1. Given the plaintext LISTENTOITTWICE.
   (a) Encrypt using a shift cipher with $b = 17$.
   (b) Encrypt using an affine cipher with $a = 11$ and $b = 8$.

2. Suppose Eve intercepts the message USWNRSCHISPWRCSGVHGCNSBINVRCNPSDN sent from Alice to Bob using an affine cipher.
   (a) Use frequency analysis to find the values of $a$ and $b$. Make your steps clear with explanations. Assume the ciphertext letter corresponding to E is most frequent and T is second-most frequent.
   (b) Decrypt the message.

3. Use the exponentiation cipher with $p = 4813$ and $e = 587$ to pad and encrypt the message: THENITFELLAPART

4. Eve intercepts the following ciphertext from Alice to Bob:
   
   2648 0498 2029 0654 2954 2116 2182 2119 0424 3096

   which he knows Alice encrypted using an exponentiation cipher with $p = 3637$ and $e = 1589$.
   (a) Find the least nonnegative residue of the decryption exponent $d$ and make sure it’s clear what the modulus is.
   (b) Decode the message.

5. Eve intercepts the following ciphertext from Alice to Bob
   
   11,17,00,12,10,24,14,00,13,10,11

   which she knows Alice encrypted using an exponentiation cipher with $p = 29$ and (obviously) using single-character chunks. Eve does not know $e$ or $d$ but she discovered that the first character of the plaintext is S.
   (a) Write down the modular exponentiation statement that corresponds to the encryption of the first character.
   (b) It is a fact that the integer $r = 2$ is a primitive root modulo $p = 29$. Use this fact along with index arithmetic to solve for $e$.
      Note: You don’t need to write down the entire table of indices for $r = 2$ since you only need two specific values. You can find these by trial-and-error on Wolfram Alpha if you like.
   (c) Use $e$ to solve for $d$.
   (d) Use $d$ to decrypt the message.