**Level 1: Simple substitution Cypher**

Use this resource to answer the following questions.

<http://practicalcryptography.com/ciphers/simple-substitution-cipher/>

1. Summarize and explain the concept of a substitution cypher
   1. What does it do?
      1. Consists of substituting every plaintext character for a different cipher text character
      2. It is a completely jumbled up alphabet
   2. How does it work?
      1. It takes a set of mixed up letters and pairs it with a deferent letter to represent it
   3. What is a “key”?
      1. A key is a set of mixed up letters and represent the normal alphabet
      2. Ex. ikcqnwusxryjtpdofablvmhgze
2. Provide an example of encoding a message using a substitution cypher key.

x simn sxccvob

1. Provide an example of decoding a message using a substitution cypher key.

I have hiccups

1. Summarize and explain the concepts related how “cryptanalysis” can be used to “break” a code.
   1. How does the “frequency analysis of letters” work?
   2. How does the “frequency analysis of words” work?

**Level 2: Morse Code**

Use this resource to answer the following questions.

<http://www.newworldencyclopedia.org/entry/Morse_Code>

1. Summarize and explain the concept of Morse code
   1. What does it do?

* An alphabet or code in which letters are represented by combinations of long and short signals of light or sound.
  1. How does it work?
* Morse code is a character encoding scheme used in telecommunication that encodes text characters as standardized sequences of two different signal durations called dots and dashes
  1. What does it use instead of a “key”?
* Morse code uses a pattern of short and long beeps or dots to represent the alphabet

1. Compare the Morse code table to the “frequency of letters” analysis in Level 1 above.
   1. What is the shortest code and how does it correspond to the frequency of letters?

* E and Tare the shortest for Morse code and they are also the 2 most frequently used letters
* The reason is for convenience
  + If the most used letters are the shortest the sending messages would be faster
  1. What is the longest code and how does it correspond to the frequency of letters?
* J, Q, V, X, Y, and Z are the longest codes
* They are also a few of the least frequently used letters
  1. What is the benefit of having a variable length code for letters?
* One benefit would be the messages won’t take as long to send because the letters that are used most frequently are the ones that take the least amount of time to send

1. Provide an example of encoding a message using Morse code.

00 0100 111 0001 0 10 111 111 10 0 010101

1. Provide an example of decoding a message using Morse code.

I love no one.

**Level 3: Encryption**

Use this resource to answer the following questions.

<https://computer.howstuffworks.com/encryption.htm>

1. Summarize and explain the concept of Symmetric-key Encryption. (See Slide 3)
   1. How is it similar to a “substitution cypher”?
   2. How is it different from a “substitution cypher”?
2. Encryption key strength is related to the number of bits and combinations. (See Slide 3)
   1. What is DES and how strong is it?
   2. What is AES and how strong is it?
3. Summarize and explain the concept of Public-key Encryption. (See Slide 4)
   1. How is it different from Symmetric-key Encryption
   2. What is an Asymmetric-Key?
4. Prime Numbers and Hashing Algorithms are used to encrypt messages. (See Slide 6)
   1. What is a Hash Value?
   2. How is a Hash Value used to encrypt a message?
   3. How is a Hash Value used to decrypt a message?
   4. How strong are current Public Keys (Hash Values) in terms of bits and combinations?
5. We use encryption every day when we use the internet and the following services. (See Slides 4 & 5)
   1. What is PGP?
   2. What is SSL / HTTPS?
   3. What is a Digital Certificate?
   4. What is a Certificate Authority?