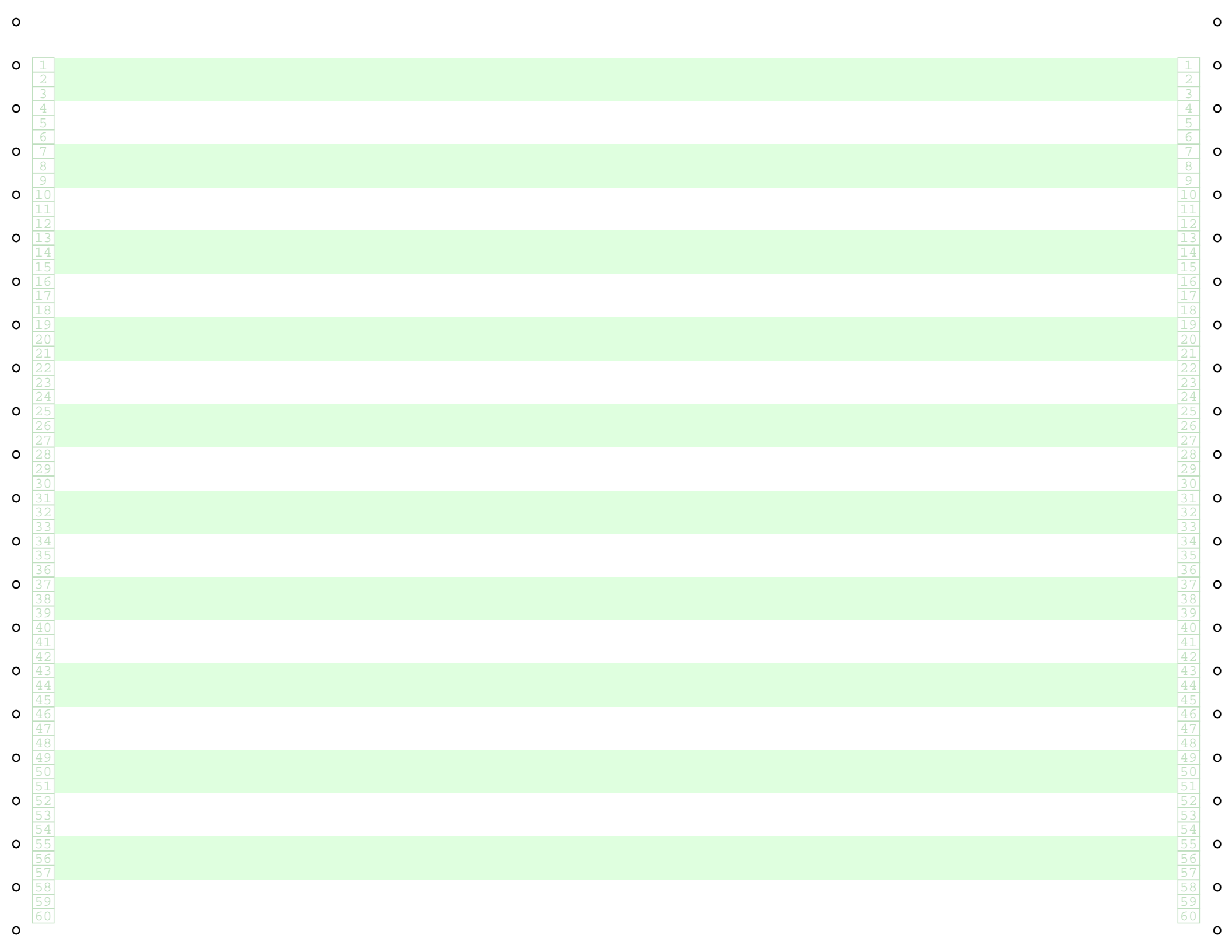


0		1			0
		2	BEGIN		
0	1	3			1
	2	4	COMMENT: *****		2
	3	5	* * * * * *		3
0	4	6	* * * * * *		4
	5	7	* * * * * *		5
	6	8	* * * * * *		6
0	7	9	* * * * * *		7
	8	10	* * * * * *		8
	9	11	* * * * * *		9
0	10	12	* A NATURAL LANGUAGE QUESTION *		10
	11	13	* ANSWERING PROGRAM BASED ON *		11
	12	14	* THE HELP SYSTEM DEVELOPED AT *		12
0	13	15	* PROJECT GENIE, UNIVERSITY OF *		13
	14	16	* CALIFORNIA, BERKELEY. *		14
	15	17	* * * * * *		15
0	16	18	*****		16
	17	19	;		17
	18	20			18
0	19	21	LITERAL TABLESIZE (459);		19
	20	22	INTEGER ARRAY TABLE[0:TABLESIZE];		20
	21	23			21
0	22	24			22
	23	25	INTEGER PROCEDURE HASH (S);		23
	24	26			24
0	25	27	COMMENT: THE HASH VALUE FOR A KEY WORD IS DEVELOPED		25
	26	28	BY PACKING THE LENGTH AND THE RADIX 16 VALUE		26
	27	29	OF THE FIRST, MIDDLE, AND LAST CHARACTERS OF		27
0	28	30	THE WORD INTO AN UNSIGNED INTEGER;		28
	29	31			29
	30	32	STRING S;		30
0	31	33			31
	32	34	BEGIN INTEGER I, J, K;		32
	33	35			33
0	34	36	J := K := LENGTH(S);		34
	35	37			35
	36	38	FOR I := 1, (K+1)/2, K DO		36
0	37	39	J := SHIFT(J, -4) OR ASCII(S,I) AND 17R8;		37
	38	40			38
	39	41	HASH := ABS(J);		39
0	40	42	END;		40
	41	43			41
	42	44			42
0	43	45	INTEGER PROCEDURE HASHINDEX (N);		43
	44	46			44
	45	47	COMMENT: AN INDEX INTO THE HASH TABLE IS DETERMINED		45
0	46	48	BY THE HASH VALUE FOR THE WORD MODULO THE		46
	47	49	SIZE OF THE HASH TABLE;		47
	48	50			48
0	49	51	INTEGER N;		49
	50	52			50
	51	53	HASHINDEX := N-(N/TABLESIZE)*TABLESIZE;		51
0	52	54			52
	53	55			53
	54	56	EXTERNAL POINTER PROCEDURE ANSWERPOINTER;		54
0	55	57	EXTERNAL PROCEDURE TREEMAINTEINER;		55
	56	58	EXTERNAL STRING PROCEDURE FETCH;		56
	57	59	EXTERNAL PROCEDURE COMBINATIONS;		57
0	58	60	EXTERNAL PROCEDURE SORT;		58
	59	61			59
	60	62	INTEGER ARRAY KEYLIST[1:20];		60
0	61	63	INTEGER I, J, N, ANSWER, KEYS;		61

