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NATIONAL SECURITY AGENCY

PROBLEM BOOK

COURSE, MILITARY CRYPTANALYTICS, PART I

(Short title: MC-I Problems)

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National Security Agency  
Washington 25, D. C.

May 1954

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## COURSE IN MILITARY CRYPTANALYTICS, PART I

## Monoalphabetic Substitution Systems

## Introduction

This is the first of a series of six basic courses in the science of military cryptanalytics. The purpose of this course is to impart to the student the methods and techniques which form the basis for the cryptanalysis of simple types of military cipher systems. An understanding of these principles is necessary to grasp the more advanced cryptanalytic techniques employed in the attack on the complex cryptosystems which constitute present-day military cryptography.

The scope of this course is: fundamental principles; uniliteral substitution; multiliteral substitution; polygraphic substitution; and miscellaneous monoalphabetic substitution systems. It consists of 10 lessons as follows:

- Lesson 1, Fundamental principles
- Lesson 2, Uniliteral substitution with standard and mixed cipher alphabets
- Lesson 3, Multiliteral substitution: miscellaneous matrices; Baconian and Trithemian systems; elementary Baudot-systems
- Lesson 4, Multiliteral substitution with variants
- Lesson 5, Polygraphic substitution: four-square and two-square matrices
- Lesson 6, Polygraphic substitution: Playfair cipher systems
- Lesson 7, Polygraphic substitution: large tables
- Lesson 8, Monoalphabetic substitution with irregular-length cipher units: monome-dinome systems and others
- Lesson 9, Syllabary squares and code charts
- Lesson 10, Miscellaneous monoalphabetic substitution systems; concealment systems

The text reference for this course is the National Security Agency publication "Military Cryptanalytics, Part I" by W. F. Friedman and L. D. Callimahos. The portion of the text which should be read by the student prior to doing each lesson is indicated in the lesson heading as the TEXT ASSIGNMENT. There are certain text *appendices* from which the student will derive considerable assistance in almost every lesson of this course, namely, Appendices 2, 3, and 4; no further restatement concerning these appendices will appear in the TEXT ASSIGNMENT of any lesson because of their universal applicability, but the student should become familiar with these appendices early in the course and should refer to them as often as necessary when working on each lesson.

This course has been designed as a self-study or extension-type course. The cryptograms contained herein have for the most part been arranged in proper worksheet form, obviating the necessity of recopying; and frequency distributions have been given to reduce the amount of time spent on the purely clerical labor incidental to the solution. The underlying texts of the cryptograms comprise hypothetical ground, naval, air, and general administrative messages. Where necessary for solution, the specific nature of the text of any particular cryptogram is indicated. Otherwise, the text of a message may be assumed to be general administrative or ground text.

The only materials required are cross-section paper of  $\frac{1}{4}$ -inch squares, and a set of printed and blank alphabet strips. An eraser is of the utmost importance.

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So far as is practicable, detailed work sheets which usually form a part of the solution should be submitted with the solutions. In all the lessons of this course, it is required that the student recover all cipher alphabets, cipher tables, and specific keys used. He will also be required to state the method of operation of each cryptosystem and give the key words upon which each component is based.

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COURSE	Military Cryptanalytics, Part I
LESSON 1	Fundamental principles
TEXT ASSIGNMENT	Chapters I-IV, inclusive

1. *a.* What four things were thought by Captain Hitt to be essential to cryptanalytic success?  
*b.* What six additional elements are also highly desirable?
2. *a.* Define the terms "cryptology", "cryptography", "cryptanalytics", and "cryptanalysis."  
*b.* What are the essential differences between substitution and transposition?  
*c.* Differentiate between a code and a cipher system.  
*d.* Explain the difference between the terms "general system" and "specific key."  
*e.* Distinguish between monoalphabetic and polyalphabetic substitution.
3. What four fundamental operations are involved in the solution of practically every cryptogram?
4. In the solution of cryptograms involving a form of substitution, to what simple terms is it necessary to reduce them in order to reach a solution?
5. Is it always necessary to determine the specific key in order to reconstruct the plain text? Explain.
6. Indicate the language in which you would expect the plain text of the encrypted portion of the following message to be written. Give reasons for your answer.

From: João Fialho, Rio de Janeiro.  
To: Gualterio Costa, Lisbon.

Com referência ao seu telegrama. NSM NRJPN INJ PMVCOEN  
VNPSN PMBMPDEN QMT JBCVCJ IJUM DTGAJ LTMCPN KPJUCEMIVCNP PMHMQQN  
UMIVCHMISJQ SMPVMCPJ SPCHMQSPM.

7. *a.* The letter *E* represents what percentage (to the nearest *whole* percent) of the letters in English telegraphic text?  
*b.* What are the four most frequent consonants in English telegraphic text?  
*c.* What are the five letters of lowest frequency in English telegraphic text?  
*d.* What are the four most frequent digraphs in English telegraphic text?  
*e.* Account for the discrepancies between frequencies of letters in English literary text and English telegraphic text.

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8. What three facts can be determined from a study of the uniliteral frequency distribution?

9. In the following extract from a speech given during World War II, each dash indicates the omission of a letter. Complete the text by writing the necessary letters over each dash to form appropriate words.

"Washington's Birthday is a most a p \_\_\_\_\_ occasion for us to talk with each \_\_\_\_\_ about things as they are \_\_\_\_\_ and things as we \_\_\_\_\_ they shall be in the \_\_\_\_\_.

"For \_\_\_\_\_ t years, General Washington and his \_\_\_\_\_ Army were faced c o \_\_\_\_\_ with formidable \_\_\_\_\_ and recurring \_\_\_\_\_ and equipment were lacking. In a \_\_\_\_\_, every winter was a Valley Forge. Throughout the \_\_\_\_\_ states there existed selfish men, jealous men, \_\_\_\_\_ u l men, who \_\_\_\_\_ that Washington's \_\_\_\_\_ was hopeless, that he should ask for a n \_\_\_\_\_ peace.

"Washington's \_\_\_\_\_ in those hard \_\_\_\_\_ has provided the \_\_\_\_\_ for all Americans ever since--a model of moral \_\_\_\_\_ a. He held to his \_\_\_\_\_, as it had been charted in the Declaration of Independence. He and the \_\_\_\_\_ men who \_\_\_\_\_ with him knew that no man's life or \_\_\_\_\_ was secure, without freedom and free i \_\_\_\_\_ n s.

"The present \_\_\_\_\_ struggle has \_\_\_\_\_ us increasingly that \_\_\_\_\_ o m of person and \_\_\_\_\_ y of property anywhere in the \_\_\_\_\_ depend upon the security of the rights and obligations of liberty and \_\_\_\_\_ everywhere in the world.

"This war is a new \_\_\_\_\_ of war. It is \_\_\_\_\_ from all other wars of the \_\_\_\_\_, not only in its methods and \_\_\_\_\_ but also in its geography. It is warfare in terms of every c o n \_\_\_\_\_, every \_\_\_\_\_ n d, every sea, and every a \_\_\_\_\_ n e in the world. The \_\_\_\_\_ oceans which have been h e r \_\_\_\_\_ in the past as our \_\_\_\_\_ from attack have become \_\_\_\_\_ s s battlefields on which we are \_\_\_\_\_ being challenged by our enemies."

10. a. In the following examples the words of sentences have been transposed. Rearrange the words to make plain text.

- (1) AT NOTHING REPORT THIS TIME TO
- (2) ARTILLERY SECTOR BARRAGE NORTHWEST HEAVY IN

b. In the following examples the letters of several words of each sentence have been transposed. Rearrange the letters to make good words that will give intelligible plain text.

- (1) Eight SESTYODRER have DTPADERE to join SAKT REOFC
- (2) ABELNU to contact ATTAINBLO on my right AFKLN

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c. In the following examples the words of each sentence have been transposed and, in the case of several words, the letters have also been transposed. Reconstruct the plain text.

- (1) OLANG RIDGE TANK GIMNOV EHOTISL EAST NOMLCU  
 (2) DOWN MEYEN OFANERTON SIX THIS OTHS SNEALP

d. In the following examples, the letters of each word of each sentence have been rearranged in the order in which they appear in the normal alphabet.- Reconstruct the plain text.

- (1) ADELY AACKTT CDDEEHL SU OT CCEEMMNO AT EGHIT HIST GIMNNOR  
 (2) ADEEIIILMMTY NOPU CEEIPRT ADHIRTWW OT AADEEGNPRRR IINOOPST

e. In the following examples the plain text has been broken up into groups of five letters and then in each group of five the letters have been rearranged in the order in which they appear in the normal alphabet. Reconstruct the plain text.

- (1) ORSUU ABIMR AEHNS ENSUV ADKOR ADEGM EEINN EMNVY EELSS S  
 (2) AEIRR ACNNO AINSS CEEPR AORST ILLRT EEMRY ACELP EMNST DERST  
 DEOY

11. Using cross-section paper prepare a uniliteral frequency bar distribution of the letters of the following paragraph:

"The shortest and surest way to live with honor in the world is to be in reality what we would appear to be; all human virtues increase and strengthen themselves by the practice and experience of them."

12. Determine the class to which the cipher systems, which were used in enciphering the following messages, belong:

a. O R A N A T H P N O S K T C D M E E E S C E R A E  
 R N U S A E T L G D A Y E C 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. D H J J K Q O A H R X K S O F H P Q G A P P H L A  
 D I A D E H J R O A M A H Q 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

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c. R O L E H    K B W F Z    C Q C P Z    N V J W Z    M I V E Q  
 E P C I N    O J S J U    Y M W Q B

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

13. Which of the following substitution ciphers are monoalphabetic?

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

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

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

c. G X Y V L    Z X M X S    L O Z G R    W E J L X    P W T K Z  
 G M X L W    Q I V Z W    Q B R X K    K T D V L    M X A E X  
 V H M X A    L O T L Y    T K D W X    G B Q K Q    L W Z X G  
 R T Y Y Z    K T O X G    A W X L Q    L O Z G R    X V W G Q

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

14. The following messages were enciphered monoalphabetically. Determine in each case whether the cipher alphabet used was a standard or mixed alphabet and if standard, whether direct or reversed.

a. A N V O R    L O U N Q    R L E Z W    Z H N E Z    W Z B O R  
 Z K Y L F    A O Z S O    O N O R F    P J Z P P    L D Z D N  
 L R Z L B    L A B W Z    H N A P O    W Q H O O    R Z I Z U

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

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b. ESPAP LVDLY OECZF RSDTY ESTDO  
 TDECT MFETZ YBFTN VWJTO PYETQ  
 JTELD OTCPN EDELY OLCON TASP C

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

c. PYHYL XOLWY JJVYX OILYR YQYPJ  
 KNYLK YHYLC PAYAC LYXIR QYJVO  
 ZKOXC PCREK UKUPJ IUJUO PRIAS

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

15. Derive the  $\phi_p$ ,  $\phi_r$ ,  $\phi_o$ ,  $\Lambda_p$ ,  $\Lambda_r$ , and  $\Lambda_o$  for each of the following distributions, and evaluate the [monoalphabetic] goodness of  $\phi_o$  and  $\Lambda_o$  of each in terms of "good", "fair", or "poor", entering these data in the attached diagram. On the basis of the foregoing, decide which distributions are most probably monoalphabetic and which are most probably non-monoalphabetic, indicating your decision by a check ( $\checkmark$ ) in the diagram; in the case of those not clearly belonging in either of these categories, check "decision suspended".

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. 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

c. 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. 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

e. 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

f. 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

g. 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

h. 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

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	N	$\phi_p$	$\phi_r$	$\phi_o$	$\Delta_p$	$\Delta_r$	$\Delta_o$	Goodness of $\phi_o$			Goodness of $\Delta_o$			Decision		
								G	F	P	G	F	P	mono.	non-mono.	susp.
a.																
b.																
c.																
d.																
e.																
f.																
g.																
h.																

16. From the intercepted traffic of three intercept stations operating in the same sector of the front, the following code messages were selected for study by a member of the cryptanalytic section at GHQ. They are undoubtedly three versions of one enemy message, but there appears to be a number of differences, due no doubt to operating difficulties at the several stations. Study the messages and reconstruct from them the actual code text sent by the enemy station.

