**Instructional Days**: 15-16

**Topic Description**: In this lesson the concept of a list (sorted and unsorted) and sorting algorithms will be explored.

**Objectives**:

The students will be able to:

* Define sorted and unsorted lists.
* Describe various sorting algorithms.
* Compare various sorting algorithms.

**Outline of the Lesson**:

* Journal Entry (15 minutes)
* CS Unplugged Activity 7: Lightest and Heaviest—Sorting Algorithms (explore sorting) (30 minutes)
* CS Unplugged Activity 7: Lightest and Heaviest—Sorting Algorithms (discover and describe sorting algorithms) (30 minutes)
* CS Unplugged Activity 7: Lightest and Heaviest—Sorting Algorithms (compare sorting algorithms) (35 minutes)

**Student Activities**:

* Complete journal entry.
* Groups participate in the various parts of the CS Unplugged: Lightest and Heaviest activity.

**Teaching/Learning Strategies**:

* Journal Entry: List examples of where it matters whether items are in order (sorted).
  + Have volunteers provide examples from their lists and explain why it matters that they are sorted; in other words, what are the consequences if the list is not sorted?
  + Ask students about the data that they have been collecting. How easy would it be for them to sort their data by hand? Does it get harder to do this with more data? Point out that this is one of the major advantages of computing—the ability to manage large sets of data that could not easily be managed by humans.
* CS Unplugged: Lightest and Heaviest activity
  + The activity can be downloaded from http://csunplugged.com. It will be helpful to read through the entire activity in advance, so that you can revise questions, add your own questions, and think about how you might want to structure each part of the activity. The goal is for students to be actively involved in some way and for all students to be able to describe the various types of sorting. What follows is the minimal suggestion.
  + Divide students into groups of 3-4 and give each group a set of weights and a balance scale as described in steps 1 and 2 on p. 66 of the Sorting Weights Activity. (There are many possible ways to make the weights. One would be to use bags with varying numbers of pieces of candy. If you don’t have balance scales, you can help students come up with a strategy that will simulate a scale. For example, if you make the weights clearly different in weight, they could do this by feel.)
  + Have students complete #3 and #4 on p. 66 and then discuss their answers as indicated.
  + Have students complete #5 on p. 66.
  + At this point in the activity, students should present their findings to the class and discuss. Point out the selection sort information on p.66.
  + Have students complete the Divide and Conquer activity on p.67. Throughout, guide students as necessary and have them keep track of the processes they use.
* If time permits, have students try both sorting methods to sort cards that have 50 random numbers on them and analyze the number of comparisons required for each.

**Resources:**

* Bell, Tim, Ian Witten and Mike Fellows. Computer Science Unplugged., New Zealand: 2002.
* Computer Science Unplugged Activity 7: Lightest and Heaviest—Sorting Algorithms, pp. 64-70
* Containers of the same size with different weights
* Balance scales (need to buy or borrow)