Minimum Garden Perimeter to Collect Enough Apples

In a garden represented as an infinite 2D grid, there is an apple tree planted at every integer coordinate. The apple tree planted at an integer coordinate \((i, j)\) has \(|i| + |j|\) apples growing on it.

You will buy an axis-aligned square plot of land that is centered at \((0, 0)\).

Given an integer \(\text{neededApples}\), return the minimum perimeter of a plot such that at least \(\text{neededApples}\) apples are inside or on the perimeter of that plot.

The value of \(|x|\) is defined as:

- \(x\) if \(x \geq 0\)
- \(-x\) if \(x < 0\)

Example 1:

Input: \(\text{neededApples} = 1\)

Output: 8

Explanation: A square plot of side length 1 does not contain any apples.

However, a square plot of side length 2 has 12 apples inside (as depicted in the image above).

The perimeter is \(2 \times 4 = 8\).
Example 2:

Input: neededApples = 13
Output: 16

Example 3:

Input: neededApples = 1000000000
Output: 5040

Constraints:

- $1 \leq \text{neededApples} \leq 10^{15}$