Exercise No. 01:

1. Find the coefficients *u* , *v* and the *GCD* of the following integers:
   - (a, b) = (60, 19)
   - (a, b) = (280, 11)
   - (a, b) = (38, 26)
2. Calculate the inverse of:
   - $41^{-1} \bmod 53$.
   - $24^{-1} \bmod 512$

Exercise No. 2: (*Ceaser cipher*)

1. Write a pseudo-code for encrypting/decrypting a text using Caesar.
2. Prove that $D_k(E_k(m))=m$.
3. Encrypt the text "CRYPTOGRAPHY" with the key **K.**
4. Decrypt the text "JSHZZPXBL" with the key **H.**

Exercise No. 3: (*Vigenère cipher*)

1. Write a pseudo-code for encrypting/decrypting a text using Vigenère.
2. Encrypt the text "CRYPTOGRAPHY" with the key "SECRET".
3. Decrypt the text "ORABCNDIBDIVD" using the key "KEY":

Exercise No. 4: (*Affine Cipher*)

Let K = (5,11)

1. Prove that $D_k(E_k(m))=m$
2. Calculate the encryption and decryption functions,
3. Encrypt the following text: "AFFINE"

Exercise No. 5: (*Transposition Cipher*)

The password is "SAMI"

4. Encrypt the text " COMPUTER SCIENCE "
5. Decrypt the text "YEMSRQITEXXU"

Exercise No. 6: (*Frequency Analysis*)

Suppose Oscar intercepted the following message (without spaces or punctuation marks):

ATKGIZOUTSGRBKORRGTZKWAOIUSVXUSKZRGYKIAXOZKJKYJUTTKKYUAYEYZKSKYJOTLUXSGZOWAK

1. Calculate the number of occurrences of each letter of the alphabet in this message.
2. Explain why we can assume that the letter K can be decrypted as E.
3. Find the decryption key and decrypt the first 9 letters of the ciphertext using the Cesear algorithm.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25