COMPUTER SOCIETY OF INDIA (CSI)
COEP TECH STUDENT CHAPTER

PRESENTS

CODE QUEST 5.0

EDITIORIAL

EQUAL PIZZA PACT

EXPLANTION

The problem requires us to divide the given N pizza slices into exactly D equal portions by making the minimum number of radial cuts. Each slice already has a given angle, and we can cut it further to achieve uniformity. The challenge is to determine the best strategy to minimize the number of cuts while ensuring that exactly D equal slices are obtained.

STEPS:

1. Sorting the slices:
   - We first sort the given N pizza slices based on their internal angles. This helps in efficiently trying to redistribute slices by making cuts in a systematic way.

2. Iterating through possible target slice sizes:
   - We assume that the final equal slice size should be some factor of an existing slice size.
   - We iterate through potential slice sizes (denoted as m) based on existing slice values to check if we can split other slices to match this target.

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3. Checking divisibility and making cuts:

- For each potential target size, we check how many cuts are needed to divide the slices accordingly.
- If a slice's angle can be evenly divided into the target size, we determine how many complete slices can be formed and count the cuts required.
- If a slice cannot be divided exactly, we approximate the best division possible while ensuring that D slices are created.

4. Tracking the minimum cuts:

- Across all possible equal slice sizes, we track the minimum number of cuts required to create exactly D slices.
- The approach ensures that we always minimize unnecessary extra cuts while maintaining the required count of slices.

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Example Walkthrough:

Input
1
3 4
180000000000 90000000000 90000000000
- 1 test case
- 3 slices: 180 × 10^9 nanodegrees, 90 × 10^9 nanodegrees, 90 × 10^9 nanodegrees
- 4 friends need equal slices

Step 1: Sorting Slices
The given angles are already sorted:
[90 × 10^9, 90 × 10^9, 180 × 10^9]

Step 2: Trying Possible Slice Sizes
- Since we need 4 equal slices, we check what size each slice should ideally be.
- Possible candidates for the final slice size are:
  - 90 × 10^9 nanodegrees
  - 45 × 10^9 nanodegrees

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Step 3: Dividing Slices

- If we take 90×10^9 as the target slice size:
  - The first two slices are already 90×10^9, so they don’t need cuts.
  - The last slice (180×10^9) can be split into two 90×10^9 slices with 1 cut.
  - Total slices now: 4 (matches required number).
  - Cuts required: 1.

- If we take 45×10^9 as the target slice size:
  - The first two slices (90×10^9) need to be split into two each (1 cut per slice 2 cuts total).
  - The last slice (180×10^9) needs to be split into four 45×10^9 slices (3 cuts).
  - Total slices now: 4 (matches required number).
  - Cuts required: 3.

Step 4: Choosing the Minimum Cuts

Among all tested slice sizes, the minimum number of cuts required is 1 cut when we choose 90×10^9 as the final equal slice size.

