Set of elements

AAAB AABA ABAA
AAAC AACA ACAA ~~ABCA~~ ACCC
AAAD AADA ADAA

AABB ABBA
AABD ABDA
AADB ADBA
AADD ADDA

AABC ABCA ADCC] I
AADC ADCA ABCC

AACB ACBA ~~ACCA~~ ACCD] II
AACD ACDA ACCB

ABAD ADAB] III
ABAC ACAB ACDC
ADAC ACAD ACBC

ABCD ADCB] IV
ABCB ADCD

ABBC ADDC

ACBB ACDD

ABBB
ABBD
ABDB
ABDD

ADBB
ADBD

ADDB
ADDD

Proof that 24 is maximum

1. From set of 26 we must eliminate both ACBB and ACDD.

If ACBB is included, then ADDD and ABDD are excluded; similarly, if ACDD is included, then ADBB and ABBB are excluded. Therefore both ACBB and ACDD must be eliminated, to achieve 25. ✓

~~All 26 cannot be eliminated~~

Can a code of 25 be written down?

1. A••A cannot be excluded.

If all A••A are excluded then AAAB and AAAD are obligatory. ✓ But both AD.. and AB.. must be included because of ~~both~~ the single choices ✓ A(noC, no A). This makes it impossible to have either ABAD or ADAB. Both are eliminated, hence 25 cannot be written. ✓

2. Compatibility systems.

III	ABAC	ACDC	ACAB
	ABAD		ADAB
	ACAD	ACBC	ADAC.

Choose ABAD. Excludes all ••AB. Eliminates ACAB. ✓
choose ABAC or ACDC.

Choose ABAC. No restrictions.

Choose ACAD excludes all ••AC not possible ✓
ACBC excludes all ••AD not possible ✓
ADAC possible.

Choice 1. ABAD ABAC ADAC

Choose ACDC excludes all ••AB, also ADAC.

choose ACAD possible
ACBC excludes all ••AD not possible. ✓

Choice 2. ABAD. ACDC ACAD

Choice 3. ADAB ADAC ABAC

Choice 4 ADAB ACBC ACAB

B~D

IV ~~[illegible]~~ ABCD ADCB
ABCB ADCD.

~~[illegible]~~ If ABCD chosen then eliminate both ADCB and ADCB. ✓ ✓

Hence choices are
1. | ABCD ABCB |
2. | ADCB ADCB |

Note (a) not possible to exclude <u>both</u> ABC• and ADC• ✓
(b) both ~~•~~ ·· CB and ·· CD are obligatory endings. ✓

II. AACB ACCD <u>A</u>CBA
AACD ACCB ACDA

Since both •• CB and •• CD are obligatory endings, it is not possible to have ~~both~~ ACBA and ACDA. Hence these can be eliminated. ✓

Choose AACB ~~excludes all ending beginning with ACB, since shown that •••A cannot be eliminated.~~ Also excludes all ACC D/B. Hence the second choice must be AACD. This excludes all beginning with ~~ACD•, and this is impossible.~~

Hence there is only ~~one~~ two choices here
1. | AACB AACD |
2. | ACCD ACCB | ✓ because ACCD excluded AACB/D

I AABC ADCC ABCA
AADC ABCC ADCA.

choose AABC excludes all ABC• ~~[illegible]~~ ✓
leaves AADC and ADCA ~~[illegible]~~
AADC eliminates all ADC. ✓ not possible.

AABC AADC

Hence (i) | AABC and ADCA |

Choose ADCC, eliminates all ABC•C/B/D ~~AABC~~
AADC eliminates all ADC not possible

(ii) | ADCC and ADCA | ✓

choose ABCA.

eliminates all $ADC_{D}^{C B}$

cannot choose ADCA as eliminates all ABC.

Hence (iii) ABCA and AADC

(iv) ABCA and ABCC ✓

we now write down choices.

		excludes	
III 1	ABAD ABAC ADAC	all ••AB	AABA
		all AC••	AADA

Hence

II 1	AACB AACD	all ACC•	AAAC, ADAA, ACAA

I	AABC ADCA	ADCC ADCA		ABCA AADC	ABCA ABCC
IV		ADCB ADCD			ABCD ABCB

ABAA eliminates AAAD.

AACA

(no AAAD, AADA, ADAA)

~~ABBB~~ ABBB eliminates AABB

~~ABBA~~

~~ABBC~~

ABBD

ABDB

ABDD eliminates AABD

ADBB

ADBD eliminates AADB

ADDB

ADDD eliminates AADD

ABBA

ABDA

ADBA

ADDA of form A $\overset{no}{C}$ • •

ABBC or ADDC.

III 2. ABAD
ACDC
ACAD

eliminates
all •• AB

all •• BC, all •• AC

Hence from
II
must choose ACCD
ACCB

all •• BA
all •• DA

all AAC•

I ADCC
ADCA
ADCB
ADCD

ABCA
ABCC
ABCD
ABCB

ABCA
AADC
ABCD
ABCB

ABCA
AADC
ABCD
ABCB

ABAA
ACAA

ACCC
ADAA

AABB
AABD
AADB
AADD
} eliminated

ADDC

#8

Counder ACAA and ACCC since ••AA is obligatory, then Accc is eliminated.

then ACAA is given. This eliminates all ••cc

ADAA is eliminated
also AAAD

hence only ~~24~~ 20 with this choice.