0	64	BASED INTEGER BI;		0
	65	LITERAL CR ("<15>");		
0	1	66	STRING (512) S;	1
	2	67		2
	3	68		3
0	4	69		4
	5	70		5
	6	71	COMMENT: *****	6
0	7	72	* * *	7
	8	73	* ANSWER DEFINITION *	8
	9	74	* * *	9
0	10	75	*****	10
	11	76		11
	12	77		12
0	13	78		13
	14	79		14
	15	80	OPEN (1, "HELP.\$\$");	15
0	16	81	FOR I := 0 STEP 1 UNTIL TABLESIZE DO	16
	17	82	TABLE[I] := 0;	17
	18	83		18
0	19	84	DEFINE: S := FETCH;	19
	20	85	IF S = CR THEN GO TO DEFINE;	20
	21	86	ANSWER := ANSWERPOINTER(S);	21
0	22	87	KEYS := 0;	22
	23	88		23
	24	89	1: S := FETCH;	24
0	25	90	IF S = CR THEN GO TO 2;	25
	26	91	IF S = "" THEN GO TO EOF;	26
	27	92	KEYS := KEYS+1;	27
0	28	93	N := HASH(S);	28
	29	94	TABLE[HASHINDEX(N)] := N;	29
	30	95	KEYLIST[KEYS] := N;	30
0	31	96	GO TO 1;	31
	32	97		32
	33	98	2: IF KEYS = 0 THEN GO TO 3;	33
0	34	99	SORT (KEYLIST, 1, KEYS);	34
	35	100	TREEMAINAINER (KEYLIST, KEYS, ANSWER, TRUE);	35
	36	101		36
0	37	102	3: READ (1, S, EOF);	37
	38	103	IF S = "" THEN GO TO DEFINE;	38
	39	104	ANSWER->BI := ANSWER->BI + 1;	39
0	40	105	GO TO 3;	40
	41	106		41
	42	107	EOF: CLOSE (1);	42
0	43	108	OPEN (1, "\$TTI");	43
	44	109	OPEN (2, "\$TTO");	44
	45	110	OPEN (3, "HELP.\$\$");	45
0	46	111		46
	47	112		47
	48	113		48
0	49	114		49
	50	115	COMMENT: *****	50
	51	116	* * *	51
0	52	117	* MAIN PROGRAM LOOP *	52
	53	118	* * *	53
	54	119	*****	54
0	55	120		55
	56	121		56
	57	122		57
0	58	123		58
	59	124	PARSE: WRITE (2, "<15>> ");	59
	60	125	S := FETCH;	60
0		126	KEYS := 0;	

0	127				0
	128	4:	IF S = "?" THEN GO TO 6;		
0	1	129	IF S = CR THEN GO TO 7;	1	0
	2	130	N := HASH(S);	2	
	3	131	IF TABLE[HASHINDEX(N)] = N THEN BEGIN	3	
0	4	132		4	0
	5	133	FOR I := 1 STEP 1 UNTIL KEYS DO	5	
	6	134	IF KEYLIST[I] = N THEN GO TO 5;	6	
0	7	135	KEYS := KEYS+1;	7	0
	8	136	KEYLIST[KEYS] := N;	8	
	9	137	END;	9	
0	10	138		10	0
	11	139	5: S := FETCH;	11	
	12	140	GO TO 4;	12	
0	13	141		13	0
	14	142	6: IF FETCH <> CR THEN GO TO 6;	14	
	15	143		15	
0	16	144	7: SORT (KEYLIST, 1, KEYS);	16	0
	17	145	FOR N := 0 STEP 1 UNTIL KEYS-1 DO BEGIN	17	
	18	146		18	
0	19	147	COMBINATIONS(KEYLIST, KEYS, KEYS-N, J);	19	0
	20	148	IF J > 0 THEN GO TO PARSE;	20	
	21	149	END;	21	
0	22	150		22	0
	23	151	WRITE (2, "I DON'T KNOW.<15>");	23	
	24	152	GO TO PARSE;	24	
0	25	153		25	0
	26	154	END	26	
	27	155		27	
0	28			28	0
	29			29	
	30			30	
0	31			31	0
	32			32	
	33			33	
0	34			34	0
	35			35	
	36			36	
0	37			37	0
	38			38	
	39			39	
0	40			40	0
	41			41	
	42			42	
0	43			43	0
	44			44	
	45			45	
0	46			46	0
	47			47	
	48			48	
0	49			49	0
	50			50	
	51			51	
0	52			52	0
	53			53	
	54			54	
0	55			55	0
	56			56	
	57			57	
0	58			58	0
	59			59	
	60			60	
0					0



0001 .MAIN

;

; BEGIN

.EXTU

.EXTN WRITE

.EXTN CLOSE

.EXTN READ

.EXTN OPEN

.EXTN SORT

.EXTN COMBINATIONS

.EXTN FETCH

.EXTN TREEMAINAINER

.EXTN ANSWERPOINTER

.EXTN MPY

.ZREL

00000-001301'.LP: LP+200

.NREL

000001 .TXTM 1

100360 .DALC FNTR=100360

; ENTIER

00000'006012\$ JSR @SAVE

00001'000021 FSO

00002'000400 1B7+0

00003'006004\$ JSR @BLKSTART

;

; COMMENT:

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; LITERAL TABLESIZE (459);

; INTEGER ARRAY TABLE[0:TABLESIZE];

