**4-SUM.** Given an array *a*[] of *n* integers, the 4-SUM problem is to determine if there exist distinct indices *i*, *j*, *k*, and *l* such that *a*[*i*]+*a*[*j*]=*a*[*k*]+*a*[*l*]. Design an algorithm for the 4-SUM problem that takes time proportional to *n*2 (under suitable technical assumptions).

**Hashing with wrong hashCode() or equals().** Suppose that you implement a data type OlympicAthlete for use in a java.util.HashMap.

* Describe what happens if you override hashCode() but not equals().
* Describe what happens if you override equals() but not hashCode().
* Describe what happens if you override hashCode() but implement public boolean equals(OlympicAthlete that) instead of public boolean equals(Object that).