



The original novel cover

# The Spymaster's Apprentice

## Activity Pages

V1.1

In the novel, Activity Pages provide you the opportunity to learn how to encode and decode messages using various codes and ciphers. Most online forums cannot support tables and images at large sizes. Print this guide out and/or use the embedded hyperlinks and QR codes to learn along with the protagonist as you read the novel.

Download more copies from <https://www.neuralsplyce.com/free-stuff>

Comments and questions: [Neuralsplyce@gmail.com](mailto:Neuralsplyce@gmail.com)

## ACTIVITY PAGE

### REVERSE THE WORD

**BACKGROUND:** Reverse The Word is the easiest method for encrypting a message. However, its simplicity makes it easy to decrypt even among people who are not familiar with the process.

#### ENCRYPTION INSTRUCTIONS

1. Write your message in lowercase letters on one line. This is the plaintext line.

i know a secret

2. Below the plaintext line, reverse the order of the letters in each word and write them in uppercase letters. This is your ciphertext.

I WONK A TERCES

#### DECRYPTION INSTRUCTIONS

1. Write the ciphertext on the first line.

I WONK A TERCES

2. On the line below the ciphertext, reverse the order of the letters in each word and write them in lowercase letters.


I know a secret

#### ADVANCED USAGE

Reverse the order of the words in the ciphertext to add a second layer of complexity.

becomes I WONK A TERCES  
TERCES A WONK I

#### ONLINE ENCRYPT/DECRYPT TOOL

WEBSITE	QR CODE
<a href="https://www.boxentriq.com/code-breaking/reverse-text">https://www.boxentriq.com/code-breaking/reverse-text</a>	

## ACTIVITY PAGE

### CAESAR CIPHER

**BACKGROUND:** The Caesar Cipher is the most famous cipher for its association with Julius Caesar who used it to encrypt his military communications when he was a Roman general.

#### ENCRYPTION INSTRUCTIONS

1. Create a 26-column wide grid and write the entire alphabet in lowercase letters in the top row.
2. Write the alphabet in uppercase letters in the bottom row. However, shift the alphabet 3 letters to the left. Place the trailing letters at the end of the row.

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

3. Write your plaintext message in lowercase letters on one line.

i know a secret

4. Match the lowercase letter of each word to its uppercase letter in the bottom row and write those letters in uppercase beneath your plaintext line.

L NQRZ D VHFUFW

#### DECRYPTION INSTRUCTIONS

1. Write the ciphertext on the first line.

L NQRZ D VHFUFW

2. Match the uppercase letter of each encrypted word to its lowercase letter in the top row and write those letters in lowercase beneath your ciphertext line.

I know a secret

#### ADVANCED USAGE

Print and assemble a Cipher Wheel to make aligning plaintext and ciphertext alphabets easier when using a different shift key.

**ONLINE ENCRYPT/DECRYPT TOOL**

WEBSITE	QR CODE
<a href="https://www.boxentriq.com/code-breaking/caesar-cipher">https://www.boxentriq.com/code-breaking/caesar-cipher</a>	
Cipher Wheel <a href="https://www.topspysecrets.com/secret-codes-for-kids.html">https://www.topspysecrets.com/secret-codes-for-kids.html</a>	

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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 - Universal

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
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Left Appendix

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---

Right Appendix

A	B	C	D	E	F	G	H	I	J	K	L	M
---	---	---	---	---	---	---	---	---	---	---	---	---

1. Cut out all four grids and attach the left and right appendixes to the Ciphertext – Universal grid to make it easier to use shift keys from 1 – 25.
2. The new grid should be twice as long as the plaintext grid and start with the letter N and end with the letter M.

nopqrstuvwxyzacdefghijklmnopqrstuvwxyzabcdefghijklm

## ACTIVITY PAGE

### ATBASH CIPHER

**BACKGROUND:** The Atbash Cipher is considered the first true cipher and dates back to the time of Ancient Egypt. The cipher was used by Israelites and the names comes from the names of letters of the Hebrew alphabet (Aleph, Taw, Bet, Shin).

