HEWLETT-PACKARD
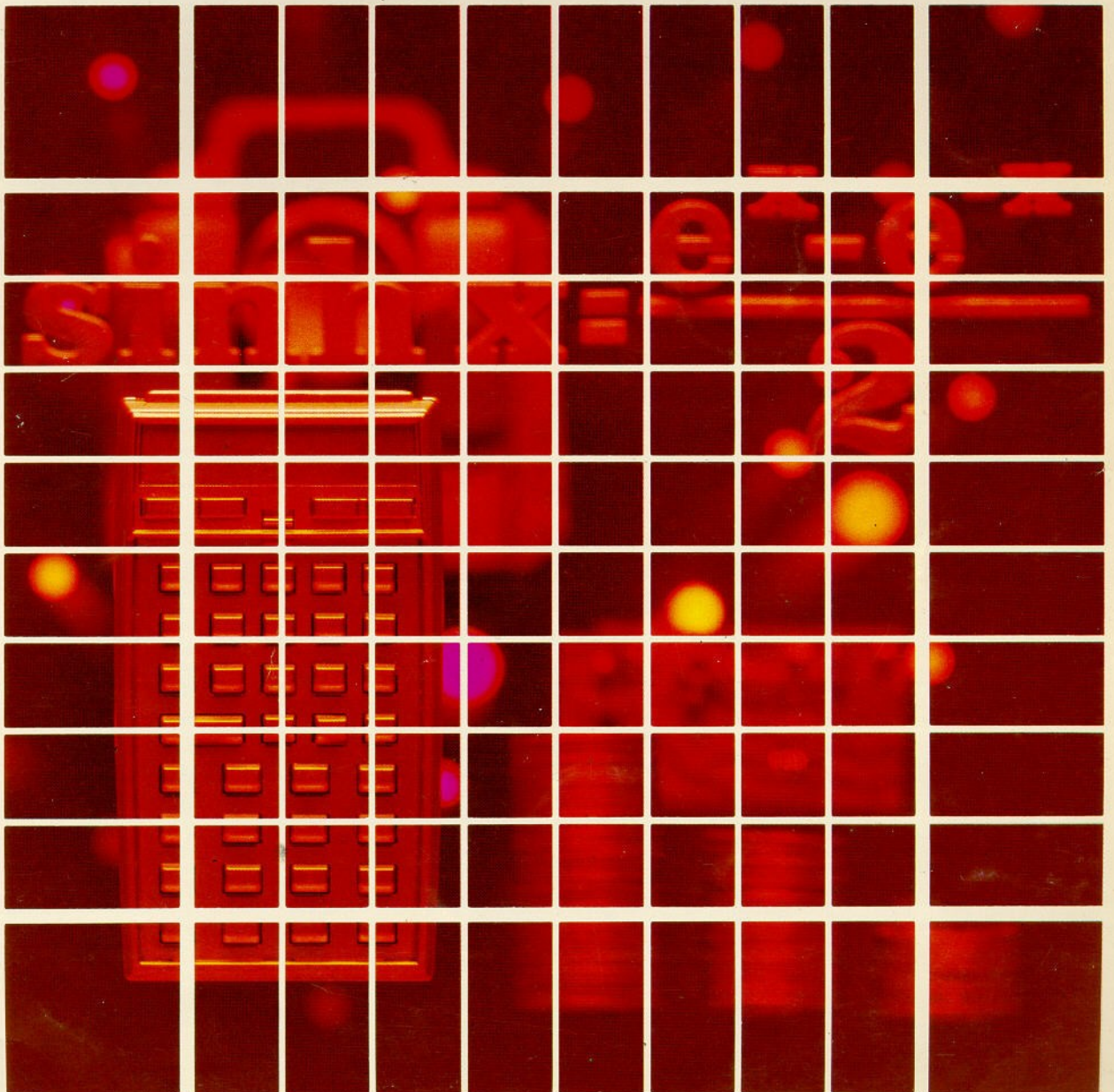
HP-41C

USERS'
LIBRARY SOLUTIONS
Calendars

NOTICE

The program material contained herein is supplied without representation or warranty of any kind. Hewlett-Packard Company therefore assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.

INTRODUCTION

This HP-41C Solutions book was written to help you get the most from your calculator. The programs were chosen to provide useful calculations for many of the common problems encountered.

They will provide you with immediate capabilities in your everyday calculations and you will find them useful as guides to programming techniques for writing your own customized software. The comments on each program listing describe the approach used to reach the solution and help you follow the programmer's logic as you become and expert on your HP calculator.

KEYING A PROGRAM INTO THE HP-41C

There are several things that you should keep in mind while you are keying in programs from the program listings provided in this book. The output from the HP 82143A printer provides a convenient way of listing and an easily understood method of keying in programs without showing every keystroke. This type of output is what appears in this handbook. Once you understand the procedure for keying programs in from the printed listings, you will find this method simple and fast. Here is the procedure:

1. At the end of each program listing is a listing of status information required to properly execute that program. Included is the SIZE allocation required. Before you begin keying in the program, press [XEQ] [ALPHA] SIZE [ALPHA] and specify the allocation (three digits; e.g., 10 should be specified as 010).

    Also included in the status information is the display format and status of flags important to the program. To ensure proper execution, check to see that the display status of the HP-41C is set as specified and check to see that all applicable flags are set or clear as specified.

2. Set the HP-41C to PRGM mode (press the [PRGM] key) and press ■ [GTO] [•] [•] to prepare the calculator for the new program.

3. Begin keying in the program. Following is a list of hints that will help you when you key in your programs from the program listings in this handbook.

    a. When you see " (quote marks) around a character or group of characters in the program listing, those characters are ALPHA. To key them in, simply press [ALPHA], key in the characters, then press [ALPHA] again. So "SAMPLE" would be keyed in as [ALPHA] "SAMPLE" [ALPHA].

    b. The diamond in front of each LBL instruction is only a visual aid to help you locate labels in the program listings. When you key in a program, ignore the diamond.

    c. The printer indication of divide sign is /. When you see / in the program listing, press [÷].

    d. The printer indication of the multiply sign is ⁑ . When you see ⁑ in the program listing, press [×].

    e. The ⱶ character in the program listing is an indication of the [APPEND] function. When you see ⱶ, press ■ [APPEND] in ALPHA mode (press ■ and the K key).

    f. All operations requiring register addresses accept those addresses in these forms:

    nn (a two-digit number)
    IND nn (INDIRECT: ■ , followed fy a two-digit number)
    X, Y, Z, T, or L (a STACK address: [•] followed by X, Y, Z, T, or L)
    IND X, Y, Z, T or L (INDIRECT stack: ■ [•] followed by X, Y, Z, T, or L)

    Indirect addresses are specified by pressing ■ and then the indirect address. Stack addresses are specified by pressing [•] followed by X, Y, Z, T, or L. Indirect stack addresses are specified by pressing ■ [•] and X, Y, Z, T, or L.

Printer Listing	Keystrokes	Display
01◆LBL "SAMPLE"	■ [LBL] [ALPHA] SAMPLE [ALPHA]	01 LBLᵀSAMPLE
02 "THIS IS A "	[ALPHA] THIS IS A [ALPHA]	02ᵀTHIS IS A
03 "ⱶSAMPLE"	[ALPHA] ■ [APPEND] SAMPLE	03ᵀ ⱶ SAMPLE
	■ AVIEW [ALPHA]	04 AVIEW
04 AVIEW		
05 6	6	05 6
06 ENTER↑	[ENTER◆]	06 ENTER ↗
07 -2	2 [CHS]	07 -2
08 ⁄	[÷]	08 /
09 ABS	[XEQ] [ALPHA] ABS [ALPHA]	09 ABS
10 STO IND L	[STO] ■ [•] L	10 STO IND L
11 "R3="	[ALPHA] R3= ■ [ARCL] 03	11ᵀR3=
12 ARCL 03	■ [AVIEW]	12 ARCL 03
13 AVIEW	[ALPHA]	13 AVIEW
14 RTN	■ [RTN]	14 RTN

TABLE OF CONTENTS

   *These programs require an additional memory module
  **This program requires a printer and two memory modules.

CALENDAR DATE TO JULIAN DATE CONVERSION

This program converts any given calendar date between March 1, 1900 and February 28, 2100, to a Julian Date (a continuous count of days from an epoch in the very distant past). For example, January 1, 1979, yield a Julian Date of 2,443,875. Thus the interval between any two calendar dates (on the Gregorian calendar) can be found by obtaining the Julian Date for each and then finding the absolute value of the difference between the two.

To calculate the Julian Day number, the following equation is used:

Julian Day number = INT (365.25 y') + INT (30.6001 m') + d + 1,720,982

where

$$y' = \begin{cases} year - 1 & \text{if } m = 1 \text{ or } 2 \\ year & \text{if } m > 2 \end{cases}$$

$$m' = \begin{cases} month + 13 & \text{if } m = 1 \text{ or } 2 \\ month + 1 & \text{if } m > 2 \end{cases}$$

This program will also convert any Julian Date (greater than 0) to its corresponding Gregorian Date.

NOTE: If any discrepancy is noticed, see the reference for further details.

REFERENCE: O'Neil, W. M., Time and the Calendars, Sydney Univ. Press, Australia, 1975.

Example 1:

Determine the Julian Day Number for July 4, 1979.

Keystrokes:	Display:
[XEQ] [ALPHA] SIZE [ALPHA] 007	
[XEQ] [ALPHA] JUL [ALPHA]	MM.DDYYYY ?
7.041979 [R/S]	JD=2,444,059.

Example 2:

Given the Julian Date 2,444,233, what is the corresponding Gregorian Date?

