## L — Locust Locus

## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 1

(1) For each year $z=y+1, y+2, y+3, \ldots$ :

- Check if $z-y$ is divisible by both $a$ and $b$.
- Break when first such $z$ is found.


## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 1

(1) For each year $z=y+1, y+2, y+3, \ldots$ :

- Check if $z-y$ is divisible by both $a$ and $b$.
- Break when first such $z$ is found.
(2) Goes on for at most $a \cdot b$ steps because $a \cdot b$ definitely divides both $a$ and $b$.


## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 1

(1) For each year $z=y+1, y+2, y+3, \ldots$ :

- Check if $z-y$ is divisible by both $a$ and $b$.
- Break when first such $z$ is found.
(2) Goes on for at most $a \cdot b$ steps because $a \cdot b$ definitely divides both $a$ and $b$.
(3) So this takes $O(a \cdot b)$ time which is fast enough because $a$ and $b$ are very small.


## L — Locust Locus

## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 2

(1) The joint period of the two species is the least common multiple of $a$ and $b$.

## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 2

(1) The joint period of the two species is the least common multiple of $a$ and $b$.
(2) Answer is $y+\operatorname{lcm}(a, b)$.

## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 2

(1) The joint period of the two species is the least common multiple of $a$ and $b$.
(2) Answer is $y+\operatorname{lcm}(a, b)$.
(3) Takes $O(\log (a \cdot b))$ time to compute.

## Problem

A pair of cicada species appear every $a$ and $b$ years, and was last observed in year $y$. Find the next year they will appear together again.

## Solution 2

(1) The joint period of the two species is the least common multiple of $a$ and $b$.
(2) Answer is $y+\operatorname{lcm}(a, b)$.
(3) Takes $O(\log (a \cdot b))$ time to compute.

Statistics at 4-hour mark: 374 submissions, 185 accepted, first after 00:02

