

The Locker Problem

Problem-of-the-Week

The Problem

A new high school has just been opened, with an enrollment of 1000 students. The school has 1000 lockers, numbered 1 to 1000, to accommodate them. On the first day of school, all 1000 lockers are closed and all 1000 students are outside waiting to be let into the building. The first student enters and opens all of the lockers. The second student follows and closes every second locker, beginning with the second locker. The third student enters the school and reverses every third locker beginning with locker 3 (i.e., if the locker is closed it is opened and vice versa). This procedure is continued until all 1000 students have passed by all the lockers. When they finish, which lockers will be open?



Strategies and Hints

1. Simplify the problem by considering fewer than 1000 lockers.
2. Make a table to help organize your information.
3. Look for a pattern in the numbers.

Extensions

Explain why the lockers end up the way they do.