Keystrokes:	Display:
[XEQ] [ALPHA] CAL [ALPHA]	JULIAN DAY?
2444233 [R/S]	12-25-1979

Keystrokes:	Display:
[XEQ] [ALPHA] JUL [ALPHA]	MM.DDYYYY ?
8.281940 [R/S]	JD=2,429,870.
[STO] 06	2,429,870.0000
[XEQ] [ALPHA] JUL [ALPHA]	MM.DDYYYY ?
8.281978 [R/S]	JD=2,443,749.
[RCL] 06	2,429,870.0000
[-]	13,879.0000

User Instructions

SIZE: 007

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1	Enter Program			
2	To calculate Gregorian Date go to step 5			
3	Calculate Julain Date:		[XEQ] JUL	MM.DDYYYY ?
4	Input date	date	[R/S]	JD= (Julian Day)
5	Calculate Gregorian Date		[XEQ] CAL	Julian Day?
6	Input Julain Day Number	day#	[R/S]	MM-DD-YYYY

Program Listings

```
01◆LBL "JUL          Initialization
"                    and prompting
02 FIX 0             for input
03 "MM.DDYY
YY ?"
04 PROMPT
05 INT
06 STO 00            Unpack month,day,
07 LASTX             and year.  Then
08 FRC               store into appro-
09 1 E2              priate register.
10 *
11 INT
12 STO 01
13 LASTX
14 FRC
15 1 E4
16 *
17 STO 02
18 2
19 RCL 00            Calculate m ,and
20 X>Y?              y'
21 GTO 00
22 1
23 ST- 02
24 12
25 ST+ 00
26◆LBL 00
27 1
28 ST+ 00
29 RCL 02
30 365.25
31 *
32 INT                Calculate day
33 30.6001            number
34 RCL 00
35 *
36 INT
37 +
38 RCL 01
39 +
40 1720982
41 +
42 "JD="              Display result
43 ARCL X
44 AVIEW
45 FIX 4
46 STOP
47◆LBL "CAL
"
```

```
48 FIX 0             Initialization
49 "JULIAN           and prompting
DAY?"                for input
50 PROMPT
51 CF 29
52 ENTER↑
53 68569             L=Julian Date +
54 +                    68569
55 STO 04
56 4
57 *                 N=4*L/146097
58 146097
59 /
60 INT
61 STO 05
62 146097
63 *
64 3
65 +
66 4
67 /
68 INT
69 CHS
70 RCL 04
71 +
72 STO 04
73 1
74 +
75 4000
76 *
77 1461001           I=4000*(L+1)/
78 /                      1461001
79 INT
80 STO 03
81 1461              L=L-1461*I/4+31
82 *
83 4
84 /
85 INT
86 CHS
87 31
88 +
89 RCL 04
90 +
91 STO 04
92 80                J=80*L/2447
93 *
94 2447
95 /
96 INT
97 STO 02
```

Program Listings

```
 98  2447
 99  *
100  80
101  /
102  INT          K=L-2447*J/80
103  CHS
104  RCL  04
105  +
106  STO  01
107  RCL  02
108  11
109  /              L=J/11
110  INT
111  STO  04
112  12
113  *
114  CHS
115  2              J=J+2-12*L
116  +
117  RCL  02
118  +
119  STO  02
120  RCL  05
121  49             I=100*(N-49)+I+L
122  -
123  1  E2
124  *
125  RCL  03
126  +
127  RCL  04
128  +
129  STO  03
130  CLA
131  ARCL  02       Display result
132  "⊢-"           in proper format
133  ARCL  01
134  "⊢-"
135  ARCL  03
136  AVIEW
137  SF  29
138  CLX
139  FIX  4
140  STOP
141  .END.
```

```
51


60




70




80




90



00
```

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS			
00	month	50	
	day		
	year		
	Term 1		
	Term 2		
05	Term 3	55	
	temporary for user		
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	.

STATUS

SIZE __007__   TOT. REG. __44__   **USER MODE**

ENG _____   FIX _____   SCI _____   ON _____ OFF __X__

DEG _____   RAD _____   GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES
29		Radix Point	No Radix Point

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

DAY OF YEAR - DAY OF WEEK

Given a date (between years 1901 and 2009), or given a year and day of the year, this program will calculate the date, the day of the year, the remaining days of the year, and the day of the week. The day of the year and date are calculated using the following Julian Day formula:

Julian Day number = INT(365.25 y') + INT(30.6001 m') + d + 1,720,982

where
$$y' = \begin{cases} year -1 & \text{if } m = 1 \text{ or } 2 \\ year & \text{if } m > 2 \end{cases}$$

$$m' = \begin{cases} month + 13 & \text{if } m = 1 \text{ or } 2 \\ month + 1 & \text{if } m > 2 \end{cases}$$

Example 1:

For July 4,1979 find:
1) Day of the year
2) Remaining days in the year
3) The day of the week

Keystrokes:	Display:
[XEQ] [ALPHA] SIZE [ALPHA] 011	
1) [XEQ] [ALPHA] DOY [ALPHA]	MM.DDYYYY ?
7.041979 [R/S]	185 DAY
2) [XEQ] [ALPHA] RDOY [ALPHA]	180 DAYS
3) [XEQ] [ALPHA] DOW [ALPHA]	WED

Example 2:

For the year 1956, the 315th day, determine the following:
1) The date
2) The remaining days in the year
3) The day of the week

Keystrokes:	Display:
1) [XEQ] [ALPHA] DAT [ALPHA]	YEAR ?
1956 [R/S]	DOY ?
315 [R/S]	11-10-1956
2) [XEQ] [ALPHA] RDOY [ALPHA]	51 DAYS
3) [XEQ] [ALPHA] DOW [ALPHA]	SAT

User Instructions

SIZE: 011

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load program			
2.	For day of Year		[XEQ] DOY	MM.DDYYYY ?
	Input date	MM.DDYYYY	[R/S]	XXX DAY
3.	For date		[XEQ] DAT	YEAR ?
	Input year	YYYY	[R/S]	DOY ?
	Input day of year	DOY	[R/S]	MM-DD-YYYY
	-AFTER EITHER STEP 2 OR 3 -			
4.	For reamining days in year		[XEQ] RDOY	XXX DAYS
5.	For day of week		[XEQ] DOW	DOW

Program Listings

```
01◆LBL "DOY
      "
02 XEQ 08              Prompt for date
03 "MM.DDYY
YY ?"
04 PROMPT             Compute day
05 XEQ 00             number
06 STO 02             Compute day
07 RCL 04             number for first
08 1 E6               of year
09 /
10 1
11 +
12 XEQ 00
13 RCL 02             Find the differ-
14 -                  ence and display
15 CHS                result
16 STO 00
17 CF 29
18 CLA
19 ARCL X
20 SF 29
21 "⊢ DAY"
22 AVIEW
23 RTN
24◆LBL 00
25 ENTER↑
26 INT                Break date into
27 STO 07             month, day and
28 -                  year.
29 1 E2
30 *
31 ENTER↑
32 INT
33 STO 08
34 -
35 1 E4
36 *
37 STO 09
38 STO 04
39 RCL 07             Calculate Julian
40 1                  Day number
41 +
42 ENTER↑
43 1/X
44 .7
45 +
46 CHS
47 XEQ 04
48 RCL 01
49 *
```

```
50 INT
51 RCL 09
52 RCL 10
53 *
54 INT
55 +
56 RCL 08
57 +
58 RTN
59◆LBL 04             Make corrections
60 INT                to m' and y'
61 ST+ 09
62 12
63 *
64 -
65 RTN
66◆LBL "DAT
      "
67 XEQ 08
68 "YEAR ?"
69 PROMPT             Prompt for year,
70 "DOY ?"            and day of year.
71 PROMPT
72 STO 00
73 RDN
74 STO 04
75 1 E6               Compute first
76 /                  day of year.
77 1
78 +
79 XEQ 00
80 RCL 00
81 +
82 STO 02
83 RCL 05
84 -                  Decipher day
85 RCL 10             number into
86 /                  month day and
87 INT                year
88 STO 09
89 RCL 10
90 *
91 INT
92 RCL 02
93 -
94 CHS
95 STO 06
96 RCL 01
97 /
98 INT
99 STO 07
```

Program Listings

```
100 RCL 06
101 X<>Y
102 RCL 01
103 *
104 INT
105 -
106 STO 08
107 RCL 07
108 1
109 RCL 08
110 %
111 -
112 -
113 RCL 07
114 14
115 /
116 XEQ 04
117 CF 29
118 CLA
119 INT
120 ARCL X
121 "⊢-"
122 LASTX
123 FRC
124 1 E2
125 *
126 ARCL X
127 "⊢-"
128 ARCL 09
129 AVIEW
130 SF 29
131 CLX
132 RTN
133◆LBL "RDO
Y"
134 RCL 04
135 4
136 /
137 FRC
138 X=0?
139 SF 07
140 RCL 03
141 .5
142 FS?C 07
143 CHS
144 -
145 RCL 00
146 -
147 CF 29
148 CLA
149 ARCL X
```

Put date into MM-DD-YYYY

Compute remaining days of the year

```
150 "⊢ DAYS"
151 AVIEW
152 SF 29
153 RTN
154◆LBL "DOW
"
155 RCL 02
156 5
157 +
158 7
159 /
160 FRC
161 7
162 *
163 RND
164 X=0?
165 "SUN"
166 1
167 X=Y?
168 "MON"
169 CLX
170 2
171 X=Y?
172 "TUE"
173 CLX
174 3
175 X=Y?
176 "WED"
177 CLX
178 4
179 X=Y?
180 "THUR"
181 CLX
182 5
183 X=Y?
184 "FRI"
185 CLX
186 6
187 X=Y?
188 "SAT"
189 AVIEW
190 RTN
191◆LBL 08
192 FIX 0
193 365.25
194 STO 10
195 .25
196 +
197 STO 03
198 30.6001
199 STO 01
```

Calculate day of week number

Display day of week

Initialize

Program Listings

```
200  122.1
201  STO 05
202  CLX
203  RTN
204  .END.
```

10

20

30

40

50

51

60

70

80

90

00

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS				STATUS			

DATA REGISTERS

00	DOY	50	
	30.6001		
	JD NUMBER		
	365.5		
	USED		
05	122.1	55	
	USED		
	MONTH		
	DAY		
	YEAR		
10	365.25	60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	.

STATUS

SIZE __11__ TOT. REG. __60__ USER MODE

ENG ____ FIX ____ SCI ____ ON ____ OFF __X__

DEG ____ RAD ____ GRAD ____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

NUMBER OF WEEKDAYS BETWEEN TWO DATES

This program calculates the number of weekdays between any two dates in history. The program uses dates encoded in MM.DDYYYY form. The number of weekdays is calculated using the following formula:

$$W(m,d,y) = 5 \left| \frac{D(m,d,y)}{7} \right| + 1/2 \left| 1.801 \, (D(m,d,y) \bmod 7) \right|$$

where: $D(m,d,y) = d - \left| 3/4 \, \left(\left| \frac{g(y,m)}{100} \right| - 7 \right) \right| + \left| 365.25 \, g(y,m) \right| + \left| 30.6 \, f(m) \right|$

$$f(m) = \begin{cases} m + 13 & \text{if } m=1,2 \\ m + 1 & \text{if } m>2 \end{cases} \qquad g(y,m) = \begin{cases} y-1 & \text{if } m=1,2 \\ y & \text{if } m>2 \end{cases} \qquad \left| \quad \right| = \text{INT}$$

The program then calculates the difference between the current W and the previous W. These calculations are from noon-to-noon, so the difference between a weekday and a non-weekday will have a half day in it.

