy the text in `f1` to `f0`.

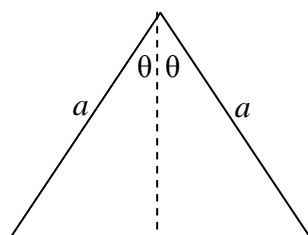
(c) Write code to copy the text in `f1` to `f0`, except that the characters of each line are reversed.

### 4D. (Modules)

Consider the `trig` module of the course notes (§11).

(a) Write code that uses this module to compute the area of the isosceles triangle shown below, given the side length  $a$  and the angle  $\theta$ . Use an “**import** ...” statement.

(b) Show how the code could be shortened by using a “**from** ... **import** ...” statement.



$$\text{area} = a^2 \sin \theta \cos \theta$$