

# Top Secret! Shhhh! Codes and Ciphers

20 15 16 19 5 3 18 5 20 19 8 8 8

Can you figure out what this message says? Do you love secret codes? Do you want to be able to write messages to friends that no one else can read? In this kit you will get to try some codes and learn to code and decode messages.

## Materials Included in your Kit

Directions and template pages

Answer key for all codes in this packet starts on page 8.

1 #2 Pencil

1 Brad Fastener

## Tools You'll Need from Home

Scissors

A Piece of Tape

## Terminology

First let's learn a few terms together.

### CODE

A code is a set of letters, numbers, symbols, etc., that is used to secretly send messages to someone.

### CIPHER

A cipher is a method of transforming a text in order to conceal its meaning.

### KEY PHRASE / KEY OBJECT

A key phrase lets the sender tell the recipient what to use to decode a message. A key object is a physical item used to decrypt a code.

### ENCRYPT

This means to convert something written in plain text into code.

### DECRYPT

This means to convert something written in code into plain text.

Why were codes and ciphers used? Codes have been used for thousands of years by people who needed to share secret information with one another.

Your mission is to encrypt and decrypt messages using different types of code. The best way to learn to read and write in code is to practice!



## SCYTALE Cipher

The Scytale was used by the ancient Greeks. A Scytale cipher uses a strip of paper for the message and a common object as the key object. As long as both the sender and receiver have the same key object they can read the message.

For this cipher you will need: a pencil, tape, scissors and the template labeled Scytale (Page 15) on the Caesar Cipher Wheel Page.

Cut out the Scytale Template.

We will use a pencil as our key object and the cutout strip of paper for our message.

Use tape to attach one end of the strip to the pencil at an angle. Then wrap the paper around the pencil so the edges meet. Do not let the paper overlap as you wind it.



When fully wound, write a message along the length of the pencil.



Unwind the paper and remove it from the pencil. Can you read the message now?



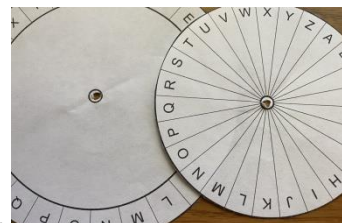
Wind the paper back around the pencil so that the letters line up. Can you decode the message? What happens if you try winding your paper around a different sized item, like a pen or a broom handle? Can you still read your message?

## CAESAR Cipher

The Caesar cipher is named after the Emperor of Rome, Julius Caesar. Julius Caesar lived until 44 BCE. This code has been around for quite some time. It works by shifting the letters of the message.

For this cipher you will need: scissors, brad fastener and the template labeled Caesar Cipher Wheel (Page 15).

Carefully cut out the two circles, along the outside edge.

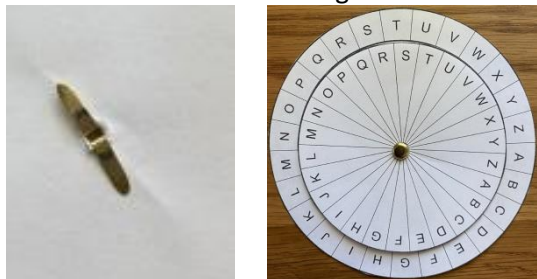


Next, poke a small hole through the dot in the middle of each of the two circles.

Take the smaller of the two circles and stick the pointed end of the brad through the hole.

Now take the smaller circle with the brad and line up the point so it passes through the hole in the larger circle.

With the two circles held together with the brad, separate the two prongs on the brad so they are flat.

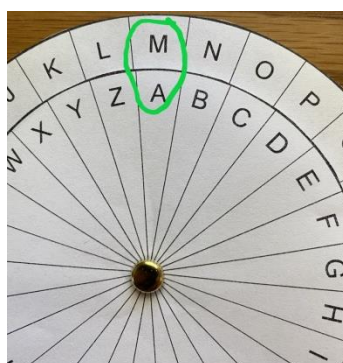


The 2 circles should be able to rotate. You've created your Cipher Wheel which will let you read and write in a Caesar cipher. The outside circle of your wheel is your **key** and inside is our **source**.

