1. Review **shift ciphers**: What is the key in the shift cipher below? KEY: _____

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
plain	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
cipher	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K

2. A shift cipher is a particular type of **substitution cipher**. Below is a substitution cipher that is **not** a shift cipher.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
plain	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
cipher	E	F	G	L	8	A	R	Q	T	U	V	P	B	D	N	O	H	M

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
plain	S	T	U	V	W	X	Y	Z	0	1	2	3	4	5	6	7	8	9
cipher	I	1	4	7	J	6	5	K	9	3	2	0	C	X	S	Z	Y	W

(a) Encrypt: MEET APRIL 3

(b) Decrypt: F 4 I E 1 9 Z 0 9

(c) What key is needed to decrypt a message using this encryption scheme?

(d) Which substitution is, in general, harder to break, a shift cipher or one that is not a shift cipher?

(e) What strategies would you use to try to break a substitution cipher that is not a shift cipher?

3. Another encryption scheme is called a **transposition cipher**.

   Encode JEWEL FOUND using a transposition cipher of rows of 4 letters (4 columns).

   (a) Put in rows

   (b) read out columns

4. Decrypt

   BNEAA ANBDA RX

   if it was encoded with a transposition cipher with rows of 4 letters (4 columns).

   (a) How many rows?

   (b) Put in columns

   (c) read out rows

5. Encrypt using a transposition cipher with a keyword KEY:

   H E L P M E

   (a) Put in grid by rows

   (b) Mix up columns

   (c) Read out columns

6. Decrypt using a transposition cipher with a keyword KEY:

   F N T I U I O D X

   (a) Determine how many rows

   (b) Put in grid by **columns**, labeled by SORTED keyword

   (c) un-mix-up columns

   (d) Read out **rows**