import java.util.Scanner;

public class ChecksumCalculator {

public static String addBinary(String a, String b) {

StringBuilder result = new StringBuilder();

int carry = 0;

StringBuilder aBuilder = new StringBuilder(a);

StringBuilder bBuilder = new StringBuilder(b);

while (aBuilder.length() < bBuilder.length()) {

aBuilder.insert(0, '0');

}

while (bBuilder.length() < aBuilder.length()) {

bBuilder.insert(0, '0');

}

for (int i = aBuilder.length() - 1; i >= 0; i--) {

int bitA = aBuilder.charAt(i) - '0';

int bitB = bBuilder.charAt(i) - '0';

int sum = bitA + bitB + carry;

result.append(sum % 2);

carry = sum / 2;

}

if (carry > 0) {

result.append(carry);

}

return result.reverse().toString();

}

public static String onesComplement(String binary) {

StringBuilder complement = new StringBuilder();

for (char bit : binary.toCharArray()) {

complement.append(bit == '0' ? '1' : '0');

}

return complement.toString();

}

public static boolean allOnes(String binary) {

for (char bit : binary.toCharArray()) {

if (bit != '1') {

return false;

}

}

return true;

}

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.println("Enter the number of frames: ");

int m = scanner.nextInt();

System.out.println("Enter the number of bits per frame: ");

int n = scanner.nextInt();

scanner.nextLine();

String[] frames = new String[m];

System.out.println("Enter the frames (each frame should be " + n + " bits): ");

for (int i = 0; i < m; i++) {

frames[i] = scanner.nextLine();

}

String checksum = frames[0];

for (int i = 1; i < m; i++) {

checksum = addBinary(checksum, frames[i]);

if (checksum.length() > n) {

checksum = addBinary(checksum.substring(1), "1");

}

}

checksum = onesComplement(checksum);

System.out.println("Calculated checksum at sender: " + checksum);

System.out.println("Enter received frames (including the checksum): ");

String[] receivedFrames = new String[m + 1];

for (int i = 0; i <= m; i++) {

receivedFrames[i] = scanner.nextLine();

}

String receivedSum = receivedFrames[0];

for (int i = 1; i <= m; i++) {

receivedSum = addBinary(receivedSum, receivedFrames[i]);

if (receivedSum.length() > n) {

receivedSum = addBinary(receivedSum.substring(1), "1");

}

}

if (allOnes(receivedSum)) {

System.out.println("No error in received data.");

} else {

System.out.println("Error detected in received data.");

}

scanner.close();

}

}