#### ENCRYPTION INSTRUCTIONS

1. Create a 26-column wide grid and write the alphabet in lowercase letters in the top row.
2. Write the alphabet backwards in uppercase letters in the bottom row.

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

3. Write your plaintext message in lowercase letters on one line.
4. Match the lowercase letter of each word to its uppercase letter in the bottom row and write those letters in uppercase beneath your plaintext line.


i know a secret  
R PMLD Z HVXIVG

#### DECRYPTION INSTRUCTIONS

1. Write the ciphertext on the first line.
2. Match the uppercase letter of each encrypted word to its lowercase letter in the top row and write those letters in lowercase beneath your ciphertext line.

R PMLD Z HVXIVG  
I know a secret

#### ONLINE ENCRYPT/DECRYPT TOOL

WEBSITE	QR CODE
<a href="https://www.boxentriq.com/code-breaking/atbash-cipher">https://www.boxentriq.com/code-breaking/atbash-cipher</a>	

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#### ATBASH Cipher

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

## ACTIVITY PAGE

### NUMBERS FOR LETTERS

**BACKGROUND:** One of the easiest substitution ciphers to use.

#### ENCRYPTION INSTRUCTIONS

1. Create a 26-column wide grid and write the alphabet in lowercase letters in the top row.
2. Write the numbers 1 - 26 in the bottom row.

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
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	26

3. Write your plaintext message in lowercase letters on one line.
4. Match the lowercase letter of each word to its number in the bottom row and write those numbers beneath your plaintext line.

i k n o w a s e c r e t  
9 11 14 15 23 1 19 5 3 18 5 20

#### DECRYPTION INSTRUCTIONS



1. Write the ciphertext on the first line.
2. Match the numbers to its lowercase letter in the top row and write those letters in lowercase beneath your ciphertext line.

9 11 14 15 23 1 19 5 3 18 5 20  
l k n o w a s e c r e t

#### ADVANCED USAGE

Reverse the numbers in the ciphertext line to go from highest to lowest.

#### ONLINE ENCRYPT/DECRYPT TOOL

WEBSITE	QR CODE 1	QR CODE 2
<ol style="list-style-type: none"> <li>1. <a href="https://www.boxentriq.com/code-breaking/letters-to-numbers">https://www.boxentriq.com/code-breaking/letters-to-numbers</a></li> <li>2. <a href="https://www.boxentriq.com/code-breaking/numbers-to-letters">https://www.boxentriq.com/code-breaking/numbers-to-letters</a></li> </ol>		

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#### Numbers For Letters

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
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	26

## ACTIVITY PAGE

### FREQUENCY ANALYSIS

**BACKGROUND:** Frequency Analysis uses the mathematical distribution of letters in written language to make educated guesses when associating symbolic reference in a substitution cipher with the letters in the alphabet. In English, vowels are used more frequently than consonants. Therefore, the most frequently used symbolic references in a ciphertext are more likely to represent a vowel.

#### INSTRUCTIONS

1. Create a table or grid with three columns.
2. In the first column, write all the symbols (letters, numbers, shapes) used in the ciphertext.
3. In the second column, write the total number of times the symbol occurs in the ciphertext.
4. Use the third column to write the letters of the alphabet the symbol represents. This is a matter of guesswork, so use a pencil (paper) or electronic document that allows erasing.
5. Match the most frequently used symbols to the most common letters first and then see if parts of the ciphertext make sense.
6. Look for one-, two-, and three-letter words and letter pairs that are easy to guess.
7. Through a process of elimination, associate every symbol with a letter in the alphabet and decrypt the message.

