Collected Problems:

1. Show that if $\gcd(ad-bc, m) = 1$ then $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is invertible (mod m) and

$$A^{-1} = (ad-bc)^{-1} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} \pmod{m}.$$

2. The following message has been set to you using "ADFGVX":

AAXV FGVF DGFX FAXD FGDD DVDA AXDD VVVA AFAA

using the key word for the permutation "caroline" and the key word for the grid "Firehouse" (i.e. you build a grid the same way as you do in playfair, start with the keyword skipping repeated letters and then filling out with the alphabet then the numbers starting with 0.)

3. Decipher the following message

GXGDVD AFAAFD DAAAFA AFGAGD GADAAA
DVGVAG GADVVG AXFGDF FFGGFD AVFGGX

knowing that it was encrypted with the permutation:

5 7 9 8 2 1 4 10 3 6

and partially completed square:

B	L			S	
		C			G
H	I	J	M	N	O
		R	T	V	W
X	Z		1	2	3