00004'006001\$ JSR @ARRAY

00005'000003 3

00006'100000 ;TABLE

00007'010021 ;INTEGER LOCAL ARRAY

00010'001102' LP+1 ;LITERAL

00011'001101' LP+0 ;LITERAL

^ 0002 .MAIN

1						1
2						2
3						3
4						4
5						5
6	00012'	002401	JMP	@.+1		6
7	00013'	000120'	G1			7
8	00014'	006012\$.L0:	JSR	@SAVE	8
9	00015'	000011	FS1			9
10	00016'	001002	2B7+2			10
11	00017'	100000	SP+0		;HASH	11
12	00020'	003421	003421		;INTEGER PARAMETER	12
13	00021'	100001	SP+1		;S	13
14	00022'	001203	001203		;STRING PARAMETER	14
15						15
16						16
17					; COMMENT: THE HASH VALUE FOR A KEY WORD IS DEVELOPED	17
18					; BY PACKING THE LENGTH AND THE RADIX 16 VALUE	18
19					; OF THE FIRST, MIDDLE, AND LAST CHARACTERS OF	19
20					; THE WORD INTO AN UNSIGNED INTEGER;	20
21						21
22					; STRING S;	22
23						23
24					; BEGIN INTEGER I, J, K;	24
25						25
26					; J := K := LENGTH(S);	26
27						27
28	00023'	006004\$	JSR	@BLKSTART		28
29	00024'	006006\$	JSR	@LENGTH		29
30	00025'	100001	SP+1		;S	30
31	00026'	001203	001203		;STRING PARAMETER	31
32	00027'	100007	SP+7		;TEMPORARY	32
33	00030'	021620	LDA	0,S+7,3	;TEMPORARY	33
34	00031'	041617	STA	0,S+6,3	;K	34
35	00032'	041616	STA	0,S+5,3	;J	35
36						36
37						37
38						38
39					FOR I := 1, (K+1)/2, K DO	39
40	00033'	102520	G4:	SUBZL	0,0 ;(1)	40
41	00034'	041615	STA	0,S+4,3	;I	41
42	00035'	006401	JSR	@.+1		42
43	00036'	000062'	G3			43
44	00037'	034020\$	LDA	3,..SP		44
45	00040'	021617	G5:	LDA	0,S+6,3 ;K	45
46	00041'	101400	INC	0,0		46
47	00042'	105000	MOV	0,1		47
48	00043'	034000-	LDA	3,..LP		48
49	00044'	031603	LDA	2,L+3,3	;LITERAL	49
50	00045'	102440	SUBO	0,0		50
51	00046'	006014\$	JSR	@SDIV		51
52	00047'	045615	STA	1,S+4,3	;I	52
53	00050'	006401	JSR	@.+1		53
54	00051'	000062'	G3			54
55	00052'	034020\$	LDA	3,..SP		55
56	00053'	021617	G6:	LDA	0,S+6,3 ;K	56
57						57
58						58
59						59
60						60

^ 0003 .MAIN

1	00054'041615	STA	0,S+4,3	;I	1
2	00055'006401	JSR	@.+1		2
3	00056'000062'	G3			3
4	00057'034020\$	LDA	3,.SP		4
5	00060'002401	JMP	@.+1		5
6	00061'000112'	G2			6
7	00062'165400 G3:	INC	3,1	;SAVE	7
8					8
9					9
10				J := SHIFT(J, -4) OR ASCII(S,I) AND 17R8;	10
11	00063'006016\$	JSR	@SHIFT		11
12	00064'100005	SP+5		;J	12
13	00065'000021	000021		;INTEGER LOCAL	13
14	00066'001105'	LP+4		;LITERAL	14
15	00067'100007	SP+7		;TEMPORARY	15
16	00070'006002\$	JSR	@ASCII		16
17	00071'000003	3			17
18	00072'100001	SP+1		;S	18
19	00073'001203	001203		;STRING PARAMETER	19
20	00074'100004	SP+4		;I	20
21	00075'100010	SP+10		;TEMPORARY	21
22	00076'021621	LDA	0,S+10,3	;TEMPORARY	22
23	00077'034000-	LDA	3,.LP		23
24	00100'031605	LDA	2,L+5,3	;LITERAL	24
25	00101'143400	AND	2,0		25
26	00102'034020\$	LDA	3,.SP		26
27	00103'031620	LDA	2,S+7,3	;TEMPORARY	27
28	00104'150000	COM	2,2		28
29	00105'143400	AND	2,0		29
30	00106'142000	ADC	2,0		30
31	00107'041616	STA	0,S+5,3	;J	31
32	00110'135000	MOV	1,3		32
33	00111'001400	JMP	0,3		33
34					34
35					35
36				HASH := ABS(J);	36
37					37
38	00112'021616 G2:	LDA	0,S+5,3	;J	38
39	00113'101112	MOVL#	0,0,SZC		39
40	00114'100400	NEG	0,0		40
41	00115'041611	STA	0,S+0,3	;HASH	41
42					42
43				END;	43
44					44
45	00116'006003\$	JSR	@BLKEND		45
46	00117'006010\$	JSR	@RETURN		46
47	000011 FS1=	11			47
48					48
49					49
50					50
51					51
52					52
53					53
54					54
55					55
56					56
57					57
58					58
59					59
60					60

^ 0004 .MAIN

```
1  
2  
3  
4 ;  
5 ; INTEGER PROCEDURE HASHINDEX (N);  
6  
7 00120'002401 G1: JMP @.+1  
8 00121'000150' G7  
9 00122'006012$.L1: JSR @SAVE  
10 00123'000002 FS2  
11 00124'001002 2B7+2  
12 00125'100000 SP+0 ;HASHINDEX  
13 00126'003421 003421 ;INTEGER PARAMETER  
14 00127'100001 SP+1 ;N  
15 00130'001021 001021 ;INTEGER PARAMETER  
16  
17 ;  
18 ; COMMENT: AN INDEX INTO THE HASH TABLE IS DETERMINED  
19 ; BY THE HASH VALUE FOR THE WORD MODULO THE  
20 ; SIZE OF THE HASH TABLE;  
21 ;  
22 ; INTEGER N;  
23 ;  
24 ; HASHINDEX := N-(N/TABLESIZE)*TABLESIZE;  
25  
26 00131'025612 LDA 1,S+1,3 ;N  
27 00132'034000- LDA 3,..LP  
28 00133'031600 LDA 2,L+0,3 ;LITERAL  
29 00134'102440 SUBO 0,0  
30 00135'006014$ JSR @SDIV  
31 00136'034000- LDA 3,..LP  
32 00137'031600 LDA 2,L+0,3 ;LITERAL  
33 00140'034020$ LDA 3,..SP  
34 00141'102440 SUBO 0,0  
35 00142'077777 MPY  
36 00143'021612 LDA 0,S+1,3 ;N  
37 00144'124400 NEG 1,1  
38 00145'107000 ADD 0,1  
39 00146'045611 STA 1,S+0,3 ;HASHINDEX  
40 00147'006010$ JSR @RETURN  
41 000002 FS2= 2  
42  
43  
44 ;  
45 ;  
46 ; EXTERNAL POINTER PROCEDURE ANSWERPOINTER;  
47 ; EXTERNAL PROCEDURE TREEMAINTEINER;  
48 ; EXTERNAL STRING PROCEDURE FETCH;  
49 ; EXTERNAL PROCEDURE COMBINATIONS;  
50 ; EXTERNAL PROCEDURE SORT;  
51 ;  
52 ; INTEGER ARRAY KEYLIST[1:20];  
53  
54 00150'006001$G7: JSR @ARRAY  
55 00151'000003 3  
56 00152'100002 SP+2 ;KEYLIST  
57  
58  
59  
60
```