I. Time intercepted 1612 by HS

W F F DE L D C

GR 35 BT

```

NR 17   D Y B I E   D U F T O   A M E J A   K I B O N
S G C O Y   F O B A K   D O D L A   L U F Y D   K A W A L
A P A Y N   C O D A P   K E D U R   J O P I D   J E N O X
M E H A Z   L O G I S   K U T E G   E V A U K   I P B E M
K E H Z A   H O B W E   A V D U Z   F O F A _   E M C O Z
E G B L O   D O F Y O   E N C _ _   M A W E N   _ _ _ _ _
_ _ _ _ _   _ _ _ _ _   _ _ _ _ _   _ _ _ _ _   _ _ _ _ _

```

II. Time intercepted 1610 by MR

M F F DE L D C

GR 35 BT

```

NR 0_   D Y B I E   B U F T O   A M E J A   K I B O N
I P K O _   F _ B A K   D O D L A   L U F Y L   K A W A L
A P A Y N   _ _ _ _ _   _ _ D U A   _ _ P I D   J E N O X
N E H A Z   L O G I S   K U T E G   E V A U C   I R B W
K E H Z A   S O B W E   V A D U Z   F O F E T   E M C O Z
E G B L O   D O F Y O   A E C D A   M A W E N   _ _ _ O M
E M C O Z   A C F A H   L O F I R   0 9 3 5

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III. Time intercepted 1612 by YG

W F F DE L D K

GR -- BT

NR 17 D Y B I E D U F T O A M E J A K S B O N  
 I P C O Y \_ \_ \_ A \_ D O \_ \_ \_ L U F Y L K A W A L  
 A P E T Y N C O D A P K E D U R W O P I D J E N O X  
 M E H A Z L O G H K U T E G E V A U K I P B E M  
 K E H Z A H O B W E A V D U Z F O F E T E M C O Z  
 E G B L O D O F Y O E N C O A M A W E N M A W E N  
 E X F O M E M C O Z A C F A H L O F I R Ø 9 3 5

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COURSE	Military Cryptanalytics, Part I
LESSON 2	Unilateral substitution with standard and mixed cipher alphabets
TEXT ASSIGNMENT	Chapters V and VI

1. *a.* What is the first step one should take in attempting to solve an unknown cryptogram that is obviously a substitution cipher?

*b.* If this step is unsuccessful and the cryptogram is obviously monoalphabetic in character, what type of cipher alphabet may be assumed to have been used?

2. *a.* Name two methods of solving monoalphabetic substitution ciphers involving standard cipher alphabets.

*b.* In the solution of a substitution cipher by completing the plain component sequence involving reversed standard alphabets, what are the successive steps?

*c.* Why do monoalphabetic cryptograms involving standard cipher alphabets yield such a low degree of cryptosecurity?

3. What are four characteristics of vowels which permit their classification as such in monoalphabetic substitution ciphers involving mixed cipher alphabets?

4. *a.* What two places in every message lend themselves more readily to successful attack by the assumption of words than do any other places? Explain.

*b.* What is meant by the "probable word method" of solution?

5. *a.* What is meant by the word pattern "A B C B A D B"?

*b.* For each pattern given below, indicate one good English word that contains the pattern:

(1) A B C B A D B

(2) A A B A

(3) A B C D A

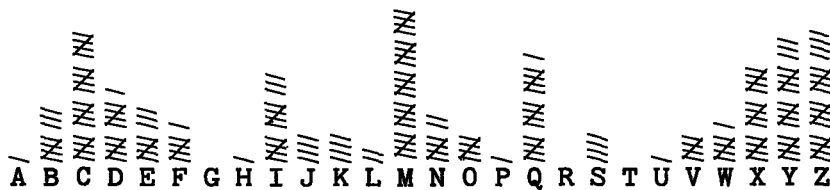
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6. Give two reasons why the enciphered text of a military message is generally divided into groups of five characters, prior to transmission.

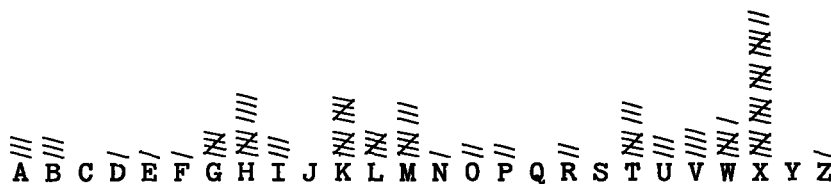
7. Solve the following cryptogram and indicate the specific key ( $A_p = \theta_c$ ):

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


  
 $\phi_p = 2655$                        $\phi_r = 1531$                        $\phi_o = 2636$

8. Solve the following cryptogram, and indicate the specific key:

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


  
 $\phi_p = 660$                        $\phi_r = 381$                        $\phi_o = 848$

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9. Solve the following cryptograms, and indicate the specific keys:

a. Q H H Y L   Y D W Q J   J M E F C

b. Y X S E D   Y F S X U   H W X U S

10. The following badly garbled cryptogram was intercepted. Reconstruct the original plain-text message, resolving the errors and omissions, and indicate the specific key:

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

$\phi_p = 2270$        $\phi_r = 1311$        $\phi_o = 2136$

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11. *a.* Construct a trilateral frequency distribution showing one prefix and one suffix of the letters of the cryptogram below. On the work sheet below, indicate by underscoring in black all repetitions of three or more letters. Other significant details may be marked in different colors.

*b.* Prepare a condensed table of repetitions of digraphs and trigraphs appearing more than twice, and include all repetitions of longer polygraphs.

*c.* Using the data obtained in *a* and *b* above, complete the solution of the cryptogram, and recover all keys.

	5	10	15	20	25
A	U B S Y B	V X R P N	C G U M Z	X G P N P	C U B Q P
B	U X X F Z	X B N B M	I G V R P	N V X U Y	R X G N D
C	F B Z H I	Z U X G L	L B U I B	M Q L Z R	B M B N X
D	V G N O P	P A B A Z	U B Z P N	B C G H B	M G L B V
E	N P U X F	B Z V X P	C D U B B	N H G L L	B V X P Q
F	Q F P X P	D U Z Q F	G R U B R	P N N Z G	V V Z N R
G	B M G V V	G P N V N	B D Z X G	H B E B R	Z Y V B P
H	C Z A H B	U V B O B	Z X F B U	R P N A G	X G P N V

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12. Solve the cryptogram below, suspected to contain the probable word "BLOCKADE"; recover all keys.

	5	10	15	20	25
A	LCTCE	<u>LUZOD</u>	UCREA	WZUSN	FZXDY
B	DRTL D	SDRZS	<u>DEUCM</u>	UZZKZ	UDCDV
C	TQTXD	AOYZC	<u>ZWYDX</u>	PTVZD	<u>SCMZZ</u> →
D	← <u>RZAQL</u>	<u>LDECM</u>	ZURXD	TLCMT	LWZZR →
E	← <u>ZSSZX</u>	<u>CZVLC</u>	<u>DOUDX</u>	PZCWT	UUTHZ
F	SUDAD	<u>EUFZL</u>	LZYLX	DRCNR	EZLCD
G	MTUTL	LM DLC	NYZLM	<u>DUZOD</u>	LNCND
H	RLTRV	MTLVT	ATHZV	UTNYY	NRZLX

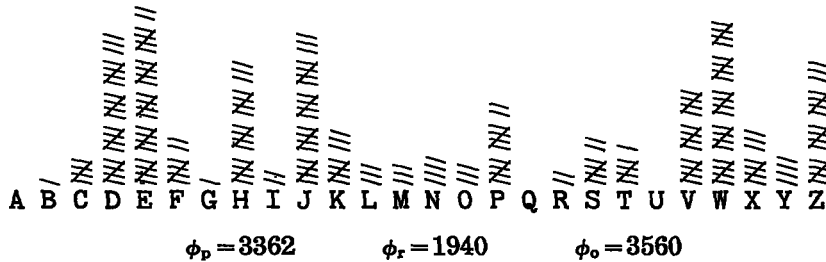
$\phi_p = 2655$        $\phi_r = 1532$        $\phi_o = 2770$

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13. Solve the following cryptogram, and recover all keys:

	5	10	15	20	25
A	J Z D F V	W H E D Z	V H W D S	Y K T W D	O E D Z D
B	E D S E C	C W H H W	E D Z T E	X X W S Z	V N Z V Z
C	S P F J K	V Z T Y P	H J D W O	L J W D P	V P W T I
D	R E D Z E	X E K V F	P J V E Y	H H J E F	E D Z F V
E	W H E D Z	V H J P J	Z H J L P	J X E K V	J L T W M
F	W H W E D	W H W D M	W S W D W	J R E X I	Y K Z C E
G	K D J P W	D C E M W	D O N Z H	J J E P J	J P S B E
H	K V F E H	W J W E D	H N Z H J	E X X P W	V J E N D
J	H J E F S	E D X W V	C P J W E	D V Z G K	Z H J Z T



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14. Using the sequences recovered in Problem 13, solve the following cryptograms and indicate the specific keys:

a. URJJR XQUQX KSARB BETOI

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

$\phi_p = 25$        $\phi_r = 15$        $\phi_o = 16$

b. FDLDY XZUMU EUFPN DVOFE ALYRW

UMLJX AFDYE XEKQP DOYCV REUAX

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

$\phi_p = 163$        $\phi_r = 94$        $\phi_o = 118$

15. The following cryptograms, enciphered with random cipher alphabets, are in bona fide word lengths. Solve them.

a. HY ARVJZGHAROT VK CGKMMGKHZM LKUG

LKUG OROE HOZ EMVHFSRMJROT

JEHZPUHGVEGM RO MCJKKSJKUME

b. RGRQRU TDSFYURDP ZFTAVDRC AYCFO

JO DRZYUUFSPPFUZR TFADYGP

c. CDGWDSA LCAUMMDCR BUCD YV DVDJR

IYSUAUYVS LZCYSS CUTDC

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16. In solving several unrelated monoalphabetic cryptograms, the following cipher alphabets were reconstructed. Recover the key words from any five of these alphabets. To facilitate solution, significant segments have been underlined.

a.

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

b.

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

c.

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

d.

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

e.

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

f.

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

g.

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

h.

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

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COURSE Military Cryptanalytics, Part I  
 LESSON 3 Multilateral substitution with single-equivalent  
 cipher alphabets  
 TEXT ASSIGNMENT Chapter VII

1. Solve the following cryptogram, and recover all keys:

	5	10	15
A	DT LR WE OE <u>OE</u> WH RR WR LA WH WA DE DA WR LE		
B	<u>LE</u> OR RE WT OR WA OH WH OR LE LR WA RR RR WH		
C	WA WH OE OR LE LE WR WA WH <u>OH LR LE LR WA</u> OH		
D	OE LR OA OA OE LR OR RE OA OA WH WT WH <u>WA WA</u>		
E	<u>WR WA WH DE</u> RT OE WH WH RE OR OA RT OE LR OR		
F	RE WR WE WA OH DE WR LR <u>WA WA WR WA WH DE</u> DA		
G	LR LR WA WH <u>OA DE LR LT</u> LT LR OA WR DE WR LR		
H	WA OA LR RA RA LR WE OE DE RT <u>OE WH RR WR LA</u>		
J	WH WA DE DA WR LE <u>LE</u> OT WH OE WH WH WA RA LR		
K	OE OH WH RE OT DT OR RE RE WR DE WR LR WA OR		
L	LE OR OE DE WR LE LE WH OE DT OA WE LT LT LR		
M	OE DE <u>OA DE LR LT</u> <u>OH LR LE LR WA</u> WH LE OT WH		
N	WA WA WR WA RR		

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	A	E	H	R	T
D	3	12	-	-	3
L	2	13	-	21	5
O	10	14	6	10	3
R	3	7	-	5	3
W	22	4	22	15	2

$\phi_p = 2270$

$\phi_r = 1362$

$\phi_o = 2362$

(25-element alphabet)

2. This message was sent by the Fifteenth Infantry. Solve it and recover all keys:

	5	10	15
A	CY	AO NX CN NO CN AO AO OG ON	<u>NG BY OX OX</u> RO
B	CG	NY RO AN RE AG RO OX AO AN AX AX AG AN AG	
C	CN	RO OX OX BY AN AG CN BE CX BN BX CG RO ON	
D	CO	RE CN AY BG CE <u>ON NO AO OG RO NO</u> NO RO RE	
E	OO	<u>NG BY OX OX</u> RY AG AX BY AN OG CN AO OY OG	
F	NO	OX CY NX OG AO AN CN AG RE AG BY OG NO AO	
G	BO	AO CN CG AG CN ON BO CN AO OY CO OE <u>ON NO</u>	→
H	AO	<u>OG RO NO</u> NG RO NO AG CN RE AO OX RX AE BY	
J	AN	BO	

	E	G	N	O	X	Y
A	1	9	7	12	3	1
B	1	1	1	3	1	6
C	1	3	11	2	1	2
N	-	3	-	9	2	1
O	1	7	5	1	9	2
R	5	-	-	9	1	1

$\phi_p = 960$  (approx.)

$\phi_r = 410$

$\phi_o = 716$

(36-element alphabet)

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3. Solve the following cryptogram, and recover all keys:

	5	10	15