#### LETTER USE FREQUENCY IN ENGLISH

Letter	Percent
E	12.7
T	9.1
A	8.2
O	7.5
I	7.0
N	6.7
S	6.3
H	6.1
R	6.0
D	4.3
L	4.0
U	2.8
C	2.8
M	2.4
W	2.4
F	2.2
G	2.0
Y	2.0
P	1.9
B	1.5
V	1.0
K	0.8
J	0.2
Q	0.1
X	0.1
Z	0.1

#### COMMON SHORT WORDS

A
I
OF
TO
IN
IT
AT
THE
AND
FOR
YOU

#### LETTER PAIRS

TH
HE
IN
ER
AN
ND
AR
RE
EN







## ACTIVITY PAGE

### POLYBIUS SQUARE

**BACKGROUND:** Developed by the Greeks, it was used to reduce the alphabet to a smaller set of symbols that could then be relayed for fire signalling.

#### ENCRYPTION INSTRUCTIONS

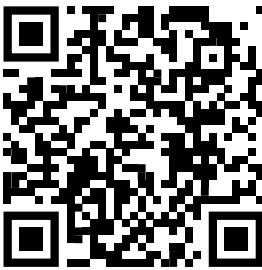
1. Create a table or grid 5 columns wide and 5 rows high.
2. Label the columns and rows 1 – 5
3. Fill the grid cells with the alphabet, using the same cell for the I and the J
4. Find the first letter in the plaintext and use the row and column numbers as the ciphertext. For example, if the plaintext is 'secret'. The S is in row 4, column 3 so its ciphertext equivalent is 43.

	1	2	3	4	5
1	A	B	C	D	E
2	F	G	H	I/J	K
3	L	M	N	O	P
4	Q	R	S	T	U
5	V	W	X	Y	Z

#### DECRYPTION INSTRUCTIONS

1. Use the first digit of the ciphertext to identify the row.
2. Use the second digit of the ciphertext to identify the column.
3. The cell at the intersection of the row and column is the letter in the plaintext.

#### ONLINE TOOLS

WEBSITE	QR CODE
<a href="https://www.boxentriq.com/code-breaking/vigenere-cipher">https://www.boxentriq.com/code-breaking/vigenere-cipher</a>	

## ACTIVITY PAGE

### VIGENERE SQUARE

**BACKGROUND:** Attributed to Blaise de Vigenere, the Vigenere cipher / square / table is essentially a table of 26 Caesar Cipher shifts. It is easy to use and was long considered 'impossible' to crack without the keyword.

#### INSTRUCTIONS

1. Create a table or grid with 26 alphabets shifted by one letter from the previous alphabet.
2. Label the columns and rows A – Z

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

#### ENCRYPTION INSTRUCTIONS

Plaintext: faded

Keyword: DOGDO

Ciphertext: IOJHR

1. Write the plaintext on a single line (e.g., faded)
2. Write the keyword on a line below the plaintext (e.g., DOG). Repeat until every letter of the plaintext has a letter from the keyword (DOGDO).

- Use the first letter of the plaintext to find the column ( f = column F )
- Run your finger down the column until you find the row with the first letter of the keyword (D)
- The letter at the column and row intersection is the ciphertext ( I )
- Repeat using each plaintext letter and keyword letter as the column and row (Y and X) coordinates.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>
<b>A</b>	A	B	C	D	E	F	G
<b>B</b>	B	C	D	E	F	G	H
<b>C</b>	C	D	E	F	G	H	I
<b>D</b>	D	E	F	G	H	I	J
<b>E</b>	E	F	G	H	I	J	K
<b>F</b>	F	G	H	I	J	K	L
<b>G</b>	G	H	I	J	K	L	M

**DECRYPTION INSTRUCTIONS**

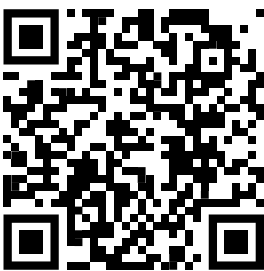
Ciphertext: IOJHR

Keyword: DOGDO

Plaintext: faded

- Write the ciphertext on a single line (e.g., IOJHR)
- Write the keyword on a line below the plaintext (e.g., DOG). Repeat until every letter of the ciphertext has a letter from the keyword (DOGDO).
- Use the first letter of the keyword to find the row ( D = row D )
- Run your finger across the row until you find the cell with the first letter of the ciphertext (I)
- The letter of the column is the plaintext letter ( column F = f )
- Repeat using each keyword letter and ciphertext letter as the row and column (X and Y) coordinates.

