**Blowfish algorithm**

// Java Program to demonstrate Blowfish encryption

import java.util.\*;

public class Main {

// Substitution boxes each string is a 32 bit hexadecimal value.

String S[][]

= { { "d1310ba6", "98dfb5ac", "2ffd72db", "d01adfb7", "b8e1afed",

"6a267e96", "ba7c9045", "f12c7f99", "24a19947", "b3916cf7",

"0801f2e2", "858efc16", "636920d8", "71574e69", "a458fea3",

"f4933d7e", "0d95748f", "728eb658", "718bcd58", "82154aee",

"7b54a41d", "c25a59b5", "9c30d539", "2af26013", "c5d1b023",

"286085f0", "ca417918", "b8db38ef", "8e79dcb0", "603a180e",

"6c9e0e8b", "b01e8a3e", "d71577c1", "bd314b27", "78af2fda",

"55605c60", "e65525f3", "aa55ab94", "57489862", "63e81440",

"55ca396a", "2aab10b6", "b4cc5c34", "1141e8ce", "a15486af",

"7c72e993", "b3ee1411", "636fbc2a", "2ba9c55d", "741831f6",

"ce5c3e16", "9b87931e", "afd6ba33", "6c24cf5c", "7a325381",

"28958677", "3b8f4898", "6b4bb9af", "c4bfe81b", "66282193",

"61d809cc", "fb21a991", "487cac60", "5dec8032", "ef845d5d",

"e98575b1", "dc262302", "eb651b88", "23893e81", "d396acc5",

"0f6d6ff3", "83f44239", "2e0b4482", "a4842004", "69c8f04a",

"9e1f9b5e", "21c66842", "f6e96c9a", "670c9c61", "abd388f0",

"6a51a0d2", "d8542f68", "960fa728", "ab5133a3", "6eef0b6c",

"137a3be4", "ba3bf050", "7efb2a98", "a1f1651d", "39af0176",

"66ca593e", "82430e88", "8cee8619", "456f9fb4", "7d84a5c3",

"3b8b5ebe", "e06f75d8", "85c12073", "401a449f", "56c16aa6",

"4ed3aa62", "363f7706", "1bfedf72", "429b023d", "37d0d724",

"d00a1248", "db0fead3", "49f1c09b", "075372c9", "80991b7b",

"25d479d8", "f6e8def7", "e3fe501a", "b6794c3b", "976ce0bd",

"04c006ba", "c1a94fb6", "409f60c4", "5e5c9ec2", "196a2463",

"68fb6faf", "3e6c53b5", "1339b2eb", "3b52ec6f", "6dfc511f",

"9b30952c", "cc814544", "af5ebd09", "bee3d004", "de334afd",

"660f2807", "192e4bb3", "c0cba857", "45c8740f", "d20b5f39",

"b9d3fbdb", "5579c0bd", "1a60320a", "d6a100c6", "402c7279",

"679f25fe", "fb1fa3cc", "8ea5e9f8", "db3222f8", "3c7516df",

"fd616b15", "2f501ec8", "ad0552ab", "323db5fa", "fd238760",

"53317b48", "3e00df82", "9e5c57bb", "ca6f8ca0", "1a87562e",

"df1769db", "d542a8f6", "287effc3", "ac6732c6", "8c4f5573",

"695b27b0", "bbca58c8", "e1ffa35d", "b8f011a0", "10fa3d98",

"fd2183b8", "4afcb56c", "2dd1d35b", "9a53e479", "b6f84565",

"d28e49bc", "4bfb9790", "e1ddf2da", "a4cb7e33", "62fb1341",