A	<u>RG GP EE GR</u> RG GP <u>ES GR RG PP GE</u> PR GE RG GS		
B	AS GR RR GS AE PP GP GA PP RA <u>EA ES GR RG</u> PP →		
C	← <u>GE RA PR GS</u> RE GP AR GP GS PP GP RG RA EA PP		
D	PS PG <u>AR PE GA RR RG GP RR</u> RE PG PP RA EA RS		
E	PG PE RG <u>AR PE GA RR RG GP RR</u> RP AE GS GA AP		
F	GP PP RA EP ES GP RA GP RA PE PR PR AE GR GP		
G	RA GA GP GP RR GP RR GR AS AS GP RR GR GS PP		
H	GP AE GE RS PG RG GS RE PP GR GG GS <u>PP GR PG</u> →		
J	← <u>GA PG RS RE PG AS PR GS GA GE RR</u> <u>EA ES GR RG</u>		
K	RR RP <u>GS PP PP GS</u> AE <u>GR PG GA</u> EP <u>RG GP EE GR</u>		
L	RA GR <u>PP GR PG GA</u> AR GS RA RP GP GP GA GS PE		
M	ES PG RG GR ER GP RR RP GE RG GP AG GR AS GP		
N	GA PP GS AE AR PA EP RG GP PR AE GE <u>RG GP EE</u>		
P	GP RA PP GP RR		

	A	E	G	P	R	S
A	-	7	1	1	5	5
E	4	3	-	3	1	5
G	11	7	1	27	16	14
P	1	5	10	16	6	1
R	11	4	16	4	12	3

$\phi_p = 2260$  (approx.)

$\phi_r = 1164$

$\phi_o = 2294$

(30-element alphabet)

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4. Solve the following cryptogram, and recover all keys:

	5						10				
A	AAC	AAB	BBA	AAB	AAC	AAB	<u>ABB</u>	<u>ACC</u>	<u>AAB</u>	CCA	
B	<u>ABA</u>	<u>ABC</u>	<u>AAC</u>	CAA	AAB	BAA	BAA	AAA	BBB	AAB	
C	ABB	ABC	CAA	BAB	AAB	AAC	BBA	ACB	CBA	AAB	
D	BBA	BCC	ACB	BBB	BBC	ACA	BBA	<u>ABA</u>	<u>ABC</u>	<u>AAC</u>	
E	ACA	BBC	AAC	AAB	AAB	BBC	AAA	BAA	BAB	AAB	
F	AAB	ABB	ACC	AAA	<u>ABB</u>	<u>ACC</u>	<u>AAB</u>	BCC	BCC	AAB	
G	BAC	CCC	ABB	AAB	CBC	ACA	ACA	AAC	ACB	CAB	
H	AAA	ACA	<u>CCB</u>	<u>AAB</u>	<u>AAC</u>	<u>ABA</u>	BAA	ACB	CBC	<u>CCB</u>	→
J	<u>AAB</u>	<u>AAC</u>	<u>ABA</u>	<u>CCB</u>	<u>AAB</u>	<u>AAC</u>	<u>ABA</u>				←

2: A A A B B B C C C  
 3: A B C A B C A B C

	A	4	18	10	5	5	3	5	4	3
1:	B	4	2	1	4	2	3	-	-	3
	C	2	1	-	1	-	2	1	3	1

$\phi_p = 499$        $\phi_r = 277$        $\phi_o = 542$

(27-element alphabet)

5. Solve the following naval message, and recover all keys:

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

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6. Solve the following cryptogram, and recover all keys:

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

7. Solve the following cryptogram, and recover all keys:

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

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8. The following is a text in the Baudot teleprinter code enciphered by a simple machine employing five two-position switches which operate polarized relays. Each switch has the function of changing the polarity of its respective baud (a single "mark" or "space" impulse), if the switch is in the 'active' position. If the switch is in the 'inactive' position, the polarity of the baud is unaffected. The switch settings remain constant for each message. As an example, if switches 1 and 4 are active (x), and 2, 3, and 5 are inactive (o), then the word REPORT is enciphered thus:

Key:   xooxo  xooxo  xooxo  xooxo  xooxo  xooxo  
 Plain: -+-+-  +----  -++++  -----  -+-+-  -----  
 Cipher: ++---  ----+  +++++  +----+  +----  +----+

Solve the message and recover the switch settings:

	1	2	3	4	5	6	7	8	9	10
A	+--+	+--+	+---	+--+	++++	+---	-+++	-----	-----	-+--+
B	+--+	+---	+---	----	++++	+--+	-+++	++++	++++	----
C	+--+	++++	-+--+	+--+	+--+	+---	-+++	++++	+---	++++
D	+++	+++	-+--+	++++	-----	+---	----	++++	++++	----
E	+---	+--+	+---	+---	+---	-+--+	+---	+---	+---	+---
F	+---	-+++	-+--+	+--+	+---	+---	-+++	-+---	+---	-----
G	+++	+---	-+--+	++++	++++	+---	+---	-+++	+---	+---
H	-+++	+--+	-+--+	++++	+---	+---	+---	+---	+---	-+---
J	-+---	+--+	-+--+	+---	+---	+---	----			

3: + + + + - - - -  
 4: + + - - + + - -  
 5: + - + - + - + -

++	5	1	4	4	3	1	6	1
+-	1	5	-	8	4	1	13	1
1,2: -+	-	3	4	3	1	3	1	2
--	2	-	5	-	2	-	-	3

$\phi_p = 480$  (approx.)       $\phi_r = 234$        $\phi_o = 386$

(32-element alphabet)

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NATIONAL SECURITY AGENCY  
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COURSE Military Cryptanalytics, Part I  
LESSON 4 Multilateral substitution with variants  
TEXT ASSIGNMENT Chapter VIII

1. Solve the following cryptogram, and recover all keys:

	5	10	15
A	RA DE KE PE VE TI BO LA GO DU JO BE KI BI JO		
B	BU JA VA ME LA BE KI RE FE DO VI JO SA DO JE		
C	KI BA MO SA CU GE GE PI BO KI JU CE CI MI NE		
D	PO JU CE RE NA BU BE KO RA DE KE TE SE TI JO		
E	FA GO DU DO JE KI DI JO BU JA CE BO FO BA BU		
F	DA LE JO NI DO NA BO BE PI GI ME TE CO JO TI		
G	SA BO TI DU MO FA BU NA DU DE TO GI BE SE BU		
H	GE CO PA TA KE CE NA VA MO LO ME NA DU DE CE		
J	BO FO DA DU DA LE BO SI JO VA DO DE TI NI DO		
K	CO FI DE VE CI BU DA LE BO VI DO NA JO BE KI		
L	VA DU DE KO GO RE MO PE SA RA JE KA DO PI RI		

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2. Solve the following cryptogram, and recover all keys:

	5	10	15
A	DR DD SY DA	RA RR SB YA BT TY AR HI DB TB AD	→
B	← YY YB SA AA HI DA TD HR YB TD	RB RI AI HH BT	
C	DD IA AI BB HA YD TH YA HI BA YT YD YY BD YH		
D	SD DI SB AA ST YD RH SD SR YR DT SR RA RR YB	→	
E	← SA BT TY HR AI DB IB AD DY YB SA HA HI DA TD		
F	TS DB SH YH DI SD TT TT YY HH ST	YI SB AA ST	→
G	← DD AH DH YT RH HI ID AR SB BA RI	HB AI HI RH	
H	DB SH HA RI DA AI IB YB DI SI	DD YA BB YT HH	
J	II YH TY BS DD YR SR RI HH TD DT TA AI RY ST		
K	SH DH AB AI TI YT AH HY AR AI RH DI YD	DD YA	→
L	← TB DT HH SB AA DT DD RH YD DR YB DH SH SR DD		
M	DA SI RI ID ST BD SI SD TT BH SH RI AA HI BB		
N	IS BI HI RH AY DB BA AI DH SH		

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3. Solve the following cryptogram, and recover all keys:

	5					10					15				
A	99	18	57	82	12	28	78	90	25	04	15	30	04	06	14
B	57	34	64	20	72	15	30	02	57	44	84	52	66	11	81
C	87	58	35	78	31	14	70	90	68	47	30	13	15	21	86
D	92	43	10	30	35	20	31	32	64	18	57	26	84	12	06
E	34	25	69	72	90	78	07	90	31	29	57	50	82	19	53
F	31	72	51	36	10	86	36	47	18	67	26	04	92	82	30
G	08	31	58	90	88	87	91	10	20	82	31	14	56	57	31
H	88	04	31	30	66	47	30	36	18	99	20	06	97	31	21
J	55	99	18	20	10	28	74	68	90	41	69	82	90	78	31
K	86	88	15	91	26	92	72	87	14	43	20	53	28	64	92
L	47	02	58	35	10	96	05	34	37	85	06	26	80	50	92
M	68	10	70	81	92	18	02	86	49	47	07	82	94	06	69
N	15	21	90	56	10	40	01	68	90	15	35	57	52	32	60
O	47	64	36	71	06	55	00	68	78	45	52	12	69	43	

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4. This message is suspected of having an ending similar to Problem 3. Solve it and recover all keys:

	5					10					15				
A	22	08	71	29	19	83	05	34	76	58	05	56	62	26	22
B	35	48	75	13	78	58	34	65	02	07	71	51	87	35	96
C	10	32	69	45	47	81	46	11	01	14	67	37	75	79	35
D	← 30	53	29	37	46	60	19	30	94	66	49	68	88	57	98
E	84	93	30	86	28	90	51	04	53	03	84	76	58	31	57
F	← 42	12	86	49	36	79	54	28	09	38	24	41	86	63	79
G	← 08	28	67	68	66	94	22	63	71	66	83	56	05	07	58
H	← 95	60	19	62	26	48	23	59	40	38	15	67	43	92	42
J	62	77	43	79	54	69	38	65	16	82	10	96	67	97	57
K	← 48	93	24	13	53	29	46	37	32	65	12	94	84	95	68
L	83	93	98	37	75	79	45	12	97	84	53	03	75	76	95
M	← 31	29	32	21	49	17	25	73	00	69	86	36	79	45	19
N	77	98	38	95	97	93	94	98	72	42	59	00	08	50	44
O	27	26	62	57	06	91	23								

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## FREQUENCY DISTRIBUTIONS

	A	E	I	O	U
B	2	6	1	8	7
C	-	5	2	3	1
D	4	6	1	8	7
F	2	1	1	2	-
G	-	3	2	3	-
J	2	3	-	9	2
K	1	3	6	2	-
L	2	3	-	1	-
M	-	3	1	4	-
N	6	1	2	-	-
P	1	2	3	1	-
R	3	3	1	-	-
S	4	2	1	-	-
T	1	2	5	1	-
V	4	2	2	-	-

Problem 1

	A	B	D	H	I	R	S	T	Y
A	5	1	2	2	9	3	-	-	1
B	3	3	2	1	1	-	1	3	-
D	5	5	8	4	4	2	-	4	1
H	3	1	-	5	8	2	-	-	1
I	1	3	1	-	1	-	1	-	-
R	2	1	-	6	6	2	-	-	1
S	3	5	4	6	3	4	-	5	1
T	1	2	4	1	1	-	1	3	3
Y	4	6	5	3	1	2	-	4	3

Problem 2

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

Problem 3

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

Problem 4

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5. Solve the following cryptogram, and recover all keys:

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

6. Solve the following cryptogram, and recover all keys:

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

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7. Solve the following cryptogram, and recover all keys:

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

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8. The following cryptograms are suspected to be isologs. Solve them, and recover all keys:

## Message "A"

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

## Message "B"

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

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9. The following naval messages are suspected to be isologs, containing the probable word "TASK FORCE" Solve them, and recover all keys.

## Message "A"

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

## Message "B"

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

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10. The following cryptogram is suspected to begin with the opening stereotype "REFERENCE YOUR MESSAGE...". Solve it, and recover all keys.

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

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NATIONAL SECURITY AGENCY  
Washington 25, D. C.

COURSE

Military Cryptanalytics, Part I

LESSON 5

Polygraphic substitution: four-square and two-square matrices

TEXT ASSIGNMENT

Pars. 64-70, inclusive; par. 73

1. Construct a digraphic distribution for the cryptogram below. Solve the cryptogram, and recover all keys.

	5					10					15				
A	MH	EA	XP	SO	ZP	LM	HT	XN	PR	QU	EH	HG	<u>RH</u>	<u>GR</u>	<u>LC</u>
B	<u>HU</u>	<u>ZW</u>	<u>VA</u>	BD	MD	WO	HU	<u>ZB</u>	<u>XR</u>	DD	DU	<u>RH</u>	<u>GR</u>	<u>CG</u>	HO
C	<u>SO</u>	<u>ZB</u>	<u>XN</u>	<u>WS</u>	<u>ZO</u>	RG	BL	PC	SO	ZP	ZC	OC	BL	BT	QL
D	CP	GR	CC	LU	SD	WS	PR	PX	MD	YG	AM	DF	MH	IL	QH
E	<u>CQ</u>	<u>YO</u>	<u>IQ</u>	<u>PF</u>	<u>GF</u>	ND	BI	PF	CC	VA	<u>LF</u>	<u>CC</u>	<u>CQ</u>	<u>YO</u>	OZ
F	RT	OQ	VH	CG	IQ	KP	DL	IY	<u>AO</u>	<u>HA</u>	<u>CG</u>	<u>HO</u>	<u>PF</u>	<u>GF</u>	TD
G	<u>CP</u>	<u>AO</u>	<u>HA</u>	<u>CV</u>	<u>LF</u>	<u>CC</u>	<u>CQ</u>	<u>YO</u>	QU	OD	CN	OG	CN	WA	QC
