Problem-2

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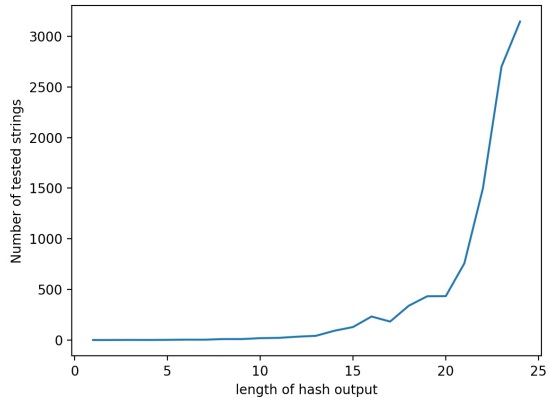
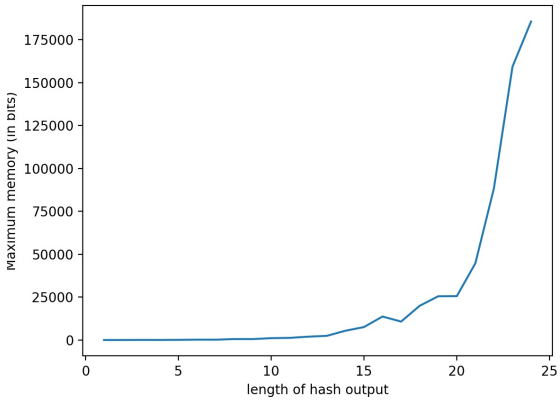
1 Implementation

I have used the `hashlib` library in python for SHA-3 256-bit encoding. First, generate a random number(N) that will be the length of the string. Using this N, in each iteration, generate a random string of length N. Calculate it's hash output h, and store the string and the first d bits in the hash output h in a dictionary with hash output as the key and the string as the value. If in an iteration the key is already present in the dictionary then that string and the current random string have the first d bits of their respective hash outputs are the same.
Since, we are supposed to give 3 such tuples, the whole process is repeated thrice using a for loop.

2 Plots

Then plots below are for strings of length = 10.





Below are all the tuples used to obtain the plot. (As mentioned in the assignment description)

```
For d = 1
s1 = CTTDNIQSGC
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s2 = TSP3BB1G41
h1 = 1001010000100001011111111101001001000111101011111100000100010110101110100000011000111001101110100011001010100101001101001100001101000010111100101000101001100100100011001000101110001011001100100001010110111000100100000010111000111101110011001010000011100110
h2 = 1010101111001111100110100000111110110101001001100110101101110100010101000000110000011000100000001101101010001010011010111100101010111111100011001111110000010111011000101101011000011011110111011110101011111110110001010010010000110111101010011110101001100111
m = 118
n = 2
s1 = CTTDNIQSGC
s2 = JUTOPA6REC
h1 = 1001010000100001011111111101001001000111101011111100000100010110101110100000011000111001101110100011001010100101001101001100001101000010111100101000101001100100100011001000101110001011001100100001010110111000100100000010111000111101110011001010000011100110
h2 = 1000000011001101111011101011100000011100111001010010100010000100101010001100011011000111000100010000111110100001011010001011011001010000000011001011111111111001110110010101011011000010001000111011100111100010000100100011000111010010000110001100010000110 1
m = 59
n = 1
s1 = CTTDNIQSGC
s2 = RN1ROYVIKG
h1 = 1001010000100001011111111101001001000111101011111100000100010110101110100000011000111001101110100011001010100101001101001100001101000010111100101000101001100100100011001000101110001011001100100001010110111000100100000010111000111101110011001010000011100110
h2 = 1011101011011110100110011110010100000110100000000110000000100011111110001001010000010101010001110101000000110001000110001010100111000111110000101000001010010100001110111001000011000000011010110010010101101011111000001000101111100010110010011011101010100000110
m = 59
n = 1

For d = 2
s1 = 0D01J5L09W
s2 = TTJYK3MLPN
h1 = 1010000110010001011111111010111011100100010011011010000100111111000111101001001000000101101010110011101111001010110000111011001011100111100100110000111110100111011001110110000110101111000101000001101011110101101011111100011000001011011001000110010010000 10
h2 = 1010010000010101000010100010110111010001100101000000001010010101110100100000000110110000001110100100000011110111010001001011010111000100110010110011101110010110010110001001111000011000110100000101010000000101110110000100111000101010111100011100011111111101010
m = 118
n = 2
s1 = 0D01J5L09W
s2 = EGX3EJTGRG
h1 = 1010000110010001011111111010111011100100010011011010000100111111000111101001001000000101101010110011101111001010110000111011001011100111100100110000111110100111011001110110000110101111000101000001101011110101101011111100011000001011011001000110010010000 10
h2 = 1010000111011110101101100010010100100000101100001101100000011110001000111000010101001100011110110100111001111011110011001011110101011010101111111101010110110000010001010101100001101000110111100000000101111001101010001110111111011011111001011111010001000001 10
m = 59
n = 1
s1 = ZFVBAUOBPZ
s2 = TRRFVYW0KO
h1 = 1111010110011100101101101100001111111100001011110110001010010100010001110011110000110110001010000000111101111101001000100100110100010011111001111000101100110100100101000011101001111101110100010010110001101100100010110100011011100110100001100100011111000 0100
h2 = 1100100110011001010101100001000111011110010111011110010011001010100110010000000111100111111100001001101111110011111100101011111110110001001110100010110111110101101111011000011001011001110111100011110111110000000011101011111010110101000100110010111010100001
m = 118

n = 2

For d = 3
s1 = NQZD6UHKJX
s2 = LMVWOCFB23
h1 = 1101000100100100011111010011100001100001011111111001000100001111101110110110100011110000
0110010111111100100011001110010111001100100111001101100010010110000010001100111110001
0010010010001101010000101110110110101011101110001100111010010001100100111111110000000
h2 = 1101010000101100000011010001101011111100010001011000000100010001011011011000011100000000
0011011100001001110101111101000111111001000010100010110111001001100001110000000010110
1011010101001110000000011000100000101010011110101111011100101111010000000001001111000
m = 236
n = 4
s1 = 3WQ6E3FLBI
s2 = Q7YQ7UJJM7
h1 = 1000110010111100011111001100110111111100001111010111110111000010111001101111000111001010
0010110101011111001100000111111100010011011000000110110011011111011101000100101100001 0
0000000011001111010100100000101000000000111001111001000001010011000100010111101000000
h2 = 1001111111000100100010111111011010011111111011101010111011000110110011111011001110100 10
1101000101010011001111011010110110010110001110110100001111100001000000011011111101001
0100100111111010001010111100000010111001001101001101001111010101010100110101100000010
m = 118
n = 2
s1 = 3WQ6E3FLBI
s2 = 2YX410DHTQ
h1 = 1000110010111100011111001100110111111100001111010111110111000010111001101111000111001010
0010110101011111001100000111111100010011011000000110110011011111011101000100101100001 0
0000000011001111010100100000101000000000111001111001000001010011000100010111101000000
h2 = 1001100001101011101011100001111000100101110110100100001011100011001011011110010110110 11
0100011111101011000110001010011100001101101100010100101101111010011100100000011010000
0101011011001000101101110010100000001011001100001000010011101011001101101101110100 11
m = 59
n = 1

For d = 4
s1 = QRNW2MTQ82
s2 = TKPFUNF2IN
h1 = 1001011010111011001101101101011110100011111011101011000000110010001000110111110100001 01
0000001001010110100100100110011001011000011111100010100111010011000100010111111111010
1111011100110001011010111011111010000011011001100100110110000010000011000110100101 00
h2 = 1001001110001110101000011001000011000000101001100000000010110111011100011011101000000001
1101100011010100000111101011010110100100010110010001001001010011101010110100000110 0100
1111111011101011011001100100100010100011100011001100101101011111101010001001111100010
m = 177
n = 3
s1 = DKZOH0FWVR
s2 = WW9RWE1QD5
h1 = 1000100111011101101111100100111101110100110010011001110111111001101110010100000100010000
1110110101011111010101010011100111010100000111111111101100100101010010100011100000010 11
1010101110110101000010001110010001010100011111010111111111000111100011101010001111 11
h2 = 1000111000001101111011001000101010111101101011011100101001100101011001000101000110000 01
0110011010011100100101100101111101101000001010010011100100110100000001010000111110110
1010000001011011110010001101110011011101111010011101010100100010110000000111111000 01
m = 118
n = 2
s1 = BVZ7JYB2N5
s2 = PH350X0R9S
h1 = 1011101011011011011010100100101011100010001110000001001000010100001110001110011101010 1
0111010010101110000110110110101100100001101110111100000101000010011111101110010100010

