HEWLETT-PACKARD

# HP-67/HP-97

## Users' Library Solutions

# Calendars

## INTRODUCTION

In an effort to provide continued value to it's customers, Hewlett-Packard is introducing a unique service for the HP fully programmable calculator user. This service is designed to save you time and programming effort. As users are aware, Programmable Calculators are capable of delivering tremendous problem solving potential in terms of power and flexibility, but the real genie in the bottle is program solutions. HP's introduction of the first handheld programmable calculator in 1974 immediately led to a request for program **solutions** — hence the beginning of the HP-65 Users' Library. In order to save HP calculator customers time, users wrote their own programs and sent them to the Library for the benefit of other program users. In a short period of time over 5,000 programs were accepted and made available. This overwhelming response indicated the value of the program library and a Users' Library was then established for the HP-67/97 users.

To extend the value of the Users' Library, Hewlett-Packard is introducing a unique service—a service designed to save you time and money. The Users' Library has collected the best programs in the most popular categories from the HP-67/97 and HP-65 Libraries. These programs have been packaged into a series of low-cost books, resulting in substantial savings for our valued HP-67/97 users.

We feel this new software service will extend the capabilities of our programmable calculators and provide a great benefit to our HP-67/97 users.

## A WORD ABOUT PROGRAM USAGE

Each program contained herein is reproduced on the standard forms used by the Users' Library. Magnetic cards are not included. The Program Description I page gives a basic description of the program. The Program Description II page provides a sample problem and the keystrokes used to solve it. The User Instructions page contains a description of the keystrokes used to solve problems in general and the options which are available to the user. The Program Listing I and Program Listing II pages list the program steps necessary to operate the calculator. The comments, listed next to the steps, describe the reason for a step or group of steps. Other pertinent information about data register contents, uses of labels and flags and the initial calculator status mode is also found on these pages. Following the directions in your HP-67 or HP-97 **Owners' Handbook and Programming Guide,** "Loading a Program" (page 134, HP-67; page 119, HP-97), key in the program from the Program Listing I and Program Listing II pages. A number at the top of the Program Listing indicates on which calculator the program was written (HP-67 or HP-97). If the calculator indicated differs from the calculator you will be using, consult Appendix E of your **Owner's Handbook** for the corresponding keycodes and keystrokes converting HP-67 to HP-97 keycodes and vice versa. No program conversion is necessary. The HP-67 and HP-97 are totally compatible, but some differences do occur in the keycodes used to represent some of the functions.

A program loaded into the HP-67 or HP-97 is not permanent—once the calculator is turned off, the program will not be retained. You can, however, permanently save any program by recording it on a blank magnetic card, several of which were provided in the Standard Pac that was shipped with your calculator. Consult your **Owner's Handbook** for full instructions. A few points to remember:

The Set Status section indicates the status of flags, angular mode, and display setting. After keying in your program, review the status section and set the conditions as indicated before using or permanently recording the program.

REMEMBER! To save the program permanently, **clip** the corners of the magnetic card once you have recorded the program. This simple step will protect the magnetic card and keep the program from being inadvertently erased.

As a part of HP's continuing effort to provide value to our customers, we hope you will enjoy our newest concept.

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# Program Description I

**Program Title** Calendar Date to Julian Date Conversion

-(See the companion routine: Julian Date to Calendar Conversion)-

**Contributor's Name** Rayner K. Rosich

**Address** 7031 Pierson Street

**City** Arvada **State** Colorado **Zip Code** 80004

**Program Description, Equations, Variables** This algorithm converts any given calendar date (YYYY.MMDD) to a Julian date--a continuous count of days from an epoch in the very distant past. For example, Jan. 1, 1970, (1970.0101) yields a Julian date 2440588. 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 difference.

The algorithm implements the FORTRAN arithmetic statement function:

(I = year; J = month, 1-12: K = day of month)

$$\begin{aligned} JD(I,J,K) = {} & K - 32075 + 1461 * (I + 4800 + (J-14)/12)/4 \\ & + 367 * (J - 2 - ((J - 14)/12) * 12)/12 \\ & - 3 * ((I + 4900 + (J-14)/12)/100)/4, \end{aligned}$$

where the algorithm takes pains to implement the truncation feature of integer arithmetic in FORTRAN by use of the "f INT" operation on the HP-65.

The algorithm given here is a conversion * to the HP-65 of the algorithm of Fliegel and Van Flandern given in the Reference(s) Section below.

**Operating Limits and Warnings** The algorithm is valid for any calendar date (Gregorian Calendar Date) which produces a Julian Date greater than zero. See the reference for further details.

* This is submitted with the approval of the second author (TCV-F) of the ref.

# Program Description I

**Program Title** Julian Date to Calendar Date Conversion
-(See the companion routine: Calendar Date to Julian Date Conversion)-

**Contributor's Name** Rayner K. Rosich
**Address** 7031 Pierson Street
**City** Arvada **State** Colorado **Zip Code** 80004

**Program Description, Equations, Variables** This algorithm converts any given Julian date--a continuous count of days from an epoch in the very distant past--to a calendar date of the form YYYY.MMDD. For example, 2440588 yields 1970.0101 (Jan. 1, 1970). Thus the calendar date corresponding to an elapsed number of days from a given calendar date can be found by obtaining the final Julian date (by addition of the no. days elapsed to the Julian date corresponding to the given calendar date--see companion routine: Calendar Date to Julian Date Conversion) and then conversion to the final calendar date.

The algorithm implements the following FORTRAN subroutine (JD = Julian date input; Output: I=year, J=month [1-12]. K=day number in month):

```
Subroutine Date(JK,I,J,K)
L = JD + 68569
N = 4*L/146097
L = L - (146097 * N + 3)/4
I = 4000 * (L+1)/1461001
L = L - 1461 * I/4 +31
J = 80 * L/2447
K = L - 2447 * J/80
L = J/11
J = J + 2 = 12*L
I = 100* (N-49) + I + L
RETURN
END
```

The algorithm takes pains to implement the truncation feature of integer arithmetic in FORTRAN by use of the "f INT" operation on the HP-65.

The algorithm given here is a conversion* to the HP-65 of the algorithm of Fliegel and Van Flandern given in the Reference(s) section below.

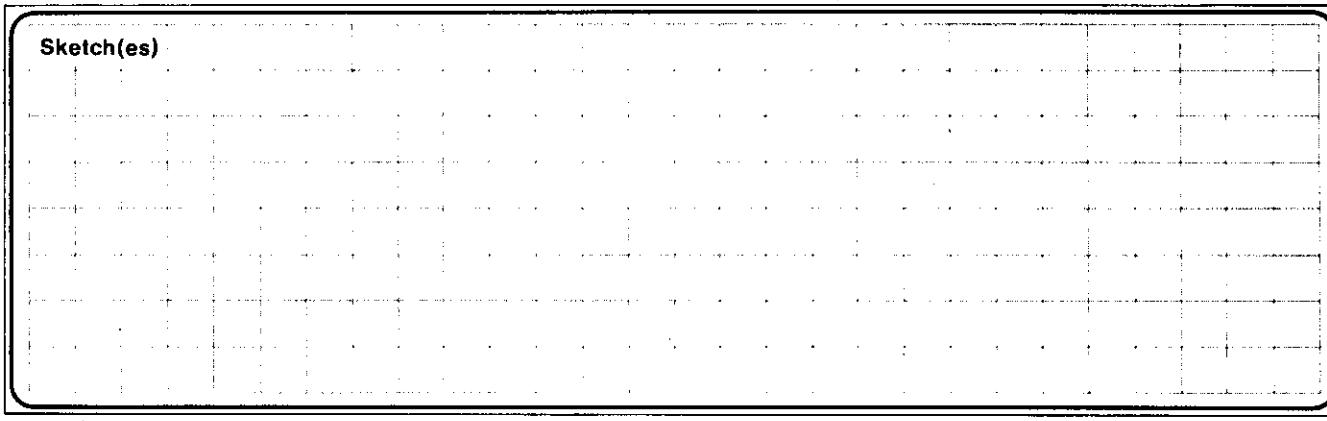
Operating Limits and Warnings The algorithm is valid for any Julian date which is greater than zero. See the reference for further details.

* This is submitted with the approval of the second author (TCV-F) of the ref.

# Program Description II

Calendar Date to Julian Date Conversion

**Sketch(es)**



**Sample Problem(s)**

1. January 1, 1970 --- Julian date 2,440,588.
2. Determine the number of elapsed days between Aug. 28, 1940 and Aug. 28, 1975. The answer is: 12,783 days.
3. Julian date 2,440,588 --- 1970.0101 (Jan. 1, 1970)
4. Determine the date corresponding to 12,783 days elapsed from Aug. 28, 1940 (Julian date: 2429870.) The answer is: Aug. 28, 1975.

Note: The routine automatically sets the display for the format yyyy.MMDD of the result.

**Solution(s)**

Problem 1:

1970.0101 A → 2440588.00

Problem 2:

1970.0828 A → 2429870.00
STO 9 → 2429870.00
1975.0825 A → 2442653.00
RCL 9 − → 12783.00

Problem 3:

1) Load Card 1.
2) 2440588 E → 1970.0101 Jan.1, 1970 (yyyy.MMDD)

Problem 4:

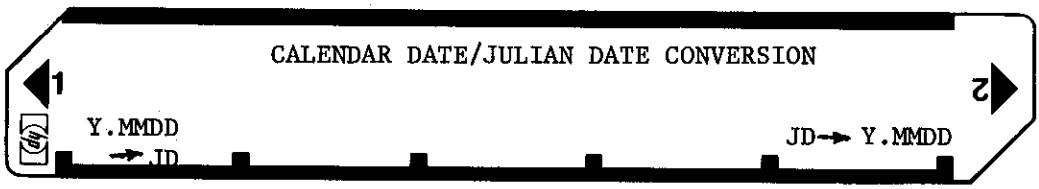
1) Determine starting Julian date(see companion pages)
2) Load card 1.
3) 2429870 ENTER↑ → 2429870.00
4) 12783 + → 2442653.00
5) E --- 1975.0828 ← Answer: Aug.28,1975

**Reference(s)**

Henry F. Fliegel and Thomas C. Van Flandern, "A Machine Algorithm for Processing Calendar Dates," Communications of the ACM, Volume II, Number 10, October, 1968, Page 657.

This is a combination of HP-65 Users' Library Programs 03874A and 03875A by Rayner K. Rosich.

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1. | Enter Program. | | | |
| 2. | Enter year, month, and day. | YYYY.MMDD | A | JD (days) |
| 3. | Enter Julian Date | JD (days) | E | YYYY.MMDD |