^ 0005 .MAIN

```
00153'010021      010021      ;INTEGER LOCAL ARRAY
00154'001103'      LP+2          ;LITERAL
00155'001107'      LP+6          ;LITERAL

; INTEGER I, J, N, ANSWER, KEYS;
; BASED INTEGER BI;
; LITERAL CR ("<15>");
; STRING (512) S;

00156'006011$      JSR      @SALLOC
00157'100011      SP+11          ;S
00160'000203      000203      ;STRING LOCAL
00161'001000      1000

;
;
;
; COMMENT: *****
; *
; *          ANSWER DEFINITION
; *
; *****
;

; OPEN (1, "HELP.$$");

00162'006005$      JSR      @CALL
00163'077777      OPEN
00164'000002      2
00165'001103'      LP+2          ;LITERAL
00166'000021      000021      ;INTEGER
00167'001113'      LP+12        ;LITERAL
00170'000202      000202      ;STRING

; FOR I := 0 STEP 1 UNTIL TABLESIZE DO

00171'102400 G12:  SUB      0,0      ;(0)
00172'041615      STA      0,S+4,3  ;I
00173'021615 G13:  LDA      0,S+4,3  ;I
00174'034000-     LDA      3, .LP
00175'025600      LDA      1,L+0,3    ;LITERAL
00176'034020$     LDA      3, .SP
00177'106546      SUBOL   0,1,SEZ
00200'000412      JMP      G14
00201'006401      JSR      @.+1
00202'000214'     G11
00203'102520      SUBZL   0,0      ;(1)
00204'034020$     LDA      3, .SP
00205'025615      LDA      1,S+4,3  ;I
00206'107000      ADD      0,1
00207'045615      STA      1,S+4,3  ;I
00210'002401      JMP      @.+1
00211'000173'     G13
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^ 0006 .MAIN

1	00212'002401	G14:	JMP	@.+1		1
2	00213'000224'		G10			2
3	00214'165400	G11:	INC	3,1	;SAVE	3
4						4
5						5
6						6
7	00215'006013\$		JSR	@SBSCR		7
8	00216'100000		SP+0		;TABLE	8
9	00217'100004		SP+4		;I	9
10	00220'102400		SUB	0,0	;(0)	10
11	00221'041000		STA	0,0,2		11
12	00222'135000		MOV	1,3		12
13	00223'001400		JMP	0,3		13
14						14
15						15
16						16
17						17
18						18
19	00224'006011\$.L2:		JSR	@SALLOC		19
20	00225'100014		SP+14		;TEMPORARY	20
21	00226'000203		000203		;STRING	21
22	00227'000040		40			22
23	00230'006005\$		JSR	@CALL		23
24	00231'077777		FETCH			24
25	00232'000001		1			25
26	00233'100014		SP+14		;TEMPORARY	26
27	00234'000203		000203		;STRING	27
28	00235'006007\$		JSR	@MOVSTR		28
29	00236'100014		SP+14		;TEMPORARY	29
30	00237'000203		000203		;STRING	30
31	00240'100011		SP+11		;S	31
32	00241'000203		000203		;STRING LOCAL	32
33	00242'006015\$		JSR	@SFREE		33
34	00243'100014		SP+14		;TEMPORARY	34
35	00244'000203		000203		;STRING	35
36						36
37						37
38						38
39	00245'006017\$		JSR	@STREQ		39
40	00246'100011		SP+11		;S	40
41	00247'000203		000203		;STRING LOCAL	41
42	00250'001110'		LP+7		;LITERAL	42
43	00251'000202		000202		;STRING	43
44	00252'102560		SUBCL	0,0		44
45	00253'101015		#MOV	0,0,SNR		45
46	00254'002402		JMP	@.+2		46
47	00255'000402		JMP	+.2		47
48	00256'000261'		G15			48
49	00257'002401		JMP	@.+1		49
50	00260'000224'		.L2			50
51						51
52						52
53						53
54						54
55						55
56						56
57						57
58						58
59						59
60						60

^ 0007 .MAIN

1					1
2					2
3					3
4	00261'006005\$G15:	JSR @CALL			4
5	00262'077777	ANSWERPOINTER			5
6	00263'000002	2			6
7	00264'100017	SP+17		;TEMPORARY	7
8	00265'000141	000141		;POINTER	8
9	00266'100011	SP+11		;S	9
10	00267'000203	000203		;STRING LOCAL	10
11	00270'021630	LDA 0,S+17,3		;TEMPORARY	11
12	00271'041620	STA 0,S+7,3		;ANSWER	12
13					13
14					14
15					15
16	00272'126400	SUB 1,1		;(0)	16
17	00273'045621	STA 1,S+10,3		;KEYS	17
18					18
19					19
20					20
21					21
22	00274'006011\$.L3:	JSR @SALLOC			22
23	00275'100014	SP+14		;TEMPORARY	23
24	00276'000203	000203		;STRING	24
25	00277'000040	40			25
26	00300'006005\$	JSR @CALL			26
27	00301'000231'	FETCH			27
28	00302'000001	1			28
29	00303'100014	SP+14		;TEMPORARY	29
30	00304'000203	000203		;STRING	30
31	00305'006007\$	JSR @MOVSTR			31
32	00306'100014	SP+14		;TEMPORARY	32
33	00307'000203	000203		;STRING	33
34	00310'100011	SP+11		;S	34
35	00311'000203	000203		;STRING LOCAL	35
36	00312'006015\$	JSR @SFREE			36
37	00313'100014	SP+14		;TEMPORARY	37
38	00314'000203	000203		;STRING	38
39					39
40					40
41					41
42	00315'006017\$	JSR @STREQ			42
43	00316'100011	SP+11		;S	43
44	00317'000203	000203		;STRING LOCAL	44
45	00320'001110'	LP+7		;LITERAL	45
46	00321'000202	000202		;STRING	46
47	00322'102560	SUBCL 0,0			47
48	00323'101015	#MOV 0,0,SNR			48
49	00324'002402	JMP @.+2			49
50	00325'000402	JMP .+2			50
51	00326'000331'	G16			51
52	00327'002401	JMP @.+1			52
53	00330'000404'	.L4			53
54					54
55					55
56					56
57					57
58					58
59					59
60					60

^ 0008 .MAIN

; IF S = "" THEN GO TO EOF;