H	HT	MH	KQ	ZG	<u>LC</u>	<u>HU</u>	PB	GT	ID	WQ	OF	WG	ZO	LG	KG
J	DL	<u>ZW</u>	<u>VA</u>	<u>ZB</u>	<u>XR</u>	AU	VA	DH	PF	MH	PF	ZB	OH	WL	<u>CG</u>
K	<u>HO</u>	LZ	<u>SO</u>	<u>ZB</u>	<u>XN</u>	<u>WS</u>	<u>ZO</u>	IU	TA	AO	GA	HA	<u>EU</u>	<u>MH</u>	YO
L	LT	<u>EU</u>	<u>MH</u>	HU	LV	WQ	MZ	YT	ZT	<u>ZO</u>	<u>YG</u>	<u>SO</u>	LZ	CP	EU
M	ON	MU	WG	RT	<u>CG</u>	<u>HO</u>	<u>MH</u>	<u>MS</u>	<u>PR</u>	OT	MF	LF	CP	KS	RO
N	WZ	MN	QU	<u>CP</u>	<u>AO</u>	<u>HA</u>	<u>CV</u>	CO	MH	DT	DU	<u>PF</u>	<u>GF</u>	NQ	YG
O	QD	IB	WS	<u>ZO</u>	<u>YG</u>	BB	YO	ZN	XR	LW	HU	<u>IQ</u>	WS	<u>QD</u>	<u>DC</u>
P	ZB	IB	RM	SO	EN	IA	RU	DW	GR	<u>CG</u>	<u>HO</u>	<u>MH</u>	<u>MS</u>	<u>PR</u>	<u>QD</u>
Q	<u>DC</u>	LZ	TN	WL	KN	PF	XD	UT	WA	ZO					

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2. The following cryptogram is suspected to contain the probable word "REQUISITIONS".  
Solve it and recover all keys.

				5						10					15
A	<u>DI</u>	<u>AF</u>	<u>IQ</u>	GY	II	KG	IT	GC	QC	OV	DE	KU	DM	RI	RN
B	<u>RO</u>	<u>NK</u>	UN	KP	DH	CU	RH	PA	<u>QQ</u>	<u>PL</u>	<u>OD</u>	CM	YB	<u>HE</u>	<u>MR</u>
C	QQ	EG	LP	QC	IP	OP	LN	SN	DT	DP	UT	RS	EM	RN	OA
D	QL	OD	DA	QC	DZ	EM	WK	NK	DC	XP	RK	HT	HE	QR	QU
E	BP	LP	LK	NQ	LE	SR	HF	SQ	SO	QR	CM	QL	HL	AC	TX
F	GK	KF	CM	TT	OB	RP	IT	BK	MP	HL	BC	IU	MT	ZF	RW
G	ZR	CK	CM	DC	VC	OA	UA	QP	RR	IV	RQ	PK	TP	CE	QH
H	KP	UC	<u>RO</u>	<u>NK</u>	HO	<u>QQ</u>	<u>PL</u>	<u>OD</u>	CM	YB	HE	MR	<u>DI</u>	<u>AF</u>	<u>IQ</u>
J	IT	IW	SO	EM	DM	QT	RQ	BK	LG	TB	CE	AY	IU	LK	NX

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

$2\phi_P = 125$        $2\phi_r = 27$        $2\phi_o = 106$

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4. Solve the following cryptogram and recover all keys:

	5					10					15				
A	WB	IT	HS	SE	SS	NA	EC	<u>PA</u>	<u>RT</u>	<u>RG</u>	DO	CP	RO	TT	GA
B	TC	EN	LZ	RT	OO	OA	DP	EH	PV	NI	FN	EO	TS	OO	WC
C	AD	WB	SP	EN	QC	OV	AS	BS	VD	DR	NS	<u>RO</u>	<u>QC</u>	CA	<u>WO</u> →
D	← <u>OG</u>	<u>EN</u>	<u>ZP</u>	<u>QS</u>	<u>WO</u>	<u>PO</u>	<u>PA</u>	<u>RT</u>	<u>RG</u>	SN	IS	CE	OT	NR	<u>RO</u> →
E	← <u>QC</u>	<u>ZE</u>	<u>WO</u>	<u>OG</u>	<u>EN</u>	<u>ZP</u>	<u>QS</u>	WB	OP	WQ	RP	IA	HA	EC	OG
F	HA	EH	ZT	SQ	PO	IT	CN	HA	RT	WP	SU	HS	CA	AB	<u>SQ</u> →
G	← <u>SS</u>	<u>SQ</u>	<u>DA</u>	<u>SG</u>	<u>AZ</u>	<u>IA</u>	<u>CW</u>	<u>HA</u>	<u>IE</u>	<u>KN</u>	RD	SA	LE	NH	BP
H	NA	AC	<u>SQ</u>	<u>SS</u>	<u>SQ</u>	<u>DA</u>	SS	NZ	<u>IE</u>	<u>KN</u>	OD	<u>CW</u>	<u>HA</u>	<u>WO</u>	<u>PO</u>
J	AE	KR	TS	MC	AL	HW									

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

$2\phi_p = 109$

$2\phi_r = 24$

$2\phi_o = 152$

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5. The following two messages were intercepted on the same radio link half an hour apart, Message "B" being in answer to a request for a service. Solve the texts, recover all keys, and determine the cause of the cryptographic error involved.

## Message "A"

	5					10					15				
A	DS	ZM	<u>CM</u>	GI	<u>QM</u>	<u>AB</u>	<u>VG</u>	<u>ED</u>	SU	XI	TO	<u>SQ</u>	OR	NR	SB
B	<u>PN</u>	QO	HN	TB	LL	QN	QS	SI	CR	YU	TQ	CC	KG	AT	FN
C	YF	<u>VG</u>	<u>ED</u>	CG	NU	MO	LL	NP	SO	SB	NP	<u>SQ</u>	OR	NR	SB
D	<u>PN</u>	CM	MB	RP	OG	LL	YX	<u>CM</u>	GI	<u>QM</u>	<u>AB</u>	SO	NQ	LZ	LC
E	FD	YR	VI	OR	SB										

## Message "B"

	5					10					15				
A	OY	RU	<u>PU</u>	KV	TU	<u>WO</u>	<u>IW</u>	LL	NR	EV	VD	<u>NB</u>	BZ	YZ	NO
B	<u>AS</u>	TD	HS	VO	DE	TS	TY	NV	PZ	SR	VB	PM	FW	WQ	XS
C	SK	<u>IW</u>	<u>LL</u>	PW	YR	CD	DE	YC	ND	NO	YC	<u>NB</u>	BZ	YZ	NO
D	<u>AS</u>	PU	CO	UC	BW	DE	SF	<u>PU</u>	KV	TU	<u>WO</u>	ND	YB	DI	DM
E	XL	SZ	IV	BZ	NO										

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6. The following cryptogram, suspected to begin with the words "AIR RECONNAISSANCE REPORTS", was enciphered by means of a four-square matrix with four different keyword-mixed sections. Solve it and recover all keys.

	5					10					15				
A	IC	RO	IK	HC	AA	OU	TC	IH	BO	NR	RD	TT	CD	FI	LP
B	MS	TD	XA	LB	<u>EA</u>	<u>OY</u>	TI	PC	<u>PF</u>	<u>HC</u>	QC	RD	TM	XB	US
C	CD	MO	EB	IV	<u>HE</u>	<u>GG</u>	LB	XA	ND	US	KC	SF	<u>EA</u>	<u>OY</u>	KC
D	PL	HC	US	LO	BT	NK	NL	IG	<u>PF</u>	<u>HC</u>	ND	GC	IX	YF	RR
E	<u>HE</u>	<u>GG</u>	OW	IR	QI	IL	IR	NB	TT	HG	TM	OU	SC	BT	RD
F	<u>US</u>	<u>HS</u>	<u>LB</u>	<u>SO</u>	<u>AR</u>	UF	CS	CA	EH	<u>CF</u>	<u>TS</u>	<u>OE</u>	<u>AQ</u>	HC	TM
G	AR	NR	OS	RU	<u>OE</u>	<u>AQ</u>	LA	DB	XA	IA	CT	NK	OG	SF	UI
H	OE	CB	TY	<u>US</u>	<u>HS</u>	AS	TD	HC	AS	<u>CF</u>	<u>TS</u>	<u>OE</u>	<u>AQ</u>	BD	IK
J	CS	QI	BR	NK	<u>LB</u>	<u>SO</u>	<u>AR</u>	PN	QE	ME	NR	RD	UF	AR	NB
K	UT	RS	GC	SC	GC	NL	SO	BD	SF	OR	<u>US</u>	<u>HS</u>	KG	IH	AS
L	SF	CK	HD	BD	TY										

(See distribution on following page)

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(Frequency distribution for Problem 6)

	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	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	3	-	-	-	-	-	-	-	-
B	-	-	3	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2	-	-	-	-	-	-	-	-
C	1	1	2	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-
D	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	-	-	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	-	-	6	1	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
I	1	-	1	-	-	1	2	-	-	2	1	-	-	-	-	-	-	2	-	-	1	1	-	-	-	-
J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	1	4	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	1	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
N	-	2	-	2	-	-	-	-	-	3	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
O	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	1	1	2	1	2	-	-	-	-	-	-
P	-	1	-	2	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q	-	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R	-	-	4	-	-	-	-	-	-	-	-	1	-	1	1	1	-	-	-	-	-	-	-	-	-	-
S	-	2	-	4	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T	-	1	2	-	-	1	-	-	3	-	-	-	-	-	2	2	-	-	-	-	-	-	-	2	-	-
U	-	-	-	2	-	1	-	-	-	-	-	-	-	-	6	1	-	-	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Z	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

$2\phi_p = 165$

$2\phi_r = 36$

$2\phi_o = 228$

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NATIONAL SECURITY AGENCY  
Washington 25, D. C.

COURSE Military Cryptanalytics, Part I  
 LESSON 6 Polygraphic substitution: Playfair cipher systems  
 TEXT ASSIGNMENT Pars. 71 and 73.

1. Solve the following cryptogram and recover all keys:

	5	10	15
A	UA SK UA SP KM MR IO OR IX YR OR OS	<u>MS SD</u>	<u>UA</u> →
B	<u>RH LV</u> BR SA AK SW AX SA BG CW PN CW	<u>XS AU</u>	<u>BS</u> →
C	<u>NA</u> NM SM VU YN <u>AR OR HG RA</u> RL SA YN UK SA OR		
D	MY IA AU BF <u>MS SD</u> UN WC AS EN CA HN DR FB NL		
E	AS BU RF VU RO MW BE RP NY IA CU GR WO SR	<u>XS</u> →	
F	<u>AU</u> BU LB UG DM <u>KS MR</u> GN HQ DM DU HU SB WC AS		
G	UB EO AS AD WB NO DK AD FB RH SP RW HO UC AD		
H	FT NO SB AU RD OT <u>MS SD</u> UN XB VL UA KS HQ	<u>KS</u> →	
J	<u>MR UA RH LV CU CW FB NL QO</u> <u>AR OR HG RA</u> LV AL		
K	UB UA CE RB AD EQ YX OE XH UM SW PR FS ON UK		
L	GN DR UP UR XW RW QH FR SD AS NO AD UA WB NO		
M	WS IG FS LR UB CA UO RP AS SB NW BH NP	<u>BS NA</u>	
N	UA OE RB RB RZ RO KR OR VR NU US DR SR SP RW		
O	FR DA		

(For distribution, see page 2)

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## (Frequency distribution for Problem 1)

	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	-	-	-	5	-	-	-	-	-	-	1	1	-	-	-	-	-	2	6	-	4	-	-	1	-	-
B	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	2	-	2	-	-	-	-
C	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	3	-	-
D	1	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	3	-	-	1	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-
F	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	1	-	-	-	-	-	-
G	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-
H	-	-	-	-	-	2	-	-	-	-	-	-	1	1	-	2	-	-	-	1	-	-	-	-	-	-
I	2	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-
J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	3	-	-	-	-	-	-	-	-
L	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-
M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-	1	-	1	-	-
N	2	-	-	-	-	-	-	-	-	-	2	1	-	4	1	-	-	-	-	1	-	1	-	1	-	-
O	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	6	1	1	-	-	-	-	-	-	-
P	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Q	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
R	2	3	-	1	-	1	-	3	-	-	1	-	-	2	2	-	-	-	-	-	-	-	3	-	1	-
S	4	3	-	4	-	-	-	-	-	1	-	1	-	-	3	-	2	-	-	-	-	-	2	-	-	-
T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	8	3	1	-	-	1	-	-	-	2	-	1	2	1	1	-	1	1	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
W	-	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-
X	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
Y	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	1	-	-
Z	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

$2\phi_1 = 266$

$2\phi_2 = 58$

$2\phi_0 = 316$

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2. The following cryptogram is suspected to contain the word "DIVISION". Solve it and recover all keys.

	5	10	15
A	MP <u>QK KA</u> SZ <u>QK KA</u> HX <u>EH LK</u> YS ND <u>TP CQ</u> OL NP		
B	RC AH <u>LM SK ND</u> YG QK <u>DU RF</u> QK <u>EH LK</u> YS ND TP		
C	SA OE SY FR QP FE YS MO FD AF RJ RS <u>DU RF</u> RN		
D	<u>TP CQ</u> UL <u>LM SK ND</u> UD FM JE HR VN <u>QK</u> UD EC LF		
E	AK BH IY QV SM FO SY DY		

3. Solve the following cryptogram and recover all keys. It is suspected that this message is signed "WINTHROP COL INF".

	5	10	15
A	4L 65 4L C3 <u>1V</u> PV 7W XV ZX <u>B1</u> DS 07 L4 CW 4K		
B	OF RT <u>4L 79</u> OL <u>HR</u> YN MR RM DQ QV 9R 6M CX 4K		
C	QF 4N <u>4L 79</u> OL <u>HR</u> OP E4 NR QB 4M XS WN <u>ØE</u> NU		
D	GC QX 4K <u>ØD</u> <u>51</u> NP Z5 4R L4 VQ PF HN <u>4L 79</u> OL		
E	<u>HR</u> EM 8X <u>41</u> ND AP <u>Z1</u> 4N XC M4 RT P6 4M 5H FZ		
F	C3 R9 Q4 CI 2H XZ 48 <u>1Ø</u> L4 YN PQ LM HR T4 PQ		
G	BQ RM D3		

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4. The following cryptogram is suspected to contain the signature "CLINTON COURTNEY COL INF." Solve it and recover all keys.