```
00111100011100111111010100111101011001011101101010110010001111000011011000110000110
h2 = 10111101001100010111000100111111110000010110111011000110110111000000001000000010111110101
01101111000111011101000001101111110010101010000111000101100100001001011110000010010110
00011110111010001010001010000000000000011011100101100011111010000001010000000100100
m = 59
n = 1


For d = 5
s1 = RFXVUP0S3V
s2 = U626N72GNX
h1 = 11111100111101001111101011000011010001010000111010101100001000110000100100010111001100010
10111110001010110011111101101000010110101001100100101010100100100111110010111010000001
10001100001000100111010101000110110010000101101000011110011111010110001010001100010001
h2 = 11111101111001010010111010101101111110000100001101110100011001110011010100000011110110101
01000111000110010101011001100010001001101101001111011000010101110110111001010110000010
00100111101101101001100111000011110001111000011110111100101010001010011011100000000
m = 354
n = 6
s1 = A960SBV3FK
s2 = 4WBQW0SXIM
h1 = 10000101000010001010110100110110011101010100001101100111101110000000101101110010011110011
11010110011101010101000101110100001100111001110011110001101011011010100100110010101111
11001001110001000001001111101001101010010000111000110011011001010101111101010101101011
h2 = 10000001001110101001001110111101110100010011100101011010000011001111111011011010111010101
00111010100101010110101001000111011001100010000110110000110110110111000000000001010010
00110010011100010011101011110010111011011010001011000010100011100110000001000111111
m = 59
n = 1
s1 = A960SBV3FK
s2 = 9SXRKH2M5K
h1 = 10000101000010001010110100110110011101010100001101100111101110000000101101110010011110011
11010110011101010101000101110100001100111001110011110001101011011010100100110010101111
11001001110001000001001111101001101010010000111000110011011001010101111101010101101011
h2 = 10000110010101101011100001111101011011001000100010110010110001000010101000111111000000101
11001000001110000011111010001011000100100111010101010111100001000000111111011010011110
00000001001111111110110011111111100110111100010110100011101010010110111111101111111000
m = 118
n = 2