# 97 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | Strip off YYYY of YYYY.MMDD |
| 002 | ENT↑ | -21 | |
| 003 | INT | 16 34 | |
| 004 | STO3 | 35 03 | Year --- Reg. 3 |
| 005 | - | -45 | (YYYY.MMDD-YYYY.) |
| 006 | EEX | -23 | .MMDD---MM.DD |
| 007 | 2 | 02 | |
| 008 | x | -35 | |
| 009 | ENT↑ | -21 | Strip off MM of MM.DD |
| 010 | INT | 16 34 | |
| 011 | STO2 | 35 02 | Month---Reg. 2 |
| 012 | - | -45 | (MM.DD-MM.) |
| 013 | EEX | -23 | |
| 014 | 2 | 02 | .DD---DD. |
| 015 | x | -35 | |
| 016 | STO1 | 35 01 | Day--- Reg. 1 |
| 017 | RCL2 | 36 02 | |
| 018 | 1 | 01 | |
| 019 | 4 | 04 | |
| 020 | - | -45 | Month-14 |
| 021 | 1 | 01 | ---Reg.4 |
| 022 | 2 | 02 | 12 |
| 023 | ÷ | -24 | |
| 024 | INT | 16 34 | |
| 025 | STO4 | 35 04 | |
| 026 | 4 | 04 | |
| 027 | 9 | 09 | Term 1 = |
| 028 | 0 | 00 | |
| 029 | 0 | 00 | -(3X((Year |
| 030 | + | -55 | + 4900 |
| 031 | RCL3 | 36 03 | +(Mo.-14)/12)/10 |
| 032 | + | -55 | ))/4 |
| 033 | EEX | -23 | |
| 034 | 2 | 02 | ↳Reg.5 |
| 035 | ÷ | -24 | |
| 036 | INT | 16 34 | |
| 037 | 3 | 03 | |
| 038 | x | -35 | |
| 039 | 4 | 04 | |
| 040 | ÷ | -24 | |
| 041 | INT | 16 34 | |
| 042 | CHS | -22 | |
| 043 | STO5 | 35 05 | |
| 044 | RCL4 | 36 04 | |
| 045 | 1 | 01 | |
| 046 | 2 | 02 | |
| 047 | x | -35 | |
| 048 | CHS | -22 | Term 2 = |
| 049 | 2 | 02 | |
| 050 | - | -45 | + (367x(Month-2 |
| 051 | RCL2 | 36 02 | -((Month-14)/12) |
| 052 | + | -55 | x12))/12 |
| 053 | 3 | 03 | |
| 054 | 6 | 06 | ↳Reg. 6 |
| 055 | 7 | 07 | |
| 056 | x | -35 | |
| 057 | 1 | 01 | |
| 058 | 2 | 02 | |
| 059 | ÷ | -24 | |
| 060 | INT | 16 34 | |
| 061 | STO6 | 35 06 | |
| 062 | RCL4 | 36 04 | |
| 063 | 4 | 04 | |
| 064 | 8 | 08 | |
| 065 | 0 | 00 | Term 3 = |
| 066 | 0 | 00 | |
| 067 | + | -55 | +(1461x(year + |
| 068 | RCL3 | 36 03 | 4800+(mo.-14)/12)) |
| 069 | + | -55 | /4 |
| 070 | 1 | 01 | |
| 071 | 4 | 04 | |
| 072 | 6 | 06 | →Reg. 7 |
| 073 | 1 | 01 | |
| 074 | x | -35 | |
| 075 | 4 | 04 | |
| 076 | ÷ | -24 | |
| 077 | INT | 16 34 | |
| 078 | STO7 | 35 07 | |
| 079 | 3 | 03 | |
| 080 | 2 | 02 | |
| 081 | 0 | 00 | Julian Date = |
| 082 | 7 | 07 | |
| 083 | 5 | 05 | Day -32075 |
| 084 | - | -45 | +Term 3 + Term 2 |
| 085 | RCL1 | 36 01 | + Term 1 |
| 086 | + | -55 | |
| 087 | RCL6 | 36 06 | ↳ x → Display |
| 088 | + | -55 | |
| 089 | RCL5 | 36 05 | |
| 090 | + | -55 | Set display to |
| 091 | DSP0 | -63 00 | YYYY.MMDD |
| 092 | RTN | 24 | for mat. |
| 093 | *LBLE | 21 15 | |
| 094 | DSP4 | -63 04 | |
| 095 | ENT↑ | -21 | |
| 096 | 6 | 06 | |
| 097 | 8 | 08 | L = Julian Date |
| 098 | 5 | 05 | +68569 |
| 099 | 6 | 06 | |
| 100 | 9 | 09 | → Reg. 4 |
| 101 | + | -55 | |
| 102 | STO4 | 35 04 | |
| 103 | 4 | 04 | |
| 104 | x | -35 | N = 4xL/146097 |
| 105 | 1 | 01 | |
| 106 | 4 | 04 | → Reg. 5 |
| 107 | 6 | 06 | |
| 108 | 0 | 00 | |
| 109 | 9 | 09 | |
| 110 | 7 | 07 | |
| 111 | ÷ | -24 | |
| 112 | INT | 16 34 | |

REGISTERS

| 0 | 1 Day | 2 Month | 3 Year | 4 (mo.-14)/12 | 5 Term 1 | 6 Term 2 | 7 Term 3 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| | | | | | |

# 97 Program Listing II

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | STO5 | 35 05 | |
| 114 | 1 | 01 | |
| 115 | 4 | 04 | |
| 116 | 6 | 06 | L = L |
| 117 | 0 | 00 | -(146097xN+3)/4 |
| 118 | 9 | 09 | |
| 119 | 7 | 07 | → Reg. 4 |
| 120 | x | -35 | |
| 121 | 3 | 03 | |
| 122 | + | -55 | |
| 123 | 4 | 04 | |
| 124 | ÷ | -24 | |
| 125 | INT | 16 34 | |
| 126 | CHS | -22 | |
| 127 | RCL4 | 36 04 | |
| 128 | + | -55 | |
| 129 | STO4 | 35 04 | |
| 130 | 1 | 01 | |
| 131 | + | -55 | |
| 132 | 4 | 04 | |
| 133 | 0 | 00 | |
| 134 | 0 | 00 | |
| 135 | 0 | 00 | |
| 136 | x | -35 | Year = |
| 137 | 1 | 01 | I=4000x(L+1)/146100 |
| 138 | 4 | 04 | |
| 139 | 6 | 06 | → Reg. 3 |
| 140 | 1 | 01 | |
| 141 | 0 | 00 | |
| 142 | 0 | 00 | |
| 143 | 1 | 01 | |
| 144 | ÷ | -24 | |
| 145 | INT | 16 34 | |
| 146 | STO3 | 35 03 | |
| 147 | 1 | 01 | |
| 148 | 4 | 04 | |
| 149 | 6 | 06 | |
| 150 | 1 | 01 | |
| 151 | x | -35 | |
| 152 | 4 | 04 | L = L |
| 153 | ÷ | -24 | - 1461 x I/4 |
| 154 | INT | 16 34 | |
| 155 | CHS | -22 | + 31 |
| 156 | 3 | 03 | |
| 157 | 1 | 01 | → Reg. 4 |
| 158 | + | -55 | |
| 159 | RCL4 | 36 04 | |
| 160 | + | -55 | |
| 161 | STO4 | 35 04 | |
| 162 | 8 | 08 | Month = |
| 163 | 0 | 00 | J = 80xL/2447 |
| 164 | x | -35 | |
| 165 | 2 | 02 | → Reg. 2 |
| 166 | 4 | 04 | |
| 167 | 4 | 04 | |
| 168 | 7 | 07 | |
| 169 | ÷ | -24 | |
| 170 | INT | 16 34 | |
| 171 | STO2 | 35 02 | |
| 172 | 2 | 02 | |
| 173 | 4 | 04 | |
| 174 | 4 | 04 | |
| 175 | 7 | 07 | Day = |
| 176 | x | -35 | K = L-2447xJ/80 |
| 177 | 8 | 08 | |
| 178 | 0 | 00 | → Reg. 1 |
| 179 | ÷ | -24 | → Display at Stop. |
| 180 | INT | 16 34 | |
| 181 | CHS | -22 | |
| 182 | RCL4 | 36 04 | |
| 183 | + | -55 | |
| 184 | STO1 | 35 01 | |
| 185 | RCL2 | 36 02 | L = J/11 |
| 186 | 1 | 01 | |
| 187 | 1 | 01 | Reg. 4 |
| 188 | ÷ | -24 | |
| 189 | INT | 16 34 | |
| 190 | STO4 | 35 04 | |
| 191 | 1 | 01 | |
| 192 | 2 | 02 | |
| 193 | x | -35 | Month = |
| 194 | CHS | -22 | J=J+2-12xL |
| 195 | 2 | 02 | |
| 196 | + | -55 | Reg. 2 |
| 197 | RCL2 | 36 02 | |
| 198 | + | -55 | |
| 199 | STO2 | 35 02 | |
| 200 | RCL5 | 36 05 | |
| 201 | 4 | 04 | |
| 202 | 9 | 09 | Year = |
| 203 | - | -45 | I = 100x(N-49) |
| 204 | EEX | -23 | |
| 205 | 2 | 02 | + I + L |
| 206 | x | -35 | |
| 207 | RCL3 | 36 03 | Reg. 3 |
| 208 | + | -55 | |
| 209 | RCL4 | 36 04 | |
| 210 | + | -55 | |
| 211 | STO3 | 35 03 | |
| 212 | RCL2 | 36 02 | |
| 213 | EEX | -23 | Clear the stack |
| 214 | 2 | 02 | and put the |
| 215 | ÷ | -24 | result into "X" |
| 216 | + | -55 | |
| 217 | RCL1 | 36 01 | in the form |
| 218 | EEX | -23 | YYYY.MMDD |
| 219 | 4 | 04 | |
| 220 | ÷ | -24 | |
| 221 | + | -55 | |
| 222 | RTN | 24 | |

**LABELS**

| | | | | | |
|---|---|---|---|---|---|
| A | B | C | D | E | |
| a | b | c | d | e | |
| 0 | 1 | 2 | 3 | 4 | |
| 5 | 6 | 7 | 8 | 9 | |

**FLAGS**

| |
|---|
| 0 |
| 1 |
| 2 |
| 3 |

**SET STATUS**

| FLAGS | | | TRIG | DISP |
|---|---|---|---|---|
| | ON | OFF | | |
| 0 | ☐ | ☐ | DEG ☐ | FIX ☐ |
| 1 | ☐ | ☐ | GRAD ☐ | SCI ☐ |
| 2 | ☐ | ☐ | RAD ☐ | ENG ☐ |
| 3 | ☐ | ☐ | | n_____ |

# Program Description I

| | |
|---|---|
| **Program Title** | DAYS TO DATES AND DATES TO DAYS; DAY OF WEEK |
| **Contributor's Name** | Hewlett-Packard |
| **Address** | 1000 N.E. Circle Blvd. |
| **City** | Corvallis **State** Oregon **Zip Code** 97330 |

**Program Description, Equations, Variables**

This program computes the number of days elapsed since a certain fixed date in antiquity, using the Formula:

$$D(m,d,y)=d+[365.25\ g(y,m)]-[3/4([\frac{g(y,m)}{100}]-7)]+[30.6f(m)]$$

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

The difference in days between two dates is computed by subtracting the base value D from the current value.

The day of week is computed by taking D mod 7.

The program uses dates coded mm.ddyyyy.

LBLa computes D(m,d,y), which is the number of days since a fixed point in antiquity; then subtracts from the previous D. The Formulas are:

$$D(m,d,y)=[365.25\ g(y,m)]+[30.6f(m)]+d$$

Where $g(y,m)=\begin{cases} y-1 & \text{if } m=1 \text{ or } m=2 \\ y & \text{if } m>2 \end{cases}$ $f(m)=\begin{cases} m+13 & \text{if } m=1 \text{ or } m=2 \\ m+1 & \text{if } m>2 \end{cases}$ $[\ ]$ = f INT

LBL b takes the date already coded byfA, adds in the days to get x, and decodes as follows:

$$\hat{y}(x)=[\frac{x-122.1}{365.25}] \qquad \hat{m}(x)=[\frac{x-[365.25\ \hat{y}(x)]}{30.6001}]$$

$$d(x)=x-[365.25\ \hat{y}(x)]-[30.6001\ \hat{m}(x)]$$

$$y(x)=g^{-1}(\hat{y}(x),\hat{m}(x)) \qquad m(x)=f^{-1}(\hat{m}(x))$$

Where $g^{-1}$ and $f^{-1}$ are the "inverses" of g and f given above.

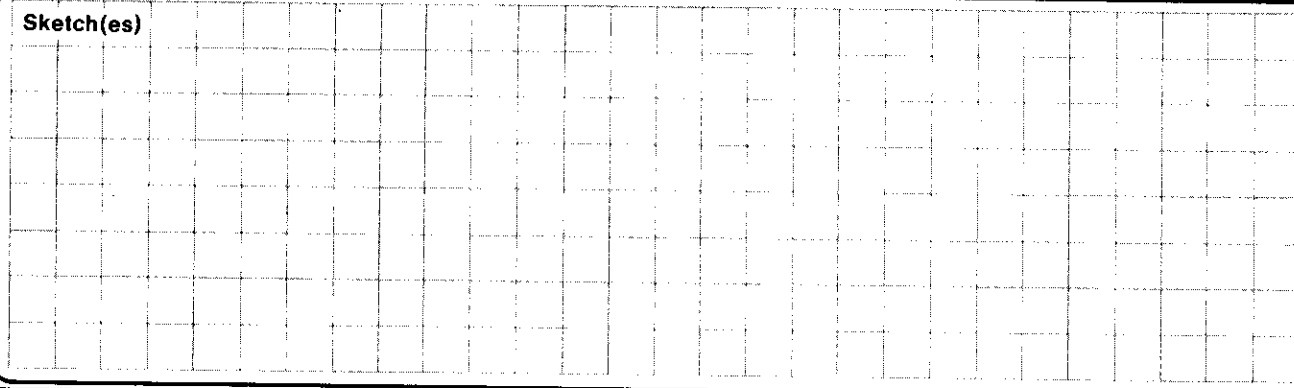
Operating Limits and Warnings: Functions under Label A and Label B are valid from the beginning of the Gregorian Calendar through the year 9999.