```

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

```

5. The following cryptogram is suspected to contain the probable beginning "PART ONE OF THREE PARTS." Solve it and recover all keys.

```

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

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NATIONAL SECURITY AGENCY  
Washington 25, D. C.

COURSE Military Cryptanalytics, Part I  
 LESSON 7 Polygraphic substitution: large tables  
 TEXT ASSIGNMENT Pars. 72 and 73

1. The following cryptogram is suspected to contain the probable word "RECONNAISSANCE"  
 Solve it and recover all keys.

				5						10					15
A	SA	<u>CJ</u>	<u>JY</u>	RO	HT	KP	LP	DO	CV	PS	LN	PE	GN	RP	SP
B	FP	LU	<u>QT</u>	<u>LW</u>	PR	CJ	KL	RN	QE	RO	CV	MF	SE	LZ	QZ
C	RR	AO	TH	SQ	PG	TL	GL	NR	QS	UZ	KK	<u>KK</u>	<u>JE</u>	MV	NL
D	LU	AR	QE	SA	MW	KK	LP	SL	AP	PZ	QV	KK	PB	<u>CJ</u>	<u>JY</u>
E	RL	CJ	HA	CO	AR	BH	LL	JH	QT	RP	AS	SL	RP	SL	NL
F	<u>QJ</u>	<u>QT</u>	<u>AJ</u>	NL	IG	NR	WX	AI	HI	YD	<u>KK</u>	<u>JE</u>	CP	YO	SP
G	KO	FB	QT	QP	YP	NZ	SO	AM	DZ	KR	FP	SX	PK	FJ	PR
H	OE	AK	CE	AS	LP	DO	PB	SI	AX	SX	PB	LP	HT	WX	RF
J	GZ	<u>QT</u>	<u>LW</u>	PR	<u>CJ</u>	<u>JY</u>	AK	HT	JY	AA	NN	SX	CB	RO	WE
K	SA	RD	LL	ML	AX	AF	YU	NC	PK	MS	NE	<u>QJ</u>	<u>QT</u>	<u>AJ</u>	

(For distribution, see next page)

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(Frequency distribution for Problem 1)

	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	1	-	-	-	-	1	-	-	1	2	2	-	1	-	1	1	-	2	2	-	-	-	-	2	-	-	16
B	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
C	-	1	-	-	1	-	-	-	-	5	-	-	-	-	1	1	-	-	-	-	-	-	2	-	-	-	11
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	3
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	4
G	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3
H	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	5
I	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
J	-	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	7
K	-	-	-	-	-	-	-	-	-	5	1	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	9
L	-	-	-	-	-	-	-	-	-	-	2	-	1	-	4	-	-	-	-	2	-	2	-	-	1	-	12
M	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	1	-	-	-	-	-	5
N	-	-	1	-	1	-	-	-	-	-	3	-	1	-	-	-	2	-	-	-	-	-	-	-	1	-	9
O	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
P	-	3	-	-	1	-	1	-	-	-	2	-	-	-	-	-	-	3	1	-	-	-	-	-	1	-	12
Q	-	-	-	2	-	-	-	-	2	-	-	-	-	-	1	-	-	1	6	-	1	-	-	-	1	-	14
R	-	-	-	1	-	1	-	-	-	-	1	-	1	3	3	-	1	-	-	-	-	-	-	-	-	-	11
S	3	-	-	-	1	-	-	-	1	-	3	-	-	1	2	1	-	-	-	-	-	-	-	3	-	-	15
T	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	3
X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	4
Z	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	5	1	2	10	3	2	3	3	10	9	13	1	4	10	16	1	9	5	9	3	4	3	7	4	7	

*Digraphic phi data*

${}_2\phi_p = 152$        ${}_2\phi_r = 33$        ${}_2\phi_o = 184$

*Monographic phi data*

$\phi_p = 1471$        $\phi_r = 849$   
 Initial ltrs:  $\phi_o = 1386$       Final ltrs:  $\phi_o = 1096$

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2. The following cryptogram is suspected to begin with the opening words "WEATHER FORECAST FOR WEDNESDAY ONE THREE SEPTEMBER". Solve it and recover all keys.

	5					10					15				
A	OL	TS	HM	XD	AW	AU	ST	ZF	AW	OL	QJ	WD	EM	KB	SA
B	OD	WE	WD	TG	YG	KC	VE	<u>JY</u>	<u>DY</u>	QG	HX	FE	KK	FP	OR
C	IF	OD	RD	MU	OB	MH	HG	SK	VQ	VQ	OD	QL	AW	WR	US
D	KK	DO	CA	US	VQ	OD	DO	<u>YD</u>	<u>VE</u>	<u>MY</u>	<u>MH</u>	<u>JY</u>	<u>DY</u>	MY	HX
E	HM	ST	YG	EI	VU	VQ	VC	TS	KX	XD	MX	DO	CK	SK	LX
F	US	MH	BZ	LU	CF	<u>XW</u>	<u>BQ</u>	VJ	OU	JD	IW	QF	UO	US	NO
G	LH	EC	WD	XJ	JM	VQ	AI	<u>YD</u>	<u>VE</u>	<u>MY</u>	<u>MH</u>	VR	VE	AP	VQ
H	ZE	HT	KW	CK	<u>XW</u>	<u>BQ</u>	HZ	BR	HP	CJ	FS	TW	OG	ZX	IZ
J	AM	AG	JD	YG	FE	MH	ER	VE	OU	TW	WD	<u>JY</u>	<u>DY</u>	RK	RG
K	WF	TG	AW	QW	DO	OD	VE	JY	TS	WP	OZ	NT	IW	HX	YJ
L	BZ	KW	CK	DQ	AM										

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3. The following two messages, intercepted on links known to be passing traffic enciphered by means of random digraphic tables, are believed to be isologs containing the probable signature "MAJ GEN CARTER WORTHINGTON" Solve the texts and reconstruct the fragmentary table.

Message "A"	5	10	15
A	<u>CX</u> <u>JI</u> <u>GO</u> <u>NB</u> <u>XJ</u> <u>LV</u> <u>OP</u> <u>LD</u> <u>XG</u> <u>OI</u>	UT	LI ZV <u>DM</u> <u>DE</u> →
B	← <u>AY</u> <u>AM</u> <u>CX</u> <u>BD</u> <u>DZ</u> <u>JX</u> <u>VK</u> <u>DQ</u> <u>IY</u> <u>IG</u>	JO	KW DE IG JX
C	BR	OU LN SR <u>SC</u> <u>DE</u> <u>UW</u> <u>QK</u> <u>VN</u> <u>LN</u> <u>ZH</u> <u>YM</u>	IQ DW KS
D	ER AV ZH LD RD DE IQ <u>OF</u> <u>QQ</u>	HT	OF VB DE PC JI
E	GS <u>XJ</u> <u>NZ</u> <u>NN</u> <u>IG</u>	OF	NB SR ZH JU TI AA GP DZ GP
F	XF DE KW FH WX ML PY RN AY AM <u>ER</u> <u>AJ</u>	UI	SX OW
G	<u>UW</u> <u>QK</u> <u>VN</u> <u>LN</u> <u>ZH</u> <u>YM</u>	AV HW OW SC JX <u>OF</u> <u>QQ</u>	<u>MO</u> <u>SR</u> →
H	← <u>AY</u> <u>NR</u> <u>DZ</u> <u>CO</u> <u>IS</u> <u>SR</u> <u>ZH</u> <u>HT</u> <u>VF</u> <u>IQ</u> <u>VN</u> <u>FH</u> <u>TQ</u> <u>UT</u> <u>HT</u>		
J	EX EV XG <u>IY</u> <u>IG</u>	OF YR <u>JL</u> <u>OF</u> <u>OF</u>	IA IG BT <u>MO</u> <u>SR</u> →
K	← <u>AY</u> <u>NR</u> <u>HF</u> <u>WX</u> <u>GD</u> <u>PX</u> <u>OL</u> <u>CO</u> <u>EN</u> <u>SG</u> <u>SL</u> <u>MG</u> <u>CX</u> <u>ID</u> <u>VM</u>		
L	OP IH <u>LN</u> <u>ZH</u> <u>TM</u> <u>SL</u> <u>SC</u> <u>OF</u> <u>GL</u> <u>IG</u>		

