import java.math.BigInteger;

import java.util.Scanner;

public class RSAEncryptionExample {

public static void main(String[] args) {

// User input

Scanner scanner = new Scanner(System.in);

System.out.print("Enter plaintext number (as BigInteger): ");

BigInteger plaintext = scanner.nextBigInteger();

System.out.print("Enter prime number p: ");

BigInteger p = scanner.nextBigInteger();

System.out.print("Enter prime number q: ");

BigInteger q = scanner.nextBigInteger();

System.out.print("Enter public key exponent e: ");

BigInteger e = scanner.nextBigInteger();

scanner.close();

// Calculate n and phi(n)

BigInteger n = p.multiply(q);

BigInteger phi = p.subtract(BigInteger.ONE).multiply(q.subtract(BigInteger.ONE));

// Encrypt the message

BigInteger ciphertext = plaintext.modPow(e, n);

System.out.println("Encrypted message (ciphertext): " + ciphertext);

// Decrypt the message

BigInteger d = e.modInverse(phi);

BigInteger decrypted = ciphertext.modPow(d, n);

System.out.println("Decrypted message (plaintext): " + decrypted);

}

}