Error messages are not given for illegal entries.

Shifted functions are valid from March 1, 1900 through February 28, 2100.

# Program Description II

**Sketch(es)**



**Sample Problem(s)**

1. I was born on May 11, 1949. How old was I on:
   March 4, 1958? August 16, 1969? February 23, 1975?
2. What day-of-week was that last date (February 23, 1975)?
3. How many days are between Jan. 1, 1900 and Jan. 1, 1901?
   between Jan 1, 2000 and Jan. 1, 2001?
4. What is the day-of-week of: Nov. 11, 1918? July 4, 1776?
   Dec. 7, 1941? Nov. 22, 1963?
5. How many days are there from May 11, 1949 to Aug. 16, 1969?
6. What date is 9000 days from May 11, 1949?
7. How many days from Feb. 28, 1964 to March 1, 1964?
8. How many days from Feb. 28, 1965 to March 1, 1965?
9. What date is 2 days from February 28, 1976?
10. What date is 1 day from Dec. 31, 1959?

**Solution(s)**

1. 5.111949 [A] 3.041958 [B] Answer: 3219 days
   8.161969 [B] Answer: 7402 days
   2.231975 [B] Answer: 9419 days
   [C] Answer: 0=Sunday
2. 1.011900 [A] 1.011901 [B] Answer: 365 days
3. 1.012000 [A] 1.012001 [B] Answer: 366 days
4. 11.111918 [C] Answer: 1 = Monday
   12.071941 [C] Answer: 0 = Sunday
   11.221963 [C] Answer: 5 = Friday
   7.041776 [C] Answer: 4 = Thursday

(Continued on next page)

**Reference(s)** The formulae are the original work of the contributor.
The base date format was suggested by Larry Sullins of Anchorage, Alaska.
Formulas are the original work of the contributor and of Andrew Harrington,

(Continued on next page)

# Program Description II

**Sketch(es)**

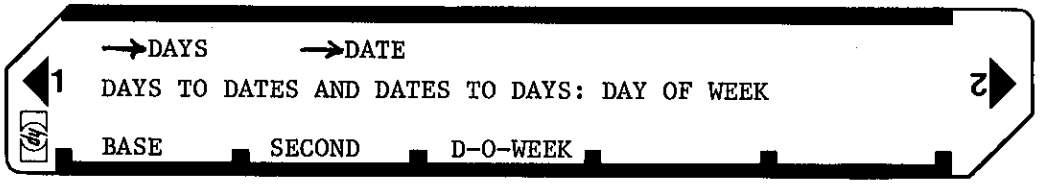
**Sample Problem(s)**

**Solution(s)**

```
 5.  5.111949 [f] [A]    8.161969 [f] [A]    →   7402
 6.  5.111949 [f] [A] 9000 [f] [B]           →   12.311973
 7.  2.281964 [f] [A] 3.011964 [f] [A]       →   2
 8.  2.281965 [f] [A] 3.011965 [f] [A]       →   1
 9.  2.281976 [f] [A] 2 [f] [B]              →   3.011976
10. 12.311959 [f] [A] 1 [f] [B]              →   1.011960
```

**Reference(s)** This program is a modification of the Users' Library Program Nos.00256B and 00277B, submitted by Eric Isaacson.

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | | OUTPUT DATA/UNITS |
|---|---|---|---|---|---|
| 1 | Enter program | | | | |
| 2 | Enter base date | mm.ddyyyy | A | | New base minus |
| | | | | | old base |
| 3 | Enter second date | mm.ddyyyy | B | | Date minus base |
| | | | | | |
| | Repeat step 3 for new date with same base. | | | | |
| | Go to step 2 for new base. | | | | |
| | | | | | |
| | To calculate day-of-week, press [C] either | | | | |
| | after punching [A] or [B], or directly after | | | | |
| | inputting date: | | | | |
| | | mm.ddyyyy | A | C | day-of-wk. |
| | OR | mm.ddyyyy | B | C | day-of-wk. |
| | OR | mm.ddyyyy | C | | day-of-wk. |
| | | | | | ⇓ |
| | | | | | Coded: |
| | | | | | 0 = Sun. |
| | | | | | 1 = Mon. |
| | | | | | 2 = Tues |
| | | | | | 3 = Wed. |
| | | | | | 4 = Thurs. |
| | | | | | 5 = Fri. |
| | | | | | 6 = Sat. |
| | To compute the number of days: | | | | |
| 4 | Enter Date 1 | mm.ddyyyy | f | A | |
| 5 | Enter Date 2 | mm.ddyyyy | f | A | Date 2- Date 1 |
| 6 | Enter Date 3 | mm.ddyyyy | f | A | Date 3- Date 2 |
| 7 | Enter Date 4 | mm.ddyyyy | f | A | Date 4- Date 3 |
| | etc. | | | | |
| | To compute the date of given number of days | | | | |
| | from a given date: | | | | |
| 4' | Enter date | mm.ddyyyy | f | A | |
| | Enter number of days | number of days | f | B | New date |
| | Go to step 4' for new case | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# 97 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | |
| 002 | GSBB | 23 12 | Compute days |
| 003 | RCL1 | 36 01 | |
| 004 | STO2 | 35 02 | Store base |
| 005 | X≠Y | -41 | Return display |
| 006 | RTN | 24 | |
| 007 | *LBLB | 21 12 | |
| 008 | 9 | 09 | |
| 009 | ENT↑ | -21 | |
| 010 | EEX | -23 | |
| 011 | 6 | 06 | |
| 012 | CHS | -22 | |
| 013 | - | -45 | |
| 014 | X≠Y | -41 | |
| 015 | 3 | 03 | |
| 016 | X≠Y | -41 | |
| 017 | X≤Y? | 16-35 | |
| 018 | GSB0 | 23 00 | |
| 019 | 1 | 01 | |
| 020 | + | -55 | m→f(m) y→g(y,m) |
| 021 | ENT↑ | -21 | |
| 022 | INT | 16 34 | |
| 023 | STO1 | 35 01 | |
| 024 | - | -45 | ,ddyyyy |
| 025 | EEX | -23 | |
| 026 | 2 | 02 | |
| 027 | x | -35 | dd.yyyy |
| 028 | ENT↑ | -21 | |
| 029 | FRC | 16 44 | |
| 030 | EEX | -23 | |
| 031 | 2 | 02 | |
| 032 | x | -35 | yy.yy |
| 033 | ENT↑ | -21 | |
| 034 | INT | 16 34 | C-no. of centuries |
| 035 | 7 | 07 | |
| 036 | - | -45 | |
| 037 | . | -62 | |
| 038 | 7 | 07 | |
| 039 | 5 | 05 | |
| 040 | x | -35 | |
| 041 | INT | 16 34 | [3/4(c-7)] |
| 042 | X≠Y | -41 | yy.yy |
| 043 | 3 | 03 | |
| 044 | 6 | 06 | |
| 045 | 5 | 05 | |
| 046 | 2 | 02 | |
| 047 | 5 | 05 | |
| 048 | x | -35 | |
| 049 | INT | 16 34 | [365.25y] |
| 050 | - | -45 | |
| 051 | - | -45 | |
| 052 | INT | 16 34 | d+[365.25y]-[3/4 |
| 053 | RCL1 | 36 01 | (c-7)] |
| 054 | 3 | 03 | |
| 055 | 0 | 00 | |
| 056 | . | -62 | |

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 057 | 6 | 06 | |
| 058 | x | -35 | |
| 059 | INT | 16 34 | [30.6f(m)] |
| 060 | + | -55 | D(m,d,y) |
| 061 | STO1 | 35 01 | |
| 062 | RCL2 | 36 02 | Base date |
| 063 | - | -45 | difference |
| 064 | RTN | 24 | |
| 065 | *LBLC | 21 13 | |
| 066 | ENT↑ | -21 | If input is integer |
| 067 | INT | 16 34 | use last date |
| 068 | X≠Y? | 16-32 | entered; if not |
| 069 | GSB1 | 23 01 | interpret as a date |
| 070 | RCL1 | 36 01 | |
| 071 | 7 | 07 | |
| 072 | ÷ | -24 | |
| 073 | FRC | 16 44 | |
| 074 | 7 | 07 | |
| 075 | x | -35 | Days mod 7 |
| 076 | RTN | 24 | |
| 077 | *LBL0 | 21 00 | |
| 078 | + | -55 | |
| 079 | + | -55 | |
| 080 | RTN | 24 | |
| 081 | *LBL1 | 21 01 | |
| 082 | X≠Y | -41 | |
| 083 | GTOB | 22 12 | |
| 084 | *LBLa | 21 16 11 | |
| 085 | STO0 | 35 00 | |
| 086 | DSP0 | -63 00 | |
| 087 | EEX | -23 | |
| 088 | 2 | 02 | |
| 089 | STO2 | 35 02 | 100→ $R_2$ |
| 090 | 1 | 01 | |
| 091 | 2 | 02 | |
| 092 | 2 | 02 | |
| 093 | . | -62 | |
| 094 | 1 | 01 | |
| 095 | STO3 | 35 03 | 122.1 → $R_3$ |
| 096 | EEX | -23 | |
| 097 | 6 | 06 | |
| 098 | CHS | -22 | $10^{-6}$ → $R_4$ |
| 099 | STO4 | 35 04 | |
| 100 | 3 | 03 | |
| 101 | 0 | 00 | |
| 102 | . | -62 | |
| 103 | 6 | 06 | |
| 104 | 0 | 00 | |
| 105 | 0 | 00 | |
| 106 | 1 | 01 | |
| 107 | STO5 | 35 05 | 30.6001 → $R_5$ |
| 108 | EEX | -23 | |
| 109 | 4 | 04 | |
| 110 | STO8 | 35 08 | 10000 → $R_8$ |
| 111 | 3 | 03 | |
| 112 | 6 | 06 | |

REGISTERS

| 0 | 1 f(m)(in B) cur. date Code after B | 2 Base date coded No.&100 | 3 122.1 | 4 $10^{-6}$ | 5 30.6001 | 6 365.25 | 7 Used | 8 10000 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| S0 | | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| | | | | | |

