

Locker Problem

Imagine you are at a school that still has student lockers. There are 1000 lockers, all shut and unlocked, and 1000 students.

Here's the problem:

1. Suppose the first student goes along the row and *opens every locker*.
2. The second student then goes along and *shuts every other locker* beginning with **number 2**.
3. The third student *changes the state* of every **third** locker beginning with **number 3**. (If the locker is open the student shuts it, and if the locker is closed the student opens it.)
4. The fourth student *changes the state* of every **fourth** locker beginning with **number 4**.

Imagine that this continues until the thousand students have followed the pattern with the thousand lockers. At the end, which lockers will be open and which will be closed? **Why?**

1. After the 36th student opens/closes lockers, which lockers are open? Which are closed?
2. After the 100th student opens/closes lockers, which lockers are open? Which are closed?
3. What pattern do you see?
4. What is the rule for any number of students and lockers? Explain why rule works.
5. Which lockers were touched by only two students? How do you know?
6. Which lockers have been switched the most often? How many lockers, and which ones, were touched exactly five times?
7. How are the lockers related to factors and multiples?

As your group works through the problem using the "locker boards," one person should **record the process** your group develops to solve the problem. The others should take turns opening and closing the lockers.

Teacher Notes

On this website you will find a video. It is an excellent example of how you can use this problem to enrich learning. Students will continue their understanding of:

- Square numbers
- Multiples
- Factors
- Patterns

Watch the video carefully and see how the teacher uses questioning techniques to enhance student thinking/understanding.

<http://lpsl.coe.uga.edu/mile3/resa/gpsinaction/LockerProblem.html>