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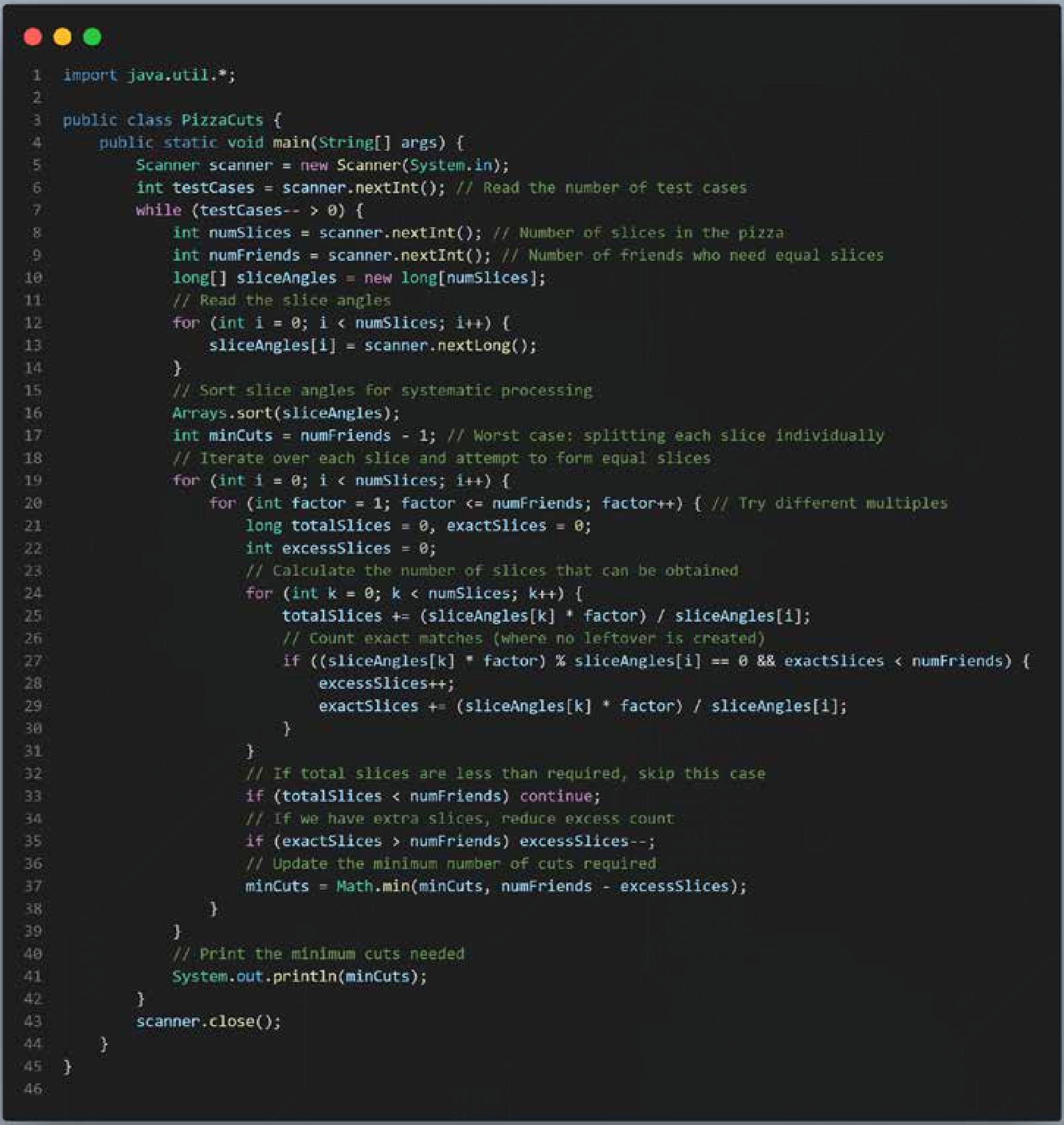
Output
1

This means that the minimum number of cuts required to create 4 equal slices is 1.

SOLUTION



```java
import java.util.*;

public class PizzaCuts {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int testCases = scanner.nextInt(); // Read the number of test cases
        while (testCases-- > 0) {
            int numSlices = scanner.nextInt(); // Number of slices in the pizza
            int numFriends = scanner.nextInt(); // Number of friends who need equal slices
            long[] sliceAngles = new long[numSlices];
            // Read the slice angles
            for (int i = 0; i < numSlices; i++) {
                sliceAngles[i] = scanner.nextLong();
            }
            // Sort slice angles for systematic processing
            Arrays.sort(sliceAngles);
            int minCuts = numFriends - 1; // Worst case: splitting each slice individually
            // Iterate over each slice and attempt to form equal slices
            for (int i = 0; i < numSlices; i++) {
                for (int factor = 1; factor <= numFriends; factor++) { // Try different multiples
                    long totalSlices = 0, exactSlices = 0;
                    int excessSlices = 0;
                    // Calculate the number of slices that can be obtained
                    for (int k = 0; k < numSlices; k++) {
                        totalSlices += (sliceAngles[k] * factor) / sliceAngles[i];
                        // Count exact matches (where no leftover is created)
                        if ((sliceAngles[k] * factor) % sliceAngles[i] == 0 && exactSlices < numFriends) {
                            excessSlices++;
                            exactSlices += (sliceAngles[k] * factor) / sliceAngles[i];
                        }
                    }
                    // If total slices are less than required, skip this case
                    if (totalSlices < numFriends) continue;
                    // If we have extra slices, reduce excess count
                    if (exactSlices > numFriends) excessSlices--;
                    // Update the minimum number of cuts required
                    minCuts = Math.min(minCuts, numFriends - excessSlices);
                }
            }
            // Print the minimum cuts needed
            System.out.println(minCuts);
        }
        scanner.close();
    }
}

```