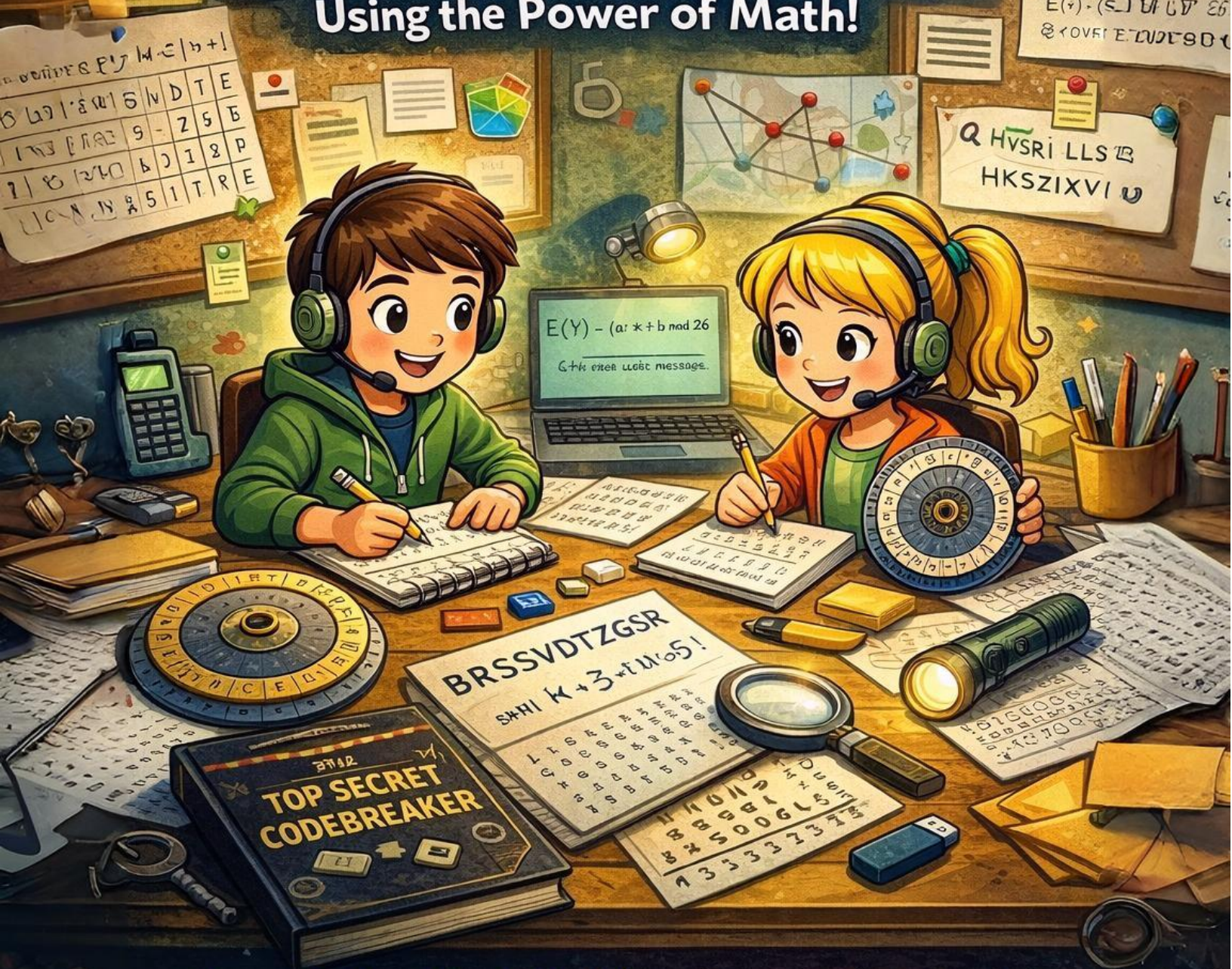


THE ULTIMATE CRYPTOGRAPHY KIT FOR KIDS

Learn to Encrypt & Decrypt Messages
Using the Power of Math!



Ages 8-14 • 50+ Activities • Answer Key Included

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Welcome, Secret Agent!

