Collected Problems:

1. Using the Vigenère keyword "test" encrypt the text VIGENERE IS EASY TO USE.

2. Using the Vigenère keyword "test" decipher the text BPAXW XZBLM KOXVQ ATVV.

3. Encrypt the message WE CAN ATTACK NOW using Playfair with the key phrase "number theory."

4. Decipher the following messages, knowing that they were encrypted using Playfair with the given keyword.

   (a) WQ GB PT BP PZ PT FE (Keyword: guest).

   (b) AH FA LF KQ LQ AT AB KY SA QY KT KE (Keyword: potato).

5. (a) Find the inverse of $\begin{bmatrix} 1 & 1 \\ 6 & 1 \end{bmatrix} \pmod{26}$

   (b) Find all values of the b (mod 26) such that $\begin{bmatrix} 1 & 1 \\ b & 1 \end{bmatrix}$ is invertible (mod 26).

6. The ciphertext

$$\text{IZ QR TL ST IB DV OK TL PR NC CM GI IX}$$

was encrypted using Hill's encipherment (mod 26) with key $\begin{bmatrix} 9 & 4 \\ 5 & 7 \end{bmatrix}$. Recover the corresponding plaintext.

Non-Collected Problems:

1. Find all primes p for which $\begin{bmatrix} 3 & 5 \\ 7 & 3 \end{bmatrix} \pmod{p}$ is not invertible.

2. How many keys are in the key space of playfair?

3. Write a message using Playfair.

4. Exchange with a friend and decode their message.

5. Do the same for Hill and Vigenère.