To write a coded message with the Caesar cipher we are going to practice using the letter M as our key letter. Take your wheel and line up the M on the outer wheel with the A on the inner wheel. Let's call this key phrase MA. Once you have your key phrase you will want to make sure you don't accidentally rotate the wheels, but if you do remember you can fix it by lining up your key phrase again, in this example M and A.

Let's try encrypting this sentence: THE BIRD SINGS

With our wheel set to MA.



First we will find the T on the inside wheel, it lines up with the F on the outside wheel so the first letter of our coded message is F. Next let's find the H on the inside wheel, the matching letter on the outside is T, so our second coded letter is T. If we repeat this process for E B I R D we get Q N U D P. Can you finish encrypting the word SINGS?

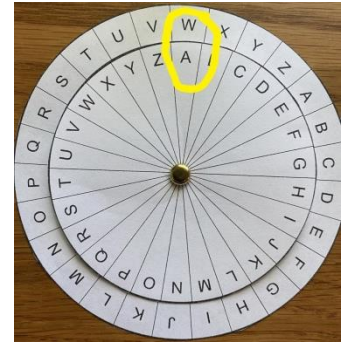
T	H	E		B	I	R	D		S	I	N	G	S	
F	T	Q		N	U	D	P							

For the next example we will decrypt a message.

When you encrypt a message you read from the inside wheel to the outside, for decrypting we read from the outside to inside.

Let's decrypt the message together: EO PDA IKKJ BQHH

With our wheel set to WA. (W on the Outside Wheel aligned with A on the Inside Wheel)



First we will find the E on the outside wheel and this lines up with I on the inner wheel, so we'll decrypt E to I. The next letter is O, find the O on the outside wheel, that lines up with S. As we continue with P D A we get T H E. Can you finish decrypting the sentence below?

E	O		P	D	A		I	K	K	J		B	Q	H	H
I	S		T	H	E										

If you are sending a secret message to a friend then you would not want to send both the encrypted message and the plain text message, written like the 2 sentences above. Instead you would send a message letting them know the key phrase and the encrypted message.

DA  
WKH WUHH LV JUHHQ

This way your friend knows that the key phrase is DA (D on the outer wheel, A on the Inner) and they can decrypt your message using their cipher wheel.

Can you decrypt this message?

DA  
WKH WUHH LV JUHHQ

## LETTER NUMBER Code

The Letter Number Code is similar to the Caesar Cipher, but instead of having a key phrase that matches a Letter to a Letter we will have a Letter match with a number.

In our kit is a page labeled Letter Number Code (page 11) which has A-Z and 1-26. This page has each letter and the number that corresponds to that letter. Think of the letters and numbers like the wheels of your Caesar Cipher. A = 1, B = 2 ... Z = 26.

To code a message find the letter you want to use and then look below that letter for a number. That number is what you want to use to write your coded message.

For example the word CODE would become 3 15 4 5  
SECRET would become 19 5 3 18 5 20.

Be careful to include spaces between the numbers otherwise your recipient might become confused if 23 = 2 3 (B C) or 23 (W).

Let's try one together. Let's change the sentence Secret codes are fun to numbers using the letter to number chart. I filled in the word Secret can you fill in the rest?

S	E	C	R	E	T		C	O	D	E	S		A	R	E		F	U	N
19	5	3	18	5	20														

Now that we have encoded the sentence above let's try decoding a sentence. This time instead of looking at the letter on the key first, we will look at the number and see what letter matches. The first word is decoded, can you do the rest?

9	20		9	19		1		19	5	3	18	5	20
I	T												

To write a secret message and keep it secret you would not want to include both the words and the numbers. You would just include the numbers for this type of code, in the final message.