"cee4c6e8", "ef20cada", "36774c01", "d07e9efe", "2bf11fb4",

"95dbda4d", "ae909198", "eaad8e71", "6b93d5a0", "d08ed1d0",

"afc725e0", "8e3c5b2f", "8e7594b7", "8ff6e2fb", "f2122b64",

"8888b812", "900df01c", "4fad5ea0", "688fc31c", "d1cff191",

"b3a8c1ad", "2f2f2218", "be0e1777", "ea752dfe", "8b021fa1",

"e5a0cc0f", "b56f74e8", "18acf3d6", "ce89e299", "b4a84fe0",

"fd13e0b7", "7cc43b81", "d2ada8d9", "165fa266", "80957705",

"93cc7314", "211a1477", "e6ad2065", "77b5fa86", "c75442f5",

"fb9d35cf", "ebcdaf0c", "7b3e89a0", "d6411bd3", "ae1e7e49",

"00250e2d", "2071b35e", "226800bb", "57b8e0af", "2464369b",

"f009b91e", "5563911d", "59dfa6aa", "78c14389", "d95a537f",

"207d5ba2", "02e5b9c5", "83260376", "6295cfa9", "11c81968",

"4e734a41", "b3472dca", "7b14a94a", "1b510052", "9a532915",

"d60f573f", "bc9bc6e4", "2b60a476", "81e67400", "08ba6fb5",

"571be91f", "f296ec6b", "2a0dd915", "b6636521", "e7b9f9b6",

"ff34052e", "c5855664", "53b02d5d", "a99f8fa1", "08ba4799",

"6e85076a" },

{ "4b7a70e9", "b5b32944", "db75092e", "c4192623", "ad6ea6b0",

"49a7df7d", "9cee60b8", "8fedb266", "ecaa8c71", "699a17ff",

"5664526c", "c2b19ee1", "193602a5", "75094c29", "a0591340",

"e4183a3e", "3f54989a", "5b429d65", "6b8fe4d6", "99f73fd6",

"a1d29c07", "efe830f5", "4d2d38e6", "f0255dc1", "4cdd2086",

"8470eb26", "6382e9c6", "021ecc5e", "09686b3f", "3ebaefc9",

"3c971814", "6b6a70a1", "687f3584", "52a0e286", "b79c5305",

"aa500737", "3e07841c", "7fdeae5c", "8e7d44ec", "5716f2b8",

"b03ada37", "f0500c0d", "f01c1f04", "0200b3ff", "ae0cf51a",

"3cb574b2", "25837a58", "dc0921bd", "d19113f9", "7ca92ff6",

"94324773", "22f54701", "3ae5e581", "37c2dadc", "c8b57634",

"9af3dda7", "a9446146", "0fd0030e", "ecc8c73e", "a4751e41",

"e238cd99", "3bea0e2f", "3280bba1", "183eb331", "4e548b38",

"4f6db908", "6f420d03", "f60a04bf", "2cb81290", "24977c79",

"5679b072", "bcaf89af", "de9a771f", "d9930810", "b38bae12",

"dccf3f2e", "5512721f", "2e6b7124", "501adde6", "9f84cd87",

"7a584718", "7408da17", "bc9f9abc", "e94b7d8c", "ec7aec3a",

"db851dfa", "63094366", "c464c3d2", "ef1c1847", "3215d908",

"dd433b37", "24c2ba16", "12a14d43", "2a65c451", "50940002",

"133ae4dd", "71dff89e", "10314e55", "81ac77d6", "5f11199b",

"043556f1", "d7a3c76b", "3c11183b", "5924a509", "f28fe6ed",

"97f1fbfa", "9ebabf2c", "1e153c6e", "86e34570", "eae96fb1",