```
00331'006017$G16: JSR @STREQ
00332'100011 SP+11 ;S
00333'000203 000203 ;STRING LOCAL
00334'001116' LP+15 ;LITERAL
00335'000202 000202 ;STRING
00336'102560 SUBCL 0,0
00337'101015 #MOV 0,0,SNR
00340'002402 JMP @.+2
00341'000402 JMP .+2
00342'000345' G17
00343'002401 JMP @.+1
00344'000475' .L6
```

; KEYS := KEYS+1;

```
00345'021621 G17: LDA 0,S+10,3 ;KEYS
00346'101400 INC 0,0
00347'041621 STA 0,S+10,3 ;KEYS
```

; N := HASH(S);

```
00350'006005$ JSR @CALL
00351'000014' .L0 ;HASH
00352'000002 2
00353'100017 SP+17 ;TEMPORARY
00354'000021 000021 ;INTEGER
00355'100011 SP+11 ;S
00356'000203 000203 ;STRING LOCAL
00357'021630 LDA 0,S+17,3 ;TEMPORARY
00360'041617 STA 0,S+6,3 ;N
```

; TABLE[HASHINDEX(N)] := N;

```
00361'006005$ JSR @CALL
00362'000122' .L1 ;HASHINDEX
00363'000002 2
00364'100017 SP+17 ;TEMPORARY
00365'000021 000021 ;INTEGER
00366'100006 SP+6 ;N
00367'000021 000021 ;INTEGER LOCAL
00370'006013$ JSR @SBSCR
00371'100000 SP+0 ;TABLE
00372'100017 SP+17 ;TEMPORARY
00373'021617 LDA 0,S+6,3 ;N
00374'041000 STA 0,0,2
```

^ 0009 .MAIN

1						1
2						2
3						3
4	00375'006013\$	JSR	@SBSCR			4
5	00376'100002	SP+2			;KEYLIST	5
6	00377'100010	SP+10			;KEYS	6
7	00400'021617	LDA	0,S+6,3		;N	7
8	00401'041000	STA	0,0,2			8
9						9
10						10
11						11
12	00402'002401	JMP	@.+1			12
13	00403'000274'	.L3				13
14						14
15						15
16						16
17						17
18	00404'021621 .L4:	LDA	0,S+10,3		;KEYS	18
19	00405'126400	SUB	1,1		;(0)	19
20	00406'106404	SUB	0,1,SZR			20
21	00407'126401	SUB	1,1,SKP			21
22	00410'125400	INC	1,1			22
23	00411'125015	#MOV	1,1,SNR			23
24	00412'002402	JMP	@.+2			24
25	00413'000402	JMP	+.2			25
26	00414'000417'	G20				26
27	00415'002401	JMP	@.+1			27
28	00416'000443'	.L5				28
29						29
30						30
31						31
32	00417'006005\$G20:	JSR	@CALL			32
33	00420'077777	SORT				33
34	00421'000003	3				34
35	00422'100002	SP+2			;KEYLIST	35
36	00423'010021	010021			;INTEGER LOCAL ARRAY	36
37	00424'001103'	LP+2			;LITERAL	37
38	00425'000021	000021			;INTEGER	38
39	00426'100010	SP+10			;KEYS	39
40	00427'000021	000021			;INTEGER LOCAL	40
41						41
42						42
43						43
44	00430'006005\$	JSR	@CALL			44
45	00431'077777	TREEMAINAINER				45
46	00432'000004	4				46
47	00433'100002	SP+2			;KEYLIST	47
48	00434'010021	010021			;INTEGER LOCAL ARRAY	48
49	00435'100010	SP+10			;KEYS	49
50	00436'000021	000021			;INTEGER LOCAL	50
51	00437'100007	SP+7			;ANSWER	51
52	00440'000021	000021			;INTEGER LOCAL	52
53	00441'001120'	LP+17			;LITERAL	53
54	00442'000061	000061			;BOOLEAN	54
55						55
56						56
57						57
58						58
59						59
60						60

^ 0010 .MAIN

1						1
2						2
3						3
4						4
5	00443'006005\$.L5:	JSR	@CALL			5
6	00444'077777	READ				6
7	00445'000003	3				7
8	00446'001103'	LP+2			;LITERAL	8
9	00447'000021	000021			;INTEGER	9
10	00450'100011	SP+11			;S	10
11	00451'000203	000203			;STRING LOCAL	11
12	00452'000475'	.L6			;EOF	12
13	00453'020100	020100			;LABEL LOCAL	13
14						14
15						15
16						16
17	00454'006017\$	JSR	@STREQ			17
18	00455'100011	SP+11			;S	18
19	00456'000203	000203			;STRING LOCAL	19
20	00457'001116'	LP+15			;LITERAL	20
21	00460'000202	000202			;STRING	21
22	00461'102560	SUBCL	0,0			22
23	00462'101015	#MOV	0,0,SNR			23
24	00463'002402	JMP	@.+2			24
25	00464'000402	JMP	+.2			25
26	00465'000470'	G21				26
27	00466'002401	JMP	@.+1			27
28	00467'000224'	.L2				28
29						29
30						30
31						31
32	00470'023620 G21:	LDA	0,@S+7,3		;ANSWER	32
33	00471'101400	INC	0,0			33
34	00472'043620	STA	0,@S+7,3		;ANSWER	34
35						35
36						36
37						37
38	00473'002401	JMP	@.+1			38
39	00474'000443'	.L5				39
40						40
41						41
42						42
43						43
44	00475'006005\$.L6:	JSR	@CALL			44
45	00476'077777	CLOSE				45
46	00477'000001	1				46
47	00500'001103'	LP+2			;LITERAL	47
48	00501'000021	000021			;INTEGER	48
49						49
50						50
51						51
52						52
53						53
54						54
55						55
56						56
57						57
58						58
59						59
60						60

^ 0011 .MAIN

1					1
2					2
3					3
4	00502'006005\$	JSR	@CALL		4
5	00503'000163'	OPEN			5
6	00504'000002	2			6
7	00505'001103'	LP+2		;LITERAL	7
