Algorithmic Number Theory - List 1

Task 1 (20 pts)
In `SageMath` (`https://www.sagemath.org/`) implement the RSA cryptosystem. That is, implement:

- the key generation procedure,
- encryption and decryption procedures. The decryption procedure should be based on the Chinese Remainder Theorem (CRT).

Prove that your implementation is correct by implementing some tests (please use large random messages).

The length of prime numbers p, q must be transfered to the key generation procedure as its input argument. You may find useful the following functions of `SageMath`: `random_prime`, `crt`, `is_prime`, `power_mod`, `inverse_mod`.