Activity 7

Lightest and Heaviest—*Sorting Algorithms*

Summary

Computers are often used to put lists into some sort of order, for example names into alphabetical order, appointments or e-mail by date, or items in numerical order. Sorting lists helps us find things quickly, and also makes extreme values easy to see. If you sort the marks for a class test into numeric order, the lowest and highest marks become obvious.

If you use the wrong method, it can take a long time to sort a large list into order, even on a fast computer. Fortunately, several fast methods are known for sorting. In this activity children will discover different methods for sorting, and see how a clever method can perform the task much more quickly than a simple one.

Curriculum links

- ✓ Mathematics: Measurement Level 2 and up. Carrying out practical weighing tasks.

Skills

- ✓ Using balance scales
- ✓ Ordering
- ✓ Comparing

Ages

- ✓ 8 and up

Materials

Each group of children will need:

- ✓ Sets of 8 containers of the same size but different weights (e.g. milk cartons or film canisters filled with sand)
- ✓ Balance scales
- ✓ Worksheet Activity: Sorting weights (page 66)
- ✓ Worksheet Activity: Divide and conquer (page 67)

Lightest and Heaviest

Discussion

Computers often have to sort lists of things into order. Brainstorm all the places where putting things into order is important. What would happen if these things were not in order?

Computers usually only compare two values at once. The activity on the next page uses this restriction to give children an idea of what this is like.

Activity

1. Divide the children into groups.

2. Each group will need a copy of the activity sheet on page 66, and its own weights and scales.

3. Have the children do the activity, then discuss the result.

Worksheet Activity: Sorting Weights

Aim: To find the best method of sorting a group of unknown weights into order.

You will need: Sand or water, 8 identical containers, a set of balance scales

What to do:

1. Fill each container with a different amount of sand or water. Seal tightly.

2. Mix them up so that you no longer know the order of the weights.

3. Find the lightest weight. What is the easiest way of doing this?

   Note: You are only allowed to use the scales to find out how heavy each container is. Only two weights can be compared at a time.

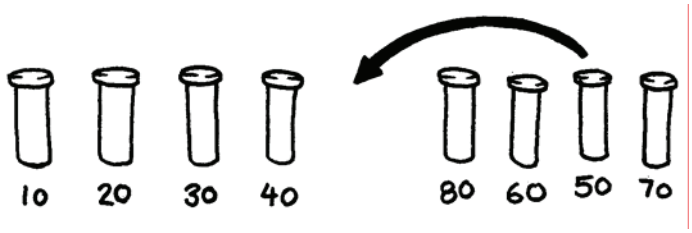
4. Choose 3 weights at random and sort them into order from lightest to heaviest using only the scales. How did you do this? What is the minimum number of comparisons you can make? Why?

5. Now sort all of the objects into order from lightest to heaviest.

When you think you have finished, check your ordering by re-weighing each pair of objects standing together.

Selection Sort

One method a computer might use is called *selection sort*. This is how selection sort works. First find the lightest weight in the set and put it to one side. Next, find the lightest of the weights that are left, and remove it. Repeat this until all the weights have been removed.



Count how many comparisons you made.

Extra for Experts: Show how you can calculate mathematically how many comparisons you need to make to sort 8 objects into order. What about 9 objects? 20?