For d = 6
s1 = 871KM0MGR2
s2 = 2W6AVVBIL4
h1 = 10001011100001111100011000110110101010110011010010100001100011011101010000000010010000001
01000011111001000010010001001001100110101111110101001000010011011010001000011101111110
11001101010100100111000110001001110101110101110011010000111100111110011010010010101010
h2 = 10001000001111111000111001001011000011111011010011111001100010111001001110101110010110000
00111110000011011110110100101111011101101111111001101000111100000110001001000110100111
10000001011011011001100101111010000101111000111100100110000010110010010100111000011
m = 236
n = 4
s1 = 7LC9BS1OZH
s2 = QC60WSCW5K
h1 = 10110101101010111110000010000001110110001100101010010001000111001000111110001010000101010
10110000100001100000111011000110101000001101011111101011000010101011001000100111011010
00100100101011011110010010001011001110001110010100100000001101011010001110000000111
h2 = 10110101110001111011000001110000011001000010000000010100111010000110101101101110100111010
00000000001100011011011011111011110011011111010001011101111111000101010011111111111101
10011111001100100100100011111011000111100111100111011110100100011111111111111011111010
m = 472
```

```
n = 8
s1 = 871KM0MGR2
s2 = PIUB4PMJ3E
h1 = 1000101110000111110001100011011010101011001101001010000110001101110101000000000100100000
010000111110010000100100010010011001101011111010100100001001101101000100001110111110
110011010101001001110001100010011101011101011100110100001111001111100110100100101010
h2 = 1000100101101001110110110101011100101010000110111000101001110111010001000011111110101011
011110000100111000100100111010100111010101111110101100100111101111011101000100110000 1
110010101011000010001100100101001111110101010111011100111111001111001110001101 01001
m = 177
n = 3


For d = 7
s1 = 346J48IBM4
s2 = IBO2W8OGVM
h1 = 1101000011100111111101011010110111011111000111110011101011010000101100100100111101 11010
100011110101101001001000000000100111101001011010110111000110111111001011000011010100 11
110000101110111110110110100000011011000100001010010111100011000100101010101010110110
h2 = 1101000101010101011010011100101000010011100010000111101101100001101011110111101111 10011
101001000100011011100100001000111111100111101110011110110011110111110011101011111 1010
000100101101100010001100100010110010011011001101001101000110001000001000011000101000
m = 413
n = 7
s1 = FCHHFSYGLL
s2 = BPFDBU5GAM
h1 = 110011110010001110010001011011010110000000011001101001111111110111101101100111101011110
111011101011111001100100101000101101100100011110110000000110010101001000111001001001 0
010000111111001110100110110000001001011001000101010100001100111110110100110011110011
h2 = 110011110001011110101011110100111011110110001111010111000001010110111011110000100010101
111000000101111110101001000011100000100110010101101100110000010111110001111111100110 1
0101101101000101010000000010001001111001011101011110010100010011101000010000000 1000
m = 295
n = 5
s1 = X79SKFHPA0
s2 = AAGBNAPR5L
h1 = 101010001010001101110011111110100110110001001100000101110100001111000110000011011111110
100000110111111011110110001101010001010000000001111010101011000100110110010110110010 10
010111101101101101001110110010111000111110101011010010000000100011001101010101101 10011
h2 = 101010010011011101000111111000011000100011100001111100111111000001101100110101001111101
100101011101011001101000101111101110000011100101010011111101011101110101010110011011 0
010000101111110001010111010000111011001100110011010101101001100101100110100110011000 1
m = 118
n = 2


For d = 8
s1 = BYXN23U0K5
s2 = 2MSWGIKW0B
h1 = 100110111001101000111100100110110101011110100101100000000001010100100011100011011001010
110100111010110111010001011100000000010101101100101000001110001010010101101100010101 1
000111101101001100011110001010110000011110100001000000111010100110101100000011011011
h2 = 100110110011100100010100000111111110011100001011010111101011000010000111011111011010100
010110111111001001100001101111111001110000110101111100010000000100111110110010011000 0
011110100100001110000000001011111101101110111000011001011011101001101011000001011 11
m = 708
n = 12
s1 = 8L822Z2AWK
s2 = 2WFWA5IOS7
h1 = 100001100000000101101101000110000110101010001010100001110000011101110111100111000010001 1
110100010001000011000011110100000110100111010101011111011111110101000110101100111110 1
```

```
11100111001100101011101000100011010100000101111010111110111101100000010100000111001 1
h2 = 10000110111100001000100111001100011011110000010000100000101010110101011100110011010101001
11100010111110011001001010111000000111111110000100110100000110101110111100000111101
00111100000111100101111101111111101000101101100011100100101011000000010110101101011111
m = 826
n = 14
s1 = 90DF8X9U8Y
s2 = 1AR52NP0Y7
h1 = 10010001011001000110001110001011111110001001011111010100100100110101000100100001101001 1
11111000010011101101001110001110011101011010001000010001100111110011010011111101100
01101000110101110000111001100010000010001011011110010110101001001111111111101001100110
h2 = 10010001111011001101000111010110010000101100010010011111010100001100011011000000101100
01100101100101111100111011011010101001011110101110001111101000000111000001011100 01
00000111101110111011101000011111000111010111111111000010101100001101000011010010101 00
m = 354
n = 6