"860e5e0a", "5a3e2ab3", "771fe71c", "4e3d06fa", "2965dcb9",

"99e71d0f", "803e89d6", "5266c825", "2e4cc978", "9c10b36a",

"c6150eba", "94e2ea78", "a5fc3c53", "1e0a2df4", "f2f74ea7",

"361d2b3d", "1939260f", "19c27960", "5223a708", "f71312b6",

"ebadfe6e", "eac31f66", "e3bc4595", "a67bc883", "b17f37d1",

"018cff28", "c332ddef", "be6c5aa5", "65582185", "68ab9802",

"eecea50f", "db2f953b", "2aef7dad", "5b6e2f84", "1521b628",

"29076170", "ecdd4775", "619f1510", "13cca830", "eb61bd96",

"0334fe1e", "aa0363cf", "b5735c90", "4c70a239", "d59e9e0b",

"cbaade14", "eecc86bc", "60622ca7", "9cab5cab", "b2f3846e",

"648b1eaf", "19bdf0ca", "a02369b9", "655abb50", "40685a32",

"3c2ab4b3", "319ee9d5", "c021b8f7", "9b540b19", "875fa099",

"95f7997e", "623d7da8", "f837889a", "97e32d77", "11ed935f",

"16681281", "0e358829", "c7e61fd6", "96dedfa1", "7858ba99",

"57f584a5", "1b227263", "9b83c3ff", "1ac24696", "cdb30aeb",

"532e3054", "8fd948e4", "6dbc3128", "58ebf2ef", "34c6ffea",

"fe28ed61", "ee7c3c73", "5d4a14d9", "e864b7e3", "42105d14",

"203e13e0", "45eee2b6", "a3aaabea", "db6c4f15", "facb4fd0",

"c742f442", "ef6abbb5", "654f3b1d", "41cd2105", "d81e799e",

"86854dc7", "e44b476a", "3d816250", "cf62a1f2", "5b8d2646",

"fc8883a0", "c1c7b6a3", "7f1524c3", "69cb7492", "47848a0b",

"5692b285", "095bbf00", "ad19489d", "1462b174", "23820e00",

"58428d2a", "0c55f5ea", "1dadf43e", "233f7061", "3372f092",

"8d937e41", "d65fecf1", "6c223bdb", "7cde3759", "cbee7460",

"4085f2a7", "ce77326e", "a6078084", "19f8509e", "e8efd855",

"61d99735", "a969a7aa", "c50c06c2", "5a04abfc", "800bcadc",

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"3d28f89e", "f16dff20", "153e21e7", "8fb03d4a", "e6e39f2b",

"db83adf7" },

{ "e93d5a68", "948140f7", "f64c261c", "94692934", "411520f7",

"7602d4f7", "bcf46b2e", "d4a20068", "d4082471", "3320f46a",

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"bfbc09ec", "03bd9785", "7fac6dd0", "31cb8504", "96eb27b3",

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"27a18dee", "4f3ffea2", "e887ad8c", "b58ce006", "7af4d6b6",

"aace1e7c", "d3375fec", "ce78a399", "406b2a42", "20fe9e35",

"d9f385b9", "ee39d7ab", "3b124e8b", "1dc9faf7", "4b6d1856",

"26a36631", "eae397b2", "3a6efa74", "dd5b4332", "6841e7f7",

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"55533a3a", "20838d87", "fe6ba9b7", "d096954b", "55a867bc",