Message "B"	5	10	15
A	<u>CX</u> <u>JI</u> <u>GO</u> <u>NB</u> <u>XJ</u> <u>LV</u> <u>OP</u> <u>LD</u> <u>XG</u> <u>OI</u>	UI	SC <u>XJ</u> <u>NZ</u> <u>NN</u> →
B	← <u>IG</u> <u>ER</u> <u>AJ</u> <u>OF</u> <u>ZH</u> <u>WC</u> <u>PM</u> <u>SR</u> <u>AY</u> <u>NR</u> <u>KQ</u> <u>RI</u> <u>BR</u> <u>LD</u> <u>YM</u>		
C	JO ED XG TI CO VU <u>QF</u> <u>UO</u> <u>KM</u> <u>LI</u> <u>JX</u>	EN	MX QF NE
D	SC SR WX LH HK EN FW DT SL DR LV CO WG ZT IG		
E	NU <u>DM</u> <u>DE</u> <u>AY</u> <u>PS</u> <u>XQ</u> <u>XQ</u> <u>TI</u> <u>LH</u> <u>YO</u> <u>CX</u> <u>VF</u> <u>OF</u> <u>JL</u> <u>OF</u>		
F	CO HI IQ PC DZ CH NN <u>IY</u> <u>IG</u>	WG	CX BD KC UT FJ
G	<u>QF</u> <u>UO</u> <u>KM</u> <u>LI</u> <u>JX</u> <u>VU</u> <u>IN</u> <u>XS</u> <u>LI</u> <u>UW</u> <u>RI</u> <u>DT</u> <u>SL</u> <u>VF</u> <u>IY</u> →		
H	← <u>IG</u> <u>IG</u> <u>SC</u> <u>DE</u> <u>VF</u> <u>TI</u> <u>JX</u> <u>FL</u> <u>LN</u> <u>KJ</u> <u>RT</u> <u>ER</u> <u>SX</u> <u>OW</u> <u>JI</u>		
J	AJ JX <u>SR</u> <u>AY</u> <u>PS</u> <u>NR</u> <u>QV</u> <u>GP</u> <u>PS</u> <u>LV</u> <u>JI</u> <u>DT</u> <u>EE</u> <u>VF</u> <u>IY</u> →		
K	← <u>IG</u> <u>SL</u> <u>DJ</u> <u>PS</u> <u>KS</u> <u>JO</u> <u>SC</u> <u>DE</u> <u>IQ</u> <u>CH</u> <u>LI</u> <u>ER</u> <u>AJ</u> <u>VF</u> <u>TF</u>		
L	WX ZZ <u>LI</u> <u>JX</u> <u>FG</u> <u>LI</u> <u>CO</u> <u>LV</u> <u>CX</u> <u>CC</u>		

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4. Solve the following cryptogram and recover all keys:

	1	2	3	4	5	6	7	8	9	10
A	003	<u>315</u>	<u>097</u>	114	347	261	067	217	314	241
B	195	062	350	115	006	451	062	<u>141</u>	<u>072</u>	472
C	189	192	018	400	189	067	<u>315</u>	<u>097</u>	530	403
D	<u>115</u>	<u>393</u>	262	609	192	356	115	186	122	467
E	212	071	074	237	235	114	416	<u>115</u>	<u>393</u>	271
F	055	293	186	552	009	062	471	141	150	193
G	186	516	184	266	274	470	002	238	053	186
H	<u>141</u>	<u>072</u>	236	516	189	004	195	191	479	067
J	008	397	080	137	105	189	391	262	343	408
K	133	273	071	084	274	400	367	223	403	186
L	211	524	008	292	011	122	393	284		

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5. The cryptogram below is suspected to begin with the stereotype "REFERRING TO YOUR MESSAGE" OR "REFERENCE YOUR MESSAGE". Solve the text and recover all keys.

	1	2	3	4	5	6	7	8	9	10
A	MRA	DMT	<u>GCI</u>	YIY	MFG	NNL	SRK	QFB	<u>DMD</u>	WII
B	DSZ	GNM	IJA	GOO	<u>LGI</u>	DEV	LTD	<u>GCI</u>	IYD	LCI
C	MMT	JIU	PNM	VZP	<u>LGI</u>	<u>DMY</u>	ITI	<u>POV</u>	<u>GIP</u>	TGO
D	PLM	MCH	JPB	MRC	<u>DGK</u>	<u>FWJ</u>	IHC	EEF	MDO	DSZ
E	TEN	<u>DGK</u>	<u>FWI</u>	NNM	LEV	EZF	TAS	DIP	HMT	TDL
F	GTR	QMD	MZU	ROD	NPC	JNJ	<u>GCI</u>	<u>IQM</u>	UZK	LIY
G	NJN	CWQ	MZF	VOD	NWG	PRG	NLC	URP	MIA	DGI
H	VRG	NRF	URV	PIF	DUJ	TDL	POJ	VRT	DAZ	MRI
J	IFX	DGG	DHV	<u>VZP</u>	<u>IQM</u>	<u>EMF</u>	JPC	<u>SMK</u>	<u>JLM</u>	MND
K	PQW	YZB	OZN	IJY	IPJ	DMD	YJP	NIP	<u>EMF</u>	JPC
L	<u>SMK</u>	<u>JLF</u>	ENG	NPW	FNV	FJJ	IWI	GTT	MOT	EOW
M	CRV	WLF	ELE	TSZ	TNM	VRS	MTR	TEQ	VRV	QJQ
N	MRV	<u>NOV</u>	<u>GIP</u>	RMT	KQX	GCJ	ELC	MZH	PRT	LMN
O	LCR	IYR	CZY	GPW	XPA					

$\theta^1$ : 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  $\phi_o = 1094$

$\theta^2$ : 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  $\phi_o = 981$

$\theta^3$ : 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  $\phi_p = 1207$   $\phi_r = 696$   $\phi_o = 794$

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6. The following cryptogram is suspected to contain the probable word "AIRCRAFT". The encipherment is believed to involve a tetranome trigraphic system employing a matrix similar to that illustrated in Fig. 59 of the text, the ciphertext sections being composed of the dinomes 00-99 inscribed in the normal manner of writing, but the plaintext sections consisting of keyword-mixed sequences which differ from those in the text example. Solve the cryptogram and recover all keys.

	1	2	3	4	5	6	7	8	9	10
A	0601	7849	4912	<u>2533</u>	<u>1747</u>	6031	4270	8240	1877	6111
B	0240	1245	4827	1236	5681	6831	<u>4214</u>	9945	1875	8917
C	3309	4143	8843	5342	7719	1517	2774	3249	4507	4872
D	6011	1266	4145	7327	6760	5345	7619	5945	7349	3043
E	7709	2819	4322	0129	3875	2713	3046	9040	0775	6561
F	2911	2507	3576	1505	<u>4214</u>	9875	3570	0208	6583	6161
G	3247	2107	1777	3918	<u>2533</u>	<u>1747</u>	0264	1956	1242	4707
H	7772	3296	3491	0576	0779	5514	1145	3143	8569	2871

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NATIONAL SECURITY AGENCY  
Washington 25, D. C.

COURSE	Military Cryptanalytics, Part I
LESSON 8	Monoalphabetic substitution with irregular-length cipher units: monome-dinome systems and others
TEXT ASSIGNMENT	Chapter X

1. Solve the following monome-dinome cryptogram and recover the original matrix:

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

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2. The following monome-dinome cryptogram is believed to contain the probable word "DIVISION". Solve the text and recover the original matrix:

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

3. The following cryptogram was intercepted on a link which has been known to be passing traffic in two different monome-dinome systems, one involving a matrix of the type shown in Fig. 75 of the text, the other involving a matrix of the type in Fig. 77. Solve the text of the message and recover the original matrix.

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

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4. The following messages, intercepted on a link known to be passing monome-dinome traffic, are believed to be isologs. Solve the texts and recover the original matrices.

## Message "A"

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

## Message "B"

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

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5. The following messages are believed to be isologous monome-dinome ciphers. Solve the texts and recover the original matrices:

## Message "A"

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

## Message "B"

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

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6. Solve the following monome-dinome-trinome cryptogram and recover the original matrix:

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

7. Solve the following uniliteral-biliteral cryptogram, and recover all keys:

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

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8. The following cryptogram, enciphered in a Playfair-type digraphic-monographic system, is suspected to begin with the probable stereotype "MORNING REPORT FOR MONDAY NOVEMBER TWENTY FIRST". Solve the text and recover all keys.

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

9. The following cryptogram was enciphered in a dinome-trinome digraphic system employing matrices similar to those in Figs. 90a and b, except that the internal numerical sequences have been changed. The message is suspected to end with the signature "VINCENT ANDERSEN COL. INF". Solve the text and reconstruct the matrices involved.

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

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10. The following cryptogram, based on a Morse code system, is suspected to begin with a spelled-out number. Solve it and recover all keys:

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

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NATIONAL SECURITY AGENCY  
Washington 25, D. C.

COURSE	Military Cryptanalytics, Part I
LESSON 9	Syllabary squares and code charts
TEXT ASSIGNMENT	Par. 80

1. The following cryptogram is suspected to begin with the words "REFERENCE YOUR MESSAGE NUMBER THREE FIVE FOUR DATED ONE SEVEN SEPTEMBER". Solve the text, and reconstruct the cryptosystem employed.

CRDSC	RJSIS	KSJTY	CLSKR	CQERB	YJQIR
KPKOJ	RCRSD	TFSDJ	TYCDP	FRDXB	RCSFS
JSCSJ	UFRJQ	IRKPK	UPDDO	FOXBP	LCRRB
DUKPI	SLSJS	KOKRG	OJNLP	KPCOF	SPFJP
CRRBF	TJNLR	AYJSH	TFOX B	QCKRH	TESDY
LRHUK	UPCFO	JNLRC	NLUFT	JSEOJ	SFXCU
YFESK	PJSHX	BRPFB	XXBFY	SCDPK	SKUCR
JWOCS	LRBKO	KRFXJ	ULPBR	QCKSK	VBQCP
JPCPJ	UJRCS	OEJRF	PJSHU	BOBRK	WPCRI
HVOBJ	PKRFY	DORDD	UKPDT	BPLPH	TFOX B

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2. The enemy is using a system incorporating a 10 x 10 bipartite square within which there are inscribed letters, digits and syllables. The row and column coordinates are invariable, but a different internal chart is used each day. The chart for 16 December was reconstructed and found to be based on the key word "PYRAMIDS" as follows:

	∅	1	2	3	4	5	6	7	8	9
∅	P	Y	R	RA	RE	RED	RES	RI	RO	A
1	1	AL	AN	AND	AR	ARE	AS	AT	ATE	ATI
2	M	ME	I	9	IN	ING	ION	IS	IT	IVE
3	D	4	DA	DE	S	SE	SH	ST	STO	B
4	2	BE	C	3	CA	CE	CO	COM	E	5
5	EA	ED	EN	ENT	ER	ERE	ERS	ES	EST	F
6	6	G	7	H	8	HAS	HE	J	∅	K
7	L	LA	LE	N	ND	NE	NT	0	OF	ON
8	OR	OU	Q	T	TE	TED	TER	TH	THE	THI
9	THR	TI	TO	U	V	VE	W	WE	X	Z

The next day the following cryptogram, suspected to contain the word "CROSSROADS", was intercepted. Solve the text, reconstruct the chart for the day, and determine the internal key word:

20 88 50 58 95 63 62 30 69 69 94 15 58 92 07  
 84 73 60 35 77 95 61 38 78 30 50 66 94 15 44  
 84 62 12 12 20 38 31 42 67 67 93 52 01 83 10  
 32 02 79 10 36 84 72 94 44 68 79 54 78 69 50  
 58 95 58 79 62 14 30 50 71 94 35 87 79 97 58  
 02 02 10 78 47 22 97 58 88 09 84 53 03 01 93  
 44 78 79 79 78 30 50 79 57 55 59 54 08 54 94  
 72 89 72 60 82 72 94 44 92 07 79 82 05 10 79  
 94 10 10 02 58 28 97 58 02 02 43 69 05 96 50  
 93 50 58 95 63 58 07 11 21 50 71 94 35 84 27  
 30 54 87 50 35 68

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3. The following two messages were encrypted by means of the Aggressor code chart illustrated in Fig. 100 of the text, but with a different set of coordinates. It is suspected that both messages end with the signature "ENRIQUE VALENZUELA". Reconstruct the plain texts and recover the coordinates of the chart.

## Message "A"

AT FH XL MK ZU AL CO TG QT KQ RD KN KL EL DR  
 JP XT RO GY RJ UA SG BW AT HX OD DV IX SR BD  
 LI CE XL JA VL TA ET UY NV QL KH WD AL YG PT  
 DI LG YR LU EF NY ZR QQ LX SY UV

## Message "B"

AL LQ QT MB VU EL UA TX XL PQ RJ WG IM GG XC  
 AT DR NP QT JB WD KZ EQ LA UG WJ AL YX PL OZ  
 SR LZ AG YG XH FG YY UP

4. The following message was encrypted by means of the Aggressor code chart illustrated in Fig. 100 of the text, but with a set of *non-variant* coordinates. Reconstruct the plain text and recover the sequences for the row and column coordinates.