For d = 9
s1 = 5MILTA7E0I
s2 = N0ZXF294SO
h1 = 11011000001100001111001110100001110110010110001111100010111000011001010111000000100 1010
11010110010110110111101110111010001010101001111101100000010000011111111001000011000 01
00010010111101010011011000100010100010010000010101011011101101101111010010101001 0111
h2 = 11011000010001100000000111011000101100101011001111100011100000110110001001110000110001 1
11111111011100010000110010010101000101011100001000000100110100111010101110001011010 10
01010011010110011010110000000000011010100011011110000000010100110001001010000100111 11
m = 1357
n = 23
s1 = KZLB0YP7IC
s2 = 07TMU9AS49
h1 = 10000100111010000010101001011000000100011101111101101111011001110011101010010111100 1110
11001001011011000011011101001111100110111001010110110101100010001101111101100001000 11
11001101110000000001111100100110000001000101011111101010000000000100001000110101010 1
h2 = 10000100100101111011101101101010110001001110000011100101101011100110001010000101001111 0
00111100010110101111101110011101111011101011010001000110110101011100010000000011111 00
00001011101011011010111101001000011110111010001111101010100111100100010111011101011 1
m = 354
n = 6
s1 = TWINC6WCNA
s2 = ESUHLWUNWT
h1 = 10010010110000101000110111011101110000100111000111101101111000011101110011011111010 0111
01100111110010101001100101010011010000101100010100101011100000011110000101111001010 1101
00010111001111010011010101010001110010010001110010111000010010000010111111111011000
h2 = 10010010101010011011101001100111101101110111111000011100101100101010111001100100010101 0
01010101011000000011100010000110111001111011010000001000101101110010010011000100110 10
11001010001011111001010110011110011101000111011100001110010010101101111000100100011011
m = 177
n = 3


For d = 10
s1 = 0ULHVC3HWO
s2 = 1PBPX8MDJG
h1 = 10110000010011001011100100010100011100110101111100000010100001001001000011101100001011 0
01101110000010100111101100100001001111000100101000011010011010000110111100001011110 01
10110110101101111010001001010011110011111100111010000100111101101001000100110010
h2 = 10110000011000001011010110000001101111011010111100101011111111101100000000001011001010011
01101100101010101101101000011110001001001110101001011100000010111100110000011011010 10
01000101000001111100100000001110000111101010100000100100001100100111010000110010010 0
m = 1947
```

n = 33
s1 = F22T3MJ1H2
s2 = D045I3FGML
h1 = 11001001110101101000010001011110000010011100001100010001010101110011010000111000101111011111010111101111111111110001110001110001101100010001010001110000110000101101110100111100001000010101100101111010100011000101100010010010000001111101100000111000100010
h2 = 110010011101000110000001111100001000100001011011110101111110011011001100100001011000010000111001011001100001011111001010010110101100110101100111001111010010011111111010110110010000011111101000110111111000010111111001111010110001111110010110101110011001000010
m = 1239
n = 21
s1 = XUU4R5QLK8
s2 = AK5KZE3042
h1 = 110011110110001011011010011110000110111101101000001111000110011101110001010101110110001111011010001101111110110011010110010100010011000010110010110101001110111100001101011000110101001111110110011011101010110101010111001010111000101101011110101000001101010
h2 = 11001111011100000111010111011110101101110110100001010111000110101111011101100111000010001110100011010000111110101011101100111011000101001011011101001011110001110111011111100000010100010011110111010011101110111101000111000001101000000011110110100100011001110
m = 295
n = 5

For d = 11
s1 = C5ARNQU76G
s2 = 2HIZX8S693
h1 = 1010110101000001011011110001110110010101001011011011000111110100001001010001101001101000011100100001111001110101101010100110111110111001001110110011111101000100001001000010110111101101111010111100111111101101010101010000100010110000001001010111011000110011
h2 = 101011010100111110101000000001010000011101000011111000111101100110010110110010111111000110000000011100111100100001101100000000101000010101100010000011100011101010100010101110011101001010100101000100110000000101100100001100000110010001010101100111010010000011
m = 295
n = 5
s1 = 690EP1H0FE
s2 = Y0KTL2JBAR
h1 = 110110011100110010001011111101010100110010111011101011011010101000000011110101001011100000010100100101010011101011111111101101100010010000101011100010101001001000110111101100101110101101011001000101100000000011011110110101000000001001110010011000101000
h2 = 1101100111010111010001111111000110011110000100000111000011010010001101110010110101000101111010111111000110001010111101000001111000111000101011000001011111111000000010011110111101110100101000111011100011100011001100100010010110011100110101001000100110111001
m = 2950
n = 50
s1 = 3VX20WFCF0
s2 = MH0EDA9ZXX
h1 = 1111110011011010001100110011111000110011100100000001011000011001000110111010100010111000100101010011100010010100010001010010101101110011110011000000001000001010011000000001011101110111011100110100001010010101011010001111010111111011011101001111110001111
h2 = 1111110011001010000011110101110000101111010000010011000100010000000111000011010011110111
1100011
010101000100001010111100011100100100000110010100011101101010010010100000000100110110001
m = 767
n = 13

For d = 12
s1 = FNJQYA8JP0
s2 = 0JQAC1K5DV
h1 = 100101010111000100000010100001101001111001100011110010000101100000110111100100001110110001101101010111101101101100101110100110000011101110100000101111111100111010010110011

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10000001110010001000111000111011011100101110100001001100111011010000110111100001011
h2 = 10010101011111111110000110010011110011100011100000101100010001101000011011110101110100010
11011001010000101011111010111011111100110100101010000100001101011100101101010111000
10100000010101111101010001110001100101100010001001111100001101111111011010111101010110
m = 1888
n = 32
s1 = Y89XN9JRAX
s2 = X23FYP084I
h1 = 10001101100110101110111101101110110011110011111010100010010001001110101011010011001100
11110101110011101111010000001111001001011001001011001010100101001001101010110000100
00011011110000111100110111011000111001011110000000001010111110111101000100011011001O
h2 = 10001101100100111101000000101001101010010000110110000110010001111111111101001000011100000
00000010101111110010111101110100110111100011110011110100110100100101100100011101011
11111110100110100010110011111010000010010111001110101100110100110011100000110010001O
m = 3953
n = 67
s1 = IHEDNX8F9L
s2 = XN7XEGRD8V
h1 = 10000110011101110101110101010111100000000111110100011101111101010000000110001101101010O
00110101101110100100110100111011110011111110111001010000001000010111011001000101010
10011111110011001011111101011110110100100101110010110101110110000001010001001001110110
h2 = 10000110011110000001111011001010000001011010110101111110110110101000111101101111010010101
10001101101101100010010011011110000101010001000000010010110100100101010011100010111
01001010100010111011010100000111010000010001011000011110010100100111010000001011010110
m = 236
n = 4


For d = 13
s1 = 0S04JPUAEV
s2 = Z9A6QEUZO1
h1 = 11000011111001110000010100101110100100111101010011010101101100110100010011010100010101O
00110011000111111010100101101101001101111000000011011110111100100001000111011011010
10010110000000011100110000001101100101110000100101100000110100100011011001000100010001
h2 = 11000011111000001000100001011101011101000101111111010011110110101100011000110100010000l
01010110101100000100011111001001010001000011001111101110101101101010101000110100000l
10110010100101010101011110010101010000101101111101010100000110111010000000011011100011
m = 2124
n = 36
s1 = 2ZMBHXSWNE
s2 = A4PH61J1Y9
h1 = 10111101001010001010111000110110101111001000000101100111011011101110001010110111111111011
01000000000000010110011001110011100100100001001111001100000000011111110011111001001101
01001111001110010000111010000001011010111001110100011001001000001101010011101111000l0
h2 = 10111101001010010101111110110111100110110011111100001000101111101011100111001110101111101
11110011111101001000011100001010111000110000010101100111011010101011110111011001100O
11000101010001001011100111110101001000000101101010111000000100001001101011101011100O1
m = 3363
n = 57
s1 = I60216A0CI
s2 = LGZ1OEMW6R
h1 = 11100010111101010001100101001100000001100000001001001011011111000010100110110110000000l
01001000000011011001101011100000101000001001101000000010101111000100000011011000011l
01110011001001011010110011001110001001010000101000010111011111011010001010111011001l1
h2 = 11100010111100010111110111101111111001000101100100011110100000001110101000101011010001l
01000110110011100110101100100110001010110100110011011000101100010011101110000010001l
11000111001111110100010000101001011111000000010111011101000100001011101010011001101O
m = 2065
n = 35
```