This program is valid from the beginning of the Gregorian Calendar, through the year 9999.

Example 1:

Determine how many weekdays there are between September 2, 1963 and June 5, 1964 and the day of the week that June 5, 1964 falls on.

Keystrokes:	Display:
[XEQ] [ALPHA] SIZE [ALPHA] 004	
[XEQ] [ALPHA] WEEK [ALPHA]	DATE 1 ?
9.021963 [R/S]	DATE 2 ?
6.051964 [R/S]	199.0 WEEKDAYS
[R/S]*	DATE 2 = FRI.

Example 2:

Determine how many weekdays between April 1, 1974 and May 1, 1974. Also, what is the day-of-week of the last date entered, May 1, 1974?

Keystrokes:	Display:
[XEQ] [ALPHA] WEEK [ALPHA]	DATE 1 ?
4.011974 [R/S]	DATE 2 ?
5.011974 [R/S]	22.0 WEEKDAYS
[R/S]*	DATE 2 = WED.

*This [R/S] is not necessary if the printer is attached.

User Instructions

SIZE: 004

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load program			
2.	Start program execution		[XEQ] WEEK	DATE 1 ?
3.	Enter first date	MM.DDYYYY	[R/S]	DATE 2 ?
4.	Enter second date	MM.DDYYYY	[R/S]	XXX WEEKDAYS
5.	To determine day-of-week after second			
	date entry		[R/S]	DOW

Program Listings

Code		Note
01♦LBL "WEE		
K"		
02♦LBL 05		
03 SF 21		
04 FIX 6		
05 "DATE 1?	Prompt for 1st	
"	date	
06 ADV		
07 XEQ 02		
08 XEQ 00		
09 "DATE 2?	Prompt for 2nd	
"	date	
10 TONE 8		
11 XEQ 02		
12 XEQ 00		
13 FIX 1		
14 CLA		
15 ARCL X	Displaying	
16 "⊢ WEEKD	output	
AYS"		
17 TONE 8		
18 AVIEW		
19 CLA		
20 ARCL 00		
21 "⊢ = "		
22 RCL 03	Determine and	
23 7	display day	
24 *	of week	
25 RND		
26 INT		
27 1		
28 X=Y?		
29 "⊢MON."		
30 RDN		
31 2		
32 X=Y?		
33 "⊢TUE."		
34 RDN		
35 3		
36 X=Y?		
37 "⊢WED."		
38 RDN		
39 4		
40 X=Y?		
41 "⊢THUR."		
42 RDN		
43 5		
44 X=Y?		
45 "⊢FRI."		
46 RDN		
47 6		

Code		Note
48 X=Y?		
49 "⊢SAT."		
50 RDN		
51 0		
52 X=Y?		
53 "⊢SUN."		
54 TONE 8		
55 AVIEW		
56 GTO 05		
57♦LBL 02		
58 PROMPT		
59 ASTO 00		
60 CLA		
61 ARCL 00		
62 "⊢ = "		
63 ARCL X		
64 FS? 55		
65 PRA		
66 RTN		
67♦LBL 00		
68 9		
69 ENTER↑		
70 1 E-6		
71 -		
72 X<>Y		
73 3		
74 X<>Y		
75 X<=Y?	M-1 or 2? Add 12	
76 XEQ 01	to M & Y = Y-1	
77 1		
78 +	Add 1 to M	
79 ENTER↑		
80 INT		
81 STO 01	Store adjusted M	
82 -		
83 100		
84 *		
85 ENTER↑		
86 FRC	.YYYY	
87 100		
88 *	YY.YY	
89 ENTER↑	C=# of centuries	
90 INT		
91 7		
92 -		
93 .75		
94 *		
95 INT		
96 X<>Y		
97 36525		
98 *	Century days	

Program Listings

```
 99 INT
100 -
101 -
102 INT
103 RCL 01
104 30.6
105 *
106 INT
107 +
108 7
109 /
110 ENTER↑
111 FRC
112 -
113 LASTX
114 STO 03
115 12.61
116 *
117 INT
118 .1
119 *
120 +
121 5
122 *
123 RCL 02
124 X<>Y
125 STO 02
126 -
127 CHS
128 RTN
129◆LBL 01
130 +
131 +
132 .END.
```

$[365.25y] + d -$
$[3/4(c-7)]$

30.6 f(m)

D/7

1-801 (D mod 7)

W

Difference

51	
60	
70	
80	
90	
00	

40	
50	

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS			
00	Alpha prompt f(m) Code # prev. date ½ day-of-week	50	
05		55	
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	

STATUS

SIZE __004__   TOT. REG. __40__   **USER MODE**

ENG _____   FIX __1__ SCI _____   ON _____ OFF _____

DEG _____   RAD _____ GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES
29		Radix point	No Radix point

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

IN WHAT YEAR IS A GIVEN DATE AN M-DAY?

Given a month m, a day-of-month d, a day-of-week w, (coded 0=SUN.,...., 6=SAT.), and a starting year Y, the program applies the following formula:

$$f(m) = \begin{cases} m+11 & \text{if } m > 2 \\ m+23 & \text{if } m = 1 \text{ or } 2 \end{cases} \qquad g(m) = \begin{cases} 1 & \text{if } m=1 \text{ or } 2 \\ 0 & \text{if } m>2 \end{cases}$$

$$N(m,d,w) = (\lfloor 2.6f(m) \rfloor + d - w) \bmod 7$$

$$h(N) = \begin{cases} 4(\lfloor \frac{N}{2} \rfloor + 4) & \text{if } N \text{ odd} \\ 2N & \text{if } N \text{ even} \end{cases} \qquad \lfloor \ \rfloor = \text{INT}$$

$$L(y,N) = \big(y-1-h(N)\big) \bmod 28 + h(N) + g(m)$$

L is a leap year, preceding the specified year, in which the given date is an M-day. By successively adding 6,11,6,5,6,11,6,5,... one obtains all the years one wants.

This program is valid from March 1, 1900 through February 28, 2100, but will generate erroneous output when the date supplied is February 29. The program will essentially consider every year as a leap year (having a February 29). The result is an output where every fourth year listed actually has a February 29 of the proper M-day. The user must know, then, at least one leap year in the sequence and count every fourth year from it in either direction. Also, the program does not test input for non-sensical dates and hence will produce correspondingly incorrect results.

Example 1:

When starting in 1949, is May 11 a Sunday?

Keystrokes:	Display:
[XEQ] [ALPHA] SIZE [ALPHA] 001	
[XEQ] [ALPHA] M-DAY [ALPHA]	MONTH ?
5[R/S]	DAY ?
11 [R/S]	M-DAY ?
0[R/S]	START.YEAR ?
1949[R/S]	1952
[R/S]	1958
[R/S]	1969
[R/S]	1975
.	.
.	.
.	.

User Instructions

SIZE: 002

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Enter program			
2.	Begin execution		[XEQ]M-DAY	MONTH ?
3.	Input month	MONTH	[R/S]	DAY ?
4.	Input day	DAY	[R/S]	M-DAY ?
5.	Input M-DAY	M-DAY	[R/S]	START. YEAR?
6.	Input year	YEAR	[R/S]	(1st YEAR)
7.	For additional year in sequence continue			
	to press [R/S]		[R/S]	(NEXT YEAR)

Program Listings

Program	Notes	Program	Notes
01◆LBL "M-DAY"		49 ENTER↑	
02 "MONTH ?"	Prompting for month	50 ENTER↑	
03 PROMPT		51 GTO 08	
04 0		52◆LBL 00	
05 STO 01		53 4	
06 CLX		54 +	
07 11		55 RTN	
08 +		56◆LBL 08	
09 14	Day of week correction factor	57 "START. YEAR ?"	Prompt for starting year
10 X>Y?		58 PROMPT	
11 GTO 03		59 1	
12 RDN		60 −	
13◆LBL 01		61 ENTER↑	
14 2.6		62 R↑	
15 *	⌈2.6m⌉	63 −	
16 INT		64 28	
17 GTO 04		65 /	
18◆LBL 03		66 INT	
19 1		67 28	
20 STO 01		68 *	
21 ENTER↑		69 R↑	
22 +		70 RCL 01	
23 −		71 +	
24 +		72◆LBL 02	Addition Loop
25 GTO 01		73 +	
26◆LBL 04		74 X>Y?	
27 "DAY ?"	Prompt for day	75 XEQ 05	
28 PROMPT		76 6	
29 +		77 +	
30 "M-DAY ?"	Prompt for M-day	78 X>Y?	
31 PROMPT		79 XEQ 05	
32 −		80 11	
33 ENTER↑		81 +	
34 ENTER↑		82 X>Y?	
35 7		83 XEQ 05	
36 /		84 6	
37 INT		85 +	
38 7	N=(⌈2.6m⌉+d−w) MOD	86 X>Y?	
39 *		87 XEQ 05	
40 −		88 5	
41 2	N/Z	89 GTO 02	
42 /		90◆LBL 05	
43 ENTER↑		91 FIX 0	
44 INT		92 CF 29	
45 X≠Y?	If N is odd add 4	93 CLA	
46 XEQ 00		94 ARCL X	
47 4	Year # MOD 28	95 FIX 4	
48 *		96 SF 29	
		97 PROMPT	
		98 RTN	

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS

00	USED	50	
05		55	
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	

STATUS

SIZE __002__   TOT. REG. __25__   USER MODE

ENG _____   FIX _____   SCI _____   ON _____ OFF __X__

DEG _____   RAD _____   GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

NUMBER OF M-DAYS BETWEEN TWO DATES,
AND THE N-TH M-DAY OF THE MONTH

In this program the user specifies a day-of-week and two dates; the program gives the number of times that day occurs between the given dates. User specifies a year, a month, a day-of-week, and a number N; the program computes the N-th occurance of the specified day in the given month.