# 97 Program Listing II



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | 5 | 05 | |
| 114 | . | -62 | |
| 115 | 2 | 02 | |
| 116 | 5 | 05 | |
| 117 | STO6 | 35 06 | 365.25 → $R_6$ |
| 118 | RCL0 | 36 00 | Dates to days |
| 119 | 9 | 09 | |
| 120 | ENT↑ | -21 | |
| 121 | ENT↑ | -21 | |
| 122 | RCL4 | 36 04 | |
| 123 | - | -45 | |
| 124 | 3 | 03 | |
| 125 | R↑ | 16-31 | |
| 126 | X≤Y? | 16-35 | |
| 127 | GSB0 | 23 00 | If m is Jan or Feb |
| 128 | 1 | 01 | shift it to prev.yr. |
| 129 | + | -55 | |
| 130 | ENT↑ | -21 | |
| 131 | INT | 16 34 | |
| 132 | STO7 | 35 07 | Month |
| 133 | - | -45 | |
| 134 | RCL2 | 36 02 | |
| 135 | x | -35 | dd.yyyy |
| 136 | ENT↑ | -21 | |
| 137 | FRC | 16 44 | .yyyy |
| 138 | RCL6 | 36 06 | |
| 139 | x | -35 | |
| 140 | RCL8 | 36 08 | |
| 141 | x | -35 | 365.25(yyyy) |
| 142 | INT | 16 34 | year-days |
| 143 | + | -55 | |
| 144 | INT | 16 34 | |
| 145 | RCL7 | 36 07 | year-days + days- |
| 146 | RCL5 | 36 05 | of month |
| 147 | x | -35 | |
| 148 | INT | 16 34 | Month days |
| 149 | + | -55 | Total days |
| 150 | RCL1 | 36 01 | Previous answer |
| 151 | X≠Y | -41 | |
| 152 | STO1 | 35 01 | |
| 153 | - | -45 | |
| 154 | CHS | -22 | Days since prev. |
| 155 | RTN | 24 | date |
| 156 | *LBL6 | 21 16 12 | Days to date |
| 157 | RCL1 | 36 01 | |
| 158 | + | -55 | Code number x |
| 159 | ENT↑ | -21 | |
| 160 | ENT↑ | -21 | |
| 161 | RCL3 | 36 03 | |
| 162 | - | -45 | |
| 163 | RCL6 | 36 06 | |
| 164 | ÷ | -24 | |
| 165 | INT | 16 34 | |
| 166 | ENT↑ | -21 | |
| 167 | ENT↑ | -21 | |
| 168 | RCL4 | 36 04 | |
| 169 | x | -35 | |
| 170 | STO1 | 35 01 | |
| 171 | CLX | -51 | |
| 172 | RCL6 | 36 06 | |
| 173 | x | -35 | |
| 174 | INT | 16 34 | |
| 175 | - | -45 | |
| 176 | ENT↑ | -21 | |
| 177 | ENT↑ | -21 | |
| 178 | RCL5 | 36 05 | |
| 179 | ÷ | -24 | |
| 180 | INT | 16 34 | |
| 181 | STO7 | 35 07 | |
| 182 | RCL5 | 36 05 | |
| 183 | x | -35 | |
| 184 | INT | 16 34 | |
| 185 | - | -45 | |
| 186 | RCL2 | 36 02 | |
| 187 | ÷ | -24 | .dd |
| 188 | RCL1 | 36 01 | |
| 189 | + | -55 | .ddyyyy |
| 190 | RCL4 | 36 04 | |
| 191 | RCL7 | 36 07 | |
| 192 | 1 | 01 | |
| 193 | - | -45 | |
| 194 | 1 | 01 | |
| 195 | 2 | 02 | Shift Jan & Feb. |
| 196 | X≠Y | -41 | back to proper yr |
| 197 | X>Y? | 16-34 | |
| 198 | GSB2 | 23 02 | |
| 199 | R↑ | 16-31 | mm.ddyyyy |
| 200 | + | -55 | |
| 201 | DSP6 | -63 06 | |
| 202 | RTN | 24 | |
| 203 | *LBL2 | 21 02 | |
| 204 | - | -45 | |
| 205 | - | -45 | |
| 206 | RTN | 24 | |
| 207 | R/S | 51 | |
| 210 | | | |
| 220 | | | |

**LABELS**

| | | | | | |
|---|---|---|---|---|---|
| A Base | B Second | C D-O-Wk | D | E | 0 |
| a →Days | b →Date | c | d | e | 1 |
| 0 Used | 1 Used | 2 Used | 3 | 4 | 2 |
| 5 | 6 | 7 | 8 | 9 | 3 |

**FLAGS**

**SET STATUS**

| FLAGS | | | TRIG | DISP |
|---|---|---|---|---|
| | ON | OFF | | |
| 0 | ☐ | ☐ | DEG ☐ | FIX ☐ |
| 1 | ☐ | ☐ | GRAD ☐ | SCI ☐ |
| 2 | ☐ | ☐ | RAD ☐ | ENG ☐ |
| 3 | ☐ | ☐ | | n____ |

# Program Description I

**Program Title** Day of Year - Day of Week FAL-12

**Contributor's Name** F.A. Lummus, P.E.
**Address** Route 2 Box 84
**City** Greenville **State** Texas **Zip Code** 75401

**Program Description, Equations, Variables** Given a date, this program primarily calculates the day of year (DOY). The remaining number of days in the year is available. Also, given a year and a DOY, this program will calculate the date. The day of week (DOW) is available. The DOY and date are calculated using the Julian Day Formulas in the HP standard Pac.

**Operating Limits and Warnings** This program is good for the 200-year period from 1901 through 2099. There are no checks for invalid inputs, however there is a check for data constants storage.

# Program Description 11

**Sketch(es)**

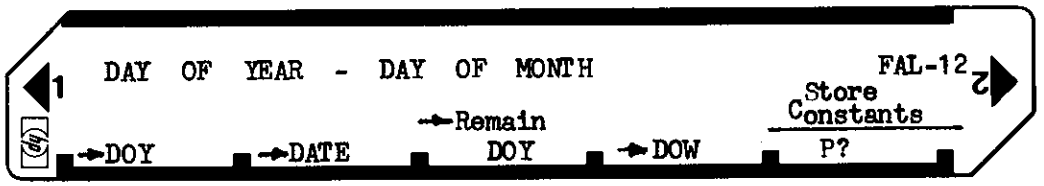
**Sample Problem(s)** (1) Find the day of year of July 4, 1976.
(2) Find the remaining days in the year from the above date.
(3) Find the day of the week for the above date.
(4) Find the date for the 320th day of 1957.
(5) Find the day of the week for the above date.

**Solution(s)**

| | | | | | |
|---|---|---|---|---|---|
| (1) | [f][E] 7.041976 [A] | → | 7.04 1976 | *** | |
| | | | 186. | *** | |
| (2) | [C] | → | 180. | *** | |
| (3) | [D] | → | 0. | *** | (Sunday) |
| (4) | 1957 [ENT] | → | 1957. | | |
| | 320 [B] | → | 320. | *** | |
| | | | 1957. | *** | |
| | | | 11.161957 | *** | |
| (5) | [D] | → | 6. | *** | (Saturday) |

**Reference(s)** HP-97 Standard Pac.

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Load Side 1 and Side 2 | | | |
| 2 | Initialize Constants | | f E | 0.00 |
| 3 | Select Print Option 1.00 yes/o.00 no | | E | 1.00/0.00 |
| 4 | For Day of Year in Put Date (mm.ddyyyy) | Date | A | DOY |
| 5 | For date, enter year & DOY | Year<br>DOY | ENT<br>B | Year<br>Date |
| | After Either Step 4 or Step 5 | | | |
| 6 | For Remaining Days in the Year | | C | Days |
| 7 | For Day of Week of Date<br>DOW Coded: 0=Sun, 1=Mon, etc. | | D | DOW |

# 97 Program Listing I

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | Input Date |
| 002 | RCLA | 36 11 | |
| 003 | X=0? | 16-43 | |
| 004 | ÷ | -24 | |
| 005 | R↓ | -31 | |
| 006 | DSP6 | -63 06 | |
| 007 | F0? | 16 23 00 | |
| 008 | PRTX | -14 | |
| 009 | GSBa | 23 16 11 | Compute Dn |
| 010 | STO2 | 35 02 | |
| 011 | RCL4 | 36 04 | |
| 012 | EEX | -23 | |
| 013 | 6 | 06 | |
| 014 | ÷ | -24 | |
| 015 | 1 | 01 | |
| 016 | + | -55 | |
| 017 | GSBa | 23 16 11 | Compute Dn of first of year |
| 018 | RCL2 | 36 02 | |
| 019 | - | -45 | |
| 020 | CHS | -22 | |
| 021 | DSP0 | -63 00 | |
| 022 | STO0 | 35 00 | |
| 023 | F0? | 16 23 00 | |
| 024 | PRTX | -14 | DOY |
| 025 | RTN | 24 | |
| 026 | *LBLa | 21 16 11 | |
| 027 | ENT↑ | -21 | Break input into individual components and compute day number |
| 028 | INT | 16 34 | |
| 029 | STO7 | 35 07 | |
| 030 | - | -45 | |
| 031 | EEX | -23 | |
| 032 | 2 | 02 | |
| 033 | x | -35 | |
| 034 | ENT↑ | -21 | |
| 035 | INT | 16 34 | |
| 036 | STO8 | 35 08 | |
| 037 | - | -45 | |
| 038 | EEX | -23 | |
| 039 | 4 | 04 | |
| 040 | x | -35 | |
| 041 | STO9 | 35 09 | |
| 042 | STO4 | 35 04 | |
| 043 | RCL7 | 36 07 | |
| 044 | 1 | 01 | |
| 045 | + | -55 | |
| 046 | ENT↑ | -21 | |
| 047 | 1/X | 52 | |
| 048 | . | -62 | |
| 049 | 7 | 07 | |
| 050 | + | -55 | |
| 051 | CHS | -22 | |
| 052 | GSB4 | 23 04 | |
| 053 | RCLB | 36 12 | |
| 054 | x | -35 | |
| 055 | INT | 16 34 | |
| 056 | RCL9 | 36 09 | |
| 057 | RCLA | 36 11 | |
| 058 | x | -35 | |
| 059 | INT | 16 34 | |
| 060 | + | -55 | |
| 061 | RCL8 | 36 08 | |
| 062 | + | -55 | |
| 063 | RTN | 24 | |
| 064 | *LBL4 | 21 04 | |
| 065 | INT | 16 34 | Correct M & Y |
| 066 | ST+9 | 35-55 09 | |
| 067 | 1 | 01 | |
| 068 | 2 | 02 | |
| 069 | x | -35 | |
| 070 | - | -45 | |
| 071 | RTN | 24 | |
| 072 | *LBLB | 21 12 | |
| 073 | RCLA | 36 11 | Input Year & DOY |
| 074 | X=0? | 16-43 | |
| 075 | ÷ | -24 | |
| 076 | R↓ | -31 | |
| 077 | STO0 | 35 00 | |
| 078 | DSP0 | -63 00 | |
| 079 | F0? | 16 23 00 | |
| 080 | PRTX | -14 | |
| 081 | R↓ | -31 | |
| 082 | F0? | 16 23 00 | |
| 083 | PRTX | -14 | |
| 084 | STO4 | 35 04 | |
| 085 | DSP6 | -63 06 | |
| 086 | EEX | -23 | |
| 087 | 6 | 06 | |
| 088 | ÷ | -24 | |
| 089 | 1 | 01 | |
| 090 | + | -55 | Compute DN of First of Year Add DOY |
| 091 | GSBo | 23 16 11 | |
| 092 | RCL0 | 36 00 | |
| 093 | + | -55 | |
| 094 | STO2 | 35 02 | |
| 095 | RCLC | 36 13 | Decipher DN into display mm.ddyyyy |
| 096 | - | -45 | |
| 097 | RCLA | 36 11 | |
| 098 | ÷ | -24 | |
| 099 | INT | 16 34 | |
| 100 | STO9 | 35 09 | |
| 101 | RCLA | 36 11 | |
| 102 | x | -35 | |
| 103 | INT | 16 34 | |
| 104 | RCL2 | 36 02 | |
| 105 | - | -45 | |
| 106 | CHS | -22 | |
| 107 | STO6 | 35 06 | |
| 108 | RCLB | 36 12 | |
| 109 | ÷ | -24 | |
| 110 | INT | 16 34 | |
| 111 | STO7 | 35 07 | |
| 112 | RCL6 | 36 06 | |

REGISTERS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| DOY | | Julian Day No. | 365.5 | Year | | Used | Month | Day | Year |
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| 365.25 | 30.6001 | 122.1 | | | |