For d = 14
s1 = POL1N34BSV
s2 = LZW1FNUMW1
h1 = 1000100110010100001100010110100101010100110001110001111110001101110101010011011001101001011110010010101001010111100000110011001010111011111010101000001110001111100100101110010001000011101010110011000011111111011001100111000010010101101000010110001101100 01
h2 = 1000100110010111000000001010110001110100001111100001011111110010100011100110100000001101001100000110101111100000001000100000111010011001110100000110000010101001010111101010111101000101111100111000101000110010111011000011011010001111101000000000100101100000 11
m = 12331
n = 209
s1 = 8AK5EE7LRK
s2 = BQ42N0AT1S
h1 = 1010011000010010001111100010010011100111101101100101111100101010010010000010011111000000011000100101110001010011100100110010110000010110111001000100000001010000101011100101101011100110001001000010010111100110010101110111101111110001110000101110001111101 0100
h2 = 1010011000010000111010101011011111000000000101110011110111000010100000110111010101010001001100101010010111111100001000110000010110000011111010010011111100001000110011011101011110110001100000110001101010111101011100000110010000010111111000100010011000101 0000
m = 1534
n = 26
s1 = ZKQI1RZ3K1
s2 = AS9PSI1FMG
h1 = 1010000100110011001101101001011101000101000011110000000110010001101100010110111011100101101011010111000111101100001111111101001111010110001101111111100111110101101001001001101111000110010010100111111010011100001001100100110101110111100111000010010110 01100
h2 = 1010000100110000001010100011111011101110101000111111110100011101110101001011001111001011000101010100000010001100011100101100110111110100100010111011000101001110100101000001100000011001101111111010001111001011110011111111000010101111010101001010100000100 001
m = 2596
n = 44

For d = 15
s1 = 8LKY4H7W08
s2 = T2D4FBCXYA
h1 = 1110101000111011010001001100110100100100010010001110011011011010110111100010010001111111101100110000011100100010010101000101000110000010011001101000010010100110111011010000001101100010101000000101101011111001011100110000101010111110100010101011100101001 100
h2 = 1110101000111011101111000011110101000011010011110111101100001001111101111001111101011111101010010101100100101110100110100111100111000000000101011101001000001001001011000000111001110011111011101100110010010010111010100101001010100011111000011001111011110 0
m = 1888
n = 32
s1 = M51TKHFSXB
s2 = R3P94M9KYF
h1 = 1011101010100100100001001011100010010101001010000000011110001010011000011111001101111100001010111011100010100010000110101101111000100001100000011010101011011011101101010100110111001010011010100000000010001101101101100000001111011110111001011111111110011010 11
h2 = 1011101010100101011011001101111111001110001101000011110011010111010000000101110010101111000110100101101111011101100011011011000000100000111010001000010101000011000010001101010001011110101100000110001011101011110001001010001011011000100110101011000011010110 01
m = 17464
n = 296
s1 = W42SPRHW7S
s2 = B20TCNZPD4
h1 = 1010101111101001011111110110111001011110100001001011010000011001110011001101101111000010100010010100100010101110010010001000001100011001110100000101011100100011110111011011011111010010010000001101000111011100110001101110110111111110100010110101000100 11
h2 = 1010101111101000010011100101001111001001101001110110110100000010110011101010110110010001010101101111001100100101111010100001110110010011000100111001101111010001000011101 10

