

username: qingxuan

01

password: nauxgniq

From function *level1Authn* and *mystery* we can know that the password is the reverse of the username.

02

hashcode: 1315697979

mysteryNumber: 79

correctPassword: hyperlink

According to function *level2Authn*, the *correctPassword* be easily directed deducted by reading the code of the function, or can be obtained by observing variable *mysteryNumber* when debugging.

03

CorrectPasswordMD5: 9d8b58a7774845bd2be08033e61c3b67

password: suspect

MD5 can not be deciphered directly, but through brute force. However, it is very time consuming, for it took more than half a day to crack. The code is as followed.

```

/**
 * brute force of MD5 for the password
 * @param MD5Hash
 * @param n: the maxime length of target password
 * @return password
 */
private static String decryptMD5_ch(String MD5Hash, int n) {
    String password = "";
    password = helpDecryptMD5_ch(MD5Hash, password, n);
    return password;
}

private static String helpDecryptMD5_ch(String MD5Hash, String password, int n) {
    String passwordMD5 = MD5OfString(password);
    System.out.println("password: " + password);
    System.out.println("MD5: " + passwordMD5);
    if (passwordMD5.equals(MD5Hash)) {
        return password;
    }
    if (n <= 0) {
        return "";
    }
    int len = password.length();
    for (char ch = 'a'; ch <= 'z'; ch++) {
        password += String.valueOf(ch);
        String resPassword = helpDecryptMD5_ch(MD5Hash, password, n - 1);
        if (!resPassword.isEmpty()) {
            return resPassword;
        }
        password = password.substring(0, len);
    }
    return "";
}

```

04

username: qingxuan

PIN: 2499

L4: You entered 2499 and its hash code is cddd1ae99f870d476bc820de7cbc866d

It is much easier to crack this one through brute force, because its length is only 4 instead of

7 like the one of question 03, and it is only number. The brute force code is as followed.

```

18 public static void main(String args[]) {
19     LoginWindow.run(); // STUDENT SHOULD NOT DELETE THIS LINE
20
21     //TODO: STUDENT MAY MODIFY (EXPAND) THE CODE BELOW TO PERFORM BRUTE-FORCE SEARCH FOR
22     //      LEVEL4 PASSWORD PIN THAT CORRESPONDS TO THE STUDENT'S USERNAME
23
24     String username = "qingxuan";
25     int PIN = decryptLevel4(username);
26     tryOnce(username, Integer.toString(PIN));
27 }
28
29 public static int decryptLevel4(String username) {
30     for (int PIN = 1000; PIN < 10000; PIN++) {
31         if (Authentication.Level4Authen(username, Integer.toString(PIN))) {
32             System.out.println("username: " + username);
33             System.out.println("PIN: " + PIN);
34             return PIN;
35         }
36     }
37     return -1;
38 }

```

4-level Password

Username	qingxuan		
Level 1	*****	Verify 1	<input checked="" type="checkbox"/>
Level 2	*****	Verify 2	<input checked="" type="checkbox"/>
Level 3	*****	Verify 3	<input checked="" type="checkbox"/>
Level 4	****	Verify 4	<input checked="" type="checkbox"/>

user name 7,