This program uses dates coded mm.ddyyyy. Program computes the number of M-days since a certain date in antiquity, using the formula:

$$N(m,d,y,w) = \left| \frac{D(m,d,y,w)}{7} \right| + 1/2 \left| 0.11 \ (D(m,d,y,w) \bmod 7) + 0.9 \right|$$

where $D(m,d,y,w) = d - \left| 3/4 \left(\left| \frac{g(y,m)}{100} \right| - 7 \right) \right| + \left| 365.25 \ g(y,m) \right| + \left| 30.6f(m) \right| - w$

$$f(m) = \begin{cases} m+13 & m=1 \text{ or } 2 \\ m+1 & m > 2 \end{cases} \qquad g(y,m) = \begin{cases} y-1 & m=1 \text{ or } 2 \\ y & m > 2 \end{cases} \qquad \left| \ \right| = \text{INT}$$

$W = \text{M-Day} \ (0 = \text{Sunday}, \ \ldots, \ 6 = \text{Saturday})$

The program then calculates the difference between the current N and the previous N.

Program first computes the first M-Day of the given month; given mongh = m year = y M-day = W (coded 0 = Sunday, ..., 6 = Saturday), the function computed is:

$$D \ (m,y,w) = h \ \left(W - \left| 2.6 \ f(m) \right| - \left| 5/4 \ g(y,m) \right| + \left| 3/4 \left(\left| \frac{g(y,m)}{100} - 7 \right| \right) \right| \right)$$

where $f(m) = \begin{cases} m+13 & \text{if } m = 1,2 \\ m+1 & \text{if } m > 2 \end{cases} \qquad g(y,m) = \begin{cases} y-1 & m=1,2 \\ y & m > 2 \end{cases}$

$$h(x) = \begin{cases} 7 \text{ if} & \text{if } x \bmod 7 = 0 \\ X \bmod 7 & \text{if } x \bmod 7 \neq 0 \end{cases}$$

For the N-TH M-Day the appropriate multiple of seven is added to the day-of-month.

This program is valid from the beginning of the Gregorian calendar through the year 9999.

Example 1:

How many Saturdays are there between July 4,1776 and July 4,1976?

Keystrokes: Display:

[XEQ] [ALPHA] SIZE [ALPHA] 005
[XEQ] [ALPHA] NDAYS [ALPHA]   M-DAY ?
6 [R/S]   DATE 1 ?
7.041776 [R/S]   DATE 2 ?
7.041976 [R/S]   10436 TIMES

Example 2:

What is the second Wednesday of June, 1984?

Keystrokes: Display:

[XEQ] [ALPHA] NTHDAY [ALPHA]   MONTH ?
6 [R/S]   YEAR ?
1984 [R/S]   M-DAY ?
3 [R/S]   NUM. ?
2 [R/S]   6-13-1984

User Instructions

SIZE: 005

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load program			
2.	Begin program execution		[XEQ] NDAYS	M-DAY ?
3.	Input day of week: 0 to 6	M-DAY	[R/S]	DATE 1 ?
4.	Input first date	DATE 1	[R/S]	DATE 2 ?
5.	Input second date	DATE 2	[R/S]	XXX TIMES
	For second option			
6.	Begin program execution		[XEQ] NTHDAY	MONTH ?
7.	Enter month	m	[R/S]	YEAR ?
8.	Enter year	y	[R/S]	M-DAY ?
9.	Enter day	d	[R/S]	NUM. ?
10.	Enter which occurance	N	[R/S]	M-DD-YYYY

Program Listings

01◆LBL "NDAYS"	Prompt for day. and storage	46 −	
02 "M-DAY ?"		47 .75	
03 PROMPT		48 *	
04 STO 04		49 INT	century days yy.yy
05 "DATE 1 ?"	Prompt for first date.	50 X<>Y	
06 PROMPT	XEQ calculate sub.	51 36525	
07 XEQ 00		52 *	
08 "DATE 2 ?"	Prompt for second date.	53 INT	[365.25y]
09 PROMPT	XEQ calculate sub.	54 −	
10 XEQ 00		55 −	
11 FIX 0		56 INT	
12 CF 29	Preparing display and output	57 RCL 01	
13 CLA		58 30.6	
14 ARCL X		59 *	[30.6 f(m)
15 "⊢ TIMES"		60 INT	
16 AVIEW		61 +	
17 FIX 4		62 RCL 04	adjusted year
18 SF 29		63 −	recall day
19 STOP		64 7	
20 GTO "NDAYS"		65 /	
21◆LBL 00		66 ENTER↑	
22 9		67 FRC	
23 ENTER↑		68 −	
24 1 E-6		69 LASTX	[2.6 f(m)]
25 −		70 .77	
26 X<>Y		71 *	w-[2.6f(m)]
27 3		72 .9	
28 X<>Y		73 +	
29 X<=Y?	If M=1 or 2 add 12 to M and Y←Y-1	74 INT	stack will fill with .07's
30 XEQ 09		75 2	
31 1		76 /	
32 +	Add 1 to M	77 +	
33 ENTER↑		78 RCL 02	w-month days- year days
34 INT		79 X<>Y	
35 STO 01	Store adjusted M	80 STO 02	
36 −		81 −	
37 1 E2		82 CHS	
38 *	.ddyyyy	83 RTN	
39 ENTER↑		84◆LBL 09	
40 FRC		85 +	
41 1 E2		86 +	
42 *	dd.yyyy	87 RTN	
43 ENTER↑		88◆LBL 02	
44 INT	YY.YY	89 RDN	
45 7	C=#of centuries	90 GTO 01	
		91◆LBL "NTH DAY"	
		92 "MONTH ?"	Prompt for month and store
		93 PROMPT	
		94 STO 03	

Program Listings

95 0		145 +		
96 STO 02	D(M,Y,W)/100	146 RCL 04		
97 CLX		147 1 E6		
98 1	recall year	148 /		
99 +		149 +		
100 4		150 RCL 03		
101 X<=Y?		151 +		
102 GTO 02	.ddyyyy	152 STO 03		
103 -1		153 FIX 6		
104 STO 02	mm.ddyyyy	154 "NUM. ?"	Prompt for	
105 CLX		155 PROMPT	occurance	
106 8		156 1		
107 +		157 -		
108 +		158 .07		
109♦LBL 01		159 *		
110 STO 01	Prompt for year	160 RCL 03	Calcualte date	
111 "YEAR ?"		161 +		
112 PROMPT		162 FIX 0		
113 STO 04		163 CF 29		
114 ST+ 02		164 INT		
115 "M-DAY ?	Prompt for day	165 CLA		
"		166 ARCL X		
116 PROMPT		167 LASTX		
117 RCL 01		168 FRC		
118 2.6		169 1 E2		
119 *		170 *		
120 INT		171 INT		
121 -		172 "├-"		
122 5		173 ARCL X		
123 RCL 02		174 LASTX		
124 .07		175 FRC		
125 RDN		176 1 E4		
126 *		177 *		
127 4		178 RND		
128 /		179 "├-		
129 INT		180 ARCL X		
130 -		181 AVIEW	Display output	
131 RCL 02		182 STOP		
132 1 E2		183 GTO "NTH		
133 /		DAY"		
134 INT		184 .END.		
135 7				
136 -				
137 .75				
138 *				
139 INT				
140 +				
141 7				
142 /				
143 FRC				
144 *		00		

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS			STATUS			
00		50	**SIZE** 005 **TOT. REG.** 52 **USER MODE**			
	f (m)		**ENG** ____ **FIX** ____ **SCI** ____ **ON** ____ **OFF** X			
	code # Date		**DEG** ____ **RAD** ____ **GRAD** ____			
	M					
	Day of week					

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES

DATA REGISTERS		
05		55
10		60
15		65
20		70
25		75
30		80
35		85
40		90
45		95

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

HOLIDAYS

This program calculates the date of Mother's Day, Father's Day, Election Day, Thanksgiving Day, Washington's Birthday, Labor Day, Columbus Day, and Veteran's Day.

It uses the following formulas:

CODED:

MD	Mother's Day	= May 14 – D(0,y)
FD	Father's Day	= June 21 – D(3,y)
ED	Election Day	= Nov. 8 – D(1,y)
TG	Thanksgiving	= Nov. 28 – D(5,y)
WB	Wash.'s Birthday	= Feb. 21 – D(2,y-1)
LD	Labor Day	= Sep. 7 – D(3,y)
CD	Columbus Day	= Oct. 14 – D(5,y)
VD	Veteran's Day	= Oct. 28 – D(5,y)

Where $D(x,y) = (x + \left| \frac{5}{4} y \right| - \left| 3/4 (1 + \left| \frac{y}{100} \right|) \right|) \bmod 7$

$\left| \quad \right| = \text{INT}$

This program is valid from the beginning of the Gregorian Calendar through the year 9999.

Example 1:

When is Labor Day in 1980?

Keystrokes:	Display:
[XEQ] [ALPHA] HOLDY [ALPHA]	HOLIDAY ?
LD [R/S]	YEAR ?
1980 [R/S]	9-1-1980

Example 2:

When was Washington's Birthday in the year 1900?

Keystrokes:	Display:
[XEQ] [ALPHA] HOLDY [ALPHA]	HOLIDAY ?
WB [R/S]	YEAR ?
1900 [R/S]	2-19-1900

User Instructions

SIZE: 000

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load Program			
2.	Begin Program execution		[XEQ] HOLDY	HOLIDAY ?
3.	Enter holiday coded as follows:	Hol.	[R/S]	YEAR ?
	MD=Mothers' Day			
	FD=Fathers' Day			
	ED=Election Day			
	TG=Thanksgiving Day			
	WB=Washingtons' Birthday			
	LD=Labor Day			
	CD=Columbus Day			
	VD=Veterans' Day			
4.	Input year	YEAR	[R/S]	MM-DD-YYYY
5.	For additional runs, press [R/S]			

Program Listings

01◆LBL "HOL DY"	Prompt for holiday in alpha mode
02 "HOLIDAY ?"	
03 AON	
04 PROMPT	
05 AOFF	
06 ASTO X	
07 GTO IND X	Go to appropriate subroutine
08◆LBL "MD"	Mothers' Day
09 XEQ 00	
10 0	
11 XEQ 09	
12 5.14	
13 +	
14 GTO 05	
15◆LBL "FD"	Fathers' Day
16 XEQ 00	
17 3	
18 XEQ 09	
19 6.21	
20 +	
21 GTO 05	
22◆LBL "ED"	Election Day
23 XEQ 00	
24 1	
25 XEQ 09	
26 11.08	
27 +	
28 GTO 05	
29◆LBL "TG"	Thanksgiving Day
30 XEQ 00	
31 5	
32 XEQ 09	
33 11.28	
34 +	
35 GTO 05	
36◆LBL 09	Main computation routine
37 X<>Y	
38 ENTER↑	
39 ENTER↑	
40 RDN	
41 RDN	
42 5	
43 *	
44 4	
45 /	
46 INT	
47 +	
48 X<>Y	