# 97 Program Listing II



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | X≷Y | -41 | |
| 114 | RCLB | 36 12 | |
| 115 | × | -35 | |
| 116 | INT | 16 34 | |
| 117 | - | -45 | |
| 118 | STO8 | 35 08 | |
| 119 | RCL7 | 36 07 | |
| 120 | 1 | 01 | |
| 121 | RCL8 | 36 08 | |
| 122 | % | 55 | |
| 123 | - | -45 | |
| 124 | - | -45 | |
| 125 | RCL7 | 36 07 | |
| 126 | 1 | 01 | |
| 127 | 4 | 04 | |
| 128 | ÷ | -24 | |
| 129 | GSB4 | 23 04 | |
| 130 | RCL9 | 36 09 | |
| 131 | EEX | -23 | |
| 132 | 6 | 06 | |
| 133 | ÷ | -24 | |
| 134 | + | -55 | |
| 135 | F0? | 16 23 00 | |
| 136 | PRTX | -14 | |
| 137 | RTN | 24 | |
| 138 | *LBLC | 21 13 | |
| 139 | RCL4 | 36 04 | **Compute remaining days in year** |
| 140 | 4 | 04 | |
| 141 | ÷ | -24 | |
| 142 | FRC | 16 44 | |
| 143 | X=0? | 16-43 | |
| 144 | SF2 | 16 21 02 | |
| 145 | RCL3 | 36 03 | |
| 146 | . | -62 | |
| 147 | 5 | 05 | |
| 148 | F2? | 16 23 02 | |
| 149 | CHS | -22 | |
| 150 | - | -45 | |
| 151 | RCL0 | 36 00 | |
| 152 | - | -45 | |
| 153 | DSP0 | -63 00 | |
| 154 | F0? | 16 23 00 | |
| 155 | PRTX | -14 | |
| 156 | RTN | 24 | |
| 157 | *LBLD | 21 14 | |
| 158 | RCL2 | 36 02 | Compute **Day of week** |
| 159 | 5 | 05 | |
| 160 | + | -55 | |
| 161 | 7 | 07 | |
| 162 | ÷ | -24 | |
| 163 | FRC | 16 44 | |
| 164 | 7 | 07 | |
| 165 | × | -35 | |
| 166 | DSP0 | -63 00 | |
| 167 | RND | 16 24 | |
| 168 | F0? | 16 23 00 | |
| 169 | PRTX | -14 | |
| 170 | RTN | 24 | |
| 171 | *LBLe | 21 16 15 | |
| 172 | 3 | 03 | **Store data Constants** |
| 173 | 6 | 06 | |
| 174 | 5 | 05 | |
| 175 | . | -62 | |
| 176 | 2 | 02 | |
| 177 | 5 | 05 | |
| 178 | STOA | 35 11 | |
| 179 | 3 | 03 | |
| 180 | 0 | 00 | |
| 181 | . | -62 | |
| 182 | 6 | 06 | |
| 183 | 0 | 00 | |
| 184 | 0 | 00 | |
| 185 | 1 | 01 | |
| 186 | STOB | 35 12 | |
| 187 | 1 | 01 | |
| 188 | 2 | 02 | |
| 189 | 2 | 02 | |
| 190 | . | -62 | |
| 191 | 1 | 01 | |
| 192 | STOC | 35 13 | |
| 193 | 3 | 03 | |
| 194 | 6 | 06 | |
| 195 | 5 | 05 | |
| 196 | . | -62 | |
| 197 | 5 | 05 | |
| 198 | STO3 | 35 03 | |
| 199 | CLX | -51 | |
| 200 | RTN | 24 | |
| 201 | *LBLE | 21 15 | |
| 202 | DSP2 | -63 02 | **Print Option** |
| 203 | F0? | 16 23 00 | |
| 204 | GTO8 | 22 08 | |
| 205 | SF0 | 16 21 00 | |
| 206 | 1 | 01 | |
| 207 | RTN | 24 | |
| 208 | *LBL8 | 21 08 | |
| 209 | CF0 | 16 22 00 | |
| 210 | CLX | -51 | |
| 211 | RTN | 24 | |
| 212 | R/S | 51 | |
| 220 | | | |

## LABELS

| | | | | | |
|---|---|---|---|---|---|
| A →DOY | B →DATE | C →Remain DOY | D →DOY | E Print | 0 Print |
| a Compute DN | b | c | d | e Store Data | 1 ——— |
| 0 | 1 | 2 | 3 | 4 Correct M & Y | 2 Leap Yr. |
| 5 | 6 | 7 | 8 Print-No | 9 | 3 ——— |

## FLAGS

| | ON | OFF |
|---|---|---|
| 0 | ☐ | ☒ |
| 1 | ☐ | ☒ |
| 2 | ☐ | ☒ |
| 3 | ☐ | ☒ |

## SET STATUS

**TRIG**: DEG ☒ GRAD ☐ RAD ☐

**DISP**: FIX ☒ SCI ☐ ENG ☐ n 0

# Program Description I

**Program Title** NUMBER OF WEEKDAYS BETWEEN TWO DATES

**Contributor's Name** Hewlett-Packard

**Address** 1000 N.E. Circle Blvd.

**City** Corvallis **State** Oregon **Zip Code** 97330

**Program Description, Equations, Variables** Program uses dates coded mm.ddyyyy. Program computes the number of weekdays since a certain fixed date in antiquity, using the formula:

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

where $D(m,d,y) = d - [3/4([\frac{g(x,m)}{100}] - 7)] + [365.25\, g(y,m)] + [30.6\, f(m)]$

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

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

Important Note: These calculations are based on noon-to-noon, so the difference between a weekday and a non-weekday will have a half-day in it. For example, the number of weekdays between Friday and Saturday is 1/2 (half of Friday); the number of weekdays between Sunday and Tuesday is 1 1/2 (all of Monday, half of Tuesday).

**Operating Limits and Warnings** Valid from the beginning of the Gregorian calendar through the year 9999.

Error messages are not given for illegal entries.

# Program Description II

**Sketch(es)**

**Sample Problem(s)** How many weekdays are there between:

| | | Coded: | |
|---|---|---|---|
| 1. | Sept. 2, 1963 and June 5, 1964 | 9,021963 | 6.051964 |
| 2. | Apr. 10, 1974 and Apr. 16, 1974 | 4.101974 | 4.161974 |
| 3. | Apr. 12, 1974 and Apr. 14, 1974 | 4.121974 | 4.141974 |
| 4. | Apr. 1, 1974 and May 1, 1974 | 4.011974 | 5.011974 |
| 5. | Apr. 1, 1974 and Apr. 1, 1975 | 4.011974 | 4.011975 |
| 6. | Jan 1, 1860 and Jan 1, 1960 | 1.011860 | 1.011960 |

7. What is the day-of-week of the last date entered, Jan. 1, 1960?

**Solution(s)**

1. 9.021963[A] 6.051964[A] --- 199.Ø
2. 4.101974[A] 4.161974[A] --- 4.Ø
3. 4.121974[A] 4.141974[A] --- Ø.5
4. 4.011974[A] 5.011974[A] --- 22.Ø
5. 4.011974[A] 4.011975[A] --- 261.Ø
6. 1.011860[A] 1.011960[A] --- 26089.5
7. [B] --- 5 (Friday)

**Reference(s)** This program is a translation of the HP-65 Users' Library Program No. 00282A submitted by Eric Isaacson.

# User Instructions


| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Enter Program | | | |
| 2 | Enter first date | mm.ddyyyy | A | (Ignore 1st output) |
| 3 | Enter subsequent date | mm.ddyyyy | A | Weekdays between date and previous date |
| | To show the day-of-week of any date, press B after A | | B | day-of-wk of last date entered (0=Sun ... 6=Sat) |
| | For other dates, do Step 3 repeatedly. Output is always the difference (in weekdays) between the last two dates entered. | | | |

# 97 Program Listing 1



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | Ent.date & compute. |
| 002 | 9 | 09 | |
| 003 | ENT↑ | -21 | |
| 004 | EEX | -23 | |
| 005 | 6 | 06 | |
| 006 | CHS | -22 | |
| 007 | - | -45 | |
| 008 | X≠Y | -41 | |
| 009 | 3 | 03 | |
| 010 | X≠Y | -41 | |
| 011 | X≤Y? | 16-35 | If M=1or2 add 12 to |
| 012 | GSB1 | 23 01 | M & subt. 1 from y. |
| 013 | 1 | 01 | |
| 014 | + | -55 | Add 1 to M |
| 015 | ENT↑ | -21 | |
| 016 | INT | 16 34 | |
| 017 | STO1 | 35 01 | Store adjusted M. |
| 018 | - | -45 | .ddyyyy |
| 019 | EEX | -23 | |
| 020 | 2 | 02 | |
| 021 | × | -35 | dd.yyyy |
| 022 | ENT↑ | -21 | |
| 023 | FRC | 16 44 | |
| 024 | EEX | -23 | |
| 025 | 2 | 02 | |
| 026 | × | -35 | yy.yy |
| 027 | ENT↑ | -21 | |
| 028 | INT | 16 34 | C = no. of centuries |
| 029 | 7 | 07 | |
| 030 | - | -45 | |
| 031 | . | -62 | |
| 032 | 7 | 07 | |
| 033 | 5 | 05 | |
| 034 | × | -35 | [3/4 |
| 035 | INT | 16 34 | Century days=(C-7)] |
| 036 | X≠Y | -41 | yy.yy |
| 037 | 3 | 03 | |
| 038 | 6 | 06 | |
| 039 | 5 | 05 | |
| 040 | 2 | 02 | |
| 041 | 5 | 05 | |
| 042 | × | -35 | |
| 043 | INT | 16 34 | |
| 044 | - | -45 | |
| 045 | - | -45 | |
| 046 | INT | 16 34 | [365.25y] + d- |
| 047 | RCL1 | 36 01 | [3/4(c-7)] |
| 048 | 3 | 03 | |
| 049 | 0 | 00 | |
| 050 | . | -62 | |
| 051 | 6 | 06 | |
| 052 | × | -35 | 30.6 f(m) |
| 053 | INT | 16 34 | |
| 054 | + | -55 | D |
| 055 | 7 | 07 | D/7 |
| 056 | ÷ | -24 | |
| 057 | ENT↑ | -21 | |
| 058 | FRC | 16 44 | |
| 059 | - | -45 | [D/7] |
| 060 | LSTX | 16-63 | 1/7(D mod7) |
| 061 | STO3 | 35 03 | |
| 062 | 1 | 01 | |
| 063 | 2 | 02 | |
| 064 | . | -62 | |
| 065 | 6 | 06 | |
| 066 | 1 | 01 | |
| 067 | × | -35 | 1.801(D mod7) |
| 068 | INT | 16 34 | |
| 069 | . | -62 | |
| 070 | 1 | 01 | |
| 071 | × | -35 | |
| 072 | + | -55 | |
| 073 | 5 | 05 | |
| 074 | × | -35 | W |
| 075 | RCL2 | 36 02 | Previous W |
| 076 | X≠Y | -41 | |
| 077 | STO2 | 35 02 | |
| 078 | - | -45 | |
| 079 | CHS | -22 | Difference |
| 080 | DSP1 | -63 01 | |
| 081 | RTN | 24 | |
| 082 | *LBLB | 21 12 | Show day-of-week |
| 083 | RCL3 | 36 03 | |
| 084 | 7 | 07 | |
| 085 | × | -35 | |
| 086 | DSP0 | -63 00 | |
| 087 | RTN | 24 | |
| 088 | *LBL1 | 21 01 | |
| 089 | + | -55 | |
| 090 | ÷ | -55 | |
| 091 | RTN | 24 | |
| 092 | R/S | 51 | |

| STEP | KEY ENTRY | KEY CODE |
|---|---|---|
| 100 | | |
| 110 | | |

## REGISTERS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 f(m) (adj.mo.) | 2 Code no. prev.date | 3 1/7(day-of-wk) | 4 | 5 | 6 | 7 | 8 | 9 |
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |
| A | B | C | D | E | I | | | | |

# Program Description I

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

**Contributor's Name** Hewlett-Packard

**Address** 1000 N.E. Circle Blvd.

**City** Corvallis **State** Oregon **Zip Code** 97330

**Program Description, Equations, Variables** 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:

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

$$N(m,d,w) = ([2.6f(m)\,] + d - w) \mod 7$$

$$h(N) = \begin{cases} 4([\frac{N}{2}] + 4) & \text{if N odd} \\ 2N & \text{if N even} \end{cases} \qquad [\,] = \text{f int}$$

$$L(y,n) = (y-1-h(n) \mod 28 + h(n) + g(m)$$

Then 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.

**Operating Limits and Warnings**

1. Valid from March 1, 1900 through Feb. 28, 2100.
2. This program does not give error messages for illegal entries.
3. For Feb. 29 non-leap-years as well as leap years will be returned. You should ignore the non-leap years until you get a leap year. Then you can successively add 28 to obtain all the answers.
4. The stack must not be disrupted between steps.

# Program Description II

**Sketch(es)**

**Sample Problem(s)**

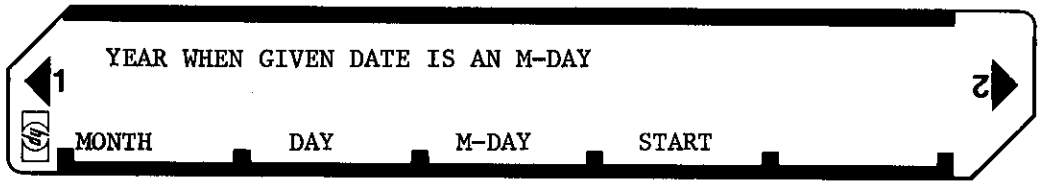
1. When starting in 1949 is May 11 a Sunday?
2. When starting in 1969 is Aug. 16 a Saturday?
3. When starting in 2000 is Christmas first a Sunday?
4. When starting in 1964 is Feb. 14 a Thursday?
5. When starting in 1927 is July 14 a Tuesday?

