

POCKET GHOST

A. ROSS ECKLER

Morristown, New Jersey

Many Word Ways readers are familiar with the game of Ghost. In the two-man version of this game, players build sequentially toward a word by alternately adding terminal letters; the one who completes a word loses the game. After a player has added a letter to the sequence, his opponent can challenge him to produce a word starting with that sequence; if he can do so, the challenger loses the game, but if he cannot, the player challenged loses the game. Both players must agree beforehand on a dictionary of admissible words; ordinarily, words must be three or more letters long in order to be counted.

In his recently-published book Your Move (McGraw-Hill, 1971), Dave Silverman suggested that two-player Ghost can be completely analyzed; that is, it is possible to determine which letters of the alphabet are safe (or unsafe) openings for the first player. In the November 1971 issue of Word Ways, Darryl Francis showed that there is only one safe opening letter -- L -- if boldface words from Webster's Third Edition (excluding all words labeled cap, usu cap or sometimes cap) are allowed. Darryl assumed perfect knowledge on the part of both players, so that inadmissible sequences of letters (and challenges) never occurred.

The game of Ghost is considerably more interesting if players are allowed to build toward a word by adding either terminal or initial letters to the sequence. However, it becomes very much more difficult to analyze the game for safe (or unsafe) openings for the first player; words containing a given internal sequence are now scattered throughout the dictionary. Searching through Webster's Third for all possible words containing a given sequence is a task best left to a digital computer. However, if a much more restricted dictionary is specified as the authority, the job of searching for safe openings becomes somewhat more manageable. One very useful aid in such a task is the trigram dictionary based on Webster's Fifth and Seventh Collegiate Dictionaries, published in the August 1969, November 1969 and November 1970 Word Ways.

Let us assume that the New Merriam-Webster Pocket Dictionary (1970 edition) is used as the source of words; specifically, let us allow uncapitalized and unhyphenated boldface words (including lists such as those under sub- and un-, but not single words from multi-word terms, prefixes or suffixes) from this dictionary.

The object of this article is to discover which letters are safe open-

ings for the first player (and which are unsafe), for both the original and the modified game of Ghost. For each letter, a single strategy is presented to demonstrate the assertion that the opening is safe or unsafe; many other strategies may exist, but to enumerate all of them would vastly lengthen this analysis. In other words, a strategy must consider all the letter-choices that the losing player can make at each of his turns, but need consider only one letter-choice for the winning player at each of his turns.

To summarize the results set out in detail below, it seems fairly certain that H, J and M are the only safe openings for the first player in the original game of Ghost, and it appears probable that A and O are the only safe openings for the first player in the modified game of Ghost. It would be foolish to make any stronger claims at this stage for the modified game, for it is quite possible that one or more words have been overlooked that would convert safe letters into unsafe ones, or vice versa. Readers are encouraged to detect any such changes, so that a definitive strategy for Ghost can be ascertained.

Let us consider first the strategy for the original game of Ghost, and begin with those letters which the first player can use to guarantee a win:

Sequence	Word	Sequence	Word
H HA HAK	hake	M MA MAH	mahout, maharaja
HE HEY	heyday	ME MEA	mead, meager, meal, mean, measurable, meat
HI HIK	hike	MI MIK	mikado, mike
HO HOY	hoyden	MN MNE	mnemonic
HU HUF	huff	MO MOA	moan, moat
HY HYB	hybrid	MU MUU	muumuu
J JA JAZ	jazz	MY MYT	myth
JE JEL	jell		
JI JIL	jilt		
JO JOK	joke		
JU JUV	juvenile		

It is interesting to note that if capitalized words were allowed, McCoy (between macaw and mace) would convert M to a win for the second player. Most letters are unsafe for the first player; the second player can dramatically narrow the alternatives by a suitable second-letter choice:

Sequence	Word
A AV	avast; ave; avionic; avocado; avuncular
B BH	bhang
C CR	crack; creed-k-l-p; crick; croquet; crude; cry
D DW	dwarf-ves; dwell-t; dwindle
E EJ	ejaculate-ion; eject
F FJ	fjord
G GH	ghastly; gherkin; ghost