49 1 E2	C=Number of centuries
50 /	
51 INT	
52 1	Century year adjustment
53 +	
54 .75	
55 *	
56 INT	
57 -	
58 7	
59 /	
60 FRC	Days to be subtracted
61 .07	
62 *	
63 CHS	
64 X<>Y	
65 1 E6	Encore year
66 /	
67 +	
68 RTN	
69◆LBL "WB"	Washington's Birthday
70 XEQ 00	
71 1	
72 -	
73 2	
74 XEQ 09	
75 2.210001	
76 +	
77 GTO 05	
78◆LBL "LD"	Labor Day
79 XEQ 00	
80 3	
81 XEQ 09	
82 9.07	
83 +	
84 GTO 05	
85◆LBL "CD"	Columbus Day
86 XEQ 00	
87 5	
88 XEQ 09	
89 10.14	
90 +	
91 GTO 05	
92◆LBL "VD"	Veterans Day
93 XEQ 00	
94 5	
95 XEQ 09	
96 10.28	
97 +	
98◆LBL 05	
99 INT	

Program Listings

```
100 CLA
101 FIX 0
102 CF 29
103 ARCL X
104 LASTX
105 FRC
106 1 E2
107 *
108 INT
109 "⊢-"
110 ARCL X
111 LASTX
112 FRC
113 1 E4
114 *
115 RND
116 "⊢-"
117 ARCL X
118 AVIEW
119 SF 29
120 FIX 4
121 CLX
122 STOP
123 GTO "HOL
DY"
124◆LBL 00
125 "YEAR ?"
126 PROMPT
127 RTN
128 .END.
```

Prepare date
for output

Output

Prompt for year

51

60

70

80

90

00

40

50

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS

00		50	
05		55	
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	

STATUS

SIZE __000__   TOT. REG. __42__   USER MODE

ENG _____   FIX _____   SCI _____   ON _____ OFF _____

DEG _____   RAD _____   GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

RELIGIOUS HOLIDAYS

This program calculates the dates of various holidays as listed below:

CODE:	HOLIDAY:
AW	ASH WEDNESDAY
FS	FIRST SUNDAY IN LENT
PA	PASSION SUNDAY
PM	PALM SUNDAY
GF	GOOD FRIDAY
RS	ROGATION SUNDAY
AD	ASCENSION DAY
WS	WHITSUNDAY
TS	TRINITY SUNDAY
EA	EASTER

Easter falls on the first Sunday following the arbitrary Paschal Full Moon, which does not necessarily coincide with a real or astronomical full moon. The Golden Number is calculated by adding 1 to the remainder obtained by dividing the year by 19. The Paschal Full Moon is determined by applying the Golden Number to the following table:

Golden Number	Date	Golden Number	Date	Golden Number	Date	Golden Number	Date	Golden Number	Date
1	Apr 14	5	Mar 31	9	Apr 16	13	Apr 2	17	Apr 17
2	Apr 3	6	Apr 16	10	Apr 5	14	Mar 22	18	Apr 7
3	Mar 23	7	Apr 8	11	Mar 25	15	Apr 10	19	Mar 27
4	Apr 11	8	Mar 28	12	Apr 13	16	Mar 30		

If the Paschal Full Moon falls on a Sunday, Easter is on the following Sunday. The earliest Easter can fall is March 23rd and the latest is April 25th. Ash Wednesday and the other religious holidays are determined by specific number of days from Easter. This program is good for the 200-year period of March 1,1900 through February 28,2100.

Example 1:

Determine when Easter occurs during the year of 1980?

Keystrokes: Display:

[XEQ] [ALPHA] SIZE [ALPHA]   012
[XEQ] [ALPHA] RL [ALPHA]   YR?
1980 [R/S]   HOL?
EA [R/S]   5.   (Golden Number)
                                               4.061980   (Apr. 6, 1980)

Example 2:

Determine when Whitsunday occurred in 1968?

Keystrokes: Display:

[XEQ] [ALPHA] RL [ALPHA]   YR?
1968 [R/S]   HOL?
WS [R/S]   12.   (Golden Number)
                                               6.021968   (June 2, 1968)

User Instructions

SIZE: 12

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load program			
2.	Begin program execution		[XEQ] RL	YR?
3.	Input year	YEAR	[R/S]	HOL?
4.	Input holiday code as follows:			
	AW = Ash Wednesday			
	FS = First Sunday in Lent			
	PA = Passion Sunday			
	PM = Palm Sunday			
	GF = Good Friday			
	RS = Rogation Sunday			
	AD = Ascension Day			
	WS = Whitsunday			
	TS = Trinity Sunday			
	EA = Easter			
		HOLIDAY	[R/S]	Golden number
				MM.DDYYYY
	.			

Program Listings

```
01◆LBL "RL"              Initialization     48 .4
02 365.25               and input of       49 X<>Y
03 STO 10               variables          50 X=Y?
04 30.6001                                 51 GTO 02          "Packed
05 STO 11                                  52 .6
06 122.1                                   53 X=Y?            Register to find
07 STO 05                                  54 GTO 03         Paschal Full
08 241303.2                                55 1              Moon
2                                          56 GTO 05
09 STO 00                                  57◆LBL 00
10 10281807                                58 1 E8
.26                                        59 GTO 05
11 STO 01                                  60◆LBL 01
12 15042312                                61 1 E6
.01                                        62 GTO 05
13 STO 02                                  63◆LBL 02
14 20092717                                64 1 E4
.06                                        65 GTO 05
15 STO 03                                  66◆LBL 03
16 "YR?"                                   67 1 E2
17 PROMPT                                  68◆LBL 05
18 STO 09                                  69 RCL IND
19 "HOL?"                                06
20 AON                                     70 X<>Y
21 PROMPT                                  71 /
22 AOFF                                    72 FRC
23 RCL 10                                  73 1 E2
24 *                                       74 *
25 INT               Determine Golden      75 INT
26 143               number and dis-       76 ST+ 04
27 +                 play                  77 RCL 04
28 STO 04                                  78 5              Determine
29 RCL 09                                  79 +              following Sunday
30 19                                      80 7
31 MOD                                     81 MOD
32 1                                       82 FIX 0
33 +                                       83 RND
34 FIX 0                                   84 7
35 PSE                                     85 -
36 5                                       86 ST- 04
37 /                                       87 ASTO X
38 FIX 1             Select appro-         88 GTO IND        Go to Holiday
39 RND               priate packed       X
40 STO 06            register             89◆LBL "AW"       Ash Wednesday
41 FRC                                     90 46
42 X=0?                                    91 ST- 04
43 GTO 00                                  92 GTO 04
44 .2                                      93◆LBL "FS"       First Sunday in
45 X<>Y                                    94 42             Lent
46 X=Y?              Deciphering           95 ST- 04
47 GTO 01                                  96 GTO 04
```

Program Listings

```
 97◆LBL "PA"      Passion Sunday
 98  14
 99  ST-  04
100  GTO  04
101◆LBL "PM"      Palm Sunday
102  7
103  ST-  04
104  GTO  04
105◆LBL "GF"      Good Friday
106  2
107  ST-  04
108  GTO  04
109◆LBL "RS"      Rogation Sunday
110  35
111  ST+  04
112  GTO  04
113◆LBL "AD"      Ascension Day
114  39
115  ST+  04
116  GTO  04
117◆LBL "WS"      Whitsunday
118  49
119  ST+  04
120  GTO  04
121◆LBL "TS"      Trinity Sunday
122  56
123  ST+  04
124◆LBL "EA"      Easter
125◆LBL 04
126  RCL  04
127  RCL  05
128  -              Decipher day
129  RCL  10         number into
130  /              Gregorian date
131  INT
132  STO  09
133  RCL  10
134  *
135  INT
136  RCL  04
137  -
138  CHS
139  STO  06
140  RCL  11
141  /
142  INT
143  STO  07
144  RCL  06         Prepare for
145  X<>Y            output
146  RCL  11
147  *
```

```
148  INT
149  -
150  STO  08
151  RCL  07
152  1
153  RCL  08
154  %
155  -
156  -
157  RCL  07
158  14
159  /
160  INT
161  ST+  09
162  12
163  *
164  -
165  RCL  09
166  1 E6
167  /
168  FIX  6
169  +
170  END
```

80	
90	
00	

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS			STATUS		

DATA REGISTERS

00	241303.22	50	
	10281807.26		
	15042312.01		
	Z0092717.06		
	DAY NUMBER		
05	122.1	55	
	USED		
	MONTH		
	DAY		
	YEAR		
10	365.25	60	
	30.6001		
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	

STATUS

SIZE __12__ TOT. REG. __62__ USER MODE

ENG _____ FIX _____ SCI _____ ON _____ OFF __X__

DEG _____ RAD _____ GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

CHINESE YEARS TO/FROM GREGORIAN YEARS

This program converts the cyclical two-character year designation of the Chinese Calendar to or from Gregorian years.

The Chinese year designation consists of two characters, the "most significant bit" called (干) and the "least significant bit" called (支). There are 10 (干)'s and 12 (支)'s which are represented here by consecutive numbers for computation purposes. The rule states that any odd number of Group One can associate with only the odd numbers of Group Two, and likewise even numbers can associate with only even numbers. This way, 60 possible combinations form one basic cycle of 60 years. Each cycle begins with the same year (甲子), or (1, 1) in the numeralized notations, or (R:1 C:1) in our machine notations, which falls in the years 1924 and 1924 + 60N; where N is any integer. This program arbitarily selects (N = -85) as the internal datum but displays 1924 (N = 0) externally as the first year and 1983 as the 60th year of the machine cycle. Actually, the machine cycle may be set to start with a year corresponding to any N. The fact that the sum of the two numbers for any year is always an even number provides us with a parity check. For example, the year 1975 falls in row 2 and column 4 (2+4=6), and the year is (R:2 C:4) or (乙卯).

		子 1	丑 2	寅 3	卯 4	辰 5	巳 6	午 7	未 8	申 9	酉 10	戌 11	亥 12
甲	1	1924		1974		1964		1954		1944		1934	
乙	2		1925		1975		1965		1955		1945		1935
丙	3	1936		1926		1976		1966		1956		1946	
丁	4		1937		1927		1977		1967		1957		1947
戊	5	1948		1938		1928		1978		1968		1958	
己	6		1949		1939		1929		1979		1969		1959
庚	7	1960		1950		1940		1930		1980		1970	
辛	8		1961		1951		1941		1931		1981		1971
壬	9	1972		1962		1952		1942		1932		1982	
癸	10		1973		1963		1953		1943		1933		1983

Example 1:

Convert the year 1956 to its Chinese equivalent.