Can you decode this message?

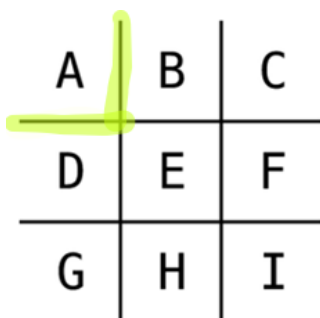
9 20 9 19 19 21 13 13 5 18

## PIGPEN Cipher

It is uncertain when this cipher was first created, but it is believed to have been used in ancient times. This cipher uses a grid that looks like a Tic Tac Toe board and is sometimes called the Tic Tac Toe cipher.

One of the pages in your kit is labeled Pigpen Cipher (page 10). When encoding messages with the pigpen cipher each letter is replaced with a symbol. Each letter is replaced by the portion of the grid surrounding it. The top half of the page with the Tic Tac Toe boards and two X shaped patterns show how the cipher was created.

The bottom half of the page might be easier to understand because it lines up the symbols similarly to how we used the Letter Number Code. It's up to you which version you prefer but both will get you the same coded message.



The letter A becomes 

The symbol for A is highlighted.

A	B	C
D	E	F
G	H	I

The letter B becomes



The symbol for B is highlighted.

A	B	C
D	E	F
G	H	I

The letter C becomes



The symbol for C is highlighted.

Let's try encoding a message. Using the Pigpen Cipher page let's change all of the letters to the correct symbol.

Pigpen																									
P	i	g	p	e	n		c	i	p	h	e	r	s		a	r	e		f	u	n				
┐	┐	┐	┐	◻	◻		┐	┐	┐	┐	◻	┐	┐												

Now let's try decoding a message using the pigpen cipher.

┐	┐		┐	>		┐	<	◻	◻	<	
I	s		i	t							

To send an encoded message to a friend you would want to send just the symbols. Let's try decoding the following message.

┐	┐	◻		┐	┐	┐	┐	◻	┐		┐	◻	┐	┐
---	---	---	--	---	---	---	---	---	---	--	---	---	---	---

## Some More Types of Codes

**Mirror writing** – If you write your name and hold the paper in front of a mirror can you read it? Try writing your name backwards and hold the paper in front of a mirror. One place you see mirrored writing is on the front of an ambulance. Ambulance is commonly written in mirrored writing so that other drivers can read the word in their mirrors.

Leonardo da Vinci wrote many of his notes in mirrored writing, only writing the standard way if he intended someone else to read the notes.

**Reverse the words** - To write using this method write each word in the message backwards.

For example:

HAVE A NICE DAY

Would become: EVAH A ECIN YAD

How would you write the sentence below in Reverse the Words:

THE BUTTERFLY FLIES

\_\_\_\_\_

**Write your own code-**

On the page labeled Write your own code (page 12) is an Alphabet with blank boxes below.

Can you make your own code? The letters of the alphabet are listed with a space for you to create what you would like for each. You could use other letters (Caesar Cipher), numbers (Letters to Numbers), Symbols (Pigpen) or a combination.

It's up to you!

This is your codes key and you would only want to share this with people you want to be able to decrypt your code.

These are only a few ways of encrypting a message. Many of these types of codes can be modified to make the messages more difficult to break. And there are many other types of codes to learn if you are interested. If you're interested in learning more ask your librarian for book suggestions.

Pages 13 and 14 are blank grid pages for you to practice writing in the codes you learned or to learn other codes.

## Answer Key for examples used in this kit.

Page one codes:

20 15 16 19 5 3 18 5 20 19 8 8 8

TOP SECRET SHHH



GOOD LUCK

## Caesar Cipher

Keyphrase MA

T	H	E		B	I	R	D		S	I	N	G	S	
F	T	Q		N	U	D	P		E	U	Z	S	E	

Keyphrase WA

E	O		P	D	A		I	K	K	J		B	Q	H	H
I	S		T	H	E		M	O	O	N		F	U	L	L

Line up the A on the inside wheel with the D on the outside wheel.