8	00506'000021	000021		;INTEGER	8
9	00507'001121'	LP+20		;LITERAL	9
10	00510'000202	000202		;STRING	10
11					11
12					12
13					13
14	00511'006005\$	JSR	@CALL		14
15	00512'000503'	OPEN			15
16	00513'000002	2			16
17	00514'001104'	LP+3		;LITERAL	17
18	00515'000021	000021		;INTEGER	18
19	00516'001124'	LP+23		;LITERAL	19
20	00517'000202	000202		;STRING	20
21					21
22					22
23					23
24	00520'006005\$	JSR	@CALL		24
25	00521'000512'	OPEN			25
26	00522'000002	2			26
27	00523'001126'	LP+25		;LITERAL	27
28	00524'000021	000021		;INTEGER	28
29	00525'001113'	LP+12		;LITERAL	29
30	00526'000202	000202		;STRING	30
31					31
32					32
33					33
34					34
35					35
36					36
37					37
38					38
39					39
40					40
41					41
42					42
43					43
44					44
45					45
46					46
47	00527'006005\$.L7:	JSR	@CALL		47
48	00530'077777	WRITE			48
49	00531'000002	2			49
50	00532'001104'	LP+3		;LITERAL	50
51	00533'000021	000021		;INTEGER	51
52	00534'001127'	LP+26		;LITERAL	52
53	00535'000202	000202		;STRING	53
54					54
55					55
56					56
57					57
58					58
59					59
60					60

1						1
2						2
3						3
4	00536'006011\$	JSR	@SALLOC			4
5	00537'100014	SP+14			;TEMPORARY	5
6	00540'000203	000203			;STRING	6
7	00541'000040	40				7
8	00542'006005\$	JSR	@CALL			8
9	00543'000301'	FETCH				9
10	00544'000001	1				10
11	00545'100014	SP+14			;TEMPORARY	11
12	00546'000203	000203			;STRING	12
13	00547'006007\$	JSR	@MOVSTR			13
14	00550'100014	SP+14			;TEMPORARY	14
15	00551'000203	000203			;STRING	15
16	00552'100011	SP+11			;S	16
17	00553'000203	000203			;STRING LOCAL	17
18	00554'006015\$	JSR	@SFREE			18
19	00555'100014	SP+14			;TEMPORARY	19
20	00556'000203	000203			;STRING	20
21						21
22						22
23						23
24	00557'102400	SUB	0,0		;(0)	24
25	00560'041621	STA	0,S+10,3		;KEYS	25
26						26
27						27
28						28
29						29
30	00561'006017\$.L10:	JSR	@STREQ			30
31	00562'100011	SP+11			;S	31
32	00563'000203	000203			;STRING LOCAL	32
33	00564'001131'	LP+30			;LITERAL	33
34	00565'000202	000202			;STRING	34
35	00566'102560	SUBCL	0,0			35
36	00567'101015	#MOV	0,0,SNR			36
37	00570'002402	JMP	@.+2			37
38	00571'000402	JMP	+.2			38
39	00572'000575'	G22				39
40	00573'002401	JMP	@.+1			40
41	00574'000742'	.L12				41
42						42
43						43
44						44
45	00575'006017\$G22:	JSR	@STREQ			45
46	00576'100011	SP+11			;S	46
47	00577'000203	000203			;STRING LOCAL	47
48	00600'001110'	LP+7			;LITERAL	48
49	00601'000202	000202			;STRING	49
50	00602'102560	SUBCL	0,0			50
51	00603'101015	#MOV	0,0,SNR			51
52	00604'002402	JMP	@.+2			52
53	00605'000402	JMP	+.2			53
54	00606'000611'	G23				54
55	00607'002401	JMP	@.+1			55
56	00610'000772'	.L13				56
57						57
58						58
59						59
60						60

1						1
2						2
3						3
4	00611'006005\$G23:	JSR	@CALL			4
5	00612'000014'	.LO			;HASH	5
6	00613'000002	2				6
7	00614'100017	SP+17			;TEMPORARY	7
8	00615'000021	000021			;INTEGER	8
9	00616'100011	SP+11			;S	9
10	00617'000203	000203			;STRING LOCAL	10
11	00620'021630	LDA	0,S+17,3		;TEMPORARY	11
12	00621'041617	STA	0,S+6,3		;N	12
13						13
14						14
15						15
16	00622'006005\$	JSR	@CALL			16
17	00623'000122'	.L1			;HASHINDEX	17
18	00624'000002	2				18
19	00625'100017	SP+17			;TEMPORARY	19
20	00626'000021	000021			;INTEGER	20
21	00627'100006	SP+6			;N	21
22	00630'000021	000021			;INTEGER LOCAL	22
23	00631'006013\$	JSR	@SBSCR			23
24	00632'100000	SP+0			;TABLE	24
25	00633'100017	SP+17			;TEMPORARY	25
26	00634'021000	LDA	0,0,2			26
27	00635'025617	LDA	1,S+6,3		;N	27
28	00636'122404	SUB	1,0,SZR			28
29	00637'102401	SUB	0,0,SKP			29
30	00640'101400	INC	0,0			30
31	00641'101015	#MOV	0,0,SNR			31
32	00642'002402	JMP	@.+2			32
33	00643'000402	JMP	+.2			33
34	00644'000717'	G24				34
35						35
36						36
37						37
38						38
39	00645'102520 G27:	SUBZL	0,0		;(1)	39
40	00646'041615	STA	0,S+4,3		;I	40
41	00647'021615 G30:	LDA	0,S+4,3		;I	41
42	00650'025621	LDA	1,S+10,3		;KEYS	42
43	00651'106546	SUBOL	0,1,SEZ			43
44	00652'000412	JMP	G31			44
45	00653'006401	JSR	@.+1			45
46	00654'000666'	G26				46
47	00655'102520	SUBZL	0,0		;(1)	47
48	00656'034020\$	LDA	3,..SP			48