Keystrokes: Display:
[USER]   (Set USER mode)
[XEQ] [ALPHA] SIZE [ALPHA]   009

[XEQ] [ALPHA] G-C [ALPHA]   YEAR ?

1956 [R/S]   R:3   C:9   (Row 3, Column 9)

Example 2:

Convert the Chinese year Row-2 and Column 4 (乙卯) to Gregorian year.

Keystrokes: Display:

[XEQ] [ALPHA] C-G [ALPHA]   ROW?

2 [R/S]   COLUMN?

4 [R/S]   1975

User Instructions

SIZE: 009

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Enter program and set USER mode		[USER]	
2.	For Chinese to Gregorian go to Step 4			
3.	For Gregorian to Chinese		[XEQ] G-C	YEAR ?
	Input year	YEAR	[R/S]	R:XX C:XX
4.	For Chinese to Gregorian		[XEQ]C-G	ROW ?
	Input row number	ROW#	[R/S]	COLUMN ?
	Input column number	COL#	[R/S]	(YEAR)
5.	To add 60 years		[C]	YEAR+60
6.	To subtract 60 years		[D]	YEAR-60

Program Listings

```
01◆LBL "G-C"          Initialization
02 FIX 0
03 CF 29
04 CLRG
05 -3176
06 STO 01
07 10
08 STO 02
09 12
10 STO 03
11 FS?C 05
12 RTN
13 "YEAR ?"
14 PROMPT             Prompt for year
15 RCL 01
16 -
17 STO 05             ΔY
18 RCL 05
19 RCL 02
20 /
21 INT
22 RCL 02
23 *
24 -
25 1
26 +                 The most
27 RCL 05             significant
28 RCL 05
29 RCL 03
30 /
31 INT
32 RCL 03
33 *
34 -
35 1                 The least
36 +                 significant
37 "   R:"
38 ARCL Y
39 "⊢  C:"            Display
40 ARCL X
41 AVIEW
42 STOP
43◆LBL "C-G"
44 SF 05             Initialize
45 XEQ "G-C"
46 "ROW ?"
47 PROMPT            Prompt for row
48 STO 06
49 "COLUMN ?"        Prompt for column
50 PROMPT
51 X>Y?
52 XEQ 00
53 STO 07
54 RCL 06
55 RCL 07
56 -
57 2
58 /
59 STO 08
60 FRC
61 0
62 X≠Y?
63 GTO 01            Parity check
64 RCL 08
65 RCL 03            Compute years in
66 *                 excess of datum
67 RCL 07            year
68 +
69 1
70 -
71 1924
72 +
73 VIEW X
74 SF 29
75 FIX 4
76 RTN
77◆LBL C
78 60                60, +
79 +
80 RTN
81◆LBL D
82 60                60, -
83 -
84 RTN
85◆LBL 00
86 RCL 03
87 -
88 RTN
89◆LBL 01
90 "ILLEGAL          Illegal date
   DATE"             message
91 AVIEW
92 STOP
93 .END.
```

| | | 00 | |

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS

00	-3176	50	
	10		
	12		
	USED		
	Y		
05	Y, Y₁	55	
	Y₂ Y₂		
	USED		
	USED		
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	

STATUS

SIZE <u>009</u>   TOT. REG. <u>34</u>   **USER MODE**

ENG _____   FIX _____   SCI _____   ON <u>X</u> OFF _____

DEG _____   RAD _____   GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES
5		INITIALIZING	RUNNING

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

NEW MOON AND FULL MOON DAY OF MONTH

This program follows an empirical algorithm published in one issue of the amateur astronomers monthly, SKY & TELESCOPE. The author of the article, O.L. Harvey claims, "By testing hundreds of dates across the interval from 1001 B.C. to A.D. 2003, I found that about half the answers obtained with this device agree exactly with the day of new moon, and about half are off by one day. A very small number (two percent in my sample) are two days in error." Mr. Harvey developed a three part table based on repeating patterns in an enormous data source and on averages of date differences. An entry point was calculated for the first part, the resultant was the entry point for the second part. A calculated difference on the second part produced a number. The month provided the key for the third part of the table. These numbers are combined with other calculations to determine the day of month. Mr. Vanderburgh devised an HP-65 program to calculate the entry points and when used with the table and additional inputs would complete the calculations for the day of month.

This program uniquely incorporates that table into the registers and selects the appropriate numbers to perform the complete calculations for day of month.

This program also requires an additional memory module.

Example 1:

Determine the date of the new moon in November, 1979.

Keystrokes: Display:

[XEQ] [ALPHA] SIZE [ALPHA]   026
[XEQ] [ALPHA] MOONS [ALPHA]   N OR F MOON?
N [R/S]   MM.YYYY ?
11.1979 [R/S]   11-18-1979

Example 2:

Find the date of the full moon in January of 1956.

Keystrokes: Display:

[XEQ] [ALPHA] MOON [ALPHA]   N OR F MOON?
F [R/S]   MM.YYYY ?
1.1956 [R/S]   1-27-1956

User Instructions

SIZE: 026

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load program			
2.	Begin program execution and initialize		[XEQ] MOONS	N OR F MOON?
3.	Input either N(Newmoon) or F(Fullmoon)	M	[R/S]	MM.YYYY?
4.	Input the month and year for moon	MM.YYYY	[R/S]	MM-DD-YYYY
5.	For next case		[XEQ] MOON	N OR F MOON?
	Then go to Step #3			

Program Listings

Code	Comment	Code	Comment
01◆LBL "MOONS"	Initialization	42 AOFF	
02 .0925102612		43 ASTO X	
03 STO 00		44 X=Y?	
04 .2813291501		45 SF 05	
05 STO 01		46 "MM.YYYY?"	Prompt for year
06 .1703190420		47 PROMPT	
07 STO 02		48 CLA	
08 .06220723		49 FIX 4	
09 STO 03		50 INT	
10 .11130002		51 STO 20	
11 STO 04		52 LASTX	
12 .02040406		53 FRC	
13 STO 05		54 STO 22	
14 .07080910		55 1 E4	
15 STO 06		56 *	
16 .301020		57 STO 21	
17 STO 10		58 2	
18 .112101		59 RCL 20	Check for Jan. or Feb.
19 STO 11		60 X<=Y?	
20 .220212		61 DSE 21	
21 STO 12		62◆LBL 00	
22 .031323		63 RCL 21	
23 STO 13		64◆LBL 01	
24 .142404		65 0	Check for year before 1582
25 STO 14		66 STO 07	
26 .250515		67 1582	
27 STO 15		68 RCL 21	
28 .061626		69 X<=Y?	
29 STO 16		70 GTO 03	
30 .172707		71 13	Check for year after 1582
31 STO 17		72 STO 07	
32 .280818		73 1900	
33 STO 18		74 STO 23	
34 .091929		75◆LBL 02	
35 STO 19		76 RCL 21	
36◆LBL "MOON"		77 RCL 23	
37 "F"		78 X<=Y?	
38 ASTO Y		79 GTO 03	
39 "N OR F MOON?"	New or full moon prompt	80 1 E2	
40 AON		81 -	
41 PROMPT		82 STO 23	
		83 1	
		84 ST- 07	
		85 GTO 02	
		86◆LBL 03	Calculate Julian year
		87 RCL 21	
		88 4712	
		89 +	
		90 76	
		91 /	

Program Listings

```
 92 INT
 93 STO 23
 94 LASTX
 95 FRC
 96 76
 97 *
 98 RND
 99 4
100 /
101 INT
102 STO 24          Entry point to
103 LASTX           table R
104 FRC
105 4
106 *
107 STO 08
108 RCL 23          Difference in
109 4               table L
110 /
111 INT
112 ST- 07
113 RCL 24
114 5
115 /
116 STO 25
117 FRC
118 10
119 *
120 STO 09
121 XEQ 09          Number from
122 STO 24          table R
123 10
124 /
125 FRC
126 10
127 *
128 LASTX
129 +
130 STO 25
131 0
132 STO 09
133 XEQ 09
134 RCL 24          Search for
135 X=Y?            number from
136 GTO 08          table R in table
137 2               L
138 ST+ 09
139 XEQ 09
140 RCL 24
141 X=Y?
142 GTO 08
```

```
143 2
144 ST+ 09
145 XEQ 09
146*LBL 08          Count down in
147 RCL 25          table L by
148 RCL 08          difference
149 -
150 10
151 X>Y?
152 GTO 06
153 RDN
154 STO 25
155*LBL 07
156 XEQ 09          Number from
157 ST+ 07          table L
158 RCL 20
159 1
160 -
161 4
162 /
163 4
164 +
165 STO 25
166 FRC
167 8
168 *
169 STO 09
170 XEQ 09
171 ST- 07
172 FS?C 05         Number from
173 XEQ 05          table M
174 RCL 07
175 30
176 X<=Y?           Check date for
177 -               range 0 and 30
178 0
179 RCL 07
180 X>Y?
181 GTO 04
182 30
183 RCL 07
184 +
185 GTO 04
186*LBL 09          Obtain appro-
187 RCL 09          priate number
188 10↑X            from selected
189 RCL IND         register
25
190 *
191 FRC
192 1 E2
```

Program Listings

```
193  *
194  INT
195  RTN
196◆LBL 06
197  +
198  STO 25
199  5
200  RCL 09
201  2
202  +
203  X>Y?
204  0
205  STO 09
206  GTO 07
207◆LBL 04
208  1 E2
209  /
210  RCL 22
211  LASTX
212  /
213  +
214  RCL 20
215  +
216  FIX 0
217  CF 29
218  INT
219  ARCL X
220  "├─"
221  LASTX
222  FRC
223  1 E2
224  *
225  INT
226  ARCL X
227  "├─"
228  LASTX
229  FRC
230  1 E4
231  *
232  ARCL X
233  AVIEW
234  RTN
235◆LBL 05
236  15
237  ST+ 07
238  RTN
239  .END.
```

Check for re-
turn to table L

Put output into
proper display
format:
MM-DD-YYYY

51
60
70
80
90
50
00

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS

00	.0925102612	50	
	.2813291501		
	.1703190420		
	.06220723		
	.11130002		
05	.02040406	55	
	.07080910		
	DAYS		
	L NO.		
	CONTROL		
10	.301020	60	
	.112101		
	.220212		
	.031323		
	.142404		
15	.250515	65	
	.061626		
	.172707		
	.280818		
	.091929		
20	MONTH	70	
	Y OR Y-1		
	YEAR		
	USED		
	R NUMBER		
25	CONTROL	75	
30		80	
35		85	
40		90	
45		95	

STATUS

SIZE ___026___ TOT. REG. ___98___ USER MODE

ENG _____ FIX _____ SCI _____ ON _____ OFF ___X___

DEG _____ RAD _____ GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

CALENDAR PRINTOUT

This program will printout a calendar for any valid Gregorian year be-
tween March, 1900 and February, 2100. This program requires a printer
and two memory modules.

