Students can make a data table using the information gathered so far. There might be columns for just the **number of open lockers** and the **number of open lockers expressed with an exponent**.

|  |  |
| --- | --- |
| lockers open149162536 | lockers open - exponent 1^22^23^24^25^26^2 |

***Ask students:*** What pattern do you see? Are there any relationships among the numbers? What will be the next locker that will remain open?

Will locker 50 be open?
Will locker 100 be open?
Will locker 1000 be open?

The completed table might look like this:

|  |  |  |
| --- | --- | --- |
| lockers open149162536496481100...n x n | lockers open - factored 1 X 12 X 23 X 34 X 45 X 56 X 67 X 78 X 89 X 910 X 10...n X n | lockers open - exponent 1^22^23^24^25^26^27^28^29^210^2...n^2 |

    ***Why?***

Every number has as factors itself and 1. Therefore, every locker is opened on the first pass and shut on the pass where the student number equals the locker number.

In addition, all numbers (lockers) *except perfect squares* have factors that occur in pairs, so that every locker except those whose number is a perfect square has its state changed an even number of times: it gets changed and then changed back, or opened and shut again.

**Only perfect squares** have a duplicate factor pair like 3x3 = 9, so that the state of these lockers is changed an odd number of times or opened and left open.