"a1159a58", "cca92963", "99e1db33", "a62a4a56", "3f3125f9",

"5ef47e1c", "9029317c", "fdf8e802", "04272f70", "80bb155c",

"05282ce3", "95c11548", "e4c66d22", "48c1133f", "c70f86dc",

"07f9c9ee", "41041f0f", "404779a4", "5d886e17", "325f51eb",

"d59bc0d1", "f2bcc18f", "41113564", "257b7834", "602a9c60",

"dff8e8a3", "1f636c1b", "0e12b4c2", "02e1329e", "af664fd1",

"cad18115", "6b2395e0", "333e92e1", "3b240b62", "eebeb922",

"85b2a20e", "e6ba0d99", "de720c8c", "2da2f728", "d0127845",

"95b794fd", "647d0862", "e7ccf5f0", "5449a36f", "877d48fa",

"c39dfd27", "f33e8d1e", "0a476341", "992eff74", "3a6f6eab",

"f4f8fd37", "a812dc60", "a1ebddf8", "991be14c", "db6e6b0d",

"c67b5510", "6d672c37", "2765d43b", "dcd0e804", "f1290dc7",

"cc00ffa3", "b5390f92", "690fed0b", "667b9ffb", "cedb7d9c",

"a091cf0b", "d9155ea3", "bb132f88", "515bad24", "7b9479bf",

"763bd6eb", "37392eb3", "cc115979", "8026e297", "f42e312d",

"6842ada7", "c66a2b3b", "12754ccc", "782ef11c", "6a124237",

"b79251e7", "06a1bbe6", "4bfb6350", "1a6b1018", "11caedfa",

"3d25bdd8", "e2e1c3c9", "44421659", "0a121386", "d90cec6e",

"d5abea2a", "64af674e", "da86a85f", "bebfe988", "64e4c3fe",

"9dbc8057", "f0f7c086", "60787bf8", "6003604d", "d1fd8346",

"f6381fb0", "7745ae04", "d736fccc", "83426b33", "f01eab71",

"b0804187", "3c005e5f", "77a057be", "bde8ae24", "55464299",

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"5366f9c3", "c8b38e74", "b475f255", "46fcd9b9", "7aeb2661",

