

# Math 4981 Spring 2021

## Cryptology HW 1 Solutions

### Due Thursday, January 21

1. Encrypt the plaintext message “GO HANG A SALAMI” using a Caesar cipher with a shift (to the right) of 7.

**Solution:** “NV OHUN H ZHSHTP”

2. The following ciphertext has been encrypted with a Caesar cipher (with an unknown-to-you shift). Decrypt the message.

XBPAPHPVCPWDV

**Solution:** The shift is fifteen. The plaintext is “IMALASAGNAHOG” or “I’m a lasagna hog”.

For the next two problems, use the following symmetric cipher table:

Plaintext	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Ciphertext	O W M R X G Q U D V F I Y S L E H J T Z K N A P B C
Ciphertext	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Plaintext	W Y Z I P K F Q L R U O C V A X G D N S H J B E M T

3. Encrypt the following plaintext message: “A MAN A PLAN A CANAL PANAMA”

**Solution:** O YOS O EIOS O MOSOI EOSOYO

4. What can you tell about the message “YOROYDYOROY” without actually deciphering it? What does this tell you about the strength of a monoalphabetic cipher?

**Solution:** The message is clearly a palindrome even before we do any decryption.

There are many security-related things you could say about this. To my mind, the clearest insight is that you know a lot about the message even *without* decrypting it. This makes it easier to decrypt, but also means sometimes you don’t have to bother.

5. Decrypt the ciphertext message: “YOROYDYOROY”

**Solution:** MADAMIMADAM or “Madam, I’m Adam”

6. Decrypt the following message, which was encrypted with a monoalphabetic substitution cipher:

KZRNK GJKIP ZBOOB XLCRG BXFAU GJBNG RIXRU XAFGJ BXRME MNKNG BURIX KJRXR SBUER  
ISATB UIBNN RTBUM NBIGK EBIGR OCUBR GLUBN JBGRL SJGLN GJBOR ISLRS BAFFO AZBUN

Letter	A B C D E	F G H I J	K L M N O	P Q R S T	U V W X Y Z
Frequency	16 32 5 - 7	8 22 - 16 11	13 10 8 20 12	1 1 28 7 3	14 1 2 10 - 6

Letter	B R G N A	I U K O J	L X M F S	E Z C T W	P V Q
Frequency	32 28 22 20 16	16 14 13 12 11	10 10 8 8 7	7 6 5 3 2	1 1 1

Bigram	NG R I B U B R
Frequency	7 7 6 5

RFAUS AGGBI NGLXM IAZRX RMNVL GEANG CJRUE KISRM BOOAZ GLOKW FAUKI NGRIC BEBRI  
 NJAWB OBNNO ATBZJ KOBRC JKIRR NGBUE BRINK XKBAF QBROA LNMGR MALUF BBG

**Solution:** Ciphertext | A B C D E | F G H I J | K L M N O | P Q R S T | U V W X Y | Z  
 Plaintext | o e c - m | f t - n h | i u y s l | k j a g v | r b p d - | w

I was, I think, well educated for the standard of my day. My sister and I had a German governess. A very sentimental creature. She taught us the language of flowers - a forgotten study nowadays, but most charming. A yellow tulip, for instance, means 'Hopeless Love,' while a China aster means 'I Die of Jealousy at Your Feet.'

From "The Tuesday Night Club" by Agatha Christie