**Solution(s)**

1. 1952, 1958, 1969, 1975, 1980, etc.
2. 1969, 1975, 1980, 1986, 1997, etc.
3. 2005
4. 1974, 1980, 1985, 1991, 2002, etc.
5. 1931, 1936, 1942, 1953, 1959, etc.

**Reference(s)** The formulae are the original work of the contributor.
This program is a translation of the HP-65 Users' Library Program No. 00280A submitted by Eric Isaacson, Math Dept., Stanford, California 94305

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Enter program | | | |
| 2 | Enter month | m | A | |
| 3 | Enter Day-of-Month | d | B | |
| 4 | Enter Day-of-Week (0=Sun,..., 6=Sat.) | w | C | |
| 5 | Enter starting year | y | D | 1st correc yr. ≥ y |
| 6 | Repeat this step as desired until year except | | | |
| | 2099 | | R/S | next correct yr. |
| | | | R/S | next correct yr. |
| | | | " | " |
| | | | " | " |
| | | | " | etc. |
| | Go back to Step 2 for A new case. | | | |
| | | | | |
| | WARNING: Do not disrupt the stack between | | | |
| | steps. | | | |

# 97 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | |
| 002 | 0 | 00 | |
| 003 | STO1 | 35 01 | Enter month |
| 004 | CLX | -51 | |
| 005 | 1 | 01 | |
| 006 | 1 | 01 | |
| 007 | + | -55 | Day-of-week correction factor |
| 008 | 1 | 01 | |
| 009 | 4 | 04 | |
| 010 | X>Y? | 16-34 | If mo.is Jan or Feb add 12 to mo. & record yr. correction in $R_1$. |
| 011 | GTO0 | 22 00 | |
| 012 | R↓ | -31 | |
| 013 | *LBL1 | 21 01 | |
| 014 | 2 | 02 | |
| 015 | . | -62 | |
| 016 | 6 | 06 | |
| 017 | x | -35 | [2.6 m] |
| 018 | INT | 16 34 | |
| 019 | RTN | 24 | |
| 020 | *LBL0 | 21 00 | |
| 021 | 1 | 01 | |
| 022 | STO1 | 35 01 | |
| 023 | ENT↑ | -21 | |
| 024 | + | -55 | |
| 025 | - | -45 | |
| 026 | + | -55 | |
| 027 | GTO1 | 22 01 | Enter day-of-mo. [2.6 m] + d |
| 028 | *LBLB | 21 12 | |
| 029 | + | -55 | |
| 030 | RTN | 24 | |
| 031 | *LBLC | 21 13 | Enter day-of-week (M-day) [2.6 m] + d-w |
| 032 | - | -45 | |
| 033 | ENT↑ | -21 | |
| 034 | ENT↑ | -21 | |
| 035 | 7 | 07 | |
| 036 | ÷ | -24 | |
| 037 | INT | 16 34 | |
| 038 | 7 | 07 | N=([2.6m]+d-w)mod 7 |
| 039 | x | -35 | |
| 040 | - | -45 | |
| 041 | 2 | 02 | N/2 |
| 042 | ÷ | -24 | |
| 043 | ENT↑ | -21 | [N/2] |
| 044 | INT | 16 34 | If N odd add 4 |
| 045 | X≠Y? | 16-32 | |
| 046 | GSB0 | 23 00 | |
| 047 | 4 | 04 | |
| 048 | x | -35 | Year number mod 28 |
| 049 | ENT↑ | -21 | |
| 050 | ENT↑ | -21 | |
| 051 | RTN | 24 | |
| 052 | *LBL0 | 21 00 | |
| 053 | 4 | 04 | |
| 054 | + | -55 | |
| 055 | RTN | 24 | |
| 056 | *LBLD | 21 14 | |
| 057 | 1 | 01 | Enter starting yr. |
| 058 | - | -45 | Sub 1 for strict inequality |
| 059 | ENT↑ | -21 | |
| 060 | R↑ | 16-31 | |
| 061 | - | -45 | |
| 062 | 2 | 02 | |
| 063 | 8 | 08 | |
| 064 | ÷ | -24 | |
| 065 | INT | 16 34 | |
| 066 | 2 | 02 | |
| 067 | 8 | 08 | |
| 068 | x | -35 | Multiple of 28 in the past. |
| 069 | R↑ | 16-31 | |
| 070 | RCL1 | 36 01 | |
| 071 | + | -55 | Ready to enter addition loop |
| 072 | *LBL2 | 21 02 | |
| 073 | + | -55 | Addition loop |
| 074 | X>Y? | 16-34 | Answer:Is it in range? |
| 075 | GSB5 | 23 05 | |
| 076 | 6 | 06 | |
| 077 | + | -55 | Answer: Is it in range? |
| 078 | X>Y? | 16-34 | |
| 079 | GSB5 | 23 05 | |
| 080 | 1 | 01 | |
| 081 | 1 | 01 | |
| 082 | + | -55 | Answer: Is it in range? |
| 083 | X>Y? | 16-34 | |
| 084 | GSB5 | 23 05 | |
| 085 | 6 | 06 | |
| 086 | + | -55 | Answer: Is it in range? |
| 087 | X>Y? | 16-34 | |
| 088 | GSB5 | 23 05 | |
| 089 | 5 | 05 | |
| 090 | GTO2 | 22 02 | |
| 091 | *LBL5 | 21 05 | |
| 092 | PRTX | -14 | |
| 093 | R/S | 51 | |
| 094 | RTN | 24 | |
| 095 | R/S | 51 | |

| 100 | | |
|---|---|---|
| 110 | | |

REGISTERS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| | | | | | |

# Program Description I

**Program Title** NUMBER OF M-DAYS BETWEEN TWO DATES AND THE NTH M-DAY OF The Month

**Contributor's Name** Hewlett-Packard
**Address** 1000 N.E. Circle Blvd.
**City** Corvallis **State** Oregon **Zip Code** 97330

**Program Description, Equations, Variables** Program uses dates coded mm.ddyyyy.

Program computes the number of M-days since a certain date in antiquity, using the formula:

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

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

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

W = M-Day (0 = Sunday, ..., 6 = Saturday)

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

IMPORTANT NOTE: These calculations are based on noon-to-noon, so the difference between an M-Day and a non M-Day will have a half day in it. For example, if M-Day is Tuesday, the difference between a Tuesday and the Wednesday 8 days following is 1 1/2 (half of the first Tuesday plus all of the following Tuesday.)

(Continued on next page)

**Operating Limits and Warnings** Valid from the beginning of the Gregorian calendar through the year 9999.

Warning: Error messages are not given for illegal dates.

This program does not detect how long a month is -- in particular, it does not detect when the fifth M-Day of a given month does not exist. It tells what it would be if it did exist.

# Program Description I

| | |
|---|---|
| **Program Title** | NUMBER OF M-DAYS BETWEEN TWO DATES AND THE NTH M-DAY OF The Month |
| **Contributor's Name** | Hewlett-Packard |
| **Address** | 1000 N.E. Circle Blvd. |
| **City** | Corvallis **State** Oregon **Zip Code** 97330 |

**Program Description, Equations, Variables**

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

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

where $f(m) = \begin{cases} m+13 & \text{if } m=1,2 \\ m+1 & \text{if } m > 2 \end{cases}$ $g(y,m) = \begin{cases} y-1 & m=1,2 \\ y & m > 2 \end{cases}$ $h(x) = \begin{cases} 7 \text{ if } x \bmod 7 = 0 \\ X \bmod 7 \text{ } x \bmod 7 \neq 0 \end{cases}$

[ ] = f int

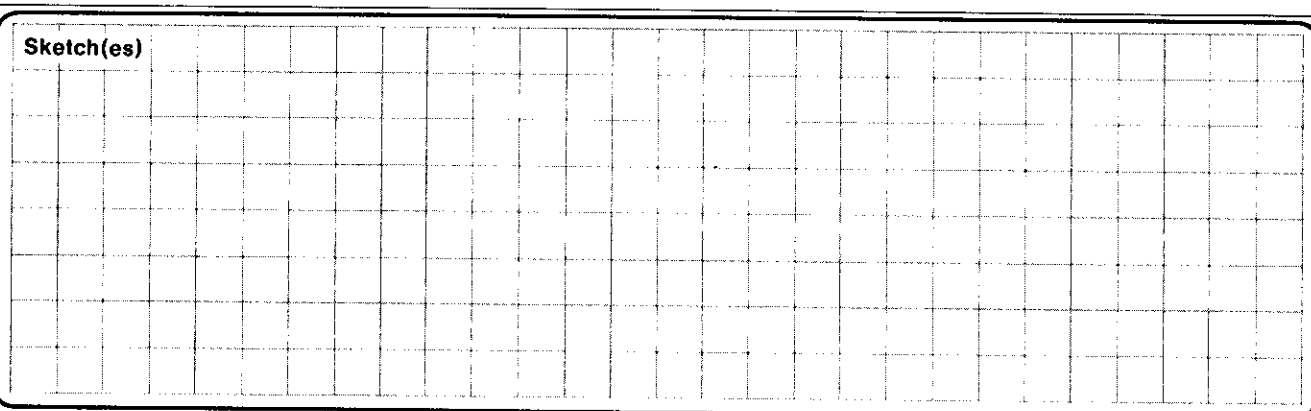
Output is coded in the form mm.ddyyyy.

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

**Operating Limits and Warnings**

# Program Description II

**Sketch(es)**



**Sample Problem(s)**

1. How many Tuesdays are there between the following pairs of dates?

| | Codes: | Tuesday=2 |
|---|---|---|
| a. May 10, 1949 and April 2, 1974 | 5.101949 | and 4.021974 |
| b. May 11, 1949 and April 2, 1974 | 5.111949 | and 4.021974 |
| c. May 11, 1949 and April 3, 1974 | 5.111949 | and 4.031974 |

2. How many Fridays are there between the following pairs of dates?

| | Friday = 5 |
|---|---|
| a. July 4, 1776 and April 15, 1984 | 7.041776 and 4.151984 |
| b. Feb. 14,1870 and Mar.4, 1958 | 2.141870 and 3.041958 |
| c. Mar. 23, 1974 and Mar. 28, 1974 | 3.231974 and 3.281974 |

3. What is the second Wednesday of May, 1949?
4. What is the fifth Friday of March, 1974?
5. What is the first Sunday of January, 2000? (Continued on next page)

**Solution(s)**

1.a. 2 [A] 5.101949[B] 4.021974[B] → 1299.Ø
b. 5.111949 [B] 4.021974 [B] → 1298.5
c. 5.111949 [B] 4.031974 [B] → 1299.Ø
2a. 5 [A] 7.041776 [B] 4.151984 [B] → 10842.Ø
b. 2.141870 [B] 3.041958 [B] → 4594.Ø
c. 3.231974 [B] 3.281974 [B] → Ø.Ø
3. 5 [f] [A] 1949 [f] [B] 3 [f] [C] + → 5.111949 (= May 11, 1949)
4. 3 [f] [A] 1974 [f] [B] 5 [f] [C] 5 [f] [D] → 3.291974 (= Mar. 29,1974

(Continued on next page)

**Reference(s)** The formulas are the original work of the contributor.

This program is a modification of the Users' Library Program Nos. 00281A &00380B, submitted by Eric Isaacson.

# Program Description II

**Sketch(es)**

**Sample Problem(s)** What is:

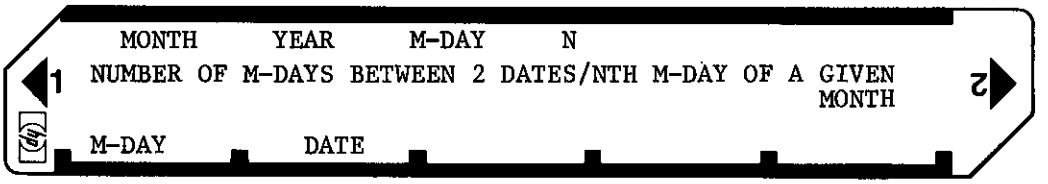
6. The second Monday of June 1811?
7. The third Tuesday of August 2525?