"8b1ddf84", "846a0e79", "915f95e2", "466e598e", "20b45770",

"8cd55591", "c902de4c", "b90bace1", "bb8205d0", "11a86248",

"7574a99e", "b77f19b6", "e0a9dc09", "662d09a1", "c4324633",

"e85a1f02", "09f0be8c", "4a99a025", "1d6efe10", "1ab93d1d",

"0ba5a4df", "a186f20f", "2868f169", "dcb7da83", "573906fe",

"a1e2ce9b", "4fcd7f52", "50115e01", "a70683fa", "a002b5c4",

"0de6d027", "9af88c27", "773f8641", "c3604c06", "61a806b5",

"f0177a28", "c0f586e0", "006058aa", "30dc7d62", "11e69ed7",

"2338ea63", "53c2dd94", "c2c21634", "bbcbee56", "90bcb6de",

"ebfc7da1", "ce591d76", "6f05e409", "4b7c0188", "39720a3d",

"7c927c24", "86e3725f", "724d9db9", "1ac15bb4", "d39eb8fc",

"ed545578", "08fca5b5", "d83d7cd3", "4dad0fc4", "1e50ef5e",

"b161e6f8", "a28514d9", "6c51133c", "6fd5c7e7", "56e14ec4",

"362abfce", "ddc6c837", "d79a3234", "92638212", "670efa8e",

"406000e0" },

{ "3a39ce37", "d3faf5cf", "abc27737", "5ac52d1b", "5cb0679e",

"4fa33742", "d3822740", "99bc9bbe", "d5118e9d", "bf0f7315",

"d62d1c7e", "c700c47b", "b78c1b6b", "21a19045", "b26eb1be",

"6a366eb4", "5748ab2f", "bc946e79", "c6a376d2", "6549c2c8",

"530ff8ee", "468dde7d", "d5730a1d", "4cd04dc6", "2939bbdb",

"a9ba4650", "ac9526e8", "be5ee304", "a1fad5f0", "6a2d519a",

"63ef8ce2", "9a86ee22", "c089c2b8", "43242ef6", "a51e03aa",

"9cf2d0a4", "83c061ba", "9be96a4d", "8fe51550", "ba645bd6",

"2826a2f9", "a73a3ae1", "4ba99586", "ef5562e9", "c72fefd3",

"f752f7da", "3f046f69", "77fa0a59", "80e4a915", "87b08601",

"9b09e6ad", "3b3ee593", "e990fd5a", "9e34d797", "2cf0b7d9",

"022b8b51", "96d5ac3a", "017da67d", "d1cf3ed6", "7c7d2d28",

"1f9f25cf", "adf2b89b", "5ad6b472", "5a88f54c", "e029ac71",

"e019a5e6", "47b0acfd", "ed93fa9b", "e8d3c48d", "283b57cc",

"f8d56629", "79132e28", "785f0191", "ed756055", "f7960e44",

"e3d35e8c", "15056dd4", "88f46dba", "03a16125", "0564f0bd",

"c3eb9e15", "3c9057a2", "97271aec", "a93a072a", "1b3f6d9b",

"1e6321f5", "f59c66fb", "26dcf319", "7533d928", "b155fdf5",

"03563482", "8aba3cbb", "28517711", "c20ad9f8", "abcc5167",

"ccad925f", "4de81751", "3830dc8e", "379d5862", "9320f991",

"ea7a90c2", "fb3e7bce", "5121ce64", "774fbe32", "a8b6e37e",

"c3293d46", "48de5369", "6413e680", "a2ae0810", "dd6db224",

"69852dfd", "09072166", "b39a460a", "6445c0dd", "586cdecf",

"1c20c8ae", "5bbef7dd", "1b588d40", "ccd2017f", "6bb4e3bb",

"dda26a7e", "3a59ff45", "3e350a44", "bcb4cdd5", "72eacea8",

"fa6484bb", "8d6612ae", "bf3c6f47", "d29be463", "542f5d9e",

"aec2771b", "f64e6370", "740e0d8d", "e75b1357", "f8721671",

"af537d5d", "4040cb08", "4eb4e2cc", "34d2466a", "0115af84",

"e1b00428", "95983a1d", "06b89fb4", "ce6ea048", "6f3f3b82",

"3520ab82", "011a1d4b", "277227f8", "611560b1", "e7933fdc",

"bb3a792b", "344525bd", "a08839e1", "51ce794b", "2f32c9b7",

"a01fbac9", "e01cc87e", "bcc7d1f6", "cf0111c3", "a1e8aac7",

"1a908749", "d44fbd9a", "d0dadecb", "d50ada38", "0339c32a",

"c6913667", "8df9317c", "e0b12b4f", "f79e59b7", "43f5bb3a",

"f2d519ff", "27d9459c", "bf97222c", "15e6fc2a", "0f91fc71",

"9b941525", "fae59361", "ceb69ceb", "c2a86459", "12baa8d1",

"b6c1075e", "e3056a0c", "10d25065", "cb03a442", "e0ec6e0e",

"1698db3b", "4c98a0be", "3278e964", "9f1f9532", "e0d392df",

"d3a0342b", "8971f21e", "1b0a7441", "4ba3348c", "c5be7120",

"c37632d8", "df359f8d", "9b992f2e", "e60b6f47", "0fe3f11d",

"e54cda54", "1edad891", "ce6279cf", "cd3e7e6f", "1618b166",

"fd2c1d05", "848fd2c5", "f6fb2299", "f523f357", "a6327623",

"93a83531", "56cccd02", "acf08162", "5a75ebb5", "6e163697",

"88d273cc", "de966292", "81b949d0", "4c50901b", "71c65614",

"e6c6c7bd", "327a140a", "45e1d006", "c3f27b9a", "c9aa53fd",

"62a80f00", "bb25bfe2", "35bdd2f6", "71126905", "b2040222",

"b6cbcf7c", "cd769c2b", "53113ec0", "1640e3d3", "38abbd60",

"2547adf0", "ba38209c", "f746ce76", "77afa1c5", "20756060",

"85cbfe4e", "8ae88dd8", "7aaaf9b0", "4cf9aa7e", "1948c25c",

"02fb8a8c", "01c36ae4", "d6ebe1f9", "90d4f869", "a65cdea0",

"3f09252d", "c208e69f", "b74e6132", "ce77e25b", "578fdfe3",

"3ac372e6" } };

// Subkeys initialisation with digits of pi.