W	K	H		W	U	H	H		L	V		J	U	H	H	Q
T	H	E		T	R	E	E		I	S		G	R	E	E	N

Letter to Number:

S	E	C	R	E	T		C	O	D	E	S		A	R	E		F	U	N
19	5	3	18	5	20		3	15	4	5	19		1	18	5		6	21	14



9	20		9	19		1		19	5	3	18	5	20
I	T		I	S		A		S	E	C	R	E	T

9	20		9	19		19	21	13	13	5	18
I	T		I	S		S	U	M	M	E	R

Pigpen Cipher

P	i	g	p	e	n		c	i	p	h	e	r	s		a	r	e		f	u	n
┐	┐	┐	┐	┐	┐		┐	┐	┐	┐	┐	┐	┐								

┐	┐		┐	>		┐	<	┐	┐	<	?
I	s		i	t		s	u	n	n	y	?

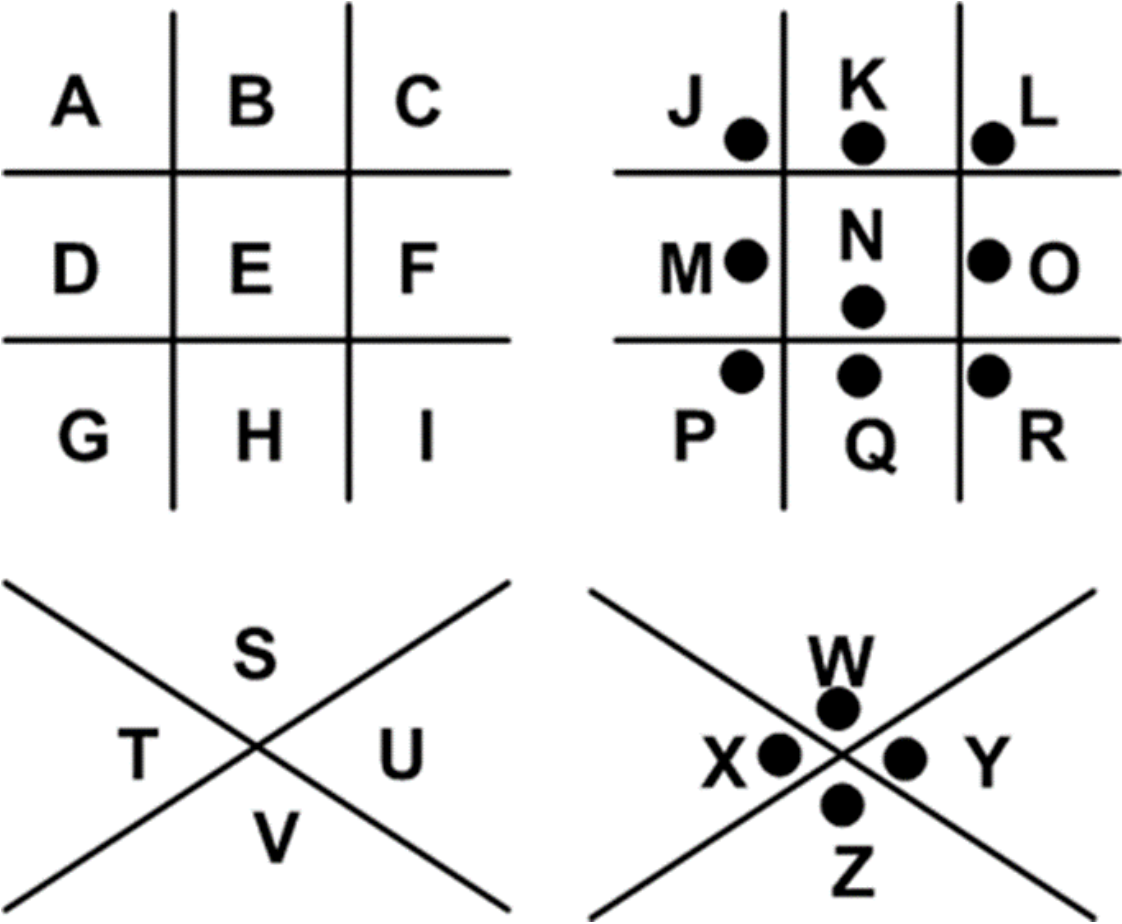
┐	┐	┐		┐	┐	┐	┐	┐	┐	┐		┐	┐	┐	┐	?
A	r	e		d	r	a	g	o	n	s		r	e	a	l	?