I IV	ivory; ivy
K KH	khaki; khedive
L LL	llama
N NY	nylon
O OA	oaf; oak; oar; oasis; oat
P PN	pneumatic
Q QU	quack; quell; quick; quoit; qursh
R RY	rye
S SK	skate; skein; ski; skunk; sky
T TW	twain; tweak; twice; two
U UD	udder
V VY	vying
W WR	wrack; wreck; wrist; wrong; wrung; wry
X XE	xebec; xenia; xeric
Y YT	ytterbium
Z ZL	zloty

Now let us turn to the corresponding strategies for the modified game of Ghost. If the first player can guarantee a win, there are a large number of moves open to the second player, each of which must be countered by a suitable move by the first player:

Sequence	Word	Sequence	Word
A AA ZAA	bazaar	A BA BAO	baobab
AB ABJ	object, abjure, abjuration	CA CAJ	cajole
AC ACM	acme	DA DAZ	bedazzle, daze, dazzle
AD ADQ	headquarters	EA EAZ	sleazy
AE YAE	hyaena	FA FAZ	faze
AF AFG	afghan	GA GAF	gaff
AG AGD	magdalen	HA HAZ	hazard, haze, haziness, hazy
AH CAH	cahoot	IA IAZ	piazza
AI AIQ	daiquiri	JA JAZ	jazz
AJ CAJ	cajole	KA KAH	hookah
AK AKW	breakwater	LA LAQ	plaque, claque
AL ALQ	catafalque	MA CMA	blancmange
AM AMT	dreamt	NA TNA	catnap
AN ANR	yeomanry	OA WOA	woad
AO GAO	gaol	PA PAQ	opaque
AP APJ	flapjack	RA RAJ	raja, maharaja, trajectory
AQ PAQ	opaque	SA FSA	selfsame
AR ARJ	marjoram	TA YTA	ponytail
AS ASQ	masque, casque	UA UAU	luau
AT ATK	catkin	VA UVA	adjuvant
AU AUE	sauerkraut	WA WAW	williwaw, stowaway
AV FAV	disfavor, favour	XA XAS	exasperate, exasperation
AW AWR	awry, outlawry, lawrencium	YA YAE	hyaena
AX AXP	taxpayer	ZA ZAA	bazaar
AY AYU	picayune, cayuse		
AZ JAZ	jazz		

Sequence	Word	Sequence	Word
O OA OAV	loaves	O AO BAO	baobab
OB OBC	bobcat	BO BOF	riboflavin
OC OCS	tocsin	CO COQ	coquet
OD XOD	exodus	DO DOF	doff
OE BOE	oboe, hoboos, buboes	EO JEO	jeopardy, jeo- pardize, jeopardous
OF OFL	roofless	FO FOW	fowl
OG OGJ	logjam	GO GOY	gargoyle
OH MOH	mohair	HO AHO	ahoy, mahout, mahogany
OI OIE	moiety	IO IOP	biopsy, calliope, audiophile
OJ BOJ	turbojet	JO JOV	jovial
OK JOK	joke	KO KOH	kohlrabi
OL XOL	doxology	LO LOE	floe, sloe, aloe, peccadilloes, haloes
OM OMT	tomtit, boomtown	MO MOH	mohair
ON ONZ	bronze	NO NOZ	nozzle
OO VOO	voodoo	PO POG	apogee, pogrom
OP YOP	myopia, myopic, myopically	RO ROH	prohibit
OQ COQ	coquet	SO SOF	sofa, soft
OR ORQ	torque	TO TOF	toffee, cutoff, photoflash
OS OSQ	mosque, mosquito	UO UOY	buoy
OT XOT	exotic, quixotic	VO VOO	voodoo
OU OUH	brouhaha	WO WOA	woad
OV JOV	jovial	XO XOD	exodus
OW JOW	jowl	YO YOF	payoff, layoff
OX OXO	doxology	ZO ZOU	zounds
OY OYD	hoyden		
OZ OZY	cozy, oozy		

The other 24 letters of the alphabet are unsafe for the first player; for 20 of them, the second player can quickly narrow the alternatives by a suitable second letter:

