Problem 0: The White Rabbit

For months on end, Morpheus has diligently monitored Neo—tracking his every move. He is now certain that he has found the One. Unfortunately, it appears that the Agents have also caught on—it is only a matter of time before Neo is caught and terminated.

As the chief of communications, you are tasked with establishing contact with the One so that he can be safely extracted from the Matrix. Your job will not be easy, the Agents have been well prepared; phones have been bugged, and computers have been compromised. Your team has reviewed the situation and has decided that it is best to use a cipher system to communicate undetected. Because of its relative simplicity, the columnar transposition cipher has become the cipher of choice.

The Columnar Transposition Cipher

This system makes use of a keyword and a grid in order to scramble the message.

Ex.

Keyword: Princess Bride

Message: My name is Inigo Montoya You killed my father Prepare to die

Step 1: Remove All Spaces and Change All Letters to Uppercase

Keyword: PRINCESSBRIDE

Message: MYNAMEISINIGOMONTOYAYOUKILLEDMYFATHERPREPARETODIE

Step 2: Determine the Dimensions of the Grid

The grid must have a row length equal to the length of the keyword

Keyword: PRINCESSBRIDE

Keyword Length: 13

Hence, the grid with have rows of length 13.

Step 3: Construct the Grid and Fill it with the Message

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P | R | I | N | C | E | S | S | B | R | I | D | E |
| M | Y | N | A | M | E | I | S | I | N | I | G | O |
| M | O | N | T | O | Y | A | Y | O | U | K | I | L |
| L | E | D | M | Y | F | A | T | H | E | R | P | R |
| E | P | A | R | E | T | O | D | I | E |  |  |  |

Step 4: Add an “X” to the Remaining Empty Squares

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P | R | I | N | C | E | S | S | B | R | I | D | E |
| M | Y | N | A | M | E | I | S | I | N | I | G | O |
| M | O | N | T | O | Y | A | Y | O | U | K | I | L |
| L | E | D | M | Y | F | A | T | H | E | R | P | R |
| E | P | A | R | E | T | O | D | I | E | X | X | X |

Step 5: Reorder the Columns, such that the Letters in the Keyword are in Alphabetical Order

Note: If there are numbers in the keyword, then the numbers come first before the letters

Note: If there exists a duplicate of a letter in the keyword, then the duplicates should be arranged in the order that they occur

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B | C | D | E | E | I | I | N | P | R | R | S | S |
| I | M | G | E | O | N | I | A | M | Y | N | I | S |
| O | O | I | Y | L | N | K | T | M | O | U | A | Y |
| H | Y | P | F | R | D | R | M | L | E | E | A | T |
| I | E | X | T | X | A | X | R | E | P | E | O | D |

Step 6: Print the Encoded Message

Read each column from top to bottom, then move onto the consecutive column.

IOHIMOYEGIPXEYFTOLRXNNDAIKRXATMRMMLEYOEPNUEEIAAOSYTD

Now that you know how the cipher works, write a code to encrypt the following message:

Wake up neo The Matrix has you Follow the white rabbit

Time is running out and the fate of humanity is in your hands! You cannot fail!