**Solution(s)**

5. 1 [f] [A] 2000 [f] [B] 0 [f] [C] → 1.022000 (Jan. 2, 2000)
6. 6 [f] [A] 1811 [f] [B] 1 [f] [C] + → 6.101811 (= June 10, 1811)
7. 8 [f] [A] 2525 [f] [B] 2 [f] [C] 3 [f] [D] → 8.212525 (Aug.21, 2525)

**Reference(s)**

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Enter program | | | |
| 2 | Enter Day-ofWeek (0=Sun., 1=Mon.,...,6=Sat.) | Day-of-Wk | A | |
| 3 | Enter first date | mm.ddyyyy | B | (ignore 1st output) |
| 4 | Enter subsequent date | mm.ddyyyy | B | M-Days Between previous date. |
| | | | | |
| | For other dates, do Step 4 repeatedly. | | | |
| | Output is always the difference in M-Days | | | |
| | between the last two dates entered.. | | | |
| | | | | |
| | To change M-Day, go back to Step 2. | | | |
| | | | | |
| 5 | Enter month | Month | f A | |
| 6 | Enter year | Year | f B | |
| 7 | Enter Day-of-Week (0=Sun.,...,6-Sat.) | Day-of-wk | f C | 1st M-Day of month |
| 8 | To find further M-Days EITHER: | | | |
| | Single-step through the M-Days | | + | 2nd M-Day |
| | | | + | 3rd M-Day |
| | | | + | 4th M-Day |
| | | | + | 5th M-Day |
| | OR: | | | |
| | Enter N | N | f D | NTH M-Day of Month |
| | | | | ↑ |
| | For a new case go back to Step 5. | | | ALL |
| | | | | OUTPUT |
| | | | | CODED |
| | | | | mm.ddyyyy |
| | NOTE: In Step 8 you can call f D after | | | |
| | single-stepping if you want to | | | |
| | (exercising both options), but you | | | |
| | cannot single-step after calling f D. | | | |

# 97 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBL A | 21 11 | |
| 002 | STO 4 | 35 04 | Enter Day-of-Week |
| 003 | RTN | 24 | |
| 004 | *LBL B | 21 12 | Enter date & compute |
| 005 | 5 | 05 | |
| 006 | ENT↑ | -21 | |
| 007 | EEX | -23 | |
| 008 | 6 | 06 | |
| 009 | CHS | -22 | |
| 010 | - | -45 | |
| 011 | X≷Y | -41 | |
| 012 | 3 | 03 | |
| 013 | X≷Y | -41 | |
| 014 | X≤Y? | 16-35 | |
| 015 | GSB 9 | 23 09 | If M=1 or 2 add 12 to M & sub. 1 from y |
| 016 | 1 | 01 | |
| 017 | + | -55 | Add 1 to M |
| 018 | ENT↑ | -21 | |
| 019 | INT | 16 34 | |
| 020 | STO 1 | 35 01 | Store adjusted M |
| 021 | - | -45 | .ddyyyy |
| 022 | EEX | -23 | |
| 023 | 2 | 02 | |
| 024 | × | -35 | dd.yyyy |
| 025 | ENT↑ | -21 | |
| 026 | FRC | 16 44 | |
| 027 | EEX | -23 | |
| 028 | 2 | 02 | |
| 029 | × | -35 | yy.yy |
| 030 | ENT↑ | -21 | |
| 031 | INT | 16 34 | C= no. of centuries |
| 032 | 7 | 07 | |
| 033 | - | -45 | |
| 034 | . | -62 | |
| 035 | 7 | 07 | |
| 036 | 5 | 05 | |
| 037 | × | -35 | |
| 038 | INT | 16 34 | Century Days |
| 039 | X≷Y | -41 | yy.yy |
| 040 | 3 | 03 | |
| 041 | 6 | 06 | |
| 042 | 5 | 05 | |
| 043 | 2 | 02 | |
| 044 | 5 | 05 | |
| 045 | × | -35 | |
| 046 | INT | 16 34 | [365.25y] |
| 047 | - | -45 | |
| 048 | - | -45 | |
| 049 | INT | 16 34 | 1+[365.25y]-[3/4 (C-7)] |
| 050 | RCL 1 | 36 01 | |
| 051 | 3 | 03 | |
| 052 | 0 | 00 | |
| 053 | . | -62 | |
| 054 | 6 | 06 | |
| 055 | × | -35 | 30.6 f(m) |
| 056 | INT | 16 34 | |
| 113 | ST+ 2 | 35-55 02 | M-Day |
| 114 | RTN | 24 | Adjust so M-day= 0 mod 7 |
| 115 | *LBL c | 21 16 13 | |
| 116 | RCL 1 | 36 01 | |
| 117 | 2 | 02 | N/7 |
| 118 | . | -62 | |
| 119 | 6 | 06 | |
| 120 | × | -35 | [N/7] |
| 121 | INT | 16 34 | |
| 122 | - | -45 | |
| 123 | 5 | 05 | |
| 124 | RCL 2 | 36 02 | |
| 125 | . | -62 | 0.11(N mod 7) |
| 126 | 0 | 00 | |
| 127 | 7 | 07 | |
| 128 | R↓ | -31 | |
| 129 | × | -35 | [0.11(N mod 7)+0.9] |
| 130 | 4 | 04 | |
| 131 | ÷ | -24 | |
| 132 | INT | 16 34 | $[\frac{N}{7}+1/2[0.11(N \bmod 7)+0.9]$ |
| 133 | - | -45 | Previous value |
| 134 | RCL 2 | 36 02 | |
| 135 | EEX | -23 | |
| 136 | 2 | 02 | |
| 137 | ÷ | -24 | Dif.from prev.value |
| 138 | INT | 16 34 | |
| 139 | 7 | 07 | |
| 140 | - | -45 | |
| 141 | . | -62 | |
| 142 | 7 | 07 | |
| 143 | 5 | 05 | |
| 144 | × | -35 | |
| 145 | INT | 16 34 | |
| 146 | + | -55 | |
| 147 | 7 | 07 | Enter month. |
| 148 | ÷ | -24 | Clear register 2 |
| 149 | FRC | 16 44 | |
| 150 | × | -35 | |
| 151 | + | -55 | |
| 152 | RCL 4 | 36 04 | |
| 153 | EEX | -23 | Add 1 to m |
| 154 | 6 | 06 | |
| 155 | ÷ | -24 | |
| 156 | + | -55 | |
| 157 | RCL 3 | 36 03 | |
| 158 | + | -55 | If m is Jan. or Feb |
| 159 | STO 3 | 35 03 | add 12 to m sub- |
| 160 | DSP 6 | -63 06 | tract 1 from y. |
| 161 | RTN | 24 | |
| 162 | *LBL d | 21 16 14 | |
| 163 | 1 | 01 | |
| 164 | - | -45 | |
| 165 | . | -62 | f(m) |
| 166 | 0 | 00 | Enter year |
| 167 | 7 | 07 | Real Year |
| 168 | × | -35 | |

REGIS...

| 0 | 1 f(m) adjus.mo. | 2 Code no. prev.date | 3 m | 4 Day-of-wk(M-Day) | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| | | | | | |

# 97 Program Listing II

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 057 | + | -55 | |
| 058 | RCL4 | 36 04 | Adjusted year |
| 059 | - | -45 | |
| 060 | 7 | 07 | Enter Day-of-Week |
| 061 | ÷ | -24 | (M-Day) |
| 062 | ENT↑ | -21 | |
| 063 | FRC | 16 44 | |
| 064 | - | -45 | |
| 065 | LSTX | 16-63 | |
| 066 | . | -62 | [2.6 f(m)] |
| 067 | 7 | 07 | W - [2.6 f(m)] |
| 068 | 7 | 07 | |
| 069 | × | -35 | |
| 070 | . | -62 | |
| 071 | 9 | 09 | Stack will fill |
| 072 | + | -55 | with .07's |
| 073 | INT | 16 34 | |
| 074 | 2 | 02 | |
| 075 | ÷ | -24 | |
| 076 | + | -55 | |
| 077 | RCL2 | 36 02 | |
| 078 | X≠Y | -41 | W - Month days- |
| 079 | STO2 | 35 02 | Year days |
| 080 | - | -45 | |
| 081 | CHS | -22 | |
| 082 | DSP1 | -63 01 | |
| 083 | RTN | 24 | |
| 084 | *LBL9 | 21 09 | |
| 085 | + | -55 | |
| 086 | + | -55 | |
| 087 | RTN | 24 | |
| 088 | *LBL2 | 21 02 | |
| 089 | R↓ | -31 | Century days |
| 090 | GTO1 | 22 01 | W-M-days - y days |
| 091 | *LBLa | 21 16 11 | + C days |
| 092 | STO3 | 35 03 | |
| 093 | 0 | 00 | |
| 094 | STO2 | 35 02 | |
| 095 | CLX | -51 | D(m,y,w)/100 |
| 096 | 1 | 01 | |
| 097 | + | -55 | Real year |
| 098 | 4 | 04 | |
| 099 | X≤Y? | 16-35 | |
| 100 | GTO2 | 22 02 | .ddyyyy |
| 101 | 1 | 01 | |
| 102 | CHS | -22 | mm.ddyyyy |
| 103 | STO2 | 35 02 | |
| 104 | CLX | -51 | |
| 105 | 8 | 08 | |
| 106 | + | -55 | |
| 107 | + | -55 | Enter N |
| 108 | *LBL1 | 21 01 | |
| 109 | STO1 | 35 01 | N-1 |
| 110 | RTN | 24 | |
| 111 | *LBLb | 21 16 12 | |
| 112 | STO4 | 35 04 | |
| 169 | RCL3 | 36 03 | Add (N-1) weeks |
| 170 | + | -55 | to first M-day. |
| 171 | RTN | 24 | |
| 172 | R/S | 51 | |

| LABELS | | | | | FLAGS |
|---|---|---|---|---|---|
| A Ent.M-day | B Enter date | C | D | E | 0 |
| a Month | b Year | c Day-of-Wk | d N | e | 1 |
| 0 | 1 Used | 2 | 3 | 4 | 2 |
| 5 | 6 | 7 | 8 | 9 | 3 |

| SET STATUS | | |
|---|---|---|
| FLAGS | TRIG | DISP |
| ON OFF | | |
| 0 ☐ ☐ | DEG ☐ | FIX ☐ |
| 1 ☐ ☐ | GRAD ☐ | SCI ☐ |
| 2 ☐ ☐ | RAD ☐ | ENG ☐ |
| 3 ☐ ☐ | | n____ |

# Program Description I

**Program Title** Holidays

**Contributor's Name** Hewlett-Packard

**Address** 1000 N.E. Circle Blvd.

**City** Corvallis **State** Oregon **Zip Code** 97330

**Program Description, Equations, Variables**

Use the formulae:

| | | | | |
|---|---|---|---|---|
| Mother's Day | = | May 14 | - | D(0,y) |
| Father's Day | = | June 21 | - | D(3,y) |
| Election Day | = | Nov. 8 | - | D(1,y) |
| Thanksgiving | = | Nov. 28 | - | D(5,y) |
| Wash.'s Birthday | = | Feb. 21 | - | D(2,y-1) |
| Labor Day | = | Sep. 7 | - | D(3,y) |
| Columbus Day | = | Oct. 14 | - | D(5,y) |
| Veteran's Day | = | Oct. 28 | - | D(5,y) |

y = given year

[ ] = f INT

Where $D(x,y) = (x + [\frac{5}{4}\, y] - [3/4(1+[\frac{y}{100}])])$ mod 7

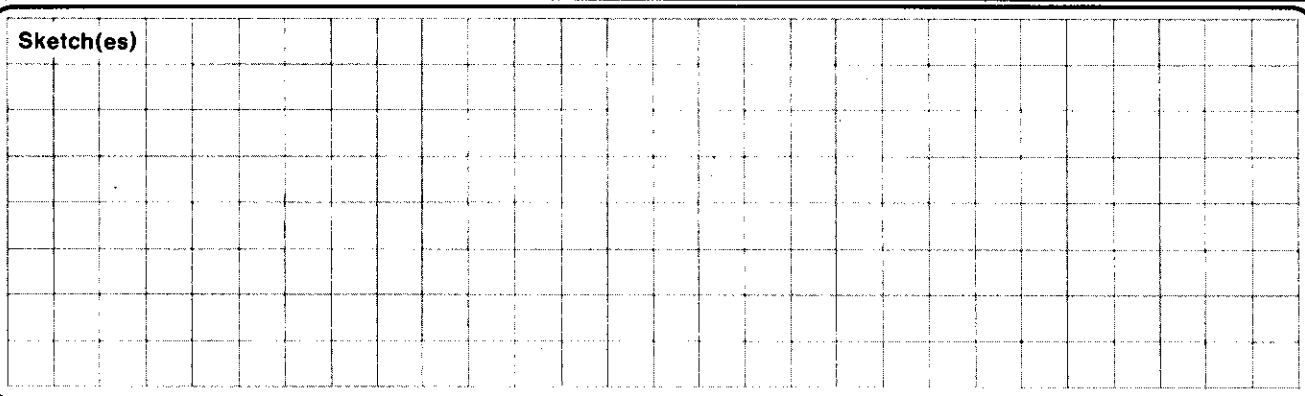
Outputs the dates coded in the form mm.ddyyyy.