49	00657'025615	LDA	1,S+4,3		;I	49
50	00660'107000	ADD	0,1			50
51	00661'045615	STA	1,S+4,3		;I	51
52	00662'002401	JMP	@.+1			52
53	00663'000647'	G30				53
54	00664'002401 G31:	JMP	@.+1			54
55	00665'000707'	G25				55
56	00666'165400 G26:	INC	3,1		;SAVE	56
57						57
58						58
59						59
60						60

^ 0014 .MAIN

1						1
2						2
3						3
4	00667'006013\$	JSR	@SBSCR			4
5	00670'100002	SP+2			;KEYLIST	5
6	00671'100004	SP+4			;I	6
7	00672'021000	LDA	0,0,2			7
8	00673'031617	LDA	2,S+6,3		;N	8
9	00674'142404	SUB	2,0,SZR			9
10	00675'102401	SUB	0,0,SKP			10
11	00676'101400	INC	0,0			11
12	00677'045630	STA	1,S+17,3		;TEMPORARY	12
13	00700'101015	#MOV	0,0,SNR			13
14	00701'002402	JMP	@.+2			14
15	00702'000402	JMP	+.2			15
16	00703'000706'	G32				16
17	00704'002401	JMP	@.+1			17
18	00705'000717'	.L11				18
19	00706'003630 G32:	JMP	@S+17,3			19
20						20
21					KEYS := KEYS+1;	21
22						22
23	00707'021621 G25:	LDA	0,S+10,3		;KEYS	23
24	00710'101400	INC	0,0			24
25	00711'041621	STA	0,S+10,3		;KEYS	25
26						26
27					KEYLIST[KEYS] := N;	27
28						28
29	00712'006013\$	JSR	@SBSCR			29
30	00713'100002	SP+2			;KEYLIST	30
31	00714'100010	SP+10			;KEYS	31
32	00715'021617	LDA	0,S+6,3		;N	32
33	00716'041000	STA	0,0,2			33
34						34
35					END;	35
36						36
37					; 5: S := FETCH;	37
38						38
39					G24:	39
40	00717'006011\$.L11:	JSR	@SALLOC			40
41	00720'100014	SP+14			;TEMPORARY	41
42	00721'000203	000203			;STRING	42
43	00722'000040	40				43
44	00723'006005\$	JSR	@CALL			44
45	00724'000543'	FETCH				45
46	00725'000001	1				46
47	00726'100014	SP+14			;TEMPORARY	47
48	00727'000203	000203			;STRING	48
49	00730'006007\$	JSR	@MOVSTR			49
50	00731'100014	SP+14			;TEMPORARY	50
51	00732'000203	000203			;STRING	51
52	00733'100011	SP+11			;S	52
53	00734'000203	000203			;STRING LOCAL	53
54	00735'006015\$	JSR	@SFREE			54
55	00736'100014	SP+14			;TEMPORARY	55
56	00737'000203	000203			;STRING	56
57						57
58						58
59						59
60						60

^ 0015 .MAIN

1						1
2						2
3						3
4	00740'002401	JMP	@.+1			4
5	00741'000561'	.L10				5
6						6
7						7
8						8
9						9
10	00742'006011\$.L12:	JSR	@SALLOC			10
11	00743'100014	SP+14			;TEMPORARY	11
12	00744'000203	000203			;STRING	12
13	00745'000040	40				13
14	00746'006005\$	JSR	@CALL			14
15	00747'000724'	FETCH				15
16	00750'000001	1				16
17	00751'100014	SP+14			;TEMPORARY	17
18	00752'000203	000203			;STRING	18
19	00753'006017\$	JSR	@STREQ			19
20	00754'100014	SP+14			;TEMPORARY	20
21	00755'000203	000203			;STRING	21
22	00756'001110'	LP+7			;LITERAL	22
23	00757'000202	000202			;STRING	23
24	00760'006015\$	JSR	@SFREE			24
25	00761'100014	SP+14			;TEMPORARY	25
26	00762'000203	000203			;STRING	26
27	00763'102500	SUBL	0,0			27
28	00764'101015	#MOV	0,0,SNR			28
29	00765'002402	JMP	@.+2			29
30	00766'000402	JMP	+.2			30
31	00767'000772'	G33				31
32	00770'002401	JMP	@.+1			32
33	00771'000742'	.L12				33
34						34
35						35
36						36
37						37
38						38
39	G33:					39
40	00772'006005\$.L13:	JSR	@CALL			40
41	00773'000420'	SORT				41
42	00774'000003	3				42
43	00775'100002	SP+2			;KEYLIST	43
44	00776'010021	010021			;INTEGER LOCAL ARRAY	44
45	00777'001103'	LP+2			;LITERAL	45
46	01000'000021	000021			;INTEGER	46
47	01001'100010	SP+10			;KEYS	47
48	01002'000021	000021			;INTEGER LOCAL	48
49						49
50						50
51						51
52						52
53						53
54						54
55						55
56						56
57						57
58						58
59						59
60						60

^ 0017 .MAIN

1					1
2					2
3					3
4	01051'021616	LDA	0,S+5,3	;J	4
5	01052'126400	SUB	1,1	;(0)	5
6	01053'103240	ADDOR	0,0		6
7	01054'127240	ADDOR	1,1		7
8	01055'106420	SUBZ	0,1		8
9	01056'102500	SUBL	0,0		9
10	01057'101015	#MOV	0,0,SNR		10
11	01060'002402	JMP	@.+2		11
12	01061'000402	JMP	+.2		12
13	01062'001065'	G41			13
14	01063'002401	JMP	@.+1		14
15	01064'000527'	.L7			15
16					16
17					17
18					18
19	01065'003630 G41:	JMP	@S+17,3		19
20					20
21					21
22					22
23					23
24	01066'006005\$G34:	JSR	@CALL		24
25	01067'000530'	WRITE			25
26	01070'000002	2			26
27	01071'001104'	LP+3		;LITERAL	27
28	01072'000021	000021		;INTEGER	28