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1001110011011110110011001100101000011100101100011101001000110000100001011011000101011
m = 3540
n = 60


For d = 16
s1 = Q85JN4C0EQ
s2 = V6T01L3NJE
h1 = 1111100000010101001110000010010110010111001101001111110000101001010000110001010010111100
0100001011011100000001010101111110010011011001010001000110001000110110001100101000000
0111100100001001110110111000111001001000110101101101100000010101110011100011010100011
h2 = 1111100000010101100010010101011111011010110001110011001001011001000010000001110011100000
1101000101100000111110111001000100111000101010010101001011100000110010100001101100011
1101101111110101101111111110011011011110101110111001000011100110000100100100111000
m = 24072
n = 408
s1 = E0FXRTRXO2
s2 = Z124D0Q6ZR
h1 = 1111111000100110111100011110101011101010011011100111000000110000011100110100010001010010
1101110110000111111101000101000000110101111111011010010011110001100001110011010000110
1000111111111111011101011111111000010010101111110011100111101110000011010010101010010
h2 = 1111111000100110010100110001001000101001111010010101111100100001011001010010011101110100
1100000111011111101000000101111001110000000000000100101000101111000101111110101000111
0110011110000011100010100101011100011000011111101110111001001001011111111011101000000
m = 3658
n = 62
s1 = AL2L59Z2ON
s2 = NZUKUQXU7H
h1 = 1101001110101011000100001000101001111100101001110101101111111110100111110101001110100100
1011011100010101001000011110101011101101110100111000011100010000111001001111111000011
1111100100110111000110000111011001101110100110111111111110110001011011100000111101100
h2 = 1101001110101011111101001001010010101011000010110110100110001110100101000001110110101111
1101100011101011110111101100001100010010110001010100000001101100001011101001111101000
1110100001001010001111011101001011010110101111100010000101100010001011100110000010000
m = 13570
n = 230


For d = 17
s1 = HL26G43PQ2
s2 = HJI3O0Q7V0
h1 = 1000000011000001001000100101101101100000010011101110101111110111101010010111101101111010
0010010100101010001111110010101111000100101111111100000101010000101000110011011010100
1101101011110001001101011101010001101101110110100001001011100111011011100011110011010
h2 = 1000000011000001010111111111001010101011111111100100110000101111011100110011100111011011
1010000110100111000101100000100100000000110100010110110101101001110101111010100010011
0010011001010101101101111011110001000101011000100011001110101010010001011001110111001100
m = 15340
n = 260
s1 = 6FEXBQIUGG
s2 = F9GGSUSPQX
h1 = 1110001110010101111110101000111000001011011001110010101101110010101011100010110011100000
0111000110001100000111101011101001011111001010111010001111010010111011100010001000000
0011111000010001011101110010101100001000111100111111111011010110110010000100001101001 1
h2 = 1110001110010101101010101011110111001011001010001110100010000001111010011000111001000100
1100010110001001110011101101101111100011011010100000001101110001110011100001010001111
1101110101000001100101101000011011011101111111001110101111010011001010101010010101000
m = 7257
n = 123
s1 = LJ396EXB2D
s2 = T2P7ESYG7A
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h1 = 1110100000100111010010000010011100001000101000011000001101100000100110101010011100101111
1001100111011000011111111110101110001001111100110011001100100010000100101100000000000010
0110000011110000000111111000010001110001010110001000001111101011010001100110001 1101
h2 = 1110100000100111001000010001110110100010001101100000011100111100001001001111001000011100
1101011001101011001100110100101001110010011001110111000000100101010010001000110000000
0100110101111000100101000110010011011011011001010011101110000110101110011010010001 01
m = 9853
n = 167

For d = 18
s1 = 9XJFASKKQB
s2 = 2UHBSFPJEY
h1 = 1001101101101111110101001000010100100100011110010000001000001010010110111111011101011 01
0100101001010111001100110010001000011010001101000111111001111111101101001101011010 00
0100111111001001111101100011001101100101101110000001111000001000001010111000010100 0
h2 = 1001101101101111110111110000001001101010000010111110000011110011001110100110111001001111
1100011101110111010010110001000011111101011001111011100010100101111010011100110001 01
1010100001001000000101110001010011011001101110001000001010100111100111110011111011101
m = 28438
n = 482
s1 = NDXHOY44VI
s2 = FHMHO1LYT7
h1 = 1001100111011100110111111010000110000010101001000000110100001000010110100100011110100 00
1100000011010011000001111111010000011001001100111111100010101100010001000110011111110
1001000110001100111100011110111011110010000100000001110110001111011100110100000110 0
h2 = 1001100111011100110111011111011010011011001000010100010111001100001011110100010101111111
1111000101101001110101111010100000110000110000010001100000000101100100101101000101011
1110111101000110100011110111100000110100000011001011011100001100000011010010110011011
m = 18231
n = 309
s1 = 5TB00G04R7
s2 = MADWJ7PZPQ
h1 = 1011011111011010100100110010100001001110101010111000110110100111101101101010001001110 10
0010101000010100001000100001101101101001100011110010101001101000001110011101111000 11
1100101111010110100010001001111111001010000011010100111100011010001010100110110010101
h2 = 1011011111011010100011000000011001100101100001011111010011011000100011100011000000001101
0110011001011111101101101000000011101100001100010000111100011101011010111010110010 00
1111011110000011011111110110011111111011101111110001000111111011011110001010000100101 1
m = 13334
n = 226