String P[] = { "243f6a88", "85a308d3", "13198a2e", "03707344", "a4093822",

"299f31d0", "082efa98", "ec4e6c89", "452821e6", "38d01377",

"be5466cf", "34e90c6c", "c0ac29b7", "c97c50dd", "3f84d5b5",

"b5470917", "9216d5d9", "8979fb1b" };

// to store 2^32(for addition modulo 2^32).

long modVal = 1;

// to convert hexadecimal to binary.

private String hexToBin(String plainText)

{

String binary = "";

Long num;

String binary4B;

int n = plainText.length();

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

num = Long.parseUnsignedLong(

plainText.charAt(i) + "", 16);

binary4B = Long.toBinaryString(num);

// each value in hexadecimal is 4 bits in binary.

binary4B = "0000" + binary4B;

binary4B = binary4B.substring(binary4B.length() - 4);

binary += binary4B;

}

return binary;

}

// convert from binary to hexadecimal.

private String binToHex(String plainText)

{

long num = Long.parseUnsignedLong(plainText, 2);

String hexa = Long.toHexString(num);

while (hexa.length() < (plainText.length() / 4))

// maintain output length same length

// as input by appending leading zeroes.

hexa = "0" + hexa;

return hexa;

}

// xor two hexadecimal strings of the same length.

private String xor(String a, String b)

{

a = hexToBin(a);

b = hexToBin(b);

String ans = "";

for (int i = 0; i < a.length(); i++)

ans += (char)(((a.charAt(i) - '0')

^ (b.charAt(i) - '0'))

+ '0');

ans = binToHex(ans);

return ans;

}

// addition modulo 2^32 of two hexadecimal strings.

private String addBin(String a, String b)

{

String ans = "";

long n1 = Long.parseUnsignedLong(a, 16);

long n2 = Long.parseUnsignedLong(b, 16);

n1 = (n1 + n2) % modVal;

ans = Long.toHexString(n1);

ans = "00000000" + ans;

return ans.substring(ans.length() - 8);

}

// function F explained above.

private String f(String plainText)

{

String a[] = new String[4];

String ans = "";

for (int i = 0; i < 8; i += 2) {

// the column number for S-box

// is 8-bit value(8\*4 = 32 bit plain text)

long col

= Long.parseUnsignedLong(

hexToBin(

plainText

.substring(i, i + 2)),

2);

a[i / 2] = S[i / 2][(int)col];

}

ans = addBin(a[0], a[1]);

ans = xor(ans, a[2]);

ans = addBin(ans, a[3]);

return ans;

}

// generate subkeys.

private void keyGenerate(String key)

{

int j = 0;

for (int i = 0; i < P.length; i++) {

// xor-ing 32-bit parts of the key

// with initial subkeys.

P[i] = xor(P[i], key.substring(j, j + 8));

System.out.println("subkey "

+ (i + 1) + ": "

+ P[i]);

j = (j + 8) % key.length();

}

}

// round function

private String round(int time, String plainText)

{

String left, right;

left = plainText.substring(0, 8);

right = plainText.substring(8, 16);

left = xor(left, P[time]);

// output from F function

String fOut = f(left);

right = xor(fOut, right);

System.out.println(

"round " + time + ": "

+ right + left);

// swap left and right

return right + left;

}

// encryption

private String encrypt(String plainText)

{

for (int i = 0; i < 16; i++)

plainText = round(i, plainText);

// postprocessing

String right = plainText.substring(0, 8);

String left = plainText.substring(8, 16);

right = xor(right, P[16]);

left = xor(left, P[17]);

return left + right;

}

Main()

{

// storing 2^32 in modVal

//(<<1 is equivalent to multiply by 2)

for (int i = 0; i < 32; i++)

modVal = modVal << 1;

String plainText = "123456abcd132536";

String key = "aabb09182736ccdd";

keyGenerate(key);

System.out.println("-----Encryption-----");

String cipherText = encrypt(plainText);

System.out.println("Cipher Text: " + cipherText);