29	01073'001133'	LP+32		;LITERAL	29
30	01074'000202	000202		;STRING	30
31					31
32					32
33					33
34	01075'002401	JMP	@.+1		34
35	01076'000527'	.L7			35
36					36
37					37
38					38
39					39
40	01077'006003\$	JSR	@BLKEND		40
41	01100'006010\$	JSR	@RETURN		41
42	000021 FS0=	21			42
43					43
44					44
45					45
46					46
47					47
48					48
49					49
50					50
51					51
52					52
53					53
54					54
55					55
56					56
57					57
58					58
59					59
60					60

^ 0018 .MAIN

1	177600 L=	-200	1
2	177611 S=	-167	2
3	100000 SP=	1B0	3
4			4
5			5
6			6
7			7
8			8
9			9
10			10
11			11
12			12
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4	01103'000001	000001			4
5	01104'000002	000002			5
6	01105'177774	177774			6
7	01106'000017	000017			7
8	01107'000024	000024			8
9	01110'002274"	.S0*2			9
10	01111'000401	000401			10
11	01112'001000	001000			11
12	01113'002276"	.S1*2			12
13	01114'003407	003407			13
14	01115'000007	000007			14
15	01116'002306"	.S2*2			15
16	01117'000000	000000			16
17	01120'000001	000001			17
18	01121'002310"	.S3*2			18
19	01122'002004	002004			19
20	01123'000004	000004			20
21	01124'002316"	.S4*2			21
22	01125'002004	002004			22
23	01126'000003	000003			23
24	01127'002324"	.S5*2			24
25	01130'001403	001403			25
26	01131'002330"	.S6*2			26
27	01132'000401	000401			27
28	01133'002332"	.S7*2			28
29	01134'007016	007016			29
30	01135'000016	000016			30
31					31
32		.S0:	.TXT	"<15>"	32
33	01136'006400				33
34		.S1:	.TXT	"HELP.\$\$"	34
35	01137'044105				35
36	01140'046120				36
37	01141'027044				37
38	01142'022000				38
39		.S2:	.TXT	" "	39
40	01143'000000				40
41		.S3:	.TXT	"\$TTI"	41
42	01144'022124				42
43	01145'052111				43
44	01146'000000				44
45		.S4:	.TXT	"\$TTO"	45
46	01147'022124				46
47	01150'052117				47
48	01151'000000				48
49		.S5:	.TXT	"<15>> "	49
50	01152'006476				50
51	01153'020000				51
52		.S6:	.TXT	"?"	52
53	01154'037400				53
54		.S7:	.TXT	"I DON'T KNOW.<15>"	54
55	01155'044440				55
56	01156'042117				56
57	01157'047047				57
58	01160'052040				58
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0		0020 .MAIN		0
0		01161'045516		0
0	1	01162'047527		1
0	2	01163'027015		2
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	ANSWE	000262'X		
0	1	ARRAY	000001\$X	1
	2	ASCII	000002\$X	2
	3	BLKEN	000003\$X	3
0	4	BLKST	000004\$X	4
	5	CALL	000005\$X	5
	6	CLOSE	000476'X	6
0	7	COMBI	001037'X	7
	8	FETCH	000747'X	8
	9	FS0	000021	9
0	10	FS1	000011	10
	11	FS2	000002	11
	12	G1	000120'	12
0	13	G10	000224'	13
	14	G11	000214'	14
	15	G12	000171'	15
0	16	G13	000173'	16
	17	G14	000212'	17
	18	G15	000261'	18
0	19	G16	000331'	19
	20	G17	000345'	20
	21	G2	000112'	21
0	22	G20	000417'	22
	23	G21	000470'	23
	24	G22	000575'	24
0	25	G23	000611'	25
	26	G24	000717'	26
	27	G25	000707'	27
0	28	G26	000666'	28
	29	G27	000645'	29
	30	G3	000062'	30
0	31	G30	000647'	31
	32	G31	000664'	32
	33	G32	000706'	33
0	34	G33	000772'	34
	35	G34	001066'	35
	36	G35	001026'	36
0	37	G36	001003'	37
	38	G37	001005'	38
	39	G4	000033'	39
0	40	G40	001024'	40
	41	G41	001065'	41
	42	G5	000040'	42
0	43	G6	000053'	43
	44	G7	000150'	44
	45	L	177600	45
0	46	LENGT	000006\$X	46
	47	LP	001101'	47
	48	MOVST	000007\$X	48
0	49	MPY	000142'X	49
	50	OPEN	000521'X	50
	51	READ	000444'X	51
0	52	RETUR	000010\$X	52
	53	S	177611	53
	54	SALLO	000011\$X	54
0	55	SAVE	000012\$X	55
	56	SBSCR	000013\$X	56
	57	SDIV	000014\$X	57
0	58	SFREE	000015\$X	58
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0		0022 .MAIN		0
		SHIFT 000016\$X		
0	1	SORT 000773'X		1
	2	SP 100000		2
	3	STREQ 000017\$X		3
0	4	TREEM 000431'X		4
	5	WRITE 001067'X		5
	6	.L0 000014'		6
0	7	.L1 000122'		7
	8	.L10 000561'		8
	9	.L11 000717'		9
0	10	.L12 000742'		10
	11	.L13 000772'		11
	12	.L2 000224'		12
0	13	.L3 000274'		13
	14	.L4 000404'		14
	15	.L5 000443'		15
0	16	.L6 000475'		16
	17	.L7 000527'		17
	18	.LP 000000-		18
0	19	.S0 001136'		19
	20	.S1 001137'		20
	21	.S2 001143'		21
0	22	.S3 001144'		22
	23	.S4 001147'		23
	24	.S5 001152'		24
0	25	.S6 001154'		25
	26	.S7 001155'		26
	27	.SP 000020\$X		27
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