

## C PROGRAMMING: THE LOCKER PROBLEM

At the local high school there is a long row of 1000 lockers, one for each student.

The lockers start with their doors wide open, and, one-by-one, each of the 1000 students passes by the lockers. Each student changes the state of every locker she examines. That is, if she finds a locker open then she closes it, and if she finds it closed, she opens it.

Student 1 looks at all the lockers: 1, 2, 3, 4, 5, 6, ...

Student 2 looks only at lockers: 2, 4, 6, 8,10,12, ...

Student 3 looks only at lockers: 3, 6, 9,12,15,18, ...

Student 4 looks only at lockers: 4, 8,12,16,20,24, ...

and so forth

Question: How many lockers are open at the end of the process? Which ones?

Comments and Questions:

[1] Write a C program to solve this problem. You will probably want to use an **array** to store the 'state' of the locker (open or closed). Do  $N = 1000$ .

[2] You'll probably recognize the pattern of closed locker numbers. Can you **prove** your answer?