# Overview

# 1  Design an Algorithm

You are given two lists of sorted numbers. Design an algorithm to find all the common elements in the two lists. For example, given `[4, 7, 7, 7]` and `[4, 4, 6, 7, 7, 9]`, the output should be `[4, 7, 7]`.

- Describe your algorithm as pseudocode.

- Explain why it works correctly.

- What is the maximum number of comparisons your algorithm makes, in terms of the lengths of the two lists (call them $m$ and $n$, respectively)?

# 2   Coin Change

## Part 1

Prove that given an unlimited supply of 4-cent coins and 9-cent coins, one can make any amount of change of 32 cents or larger.

## Part 2

Based on Part 1, describe a recursive algorithm to make change using 4-cent and 9-cent coins for any amount greater than or equal to 32 cents.

**procedure** CoinChange4and9($n$)
   ▷ *Input: an integer $n$; assume $n \geq 32$*
    *Output: a pair of integers $(a, b)$ such that $n = 4a + 9b$.*
                  ◁

   ▷

                  ◁