For d = 19
s1 = EUY0907WAP
s2 = 30J4RSNSSR
h1 = 1000010101010011101000001111101000000011000111101101100011011111001001100110001010010 10
0011001100110010001101111010110101110110001001011000001000001011001010111111000100100
1111100001001110110111100000010100000101110111001101000010110010000011010110000011
h2 = 1000010101010011101000100001110010101101001111001111010101001000011111111110101101000 10
0111101010011011011100001010000000101011111010111001000001010001000100100011110000001
1010111101100001110011011101011001100111010011000000011001000111000001010101010001 00
m = 59177
n = 1003
s1 = VW184INCKQ
s2 = Y2E7LCNKE2
h1 = 1000010011011100010100010000101110110110111100111010101000010111110010000101001000111 01
1111101111001100110010011101011000001011111101101101001011111010000100011001111111101
0100001011011100101101101100010100101111010011100010111100000111111000100111011111
h2 = 1000010011011100010101110000100101100000110010100110011111001101100010000001111100010 01
0111101110001110110001100011100111101110011010000011010101100110100000101111110 1101

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00101001101100001110010101100011000111000110110100100011001010111011111111010110011 0
m = 3540
n = 60
s1 = LF29YVSME2
s2 = 3E4PYFPMSE
h1 = 11010001010001000110111001000111000011100110010110101101101001001100000000001010110101 0
01011100101101000110110100111010101111100100100101010000111001110010011111000100111 11
00011111100111100111111011010000110010111110110111110011001011110000101100010000011
h2 = 11010001010001000111100100010011100011111000011001011111011100101000010100001001001 1011
00010000001010001110101100101000001011000111001100110000011000011111001000011011111 11
01010011000111011101001111100011101101111001010100011010101011001100010011001110111
m = 13983
n = 237


For d = 20
s1 = 8SJNDNHF8X
s2 = 02V65A4H2F
h1 = 10110011101110010001110001001101110000111001101111001010010010101100110111011111011 1011
11101101000001111111011001010010110000101110011111100001101010001100111100011011011011
11001000100100000100111010011000001110110110001110101011101101101001110101001010110 0
h2 = 10110011101110010001100010001000110011101111010010000100110010100100010001010110101 1111
01000000010010110010111110001000101100000110001110000100100101101000010101100011100 11
00000101101000010110101100111101011011010100011101011000011100110111111011010101 11
m = 9735
n = 165
s1 = 0X6462O970
s2 = 857RVMCP3A
h1 = 11011101111101010100111111110010110000101111010000101111111100000111001011001000 1000
10010001100110100101100010100001000100101111010100011110001100110000011000101111001 01
11111101101100111000101011010101101001001100001101101111110001101111011110111111111
h2 = 11011101111101010100111001001100000001010110100100011111001101101001000100000000011 01000
10000010001011000100011100001111000110101100110110000000011001011000111110001101110 00
11111011101100010011111101100011111000010011011001001101101110010110011001111000101 10
m = 27671
n = 469
s1 = T7SXXC2LMT
s2 = OLE8YAGI9V
h1 = 11110000001111011111000011001110010011110010000101001010010011011001011000000001110 1111
11000001110100010010001101011111011111101101000111011100010111100101101001011001111 00
00010011010101101001001011101010001111100111100001010111011010000101100111000010 11
h2 = 11110000001111011111101011000111000110100111000101111110000101101110101000001001000 1111
11000000111001011000100101100100111000001111011100111010010110111111111000111111111 10111
10101010100110011000001010100001100011001000000010000010011110010000010111011101010
m = 39471
n = 669


For d = 21
s1 = YPKV0L042L
s2 = 97MDFGAJS2
h1 = 11101001111010110000101010000100111111111001010111001000010111111100111001010111000 1100
01100111011101101111001000101011101001101110110010101010101001111001101010001001100 01
11011110010011111101101110010001010111011000101101000111111111111110011011101011101 1000
h2 = 11101001111010110000100000011100011000101100111000000110100001110101011010001110110 1011
00111110010110011001100000010100011000111000100111011000100010100111101011000111101 1100
10111001011110110101000001000101001110001011010010010000001001000101101111000010001 10
m = 86258
n = 1462
s1 = IHS4TT4GME
s2 = 5VYK75P9KY
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h1 = 1001111101110100110101000001100010111101010101110100010001000010100010100011110001110
0100110010111100111000010010101010010010110111000000100000001010001000100101111100011
1010010110100100100011111111011010011010110111001100100010011110011001100011101100001
h2 = 1001111101110100110100111110111101001011001101001101110100010101111100100111110011100
1100101010011100100000100100011100000100000001010011010010101110110111011000011100001
0111000100011010100100000010011010111111001010111100011100010001110011101111011011000
m = 3953
n = 67
s1 = LQWRFJSQW9
s2 = I7V08BSMW6
h1 = 1111100110101000110111011101110000100010001111101101000101110001010101010001011100001
1101000110010010110110101000000000100101001001011000011011111100011101101100101000100
0101001110110011110011001000100010101000010101010010011101011110010111101111010000111 1
h2 = 1111100110101000110111010001010011111000001001100111011111111101000100110101101111110110
1101101011100101001000001111110001001000110001101010001111000111111111111100001111010
0110101011001111110001000111011001011100010111010100110101100011010101010000110111011 00
m = 44014
n = 746