**ONLINE TOOLS**

WEBSITE	QR CODE
<a href="https://www.boxentriq.com/code-breaking/vigenere-cipher">https://www.boxentriq.com/code-breaking/vigenere-cipher</a>	

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Vigenere Square

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

## ACTIVITY PAGE

### ASCII Code

**BACKGROUND:** American Standard Code for Information Interchange (ASCII). Used in digital communications. All characters, visible and hidden, in a webpage or document are encoded in ASCII because digital devices, like computers, manipulate numbers. Text, digital pictures, videos, and music are all number sequences to a computer.

#### ENCODING INSTRUCTIONS

1. Create a 26-column wide by 4 row grid and write the alphabet in uppercase and lowercase letters in the odd rows.
2. Write the numbers 65 – 90 in row two and 97 – 122 in the fourth row.
  - a. **NOTE:** the space between words is 032 in ASCII

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
6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	9
5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
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
9	9	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	8	9	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2

3. Write your plaintext message in lowercase letters on one line.
4. Match the lowercase letter of each word to its number in the row below it and write those numbers beneath your plaintext line. Pad two-digit numbers with a 0 to make three digits.

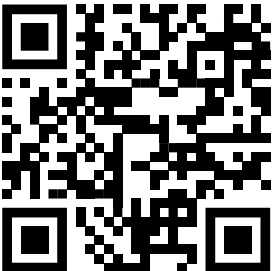
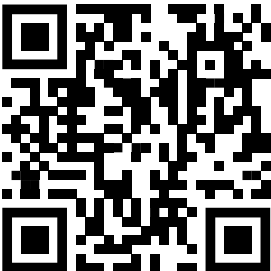
l k n o w a s e c r e t  
 073 032 107 110 111 119 032 097 032 115 101 099 114 101 116

#### DECODING INSTRUCTIONS

1. Write the ciphertext on the first line.
2. Match the number to its associated letter and write those letters beneath your ciphertext line.

073 032 107 110 111 119 032 097 032 115 101 099 114 101 116  
 l k n o w a s e c r e t

#### ONLINE TOOLS

WEBSITE	QR CODE 1	QR CODE 2
Text-to-ASCII <a href="https://codebeautify.org/text-to-ascii">https://codebeautify.org/text-to-ascii</a>		
ASCII-to-Text <a href="https://codebeautify.org/ascii-to-text">https://codebeautify.org/ascii-to-text</a>		

## ACTIVITY PAGE

### CARDAN GRILLE

**BACKGROUND:** A Cardan Grille is a mask placed over plaintext to conceal everything except the components of the secret message. Named after its Italian creator, Jerome Cardano.

#### INSTRUCTIONS

1. Create multiple copies of the Cardan Grille out of a stiff material and give one copy to each intended message recipient.
2. Place the Grille on top of a blank piece of paper and write the secret message inside the cutouts.
3. Write an ordinary looking message around the secret message.
4. While keeping the secret components inside the cutouts, rewrite the message on a new sheet of paper so the words look natural without obvious gaps around the secret words.

#### ADVANCED USAGE

Rotate the grille to write on different parts of the paper. <https://youtu.be/lbmOJEGFIK4?si=vr-XPeO60La6KLaz>

----- CUT HERE -----

Message

Hello	Samuel					
Thank	you	for	the	book.	It	
is	very	informative	and	is	keeping	
me	entertained	a	great	deal	while	
teaching	me	to	use	secret	codes.	

Cardan Grille

