K4 Class Grid (0-96)

Class 0	0 **O**	6 **X**	12 **B**	18 **B**	24 **V**	30 **G**	36 **W**	42 **S**	48 **W**	54 **U**	60 **N**	66 **V**	72 **P**	78 **Z**	84 **I**	90 **A**	96 **R**
Class 1	4 **U**	10 **U**	16 **I**	22 **L**	28 **R**	34 **O**	40 **J**	46 **Z**	52 **K**	58 **W**	64 **Y**	70 **Z**	76 **D**	82 **C**	88 **H**	94 **C**	
Class 2	2 **K**	8 **G**	14 **O**	20 **W**	26 **Q**	32 **S**	38 **Q**	44 **E**	50 **T**	56 **I**	62 **B**	68 **T**	74 **W**	80 **T**	86 **K**	92 **E**	
Class 3	3 **R**	9 **H**	15 **L**	21 **F**	27 **P**	33 **S**	39 **S**	45 **K**	51 **J**	57 **A**	63 **N**	69 **M**	75 **G**	81 **J**	87 **U**	93 **K**	
Class 4	1 **B**	7 **O**	13 **S**	19 **B**	25 **Q**	31 **K**	37 **T**	43 **S**	49 **A**	55 **D**	61 **F**	67 **T**	73 **K**	79 **X**	85 **G**	91 **U**	
Class 5	5 **O**	11 **L**	17 **F**	23 **R**	29 **N**	35 **T**	41 **Q**	47 **Z**	53 **L**	59 **I**	65 **P**	71 **F**	77 **K**	83 **D**	89 **U**	95 **A**	

Cribs:

EAST (21-24) NORTHEAST (25-33) BERLIN (63-68) CLOCK (69-73) Tail (75-96)

Decrypt Formulas:

- Vigenère: P = C - K (mod 26)
- Beaufort: P = K - C (mod 26)
- Variant-Beaufort: P = C + K (mod 26)

Letter-Number: A=0, B=1, ..., Z=25

Class Function: class(i) = ((i mod 2) × 3) + (i mod 3)

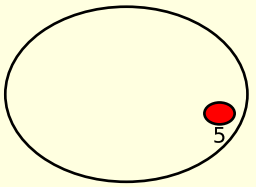
Forcing K at Anchor Positions

Crib: EAST

Index: 22

Ciphertext: L = 11
Plaintext: A = 0

Class: 1
Family: vigenere
Period L: 17, Phase: 0
Slot: 5



Class 1 Wheel

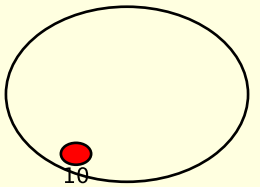
K = C - P = 11 - 0 = 11
K = 11 (L)
✓ K ≠ 0 (Option-A satisfied)

Crib: NORTHEAST

Index: 27

Ciphertext: P = 15
Plaintext: R = 17

Class: 3
Family: vigenere
Period L: 17, Phase: 0
Slot: 10



Class 3 Wheel

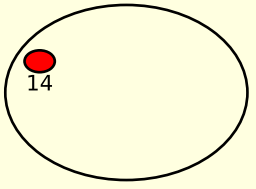
K = C - P = 15 - 17 = 24
K = 24 (Y)
✓ K ≠ 0 (Option-A satisfied)

Crib: BERLIN

Index: 65

Ciphertext: P = 15
Plaintext: R = 17

Class: 5
Family: vigenere
Period L: 17, Phase: 0
Slot: 14



Class 5 Wheel

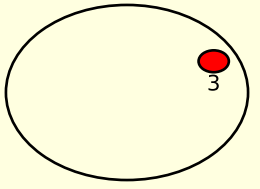
K = C - P = 15 - 17 = 24
K = 24 (Y)
✓ K ≠ 0 (Option-A satisfied)

Crib: CLOCK

Index: 71

Ciphertext: F = 5
Plaintext: O = 14

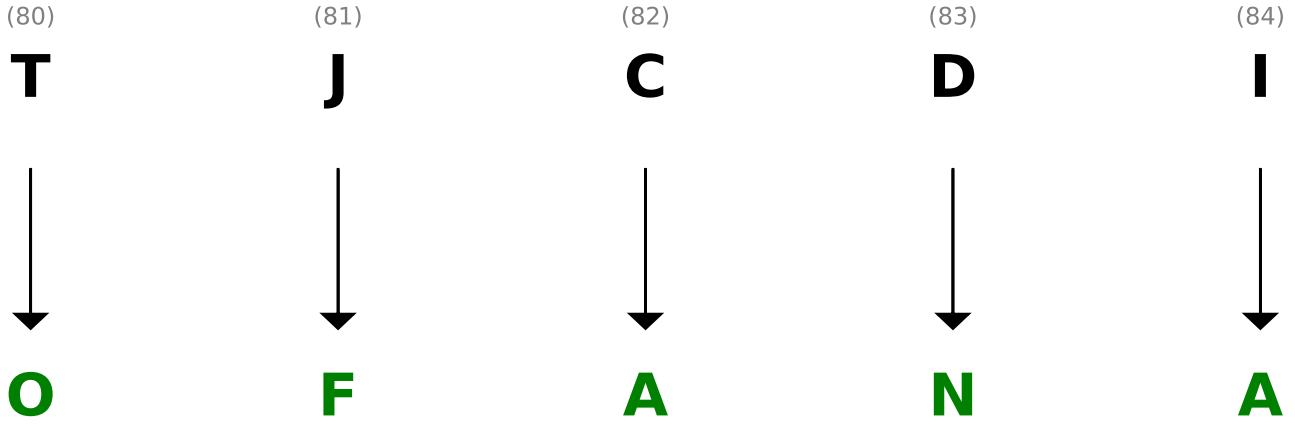
Class: 5
Family: vigenere
Period L: 17, Phase: 0
Slot: 3



Class 5 Wheel

K = C - P = 5 - 14 = 17
K = 17 (R)
✓ K ≠ 0 (Option-A satisfied)

Tail Propagation: Indices 80-84



"...JOY OF AN ANGLE..."

Index	CT	Class	Family	Slot	K	Formula	PT
80	T	2	beau	12	7(H)	P = K - C = 7 - 19 = 14	O(14)
81	J	3	vige	13	4(E)	P = C - K = 9 - 4 = 5	F(5)
82	C	1	vige	14	2(C)	P = C - K = 2 - 2 = 0	A(0)
83	D	5	vige	15	16(Q)	P = C - K = 3 - 16 = 13	N(13)
84	I	0	vige	16	8(I)	P = C - K = 8 - 8 = 0	A(0)

Verification: Round-trip & Drop-crib

Round-trip Verification

Example: Re-encrypting position 22 (EAST anchor)
Index 22: P=A → C = P + K = 0 + 11 = 11 → C=L ✓ (matches)

Example: Re-encrypting position 80 (tail)
Index 80: P=O → C = K - P = 7 - 14 = -7 ≡ 19 → C=T ✓ (matches)

Example: Re-encrypting position 40 (non-anchor)
Index 40: P=S → C = P + K = 18 + 2 = 20 → C=U ✓ (matches)

Drop-crib Illustration

With BERLIN crib:

Y	P	V	T	T	M
↓	↓	↓	↓	↓	↓
B	**E**	**R**	**L**	**I**	**N**

Without BERLIN crib:

Y	P	V	T	T	M
↓	↓	↓	↓	↓	↓
?	**?**	**?**	**?**	**?**	**?**

Note: Removing a crib does not reconstruct it. Those positions remain undetermined.