EO BO JO BO EO IO AY IT JO DO EO AZ JO IQ AU  
 KU EO FQ AQ JO JZ JQ JY EO JS JO JT JS EO AX  
 AN AQ LX JO BO FU DU IP EO HQ BQ GQ JP AS IR  
 CZ AT JO BW EO JS JO HZ JP IZ HX KV EO FV JO  
 LR EO FV DT DS LS ET LT JS KS BW JX ET MW JX

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5. The following 30 messages, intercepted on low-level ground nets, have been selected for study because of homogeneous characteristics. Solve the texts and reconstruct the cryptosystem employed. (A condensed table of the repetitions contained in these messages is included on pages 10-12.)

No. 1            INL DE ETN    1630 08 Aug 53

77 05 19 39 45 39 89 19 59 25 49 32 35 22 35

90 00 45 95 60 81 55 05 90 32 62 00 92 08 78

95 50 36 05 79 60 92 58 90 95 42 93 05 27 88

65 00 21

No. 2            INL DE ETN    1633 08 Aug 53

77 05 19 19 45 39 89 69 09 25 49 32 35 22 35

97 45 95 60 37 62 05 10 50 11 00 61 78 95 07

05 88 31 95 13 05 29 19 89 45 95 20 49 43

No. 3            INL DE ETN    1636 08 Aug 53

77 05 19 69 45 39 89 69 09 25 49 32 35 22 35

97 45 73 32 15 55 95 74 05 82 92 46 21 95 50

70 65 05 45 95 28 05 62 41 07 11 10 45 88 61

95 49 05 90

No. 4            SIA DE BYE    0805 10 Aug 53

77 05 09 89 45 09 49 09 09 25 39 09 32 35 22

35 97 45 95 99 00 88 05 60 68 90 95 34 05 78

32 35 04 23 92 85 61 95 46 05 90

No. 5            LQS DE QEI    1836 11 Aug 53

77 05 79 29 45 39 49 69 09 25 39 39 32 35 22

35 90 00 45 95 87 05 56 73 32 15 55 95 37 05

82 92 46 78 95 91 05 27 06 28 66 00 91 80 53

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No. 6 ALU DE YUT 1644 12 Aug 53

77	05	69	19	45	39	89	79	09	25	39	19	32	35	22
35	97	45	95	22	05	80	46	96	24	95	76	05	27	95
08	67	39	82	05	45	95	50	75	05	71	26	00	18	34
22	61													

No. 7 QEI DE INL 1256 20 Aug 53

77	05	19	19	45	39	19	59	09	25	19	09	32	35	22
35	97	45	95	20	68	05	46	22	31	72	56	72	57	80
50	90	51	54	37	95	46	05	27	95	60	97	05	90	88
31	55	50	35											

No. 8 USQ DE SIA 0917 21 Aug 53

77	05	39	39	45	09	99	39	59	25	19	39	32	35	22
35	97	45	95	25	05	60	23	52	95	68	05	21	95	10
05	92	52	90	78	38	48	35	10	00	95	97	05	90	

No. 9 OAY DE NBQ 2357 27 Sep 53

77	05	99	69	45	19	69	59	09	25	19	29	96	80	93
60	17	40	45	95	98	05	57	80	40	74	63	00	95	76
05	27	95	08	15	05	46	80	10	55	95	39	82		

No. 10 NBQ DE OAY 0010 28 Sep 53

77	05	09	39	45	09	09	09	59	25	19	49	96	80	93
60	17	40	45	95	50	15	52	05	10	50	11	98	59	09
09	95	01	78	19	05	27	95	21	69	05	49	49	89	64
94	14	30	76											

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No. 11 OAY DE ALU 1008 29 Sep 53  
 77 05 39 79 45 39 09 09 09 25 19 99 96 80 00  
 52 60 17 40 45 95 99 05 62 34 55 50 35 95 23  
 05 20 35 31 06 60 38 06 95 41 05 92 74 01 79  
 04 95 83

No. 12 US0 DE TOB 2219 29 Sep 53  
 77 05 69 99 45 19 19 39 59 25 19 99 96 80 00  
 52 60 12 76 45 95 60 63 31 05 56 21 95 50 24  
 65 05 45 95 04 05 56 01 95 80 38 93 05 27 22  
 46 63 95 27

No. 13 ETN DE SIA 2347 30 Sep 53  
 77 05 19 39 45 19 69 79 09 25 69 09 96 80 93  
 60 12 76 45 95 71 08 14 05 50 35 00 27 95 85  
 05 37 17 95 86 66 11 05 45 95 88 05 87 24 90  
 17 56 96 24

No. 14 TOB DE BYE 2142 30 Sep 53  
 77 05 49 99 45 19 39 69 59 25 69 09 90 52 80  
 93 60 17 40 45 95 53 05 01 95 11 60 57 05 36  
 21 22 95 45 05 25 37 04 63 17 95 86 05 01 62  
 43 90 90 95 45

No. 15 BYE DE YUT 1818 10 Oct 53  
 77 05 89 09 45 39 49 39 09 25 39 09 50 62 01  
 17 40 45 95 61 05 79 19 59 95 12 05 72 45 95  
 10 05 92 74 95 29 05 45 95 82 05 78 97 40 35  
 62 00 54 90

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No. 16      SIA   DE   US0   1629   17 Oct 53

77 05 79 59 45 39 89 19 59 25 39 29 50 62 01

12 76 45 95 44 60 66 05 13 90 95 32 05 56 36

22 22 95 75 13 05 79 59 49 64 94 95 21 69 05

59 99 19

No. 17      ALU   DE   LQS   2001   19 Oct 53

77 05 69 29 45 39 99 59 59 25 39 99 50 62 00

50 17 40 45 95 02 05 33 95 41 05 67 80 50 00

90 10 50 11 98 78 95 50 09 05 45 88 61 95 35

05 14 72 10 55

No. 18      LQS   DE   YUT   0905   12 Nov 53

77 05 39 89 45 09 99 09 09 25 39 19 26 08 60

17 40 45 95 18 26 05 90 95 71 05 56 01 90 92

75 66 40 88 40 90 16 95 69 05 27 19 03 32 62

30 95 80

No. 19      SIA   DE   ETN   1314   14 Nov 53

77 05 39 89 45 39 69 39 09 25 39 79 70 50 08

60 12 76 45 95 26 35 05 52 75 42 32 35 90 98

45 95 33 48 05 61 45 95 88 05 60 68 90 92 60

80 76 16 92 08

No. 20      INL   DE   SIA   1116   25 Nov 53

77 05 19 79 45 39 39 39 09 25 19 59 26 15 52

60 17 40 45 73 32 15 55 95 30 31 03 06 72 10

05 92 74 45 95 16 05 72 57 40 35 80 98 95 06

84 97 05 90

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No. 21      YUT DE BYE    1348   04 Dec 53

77 05 59 89 45 39 69 79 59 25 79 67 13 60 17

40 45 95 31 47 05 45 95 32 05 56 01 91 30 52

95 61 05 49 69 09 45 95 16 06 05 19 83 95 33

05 47 01 44

No. 22      OAY DE INL    1956   06 Dec 53

77 05 79 09 45 39 99 59 09 25 89 72 52 13 60

12 76 45 95 60 81 40 12 05 72 96 08 40 36 95

58 05 90 78 95 90 05 90 28 92 72 45 95 28 05

26 40 60 36

No. 23      QEI DE YUT    1710   07 Dec 53

77 05 69 19 45 39 29 09 59 25 29 67 62 52 60

17 40 45 95 51 32 05 37 95 59 05 01 95 46 05

63 95 08 57 05 45 95 60 28 05 71 26 00 18 34

22 61

No. 24      EIB DE BQT    1207   05 Jan 54

77 05 69 09 45 39 19 09 09 25 59 02 34 35 31

55 45 95 72 60 05 03 50 50 80 95 17 05 54 97

92 10 10 95 89 05 56 78 95 19 05 76 70 96 62

01 40

No. 25      NLE DE IAQ    1519   11 Jan 54

77 05 79 29 45 39 59 39 09 25 39 39 02 32 70

35 31 55 45 95 92 41 54 00 89 05 50 80 63 35

24 92 10 95 96 05 26 21 95 66 05 86 60 92 98

35 96

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No. 26 QSN DE TNY 1034 12 Jan 54  
 77 05 19 69 45 39 09 69 09 25 39 19 02 34 35  
 32 40 55 45 95 50 81 56 12 05 72 49 95 58 05  
 90 95 90 05 16 09 89 09 09 88 31 81 00 54 36  
 80 31 30

No. 27 YEO DE UTA 0932 23 Feb 54  
 77 05 39 89 45 09 99 19 59 25 19 69 82 52 12  
 40 35 31 55 45 95 60 37 73 05 72 95 39 05 66  
 35 24 76 14 00 00 76 55 82 92 46 95 64 50 57  
 05 90

No. 28 SOL DE AYS 1440 13 Mar 54  
 77 05 19 39 45 39 79 69 59 25 39 69 60 31 18  
 45 95 92 57 05 90 80 53 90 93 44 95 39 30 05  
 12 50 60 12 56 52 31 10 55 95 92 05 60 23 70  
 56

No. 29 LUI DE OBU 1846 30 Mar 54  
 77 05 69 09 45 39 49 79 09 25 69 09 60 31 62  
 42 45 95 08 83 00 71 94 05 01 95 53 27 05 62  
 43 90 90 56 37 77 32 12 10 92 94 95 38 05 73  
 32 72

No. 30 BQT DE UTA 0503 31 Mar 54  
 77 05 09 39 45 09 59 09 09 25 69 39 84 40 62  
 42 45 95 79 05 01 95 22

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**CONDENSED TABLE OF REPETITIONS  
FOR PROBLEM 5**

The first column designates the particular dinome; the second column shows the frequency of the particular dinome; and the third column indicates the messages (with occurrences of more than one shown in parentheses) in which the particular dinome is found.

00	22	1(3), 2, 4, 5(2), 6, 8, 9, 11, 12, 13, 15, 17(2), 23, 25, 26, 27(2), 29
01	14	10, 11, 12, 14(2), 15, 16, 18, 21(2), 23, 24, 29, 30
02	4	17, 24, 25, 26
03	3	18, 20, 24
04	4	4, 11, 12, 14
05	134	1(4), 2(4), 3(5), 4(4), 5(4), 6(5), 7(4), 8(5), 9(4), 10(4), 11(4), 12(5), 13(5), 14(5), 15(6), 16(5), 17(5), 18(4), 19(4), 20(4), 21(6), 22(5), 23(6), 24(5), 25(4), 26(4), 27(4), 28(4), 29(4), 30(2)
06	6	5, 11(2), 20(2), 21
07	2	2, 3
08	10	1, 6, 9, 13, 18, 19(2), 22, 23, 29
09	55	2, 3, 4(5), 5, 6, 7(2), 8, 9, 10(6), 11(3), 13(2), 14, 15(3), 17, 18(3), 19, 20, 21, 22(2), 23, 24(3), 25, 26(5), 27, 29(3), 30(4)
10	15	2, 3, 8(2), 9, 10, 15, 17(2), 20, 24(2), 25, 28, 29
11	6	2, 3, 10, 13, 14, 17
12	12	12, 13, 15, 16, 19, 22(2), 26, 27, 28(2), 29
13	5	2, 16(2), 21, 22
14	4	10, 13, 17, 27
15	6	3, 5, 9, 10, 20(2)
16	5	18, 19, 20, 21, 26
17	14	9, 10, 11, 13(2), 14(2), 15, 17, 18, 20, 21, 23, 24
18	4	6, 18, 23, 28
19	40	1(2), 2(3), 3, 6(2), 7(4), 8, 9(2), 10(2), 11, 12(3), 13(2), 14, 15, 16(2), 18(2), 20(2), 21, 23, 24(2), 26(2), 27(2), 28
20	3	2, 7, 11
21	9	1, 3, 8, 10, 12, 14, 16(2), 25
22	16	1, 2, 3, 4, 5, 6(3), 7(2), 8, 12, 14, 16, 23, 30
23	4	4, 8, 11, 28
24	7	5, 6, 12, 13(2), 25, 27
25	32	1, 2, 3, 4, 5, 6, 7, 8(2), 9, 10, 11, 12, 13, 14(2), 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30
26	8	6, 18(2), 19, 20, 22, 23, 25
27	11	1, 5, 6, 7, 9, 10, 12(2), 13, 18, 29
28	5	3, 5, 22(2), 23
29	9	2, 5, 9, 15, 16, 17, 23(2), 25
30	6	10, 18, 20, 21, 26, 28
31	15	2, 7(2), 11, 12, 20, 21, 24, 25, 26(2), 27, 28(2), 29
32	22	1(2), 2, 3(2), 4(2), 5(2), 6, 7, 8, 16, 18, 19, 20, 21, 23, 25, 26, 29(2)
33	3	17, 19, 21
34	6	4, 6, 11, 23, 24, 26

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35	34	1(2), 2(2), 3(2), 4(3), 5(2), 6(2), 7(3), 8(3), 11(2), 13, 15, 17, 19(2), 20, 24, 25(3), 26, 27(2)
36	6	1, 14, 16, 22(2), 26
37	8	2, 5, 7, 13, 14, 23, 27, 29
38	4	8, 11, 12, 29
39	58	1(2), 2, 3, 4, 5(3), 6(3), 7, 8(4), 9, 10, 11(2), 12, 13, 14, 15(3), 16(2), 17(2), 18(2), 19(4), 20(3), 21, 22, 23, 24, 25(4), 26(2), 27(2), 28(4), 29, 30(2)
40	22	9(2), 10, 11, 14, 15(2), 17, 18(3), 20(2), 21, 22(3), 23, 24, 26, 27, 30
41	4	3, 11, 17, 25
42	4	1, 19, 29, 30
43	3	2, 14, 29
44	3	16, 21, 28
45	78	1(2), 2(3), 3(4), 4(2), 5(2), 6(3), 7(2), 8(2), 9(2), 10(2), 11(2), 12(3), 13(3), 14(4), 15(4), 16(2), 17(3), 18(2), 19(4), 20(3), 21(4), 22(3), 23(3), 24(2), 25(2), 26(2), 27(2), 28(2), 29(2), 30(2)
46	10	3, 4, 5, 6, 7(2), 9, 12, 23, 27
47	2	21(2)
48	2	8, 19
49	16	1, 2(2), 3(2), 4, 5, 10(3), 14, 15, 16, 21, 26, 29
50	25	1, 2, 3, 6, 7(2), 10(2), 11, 12, 13, 15, 16, 17(5), 19, 24(2), 25, 26, 27, 28
51	2	7, 23
52	13	8(2), 10, 11, 12, 14, 19, 20, 21, 22, 23, 27, 28
53	4	5, 14, 28, 29
54	5	7, 15, 24, 25, 26
55	14	1, 3, 5, 7, 9, 11, 17, 20, 24, 25, 26, 27(2), 28
56	13	5, 7, 12(2), 13, 16, 18, 21, 24, 26, 28(2), 29
57	7	7, 9, 14, 20, 23, 27, 28
58	3	1, 22, 26
59	26	1, 7, 8, 9, 10(2), 12, 14, 15, 16(4), 17(2), 20, 21(2), 22, 23(2), 24, 25, 27, 28, 30
60	34	1(2), 2, 4, 7, 8, 9, 10, 11(2), 12(2), 13, 14(2), 16, 18, 19(3), 20, 21, 22(3), 23(2), 24, 25, 27, 28(3), 29
61	9	2, 3, 4, 6, 15, 17, 19, 21, 23
62	15	1, 2, 3, 11, 14, 15(2), 16, 17, 18, 23, 24, 29(2), 30
63	6	9, 12(2), 14, 23, 25
64	3	10, 16, 27
65	3	1, 3, 12
66	6	5, 13, 16, 18, 25, 27
67	4	6, 17, 21, 23
68	4	4, 7, 8, 19
69	29	2, 3(2), 5, 6, 9(2), 10, 12, 13(2), 14(2), 16, 17, 18, 19, 21(2), 23, 24, 26(2), 27, 28(2), 29(2), 30
70	5	3, 19, 24, 25, 28
71	5	6, 13, 18, 23, 29
72	13	7(2), 15, 17, 20(2), 22(3), 24, 26, 27, 29
73	5	3, 5, 20, 27, 29
74	5	3, 9, 11, 15, 20
75	4	6, 16, 18, 19
76	12	6, 9, 10, 12, 13, 16, 19(2), 22, 24, 27(2)

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77	31	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, 27, 28, 29(2), 30
78	10	1, 2, 4, 5, 8, 10, 15, 17, 22, 24
79	18	1, 5, 6, 11(2), 13, 15, 16(2), 19, 20, 21(2), 22, 25, 28, 29, 30
80	20	5, 6, 7, 9(3), 10, 11, 12(2), 13, 14, 17, 18, 19, 20, 24, 25, 26, 28
81	4	1, 22, 26(2)
82	7	3, 5, 6, 9, 15, 27(2)
83	3	11, 21, 29
84	2	20, 30
85	2	4, 13
86	3	13, 14, 25
87	2	5, 13
88	10	1, 2, 3, 4, 7, 13, 17, 18, 19, 26
89	17	1, 2(2), 3, 4, 6, 10, 15, 16, 18, 19, 21, 22, 24, 25, 26, 27
90	34	1(3), 3, 4(2), 5, 7(2), 8(2), 13, 14(3), 15, 16, 17, 18(3), 19(2), 20, 22(3), 26(2), 27, 28(2), 29(2)
91	3	5(2), 21
92	21	1(2), 3, 4, 5, 8, 11, 15, 18, 19(2), 20, 22, 24, 25(3), 27, 28(2), 29
93	7	1, 9, 10, 12, 13, 14, 28
94	4	10, 16, 29(2)
95	111	1(3), 2(4), 3(4), 4(3), 5(3), 6(4), 7(3), 8(4), 9(4), 10(3), 11(4), 12(5), 13(4), 14(5), 15(5), 16(4), 17(4), 18(4), 19(3), 20(3), 21(5), 22(4), 23(5), 24(4), 25(3), 26(3), 27(3), 28(3), 29(3), 30(2)
96	11	6, 9, 10, 11, 12, 13(2), 22, 24, 25(2)
97	11	2, 3, 4, 6, 7(2), 8(2), 15, 20, 24
98	6	9, 10, 17, 19, 20, 25
99	14	4, 8, 9, 11(2), 12(2), 14, 16, 17(2), 18, 22, 27

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NATIONAL SECURITY AGENCY  
Washington 25, D. C.

COURSE	Military Cryptanalytics, Part I
LESSON 10	Miscellaneous monalphabetic substitution systems; concealment systems
TEXT ASSIGNMENT	Pars. 81-84

1. The following two messages were intercepted on the same net during a morning offensive. Solve them and recover all keys.

Message "A"

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

Message "B"

R B V Y W   B Y Y Z C   T H E E B   M M E Z I   A B X H W   S Y X C K  
N N B Y M   S X Q D Y   A E P C X

2. Solve the following cryptogram and recover all keys.

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

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3. The following cryptogram is suspected to contain the word "REGIMENT". Solve it and recover all keys.

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

4. The following cryptogram is suspected to contain the word "BATTALION". Solve it and recover all keys.

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

5. The following two messages are suspected to be isologs. Recover the plain text and reconstruct the cipher alphabet involved.

Message "A"

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

Message "B"

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

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6. Solve any five of the ten innocent-text messages given below.

- a. TO COVER AND HIDE YOUR FINANCES, I MAINTAIN STAFF TO BARTER FRANC EXCHANGE.
- b. BEARER IS A FRIEND. I CANNOT WRITE MUCH. WILL YOU BE READY TO MEET A TRUSTED INTERMEDIARY SO YOU CAN GIVE ALL NECESSARY DOCUMENTS TO HIM NEXT WEEK? I HAVE NOTHING MORE TO SAY.
- c. The following is an actual radiogram which was held up by a censor:

ES100 81 RADIO-WASHINGTON DC 210P JULY 1 1941

ROBERT C JOHNSTON III  
CARE HELVETIA PALACE HOTEL LUGANO (SWITZERLAND)

MATERIALS ADEQUATE. CONTRACTS YOUR ASSISTANT RETURNED TO ME WERE OKAY AT CONSULATE. INSURANCE EXPEDITED QUOTATIONS ON CARGO RATES ALSO AS OF TOTAL POOLED SHIPMENTS. BECAUSE PRESENT HOLDING OF SHARES IS LINKED TO UNDECLARED ASSETS ATTENTION IS DIRECTED TO PROGRAM OF DENUNCIATION BY AGGRESSIVE MINORITY CHALLENGING DIVIDENDS. REALTY VALUES PREDICT SUSTAINED EXCEPTIONAL PROFITS HEREAFTER WITH DISCLOSURES AT MEETING ON SEVENTEENTH BREAKING UP RENEWED OPPOSITION.

REMSSEN

- d. The following message, poorly spelled, is shown just as it was written by the originator.

DISATISFIED WITH IMMEDIATE RESULTS OF YOUR ANALYSIS STOP ADDITIONAL RENUNERATION TO ALL PERSONNEL WHO IDENTIFY COMPONENT PARTS OF THE ALLOIS OTHER THAN NICKEL OR COPPER

- e. CATALOG VALUES CANCELED UNLESS OFFER STRENGTHENED. COMPLEX SELECTION EFFECTIVELY STALEMATED. PSYCHOLOGICAL FOUNDATION UNWARRANTED
- f. REQUEST CONSIDERATION OF ONLY THE MOST USUAL PLACEMENTS OF ORDERS FOR BALANCED BUSINESS TRANSACTION. LET NOTICE BE GIVEN FOR A SUBSTITUTION AS SOME ARTICLES NOT EASILY CHANGED. PARTNER AGREEMENT IS EXTRA HELPFUL WHEN MAXIMUM.

- g. The secret text in the following message was solved by Sherlock Holmes in one of Sir Arthur Conan Doyle's stories.

"The supply of game for London is going steadily up. Head-keeper Hudson, we believe, has been now told to receive all orders for fly-paper and for preservation of your hen-pheasant's life."

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- h. In April 1941, the French (Nazi-controlled) newspaper *Paris-Soir* printed the following poem by an anonymous contributor apparently extolling Adolph Hitler. A fairly literal translation is given beneath the original.

Aimons et admirons le Chancelier Hitler  
 L'éternelle Angleterre est indigne de vivre  
 Maudissons et écrasons le peuple d'outre-mer  
 Le Nazi sur la terre sera seul à survivre.  
 Soyons donc le soutien du Führer allemand  
 Des boys navigateurs finira l'odyssée  
 A eux seuls appartient un juste châtement  
 La Palme du vainqueur attend la Croix gammée.

(Let us love and admire Chancellor Hitler  
 Eternal England is not worthy to live  
 Curse and eliminate the people across the sea  
 Nazidom on earth will be the sole survivor.  
 Let us therefore support the German Führer  
 The seafaring boys will finish the odyssey  
 To them alone a fitting punishment  
 The palm of victory awaits the swastika.)

- i. The following telegrams were filed by the same originator to the same addressee on successive days.

**Message No. 1**

MONEY SENT TO NEW HAVEN IN BANK ON ARTS ACCOUNT. HE MAY HAVE DRAWN ALL AND GONE HOME BEING SO BORED. AS ALWAYS HE NEEDS A LOT OF CASH, YET IS NOT ABLE TO DO MUCH WITH THE MONEY SENT TO PAY HIS LAB SCHOOL BILLS.

**Message No. 2.**

SENT FORTY DOLLARS BY CHECK TO HENRY AND ALICE AFTER THEY PAYED ALL ARTS OLD DEBTS STOP. I REALLY WANT AGREEMENT WITH THEM AND WE MUST MAKE ART STOP CHARGES AND BILLS ABOUT TOWN. SEND NO MORE CHECKS TO HIM OR CASH TO WASTE ALWAYS FOR HE SPENDS IT.

**Message No. 3**

MOTHER SENDS LOVE AND WAITS EACH LETTER AS SHE ALWAYS DOES, SO WRITE AS MANY AS TOM AND ELOIS DO TO HER AS ALWAYS, JERRY.

- j. The following innocent-text message is suspected to contain information on ships sailing from Boston.

AT NINE ELEVEN THIS MORNING FOLLOWING CONVERSATION SURPRISED REPORTERS: "RUSSIA, FRANCE AND ENGLAND ASSURED PREPARATIONS WERE NOW RAPIDLY ATTAINING SATISFACTORY ALLOCATIONS. HOWEVER, THEIR ALLOTMENTS VARIED SLIGHTLY, AND IN AGREEING PROBABLY WERE NOT SURE OF THE OUTCOME. UNLESS TERMS ARE QUICKLY DETERMINED, MANY SPECIFIC AGREEMENTS WITH EACH OTHER WILL HAVE TO BE MADE."

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