1. Using Euler's Totient Theorem calculate $7^{63} \pmod{31}$, $5^{2021} \pmod{137}$, $4^{128} \pmod{125}$.

2. Find all elements of groups $\mathbb{Z}_7$, $\mathbb{Z}_7^*$, $\mathbb{Z}_8$, $\mathbb{Z}_8^*$.

3. Using Euclidean Algorithm find the inverse of 7 in $\mathbb{Z}_{31}^*$ and $\mathbb{Z}_{137}^*$.

4. Knowing $n = 5133$ and

0	1	2	3	4	5	6	7	8	9
RY	SYS	TEM	O	TY	MA	GA	EK	WA	TE

   encrypt the message SYSTEM, TEORY using Rabin method.

5. Using Rabin method decrypte the messege $E(M) = 17 (\mathrm{mod}\, 1121)$, if you know that $1121 = 19 \cdot 59$.

0	1	2	3	4	5	6	7	8	9
A	M	L	D	F	T	Y	O	Z	K

6. Knowing that $n = 589 = 19 \cdot 31$, $e = 53$ and encrypting function for RSA cryptosystem is $E(M) = M^e (\mathrm{mod}\, n)$ find decrypting function (for RSA method).

7. Knowing that $n = 589 = 19 \cdot 31$, $d = 23$ and decrypting function for RSA cryptosystem is $D(N) = N^d (\mathrm{mod}\, n)$ find encrypting function (for RSA method).

8. Let *day-23, nice-7, good-1, have-4, luck-3, the-59, always-54, reason-47*. Using RSA method for $p = 11$, $q = 13$, $e = 11$ decrypt the message "$113, 1$".