This homework is due on May 4, 9am ET.

You are welcome to work with others, however you must explicitly list all collaborators and materials that you used. You must write up your own solution and your own code to every problem. See Georgetown University Honor System When in doubt, ask the instructor what is allowed.
**Problem 1** (Error correcting codes). Use results from Lecture 19 (on Error Correcting Codes) to design an algorithm for the following game. I choose a number from 1 to 16. You can ask yes-no questions, and I’ll lie on all or all but one question. Design an algorithm that finds my number using as few questions as possible. (For the full score, prove that there is an algorithm that always asks at most 7 questions.)
Problem 2 (Substitution ciphers). In the class we saw that even though substitution ciphers have reasonably long keys, they are not secure. Decode the following ciphertext encrypted by a substitution cipher.

S ilqa l ocalh jilj pxa olh jisr xljspx esmm csra tb lxo msqa ptj jia jcta nalxsxu py sjr wcaao: Ea ipmo jiara jctjir jp fa ramy-aqsoaxj, jilj lmm nax lca wcaljao adthm. S ilqa l ocalh jilj pxa olh px jia cao ismmr py Uapcusi, jia rpxr py ypcncar rmlqr lxo jia rpxr py ypcncar rmlqa pexacr esmm fa lfna jp rsj opex jpuajiac lj jia jlfma py fcpjiacippo. S ilqa l ocalh jilj pxa olh aqax jia rilja py Nrrsrrsbbhs, l rilja reamjacsxu esji jia iajl py sxvtrjswa, reamjacsxu esji jia iajl py pbbcarrspx esmm fa jclxrypcaox sxjp lx plsr py ycaopn lxo vtrjswa. S ilqa l ocalh jilj nh yptc majjma wismocax esmm pxa olh msqa sx l xljspx eiaca jiah esmm xpj fa vtouao fh jia wpmpc py jiasc rksx ftj fh jia wpxjajxj py jiasc wilclwjac. S ilqa l ocalh jpolh.

Feel free to use tools that count frequency of characters in the ciphertext, letter/digram frequency tables (e.g., here), common sense, or implement any tools in your favorite programming language. Name the author of this text, and explain how you arrived at the solution.
Problem 3 (Breaking RSA). Implement four attacks from Lecture 23 on the Textbook RSA to solve the following puzzle: https://colab.research.google.com/drive/1E-6MCkqY-EBb5VpqChC33WalOQ1Neb6?usp=sharing