}

public static void main(String args[])

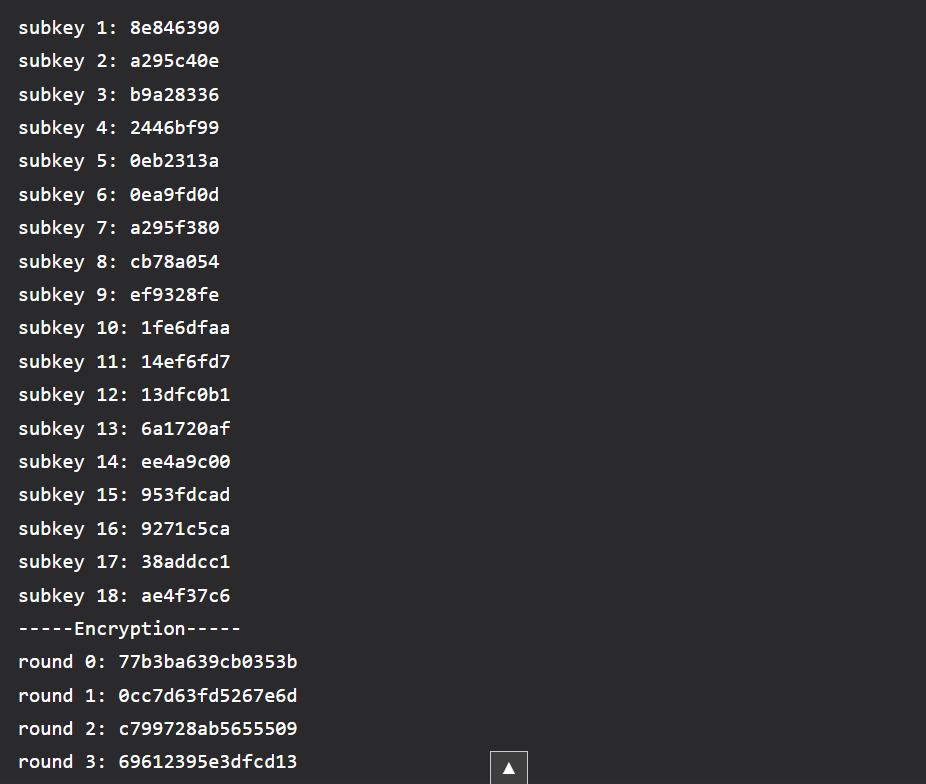
{

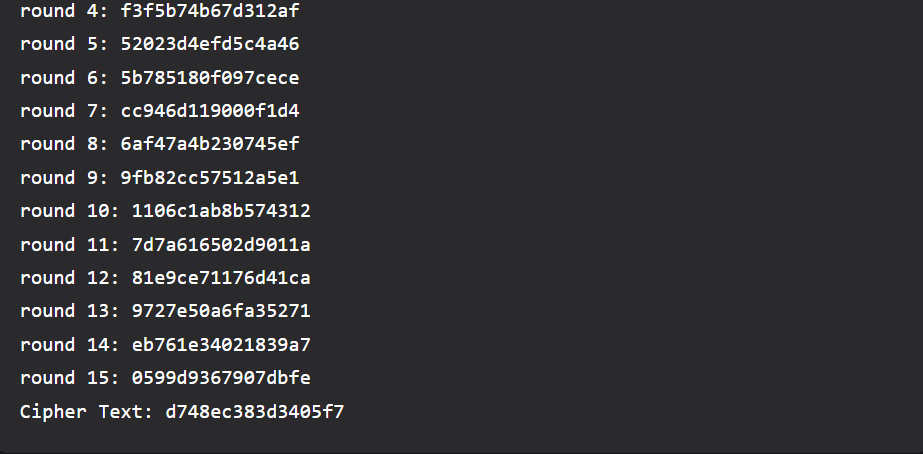
new Main();

}

}

**Output**

****

****