Sequence	Word
B XB	oxbow, oxblood
C FC	briefcase
D FD	serfdom
F FJ	fjord
G GC	dogcart (the second player should avoid playing A, for the first player can then convert the word to dogcatcher)
I II	genii, radii
J FJ	fjord
K KJ	blackjack, lockjaw
L LJ	killjoy
M MQ	kumquat
P FP	halfpenny
Q MQ	kumquat
R VR	chevron, manoeuvre
S SJ	disjoin, misjudgment (second player should avoid play-

ing G, for the first player can then convert the word to misjudge)

U	ZU	azure, seizure, mazurka, zucchetto
V	VV	flivver
W	FW	halfway
X	XQ	exquisite
Y	YJ	pyjamas
Z	ZU	azure, seizure, mazurka, zucchetto

The final four letters -- E, T, N and H -- are also unsafe for the first player to start with, but the alternatives for the first player on his second move are considerably more numerous:

Sequence	Word	Sequence	Word
N NH ANH PANH	panhandle	N NH NHA NHAP	unhappy
or ENH KENH	brokenhearted	NHE ONHE	nonhereditary
INH INHI	uninhibited, inhibit	or NHI NHIB	inhibit, uninhibited
H ONH ONHE	nonhereditary	H NHO NHOR	unhorse
UNH UNHU	unhurried	NHU ANHU	manhunt
WNH WNHE	downhearted	NHY ANHY	anhydrous
E ET AET HAET	phaeton	E ET ETA FETA	fetal, taffeta
or BET	bet	ETB SETB	setback
CET CETO	acetone	or ETC KETC	ketch
DET ADET	cadet	ETD LETD	letdown
T EET EETM	sweetmeat	T ETE ETEX	pretext
FET FETC	fetch	ETF KETF	pocketful, basketful
GET	get	ETH HETH	whether
HET HETH	whether	ETI ETIQ	etiquette
IET UIET	quiet, quietly, quietness, quietus	ETK KETK	pocketknife
JET	jet	ETL IETL	quietly
KET KETC	ketch	ETMEETM	sweetmeat
LET	let	ETN WETN	wetness
MET	met	ETO AETO	phaeton
NET	net	ETP KETP	marketplace
OET OETE	poetess	ETR DETR	detract, detriment
PET	pet	ETS ETST	whetstone
RET RETZ	pretzel	ETT ZETT	gazette, gazetteer
SET	set	ETU FETU	fetus
TET CTET	octet	ETW ETWE	between
UET RUET	cruet	ETY GETY	fidgety
VET	vet	ETZ RETZ	pretzel
WET	wet		
YET	yet		
ZET ZETT	gazette, gazetteer		

What does all this have to do with an actual game of Ghost? It is very difficult to commit all the modified Ghost strategies to memory, and your opponent is likely to become suspicious if you consult this article between moves. The best strategy is to gallantly insist that your opponent go first as often as possible; if you memorize the strategies for all letters but E, T, N and H, you then have 10 chances out of 13 of winning, assuming that he chooses his initial letter at random. Better yet, insist on playing the original version of Ghost and memorize its strategy table. If he insists that you go first occasionally, it might be wise to select initial letters other than H, J and M as often as possible, in order to conceal the special advantage of these letters. For example, unless your opponent is especially alert, it is likely that you can defeat him even if you choose the initial letter A -- for any of the 26 letters can be added to A to form an admissible sequence, and 25 of these (all but AV) can be converted to winning sequences for the first player. However, it is probably easier to memorize the shorter tables of first-player winning strategies for such letters as L, N, R and Z:

LA	LAS	lascar, lascivious,	RA	RAF	raffle, raft
		lash, lass, last	RE	REW	reward
LE	LEF	left	RH	RHA	rhapsody, rhapsodize
LI	LIF	life, lift	RI	RIO	riot
LO	LOF	loft	RO	ROP	rope
LU	LUF	luff	RU	RUF	ruff
LY	LYC	lyceum			
			ZA	ZAN	zany, zanyly
NA	NAM	name	ZE	ZEA	zeal
NE	NEA	neap, near, neat	ZI	ZIG	zigzag
NI	NIA	niacin	ZO	ZOU	zounds
NO	NOZ	nozzle	ZW	ZWI	zwieback
NU	NUZ	nuzzle	ZY	ZYG	zygote