Congratulations! You've just been recruited into the world of cryptography—the science of secret codes and hidden messages. For thousands of years, spies, soldiers, and secret agents have used cryptography to protect important information. Now it's your turn to learn these amazing skills!

In this workbook, you'll discover how mathematics can turn ordinary messages into unbreakable codes. You'll learn techniques used by real cryptographers, from ancient Roman ciphers to modern mathematical encryption that protects our computers and phones today.

What You'll Learn

- How to encrypt (hide) and decrypt (reveal) secret messages
- The mathematics behind famous historical ciphers
- How to create your own unbreakable codes
- How modern encryption keeps your online data safe
- Real-world cryptography careers and applications

How to Use This Workbook

Each section introduces a new cipher or concept with clear examples. You'll practice encoding and decoding messages, solve puzzles, and even create secret messages for your friends. Don't worry if you make mistakes—that's how we learn! The answer key at the back will help you check your work.

Ready to become a cryptography expert? Let's begin!

Chapter 1: The Caesar Cipher

Over 2,000 years ago, the Roman emperor Julius Caesar needed a way to send secret messages to his generals. He invented one of the first and simplest ciphers in history—the Caesar Cipher!

How It Works

The Caesar Cipher uses a simple shift. Every letter in your message moves forward (or backward) by the same number of positions in the alphabet. This number is called the key.

Example: Shift of 3

If we use a shift of 3 (Caesar's favorite!), each letter moves 3 positions forward:

Original Letter	Encrypted Letter
A → D	N → Q
B → E	O → R
C → F	P → S
D → G	Q → T
E → H	R → U
... and so on!	Z → C (wraps around!)

Let's encrypt the message: HELLO

H → K, E → H, L → O, L → O, O → R

Encrypted message: KHOOR

The Math Behind It

We can describe the Caesar Cipher using a mathematical formula. First, we assign each letter a number: A=0, B=1, C=2, ... Z=25.

Encryption formula: $E(x) = (x + k) \bmod 26$

Where x is the letter's number, k is the shift key, and 'mod 26' means we wrap around after Z.

Decryption formula: $D(x) = (x - k) \bmod 26$

Practice Activities

Activity 1.1: Basic Encryption

Encrypt these words using a Caesar Cipher with shift = 5:

1. MATH:

2. CODE:

3. SECRET:

Activity 1.2: Decryption Challenge

Decrypt these messages. They all use shift = 7:

4. OLSSV:

5. JWVK QVI:

6. ZHAL PZ MBU:

Activity 1.3: Create Your Own

Choose your own shift key and encrypt a secret message for a friend. Write down both the encrypted message and the key!

My shift key:

My original message:

My encrypted message:

Chapter 2: The Multiplication Cipher

Now that you've mastered shifting letters, let's add some multiplication! The multiplication cipher is more secure than the Caesar Cipher because it scrambles letters in a different way.

How It Works

Instead of adding a number to each letter, we multiply! But there's a catch—we can only use certain numbers as keys, or the cipher won't work properly.

Valid keys for multiplication: 1, 3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 25

These numbers are coprime with 26 (they don't share any factors with 26 except 1). This ensures every letter maps to a unique encrypted letter!

The Math Behind It

Encryption formula: $E(x) = (a \times x) \bmod 26$

Where x is the letter's number (A=0, B=1, ..., Z=25) and a is your multiplication key.

Example: Key = 5

Let's encrypt the letter 'M' using key = 5:

- M is the 13th letter, so $x = 12$ (remember, A=0)
- $E(12) = (5 \times 12) \bmod 26 = 60 \bmod 26 = 8$
- 8 corresponds to the letter 'I'
- So $M \rightarrow I$

Practice Activities

Activity 2.1: Multiplication Practice

Complete this multiplication cipher table using key = 3. The first few are done for you!

Letter	Number (x)	$(3 \times x) \bmod 26$	Encrypted
A	0	0	A
B	1	3	D
C			
D			
E			
F			

Activity 2.2: Encode Messages

Use a multiplication cipher with key = 7 to encrypt these words:

7. SPY:

8. AGENT: