NATIONAL SECURITY AGENCY
Washington 25, D.C.

COURSE	Military Cryptanalysis, 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.

```
C R D S C    R J S I S    K S J T Y    C L S K R    C Q E R B    Y J Q I R

K P K O J    R C R S D    T F S D J    T Y C D P    F R D X B    R C S F S

J S C S J    U F R J Q    I R K P K    U P D D O    F O X B P    L C R R B

D U K P I    S L S J S    K O K R G    O J N L P    K P C O F    S P F J P

C R R B F    T J N L R    A Y J S H    T F O X B    Q C K R H    T E S D Y

L R H U K    U P C F O    J N L R C    N L U F T    J S E O J    S F X C U

Y F E S K    P J S H X    B K P F B    X X B F Y    S C D P K    S K U C R

J W O C S    L R B K O    K R F X J    U L P B R    Q C K S K    V B Q C P

J P C P J    U J R C S    O F J R F    P J S K U    B O B R K    W P C R I

H V O B J    P K R F Y    D O R D D    U K P D T    B P L P H    T F O X B
```

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:

	0	1	2	3	4	5	6	7	8	9
0	P	Y	R	RA	RE	RED	RES	RI	RO	A
1	1	AL	AN	AND	AR	ARE	AS	AT	ATE	ATI
2	M̄	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	Ø	K
7	L	LA	LE	N	ND	NE	NT	O	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
```

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	IQ	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 se-
quences 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

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

24

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  58  80
50  90  51  54  37  95  46  05  27  95  60  97  05  90  88
31  55  50  35
```

No. 8   USO 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
```

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   USO 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 56

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

No. 16   SIA DE USO   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

21 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 39 69 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

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

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

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 indi-
cates 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

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)
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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