For d = 22
s1 = X8E0W029G6
s2 = RH3ZBZF73F
h1 = 1001111100100000011010011011100111110000001111111000111111011110010001100000010010001 1
0110111101110100000010010001101111000000111011110111010001110101101010101010101010110001
1011100000111001011000101011111100101100111110010101011001110000010111101000110000000 1
h2 = 1001111100100000011010011000100100110010000100001111100110100011000100000101010101011 1
0000000111100000001010010010100001101011001100110011111110110101001101001111010110111
1010011100100101111010101000110110001001101000101111111011001100100110000100100001111
m = 101834
n = 1726
s1 = E7VS2HFAQH
s2 = M6QSCVVK6M
h1 = 1001100000100101100000010111110001110001001100111001000100111001001000010001011010111 1
1100111000111100101110101000100010100111101000100000000100011001110101111000011101111
1000001010000000001011101111000100011001110001010000111110000000110101000010001000100 10
h2 = 1001100000100101100000110110100000100011101011001101101011110110111001010100101000110 1
0111011100111111010111100110000110101000000000010010110110100000000000100010001011000010
1110100000101101010101110000010101110101111110111010100111100100010100001100011001111
m = 67083
n = 1137
s1 = 6OCT1F4ILW
s2 = PIB2CUCGPM
h1 = 1100011010100111000100101101011001100101011011110010110001010100101001110100001111010 0
1111010011101111101010101011011111111110011001011100000001011110111111000111000010000 01
1011111001110000101101101011000000100100101011101011001101011010010111000110100101001
h2 = 1100011010100111000100010100010000101001101000011010111011000110010100000111011111000 0
0001001010010010110111011111111011000110000001001011111000101110001000100101100110011
0000111111011010001110101101100101101100101000010111101101000100101000101110001001010101
m = 96347
n = 1633

For d = 23
s1 = M40HZJO2S6
s2 = 7ZP1YB8G33
h1 = 1010100100101000101101010110001010111101010100010111110000010000110110001101001001010110 0
1010000001101101111111111101000000101110101110110010010011001101010111011011001111001
1001100100011010000101111001100011101011100001101101010101011000001101110111011111110
h2 = 1010100100101000101101010100101001001010001100000111011010110001111101001111111000000000
0100000101101001110101001100010111111010011111011010101101001100010011011100111001111

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00100101001100111000011000000101001100110011001100101110011010101011000101010111110100
m = 407690
n = 6910
s1 = 3N0E2GFXJ0
s2 = SRIH33IG09
h1 = 10010101101011100000011111011011011001001100011101111111110101001100100010101010110100011
01111000001101000110100000000010111000001111000100100100011000000011110000100101011101
01001001010000001101000101010000100011010100101000011100001000111010100011100011110
h2 = 10010101101011100000011101010100101101000001110100100111001101101101110000010110110101100
11101001111000000111011000011110101101101000100110100000111001010101000010101101110 0
01111100101010110011010010100000111011100000110010101111010110010111000000111001110 10
m = 24249
n = 411
s1 = Z6QLFYPJPV
s2 = WFRQJUBOAQ
h1 = 10001001010000011101010000001000010110101010101011010111000001000101100110111100111000
11001101101010001011000000001101000001000010100110001100010001000010100011001100 1111
00100100110011011001100100111110101110100101111110110110011010110101010011001010 1010
h2 = 10001001010000011101010010100000001010010100111010010101100011010100011100011110111000 0
11011100110100001100101011001111010011100111001101011000110001000010111111110011010
00010101000100111010000100111000100011001111001100010000100001100111110100111011110 10
m = 45784
n = 776


For d = 24
s1 = Y17XPEADZX
s2 = 25U46V0UOE
h1 = 10101011010111010111100001101100010001111011010100000011101101100101001011100011010000 0
01110100001111100110100001000111110110010010100010101110110111000111000110101101101 1
00101101101101100001000010011110001000101011001000000001100101000010001011100110101 11
h2 = 10101011010111010111100010011010101011010100111001000100100000110001001011001011101010 1
10111110101000111100111010010100000010010000110010110001001001000010000111101100000 0
00100000100101101110110111000111111011000001100011010111100111011001110111000001110 11
m = 509701
n = 8639
s1 = 2Y4BEX65M5
s2 = X9MCII74EE
h1 = 11010010101011001100100101001110001111011101100011001001010101100000110110000100100011 0
10011001011010110100011001100011111011101011000111100011101011011001000010001110101 0
01010111001001001110010100000111011111111111110010001011100110111001011010000100010 0
h2 = 11010010101011001100101111110001010110110001110100010011000000100011101001100101011010 1
11011001010111111100101111100111011000000101100000000010010011000101010000001110011 01
00000010111111011001110000000011111010110001011000000101001010010010011110001110111
m = 24308
n = 412
s1 = Y05AWEWQG6
s2 = GMOD2AZCLC
h1 = 10111001110111100011000101110001001010001110111100010100001101100000000110011000011111 0
01011111000010100100001100001010011011101100101000010011101000100000011001100011 0010
01110101000001010110110001111101011110000011101000011111110000101101001111101101 0110
h2 = 10111001110111100011000100110100010101100011111001101101100101101011110111000000000110 11
01001000000011110010111011001101110101111100000001011101010100010101100001101011 0101
01110111111110001000011111000000000011110010001011101100010110000010010001110110100 10
m = 22597
n = 383
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