1. There are \( n \) lockers in a hallway, numbered sequentially from 1 to \( n \). Initially, all the locker doors are closed. You make \( n \) passes by the lockers, each time starting with locker #1. On the \( i \)th pass, \( i = 1, 2, \ldots, n \), you toggle the door of every \( i \)th locker: if the door is closed, you open it; if it is open, you close it. After the last pass, which locker doors are open and which are closed? How many of them are open?

2. There are four people who want to cross a rickety bridge; they all begin on the same side. You have 17 minutes to get them all across to the other side. It is night, and they have one flashlight. A maximum of two people can cross the bridge at one time. Any party that crosses, either one or two people, must have the flashlight with them. The flashlight must be walked back and forth; it cannot be thrown, for example. Person 1 takes 1 minute to cross the bridge, person 2 takes 2 minutes, person 3 takes 5 minutes, and person 4 takes 10 minutes. A pair must walk together at the rate of the slower person’s pace.
3. Consider the following algorithm for finding the distance between the two closest elements in an array of numbers.

```
Algorithm MinDistance(A[0..n-1])
// Input: Array A[0..n-1] of numbers
// Output: Minimum distance between two of its elements
dmin ← ∞
for i ← 0 to n−1 do
    for j ← 0 to n−1 do
return dmin
```

Indicate the time efficiency class of the algorithm using the most appropriate notation (O, Θ or Ω)

Make as many improvements as you can in this algorithmic solution to the problem. And also indicate the time efficiency class of your new algorithm using the most appropriate notation (O, Θ or Ω)