# CodeCrackers Instruction Manual

## Vigenère Cipher Study Guide

The Vigenère cipher is a polyalphabetic substitution cipher. It encrypts messages using a keyword where each letter of the keyword specifies a Caesar-style shift. Instead of applying a single fixed shift, the cipher applies a series of shifts that repeat with the keyword, making it harder to crack than simple substitution ciphers.

## How It Works

1. Choose a keyword (e.g., KEY).
2. Repeat the keyword to match the length of the plaintext.
3. Convert each letter of the plaintext and keyword into positions (A=0 to Z=25).
4. Encrypt: Add the values modulo 26.
5. Decrypt: Subtract the keyword letter values modulo 26.

Formula: Cipher = (Plain + Key) mod 26
        Plain  = (Cipher - Key + 26) mod 26

## Encryption Example

```
Plaintext : C O D E S
Keyword   : K E Y K E
Shift     : 10 4 24 10 4
Ciphertext: R I J V S
```

## Decryption Example

```
Ciphertext: R I J V S
Keyword   : K E Y K E
Shift     : 10 4 24 10 4
Plaintext : C O D E S
```

## Practice Problems

Use the keyword LOCK:

```
1. Encrypt: SECRETS
2. Decrypt: DIPVMHLP (from keyword LOCK)
3. Encrypt your name or favorite word with a keyword of your choice
```

## Answers

```
1. SECRETS + LOCK   -> DIPVMHLP
```

```
2. DIPVMHLP + LOCK  -> SECRETS
```

### Keyword Alignment Visualization

```
Plaintext : C O D E S
Keyword   : K E Y K E
Ciphertext: R I J V S
```

### Tips for Success

- Use long, random keywords to improve security.

- Avoid using common words as keywords - they're easier to guess.

- Write the keyword over the plaintext to keep alignment clear.

- Use the Vigenère table or shift formulas when needed.

- This cipher avoids simple frequency analysis - that's why it was once called 'le chiffre indechiffrable'.