Reverse the Words

THE BUTTERFLY FLIES

EHE YLFRETTUB SEILF

Pigpen Cipher

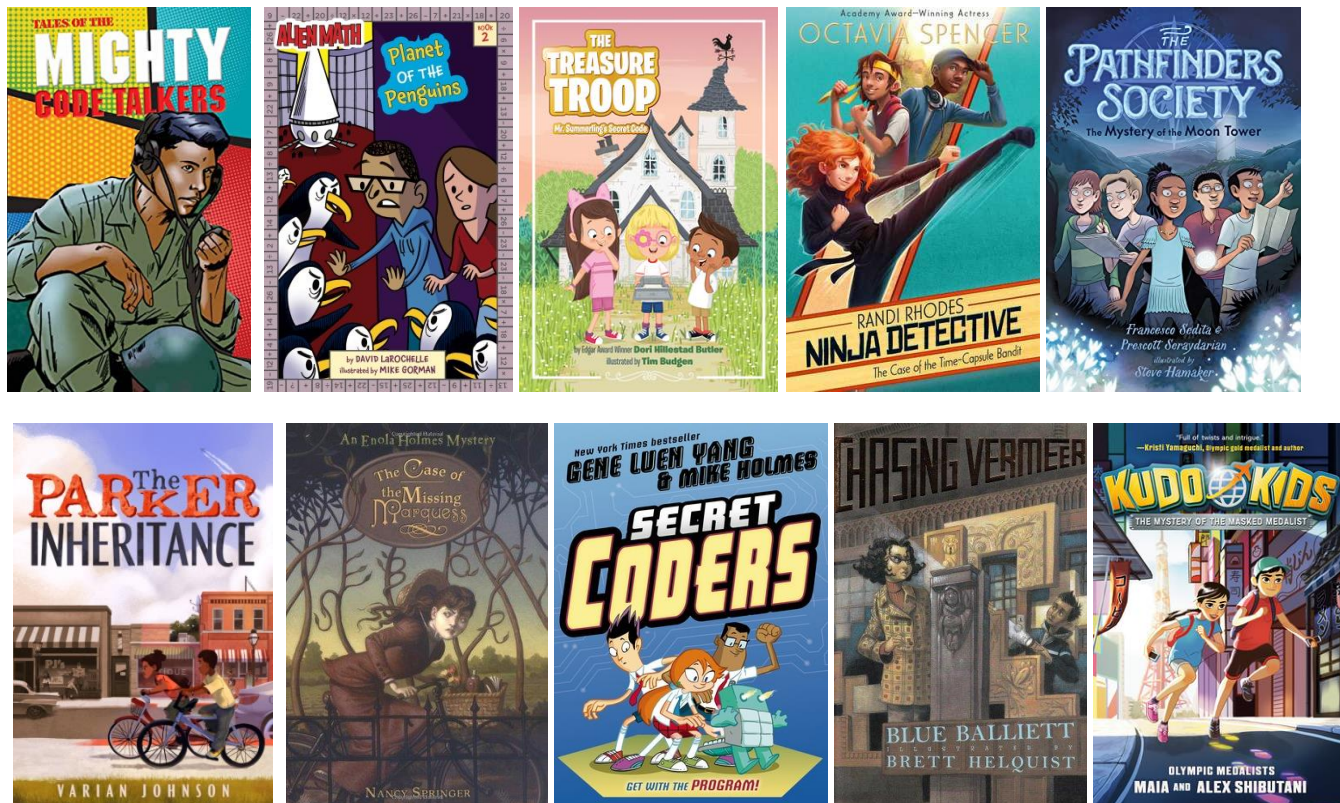


a	b	c	d	e	f	g	h	i	j
└	┐	┌	┘	□	├	┐	└	┌	┘
k	l	m	n	o	p	q	r	s	t
└	┐	┌	┘	□	├	┐	└	┌	┘
u	v	w	x	y	z				
<	^	∨	>	<	^				

## Letter to Number code

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

## Codes and Ciphers book ideas



### Tales of the Mighty Code Talkers

Planet of the Penguins By David LaRochelle

Mr. Summerling's Secret Code By Dori Hillestad Butler

The Case of the Time-Capsule Bandit By Octavia Spencer

The Mystery of the Moon Tower By Francesco Sedita

The Parker Inheritance By Varian Johnson

The Case of the Missing Marquess By Nancy Springer

Secret Coders By Gene Luen Yang

Chasing Vermeer By Blue Balliett

The Mystery of the Masked Medalist By Maia and Alex Shibutani

Create your own code

A	B	C	D	E	F	G	H	I	J

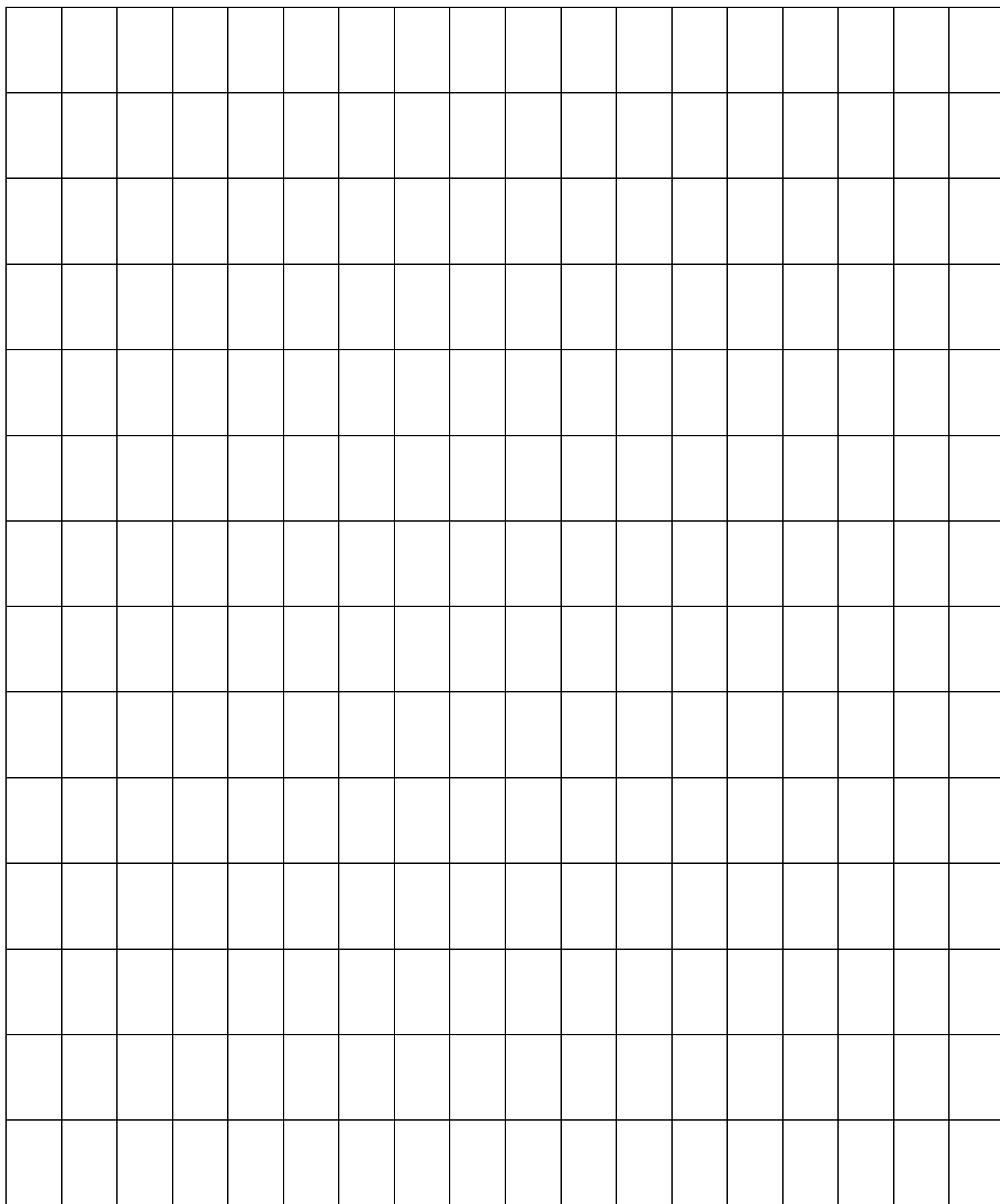
K	L	M	N	O	P	Q	R	S	T

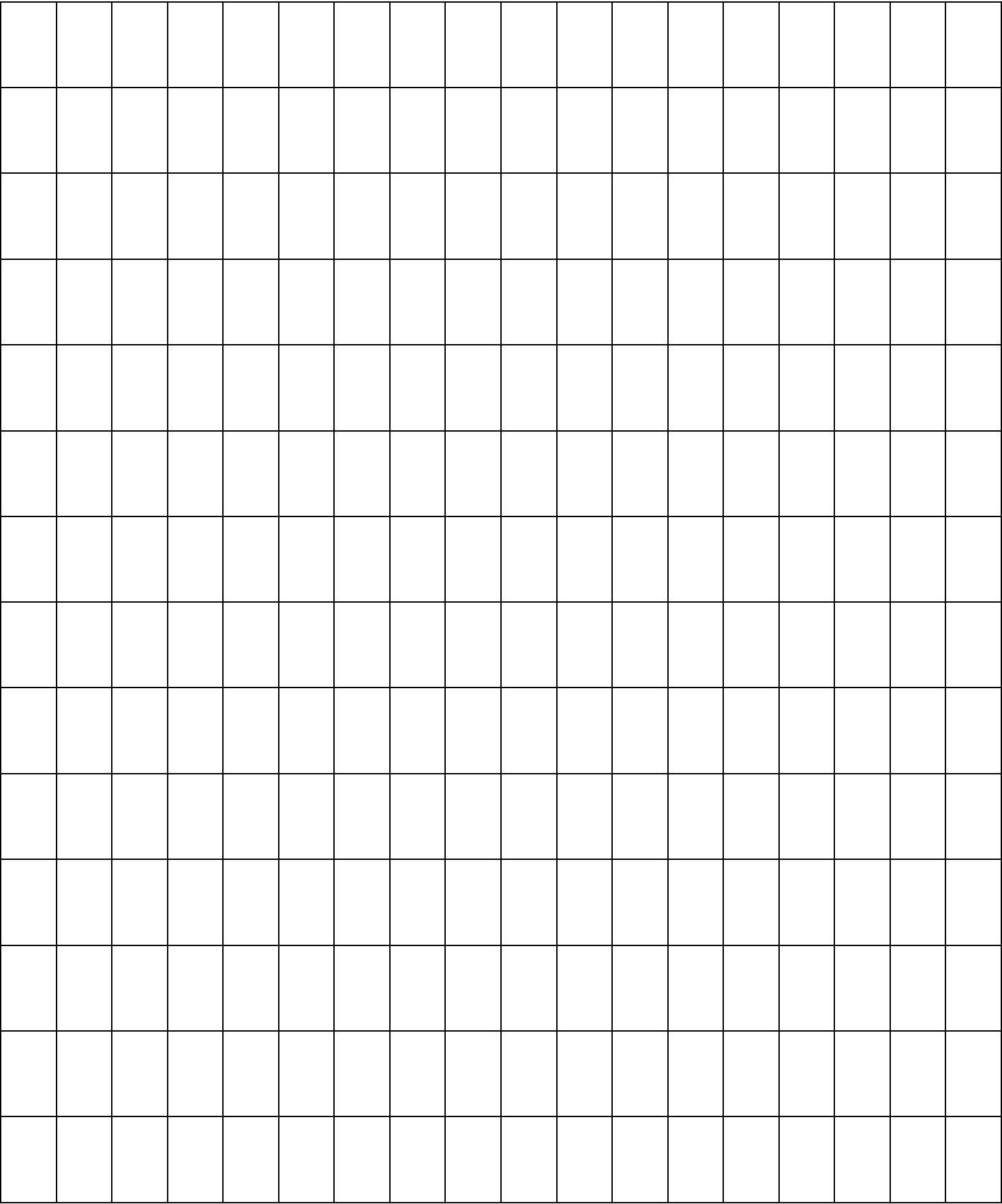
U	V	W	X	Y	Z

A	B	C	D	E	F	G	H	I	J

K	L	M	N	O	P	Q	R	S	T

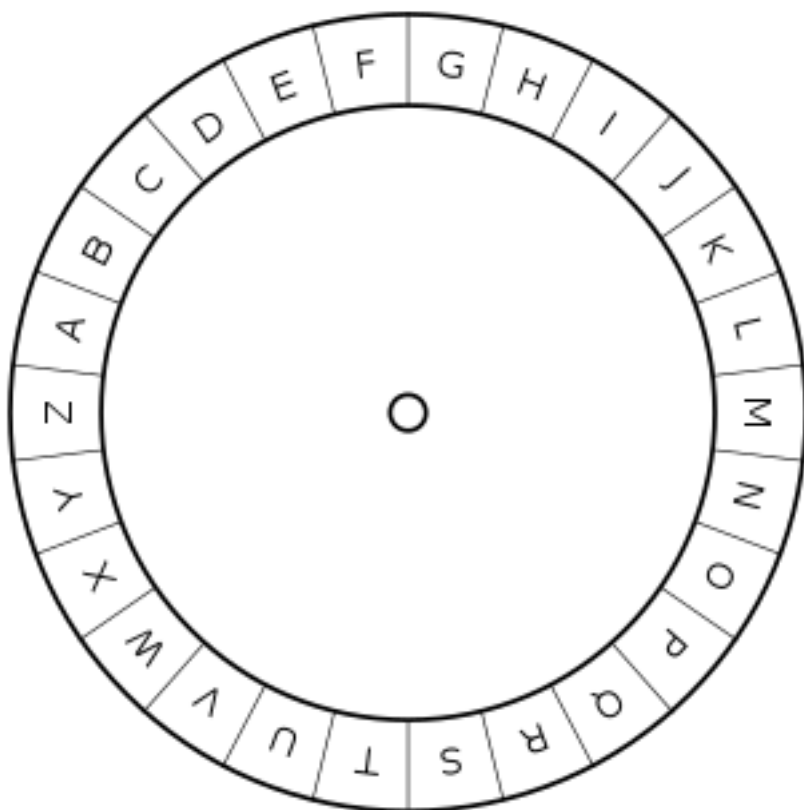
U	V	W	X	Y	Z





## Caesar Cipher Wheel

<https://commons.wikimedia.org/wiki/File:Caesar-cipher-template.svg>



Scytale