NOTE: If any discrepancy is noticed, see the reference for further de-
       tails.

REFERENCE: O'Neil, W. M., Time and the Calendars, Sydney Univ. Press,
            Australia, 1975.

Example 1:

Print a calendar for the months June, July and August of the year 1976.

Keystrokes: Display:

[XEQ] [ALPHA] SIZE [ALPHA] 043

[XEQ] [ALPHA] INIT [ALPHA]   YEAR ?

1976 [R/S]   START. MONTH?

6 [R/S]   NO. OF MON.?

3 [R/S]

```
            JUNE
            1976
      S M T W T F S              (Printout)
     | | | 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|30| | | |


            JULY
            1976
      S M T W T F S
     | | | | | 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|30|31|


           AUGUST
            1976
      S M T W T F S
     | 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|30|31| | | | |
```

Example 2:

Print the calendar for the first 4 months of the year 1980.

Keystrokes: Display:

[XEQ] [ALPHA] CAL [ALPHA]   YEAR?

1980 [R/S]   START. MONTH?

1 [R/S]   NO. OF MON.?

JANUARY
1980   (Print Out)
S M T W T F S
		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	30	31		

FEBRUARY
1980
S M T W T F S
					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	

MARCH
1980
S M T W T F S
						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
30	31					

APRIL
1980
S M T W T F S
		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	30			

User Instructions

SIZE: 043

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Load program			
2.	Initialize		[XEQ] INIT	YEAR ?
3.	Input starting year	YEAR	[R/S]	START.MONTH ?
4.	Input starting month number	MONTH	[R/S]	NO. OF MON.?
5.	Input number of months – N			
	where: 1 ≤ N ≤ 999	N	[R/S]	"CALENDAR
				OUTPUT"
6.	For another calendar printout		[XEQ] CAL	YEAR ?
7.	Go to Step #3			

Program Listings

```
01◆LBL "LIN
E"
02◆LBL 09
03 RCL 33
04 1
05 -
06 1 E3
07 /
08 1
09 +
10 0
11 ENTER↑
12 124
13 BLDSPEC        Vertical line
14 CLA
15 ARCL X
16 "├  "
17 ASTO X
18 CLA
19◆LBL 14         Begin Loop 14
20 ARCL X         Loop to blank-
21 ISG Y          fill portion of
22 GTO 14         first line
23 0
24 ENTER↑         End Loop 14
25 124
26 BLDSPEC
27 8
28 RCL 33
29 -
30 1 E3
31 /
32 1
33 +
34◆LBL 13         Begin Loop 13
35 ARCL Y         Loop to complete
36 ARCL IND       first line of
X                 the calendar
37 ISG X
38 GTO 13         End Loop 13
39 ARCL Y
40 ACA
41 ADV
42 9              Print line of
43 RCL 33         calendar
44 -
45 ENTER↑
46 ENTER↑
47 ENTER↑
48 7
49 MOD
```

```
50 X=0?
51 SF 00
52 FS? 00
53 CLX
54 FS? 00
55 +
56 FS?C 00
57 7
58 X=0?
59 7
60 RCL 34
61 -
62 CHS
63 1
64 +
65 7
66 /
67 INT
68 7
69 *
70 .07
71 +
72 1 E3
73 /
74 +
75 STO 00
76◆LBL 23         Begin Loop 23
77 RCL 00
78 INT
79 ENTER↑
80 ENTER↑
81 6
82 +
83 1 E3
84 /
85 +
86 0
87 ENTER↑
88 124
89 BLDSPEC
90 CLA
91◆LBL 22         Begin Loop 22
92 ARCL X         Loop to build
93 ARCL IND       middle lines
Y
94 ISG Y
95 GTO 22         End Loop 22
96 ARCL X
97 ACA
98 ADV
99 ISG 00
```

Program Listings

```
100 GTO 23          Print middle line
101 RCL 34          End Loop 23
102 RCL 00
103 INT
104 X>Y?
105 RTN
106 ENTER↑
107 ENTER↑
108 RCL 35
109 +
110 1
111 -
112 1 E3
113 /
114 +
115 0
116 ENTER↑
117 124
118 BLDSPEC
119 CLA
120◆LBL 20          Begin Loop 20
121 ARCL X          Loop to build
122 ARCL IND        last line
 Y
123 ISG Y
124 GTO 20          End Loop 20
125 7
126 RCL 35
127 -
128 1 E3
129 /
130 1
131 +
132◆LBL 18          Begin Loop 18
133 ARCL Y
134 "├  "           Loop to fill in
135 ISG X           blanks in last
136 GTO 18          line
137 0               End Loop 18
138 ENTER↑
139 124
140 BLDSPEC
141 ARCL X
142 ACA
143 ADV
144 RTN
145◆LBL 29          Subroutine to
146 RCL 37
147 RCL 36
148 1
149 +               compute
```

```
150 ENTER↑
151 1/X
152 .7              day of week
153 +
154 CHS
155 INT
156 ST+ 37          of
157 12
158 *
159 -               first day
160 30.6001
161 *
162 INT
163 RCL 37          of
164 365.25
165 *
166 INT             month
167 +
168 STO 40          and
169 7
170 MOD             Julian Day
171 X=0?
172 7
173 RTN
174◆LBL "CAL
 "
175 "YEAR ?"
176 PROMPT          Prompt for year
177 STO 38          and initial
178 "START.         month
MONTH?"
179 PROMPT
180 ENTER↑
181 ENTER↑
182 "NO. OF         Ask how many
MON. ?"             months
183 PROMPT
184 +
185 1
186 -
187 .001
188 *
189 +
190 STO 42          Set up counter
191◆LBL 15
192 RCL 42
193 INT
194 STO 36
195 RCL 38
196 STO 37
197 XEQ 29
```

Program Listings

```
198 STO  33        Dow of 1st day
199 RCL  40        of month
200 STO  41        save JD
201 1
202 ST+  36
203 RCL  38
204 STO  37
205 XEQ  29
206 1
207 -               Dow of last day
208 STO  35         of month
209 RCL  40
210 RCL  41
211 -               # days in month
212 STO  34
213 SF 12
214 XEQ  IND        Print month name
42
215 CLA
216 "        "
217 ARCL 38
218 AVIEW           Print year
219 "S"
220 ACA
221 4
222 SKPCOL          Print day labels
223 "M"
224 ACA
225 SKPCOL
226 "T"
227 ACA
228 SKPCOL
229 "W"
230 ACA
231 SKPCOL
232 "T"
233 ACA
234 SKPCOL
235 "F"
236 ACA
237 SKPCOL
238 "S"
239 ACA
240 2
241 SKPCOL
242 ADV
243 CF 12
244 XEQ "LIN
E"                  Print the
245 ADV              calendar
246 ADV
```

```
247 RCL  42
248 INT
249 12
250 X=Y?             If December then
251 XEQ  30          fix pointers
252 ISG  42          If not done then
253 GTO  15          repeat STOP
254 RTN
255◆LBL  01
256 "      JANU
ARY"
257 AVIEW
258 RTN
259◆LBL  02
260 "      FEBR
UARY"
261 AVIEW
262 RTN
263◆LBL  03
264 "      MAR
CH"
265 AVIEW
266 RTN
267◆LBL  04
268 "      APR
IL"
269 AVIEW
270 RTN
271◆LBL  05
272 "      MA
Y"
273 AVIEW
274 RTN
275◆LBL  06
276 "      JU
NE"
277 AVIEW
278 RTN
279◆LBL  07
280 "      JU
LY"
281 AVIEW
282 RTN
283◆LBL  08
284 "      AUG
UST"
285 AVIEW
286 RTN
287◆LBL  09
288 "   SEPTE
MBER"
```

Program Listings

```
289 AVIEW
290 RTN
291◆LBL 11
292 "   NOVEM
BER"
293 AVIEW
294 RTN
295◆LBL 10
296 "    OCTO
BER"
297 AVIEW
298 RTN
299◆LBL 12
300 "   DECEM
BER"
301 AVIEW
302 RTN
303◆LBL "INI        Initialization
T"
304 CLRG
305 1.031
306 STO 00
307◆LBL 00
308 9
309 RCL 00
310 INT
311 X<=Y?
312 "  "
313 FIX 0
314 CF 29
315 ARCL X
316 ASTO IND
 X
317 CLA
318 ISG 00
319 GTO 00
320 0
321 STO 00
322 722923
323 STO 40
324 722892
325 STO 41
326 GTO "CAL
"
327◆LBL 30          Increment year
328 1
329 ST+ 38
330 12
331 ST- 42          Fix up pointer
332 .001            in R_{42}
333 *
```

```
334 ST- 42
335 RTN
336 .END.
```

                    60

                    70

                    80

                    90

                    00

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS			
00	USED	50	
	" 1"		
	" 2"		
	" 3"		
	" 4"		
05	" 5"	55	
	" 6"		
	" 7"		
	" 8"		
	" 9"		
10	"10"	60	
	"11"		
	"12"		
	"13"		
	"14"		
15	"15"	65	
	"16"		
	"17"		
	"18"		
	"19"		
20	"20"	70	
	"21"		
	"22"		
	"23"		
	"24"		
25	"25"	75	
	"26"		
	"27"		
	"28"		
	"29"		
30	"30"	80	
	"31"		
	USED		
	DOW OF 1st OF MONTH		
	# DAYS IN MONTH		
35	DOW OF LAST DAY OF MONTH	85	
	FIRST MONTH		
	YEAR		
	YEAR		
	USED		
40	JULIAN DAY #1	90	
	JULIAN DAY #2		
	MONTH NUMBER		
45		95	

STATUS

SIZE __043__   TOT. REG. __144__   USER MODE

ENG _____   FIX _____   SCI _____   ON _____ OFF _X_

DEG _____   RAD _____   GRAD _____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES
29		Radix Point	No Radix Point

ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY

HEWLETT-PACKARD

HP-41C

USERS' LIBRARY SOLUTIONS

Bar Codes

Calendars

CALENDARS

NOTICE

CALENDAR DATE/JULIAN DATE
CONVERSIONS
PROGRAM REGISTERS NEEDED: 38

HEWLETT–PACKARD
SOLUTION BOOK:
CALENDARS

ROW 1 (1 – 3)

ROW 2 (3 – 8)

ROW 3 (9 – 17)

ROW 4 (18 – 26)

ROW 5 (27 – 33)

ROW 6 (33 – 40)

ROW 7 (40 – 43)

ROW 8 (44 – 48)

ROW 9 (49 – 50)

ROW 10 (51 – 58)

ROW 11 (58 – 62)

ROW 12 (62 – 74)

ROW 13 (75 – 78)

ROW 14 (79 – 87)

ROW 15 (88 – 96)

ROW 16 (97 – 105)

ROW 17 (106 – 116)

ROW 18 (117 – 126)

ROW 19 (127 – 134)

ROW 20 (134 – 141)

PROGRAM REGISTERS NEEDED: 50

ROW 1 (1 – 3)

ROW 2 (3 – 5)

ROW 3 (6 – 14)

ROW 4 (15 – 21)

ROW 5 (21 – 30)

ROW 6 (31 – 41)

ROW 7 (42 – 51)

ROW 8 (52 – 62)

ROW 9 (63 – 67)

ROW 10 (68 – 70)

ROW 11 (70 – 79)

ROW 12 (79 – 91)

ROW 13 (92 – 104)

ROW 14 (105 – 116)

ROW 15 (116 – 123)

ROW 16 (124 – 130)

ROW 17 (130 – 135)

ROW 18 (136 – 145)

ROW 19 (146 – 150)

ROW 20 (151 – 156)

ROW 21 (157 – 166)

ROW 22 (167 – 173)

ROW 23 (174 – 180)

ROW 24 (180 – 188)

ROW 25 (188 – 193)

ROW 26 (194 – 198)

ROW 27 (199 – 204)

NUMBER OF WEEKDAYS BETWEEN TWO DATES
PROGRAM REGISTERS NEEDED: 37

ROW 1 (1 : 4)

ROW 2 (5 : 8)

ROW 3 (8 : 11)

ROW 4 (11 : 16)

ROW 5 (16 : 20)

ROW 6 (20 : 28)

ROW 7 (29 : 33)

ROW 8 (33 : 39)

ROW 9 (40 : 45)

ROW 10 (45 : 49)

ROW 11 (50 : 56)

ROW 12 (56 : 62)

ROW 13 (63 : 70)

ROW 14 (70 : 80)

ROW 15 (81 : 89)

ROW 16 (90 : 97)

ROW 17 (97 : 106)

ROW 18 (107 : 115)

ROW 19 (116 : 127)

ROW 20 (128 : 132)

IN WHAT YEAR IS A GIVEN DATE
AN M—DAY?
PROGRAM REGISTERS NEEDED: 24

HEWLETT-PACKARD
SOLUTION BOOK:
CALENDARS

ROW 1 (1 — 2)

ROW 2 (2 — 9)

ROW 3 (10 — 18)

ROW 4 (19 — 27)

ROW 5 (27 — 31)

ROW 6 (32 — 44)

ROW 7 (45 — 54)

ROW 8 (55 — 57)

ROW 9 (57 — 66)

ROW 10 (67 — 76)

ROW 11 (77 — 84)

ROW 12 (85 — 92)

ROW 13 (93 — 99)

NO. OF M—DAYS BET. TWO DATES AND THE NTH M—DAY OF THE MONTH
PROGRAM REGISTERS NEEDED: 48

ROW 1 (1 – 2)

ROW 2 (2 – 5)

ROW 3 (5 – 8)

ROW 4 (8 – 14)

ROW 5 (15 – 18)

ROW 6 (19 – 24)

ROW 7 (24 – 33)

ROW 8 (34 – 42)

ROW 9 (43 – 51)

ROW 10 (51 – 59)

ROW 11 (60 – 70)

ROW 12 (71 – 82)

ROW 13 (83 – 91)

ROW 14 (91 – 92)

ROW 15 (92 – 103)

ROW 16 (103 – 111)

ROW 17 (111 – 115)

ROW 18 (115 – 124)

ROW 19 (124 - 134)

ROW 20 (135 - 145)

ROW 21 (146 - 154)

ROW 22 (154 - 160)

ROW 23 (161 - 169)

ROW 24 (169 - 176)

ROW 25 (177 - 183)

ROW 26 (183 - 184)

PROGRAM REGISTERS NEEDED: 43

ROW 1 (1 - 2)

ROW 2 (2 - 7)

ROW 3 (8 - 11)

ROW 4 (12 - 15)

ROW 5 (16 - 21)

ROW 6 (21 - 25)

ROW 7 (25 - 29)

ROW 8 (29 - 33)

ROW 9 (33 - 44)

ROW 10 (45 - 54)

ROW 11 (54 - 64)

ROW 12 (65 - 70)

ROW 13 (70 - 75)

ROW 14 (75 - 79)

ROW 15 (79 - 84)

ROW 16 (85 - 88)

ROW 17 (89 - 92)

ROW 18 (92 - 96)

ROW 19 (97 – 106)

ROW 20 (106 – 113)

ROW 21 (113 – 120)

ROW 22 (121 – 125)

ROW 23 (125 – 128)

PROGRAM REGISTERS NEEDED: 50

ROW 1 (1 : 3)

ROW 2 (4 : 6)

ROW 3 (7 : 10)

ROW 4 (10 : 12)

ROW 5 (12 : 14)

ROW 6 (14 : 17)

ROW 7 (18 : 26)

ROW 8 (26 : 35)

ROW 9 (36 : 45)

ROW 10 (46 : 54)

ROW 11 (54 : 61)

ROW 12 (61 : 67)

ROW 13 (68 : 76)

ROW 14 (77 : 87)

ROW 15 (87 : 91)

ROW 16 (92 : 96)

ROW 17 (96 : 100)

ROW 18 (101 : 105)

ROW 19 (105 : 109)

ROW 20 (109 : 113)

ROW 21 (113 : 117)

ROW 22 (118 : 122)

ROW 23 (122 : 128)

ROW 24 (129 : 141)

ROW 25 (142 : 154)

ROW 26 (155 : 164)

ROW 27 (165 : 170)

CHINESE YEARS TO/FROM
GREGORIAN YEARS
PROGRAM REGISTERS NEEDED: 26

HEWLETT-PACKARD
SOLUTION BOOK:
CALENDARS

ROW 1 (1 - 5)

ROW 2 (5 - 11)

ROW 3 (12 - 18)

ROW 4 (19 - 31)

ROW 5 (32 - 39)

ROW 6 (39 - 43)

ROW 7 (43 - 46)

ROW 8 (46 - 49)

ROW 9 (49 - 59)

ROW 10 (60 - 71)

ROW 11 (71 - 77)

ROW 12 (78 - 87)

ROW 13 (88 - 90)

ROW 14 (90 - 93)

NEW MOON AND FULL MOON
DAY OF MONTH
PROGRAM REGISTERS NEEDED: 73

HEWLETT–PACKARD
SOLUTION BOOK:
CALENDARS

ROW 1 (1 – 2)

ROW 2 (2 – 4)

ROW 3 (4 – 6)

ROW 4 (6 – 8)

ROW 5 (8 – 11)

ROW 6 (12 – 14)

ROW 7 (14 – 16)

ROW 8 (16 – 20)

ROW 9 (20 – 23)

ROW 10 (24 – 26)

ROW 11 (26 – 30)

ROW 12 (30 – 32)

ROW 13 (32 – 35)

ROW 14 (36 – 39)

ROW 15 (39 – 40)

ROW 16 (41 – 46)

ROW 17 (46 – 53)

ROW 18 (54 – 61)

ROW 19 (61 – 68)

ROW 20 (69 – 75)

ROW 21 (76 – 82)

ROW 22 (83 – 89)

ROW 23 (90 – 99)

ROW 24 (100 – 110)

ROW 25 (111 – 119)

ROW 26 (120 – 127)

ROW 27 (128 – 136)

ROW 28 (136 – 143)

ROW 29 (144 – 151)

ROW 30 (152 – 158)

ROW 31 (159 – 170)

ROW 32 (170 – 176)

ROW 33 (177 – 186)

ROW 34 (187 – 196)

ROW 35 (197 – 207)

ROW 36 (208 – 216)

ROW 37 (216 - 223)

ROW 38 (223 - 230)

ROW 39 (231 - 239)

ROW 40 (239 - 239)

PROGRAM REGISTERS NEEDED: 102

ROW 1 (1 - 5)

ROW 2 (6 - 13)

ROW 3 (14 - 20)

ROW 4 (21 - 28)

ROW 5 (28 - 36)

ROW 6 (37 - 44)

ROW 7 (45 - 54)

ROW 8 (55 - 65)

ROW 9 (66 - 74)

ROW 10 (75 - 84)

ROW 11 (85 - 92)

ROW 12 (93 - 99)

ROW 13 (99 - 108)

ROW 14 (108 - 117)

ROW 15 (117 - 124)

ROW 16 (124 - 132)

ROW 17 (132 - 137)

ROW 18 (138 - 145)

ROW 19 (145 – 154)

ROW 20 (155 – 160)

ROW 21 (160 – 166)

ROW 22 (167 – 174)

ROW 23 (174 – 178)

ROW 24 (178 – 178)

ROW 25 (179 – 182)

ROW 26 (182 – 188)

ROW 27 (189 – 196)

ROW 28 (196 – 202)

ROW 29 (203 – 209)

ROW 30 (210 – 216)

ROW 31 (216 – 222)

ROW 32 (223 – 229)

ROW 33 (229 – 235)

ROW 34 (236 – 243)

ROW 35 (243 – 249)

ROW 36 (249 – 256)

ROW 37 (256 – 259)

ROW 38 (260 – 261)

ROW 39 (262 – 265)

ROW 40 (266 – 269)

ROW 41 (270 – 274)

ROW 42 (275 – 278)

ROW 43 (279 – 282)

ROW 44 (283 – 285)

ROW 45 (286 – 288)

ROW 46 (288 – 292)

ROW 47 (292 – 296)

ROW 48 (296 – 300)

ROW 49 (300 – 303)

ROW 50 (303 – 311)

ROW 51 (312 – 318)

ROW 52 (319 – 324)

ROW 53 (324 – 327)

ROW 54 (327 – 333)

ROW 55 (334 – 336)

CALENDARS