**Operating Limits and Warnings**

1. Valid from the beginning of the Gregorian calendar through the year 9999.
2. Error messages are not given for illegal entries.
3. Uses current definition of holidays involved for all years.

# Program Description II

**Sketch(es)**



**Sample Problem(s)**

When is:

1. Mothers Day 2199?
2. Mother's Day 2200?
3. Father's Day 1974?
4. Father's Day 1975?
5. Election Day 1976?
6. Election Day 1977?
7. Thanksgiving 1621?
8. Thanksgiving 1974?
9. Washington's Birthday 1776?
10. Washington's Birthday 1974?
11. Labor Day 1935?
12. Labor Day 1984?
13. Columbus Day 1492?
14. Columbus Day 1992?
15. Veteran's Day 1918?
16. Veteran's Day 1978?

**Solution(s)**

1. 2199[A] ---5.122199 (= May 12, 2199)
2. 2200[A] ---5.112200 (=May 11, 2200)
3. 1974[B] ---6.161974 (= June 16, 1974)
4. 1975[B] ---6.151975 (=June 15, 1975)
5. 1976[C] --11.021976 (=Nov. 2, 1976)
6. 1977[C]---11.081977 (=Nov. 8, 1977)
7. 1621[D]---11.251621 (=Nov. 25, 1621)
8. 1974[D]---11.281974 (=Nov. 28, 1974)

*But that's okay, Pope Gregory wasn't born yet.

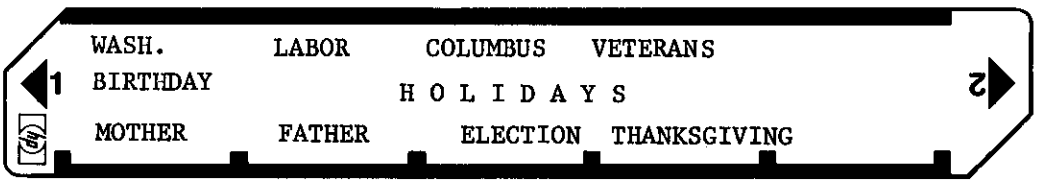
9. 1776[f] [A]---2.191776 (=Feb.19,1776)
10. 1974[f] [A]---2.181974
11. 1935[f] [B]---9.021935
12. 1984[f] [B]---9.031984
13. 1492[f] [C]--10.101492 (Columbus was two days late.)*
14. 1992[f] [C]--10.121992
15. 1918[f] [D]--10.281918 (The Armistice was a couple of weeks late)
16. 1978[f] [D]--10.231978

**Reference(s)** The formulae are the original work of the contributor.

This program is a modification of the Users' Library Program No.s 00278A and 00279A, submitted by Eric Isaacson.

# User Instructions






| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Enter program | | | |
| 2 | Key in year; choose a holiday | year | A | Mothers Day |
| | | | B | Fathers Day |
| | | | C | Election Day |
| | | | D | Thanks-giving |
| | | | f A | Washington's Birthday |
| | | | f B | Labor Day |
| | | | f C | Columbus Day |
| | | | f D | Veteran's Day |

# 97 Program Listing I

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | Mother's Day |
| 002 | 0 | 00 | |
| 003 | GSBE | 23 15 | |
| 004 | 5 | 05 | |
| 005 | . | -62 | |
| 006 | 1 | 01 | |
| 007 | 4 | 04 | |
| 008 | + | -55 | |
| 009 | RTN | 24 | |
| 010 | *LBLB | 21 12 | Father's Day |
| 011 | 3 | 03 | |
| 012 | GSBE | 23 15 | |
| 013 | 6 | 06 | |
| 014 | . | -62 | |
| 015 | 2 | 02 | |
| 016 | 1 | 01 | |
| 017 | + | -55 | |
| 018 | RTN | 24 | |
| 019 | *LBLC | 21 13 | Election Day |
| 020 | 1 | 01 | |
| 021 | GSBE | 23 15 | |
| 022 | 1 | 01 | |
| 023 | 1 | 01 | |
| 024 | . | -62 | |
| 025 | 0 | 00 | |
| 026 | 8 | 08 | |
| 027 | + | -55 | |
| 028 | RTN | 24 | |
| 029 | *LBLD | 21 14 | Thanksgiving |
| 030 | 5 | 05 | |
| 031 | GSBE | 23 15 | |
| 032 | 1 | 01 | |
| 033 | 1 | 01 | |
| 034 | . | -62 | |
| 035 | 2 | 02 | |
| 036 | 8 | 08 | |
| 037 | + | -55 | |
| 038 | RTN | 24 | - |
| 039 | *LBLE | 21 15 | Main Computation Subroutine |
| 040 | X≠Y | -41 | |
| 041 | ENT↑ | -21 | |
| 042 | ENT↑ | -21 | |
| 043 | R↓ | -31 | |
| 044 | R↓ | -31 | |
| 045 | 5 | 05 | |
| 046 | × | -35 | |
| 047 | 4 | 04 | |
| 048 | ÷ | -24 | |
| 049 | INT | 16 34 | |
| 050 | + | -55 | |
| 051 | X≠Y | -41 | |
| 052 | EEX | -23 | |
| 053 | 2 | 02 | |
| 054 | ÷ | -24 | |
| 055 | INT | 16 34 | C = Number of Centuries |
| 056 | 1 | 01 | |
| 057 | + | -55 | Century year adjustment |
| 058 | . | -62 | |
| 059 | 7 | 07 | |
| 060 | 5 | 05 | |
| 061 | × | -35 | |
| 062 | INT | 16 34 | |
| 063 | - | -45 | |
| 064 | 7 | 07 | |
| 065 | ÷ | -24 | |
| 066 | FRC | 16 44 | |
| 067 | . | -62 | |
| 068 | 0 | 00 | |
| 069 | 7 | 07 | |
| 070 | × | -35 | |
| 071 | CHS | -22 | Days to be subtracted |
| 072 | X≠Y | -41 | |
| 073 | EEX | -23 | |
| 074 | 6 | 06 | Encode year |
| 075 | ÷ | -24 | |
| 076 | + | -55 | |
| 077 | DSP6 | -63 06 | |
| 078 | RTN | 24 | |
| 079 | *LBLa | 21 16 11 | Washington's Birthday |
| 080 | 1 | 01 | |
| 081 | - | -45 | |
| 082 | 2 | 02 | |
| 083 | GSBE | 23 15 | |
| 084 | 2 | 02 | |
| 085 | . | -62 | |
| 086 | 2 | 02 | |
| 087 | 1 | 01 | |
| 088 | 0 | 00 | |
| 089 | 0 | 00 | |
| 090 | 0 | 00 | |
| 091 | 1 | 01 | |
| 092 | + | -55 | |
| 093 | RTN | 24 | |
| 094 | *LBLb | 21 16 12 | Labor Day |
| 095 | 3 | 03 | |
| 096 | GSBE | 23 15 | |
| 097 | 9 | 09 | |
| 098 | . | -62 | |
| 099 | 0 | 00 | |
| 100 | 7 | 07 | |
| 101 | + | -55 | |
| 102 | RTN | 24 | |
| 103 | *LBLc | 21 16 13 | Columbus Day |
| 104 | 5 | 05 | |
| 105 | GSBE | 23 15 | |
| 106 | 1 | 01 | |
| 107 | 0 | 00 | |
| 108 | . | -62 | |
| 109 | 1 | 01 | |
| 110 | 4 | 04 | |
| 111 | + | -55 | |
| 112 | RTN | 24 | |

REGISTERS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|

# 97 Program Listing II



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | *LBL d | 21 16 14 | |
| 114 | 5 | 05 | |
| 115 | GSBE | 23 15 | |
| 116 | 1 | 01 | |
| 117 | 0 | 00 | |
| 118 | . | -62 | |
| 119 | 2 | 02 | |
| 120 | 8 | 08 | |
| 121 | + | -55 | |
| 122 | RTN | 24 | |
| 123 | R/S | 51 | Veteran's Day |
| 130 | | | |
| 140 | | | |
| 150 | | | |
| 160 | | | |
| 170 | | | |
| 180 | | | |
| 190 | | | |
| 200 | | | |
| 210 | | | |
| 220 | | | |

| LABELS | | | | | FLAGS | SET STATUS | | |
|---|---|---|---|---|---|---|---|---|
| A Mother's Day | B Father's Day | C Election Day | D Thanks-giving Day | E Compute | 0 | FLAGS | TRIG | DISP |
| a Wash.'s Birthday | b Labor Day | c Columbus Day | d Veteran's Day | e | 1 | ON OFF<br>0 ☐ ☐<br>1 ☐ ☐<br>2 ☐ ☐<br>3 ☐ ☐ | DEG ☐<br>GRAD ☐<br>RAD ☐ | FIX ☐<br>SCI ☐<br>ENG ☐<br>n____ |
| 0 | 1 | 2 | 3 | 4 | 2 | | | |
| 5 | 6 | 7 | 8 | 9 | 3 | | | |

# Program Description I

**Program Title** EASTER-ASH WEDNESDAY-RELIGIOUS HOLIDAYS FAL-10

**Contributor's Name** Fred A. Lummus, P. E.
**Address** Route 2 Box 84
**City** Greenville **State** Texas **Zip Code** 75401

**Program Description, Equations, Variables** 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:

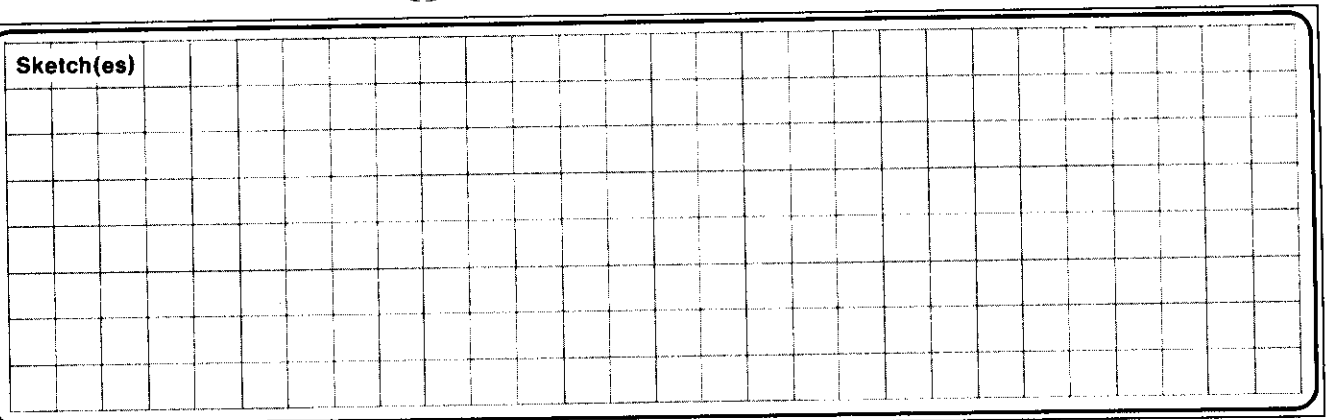
| Golden Number | Date | Golden Number | Date | Golden Number | Date | Golden Number | Date | Golden Number | Date |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Apr 14 | 5 | Mar 31 | 9 | Apr 16 | 13 | Apr 2 | 17 | Apr 17 |
| 2 | Apr 3 | 6 | Apr 16 | 10 | Apr 5 | 14 | Mar 22 | 18 | Apr 7 |
| 3 | Mar 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 delta days from Easter.

**Operating Limits and Warnings** This program is good for the 200-year period of March 1, 1900 through February 28, 2100.

# Program Description II

**Sketch(es)**



**Sample Problem(s)** Determine the religious holidays for the year 1976:

To find Easter and Ash Wednesday:

```
1976  [A] → 4.181976 ***   Easter
      [B] → 3.031976 ***   Ash Wednesday
      [C] →       1. ***   Golden Number
```

**Solution(s)**

To find all religious holidays:

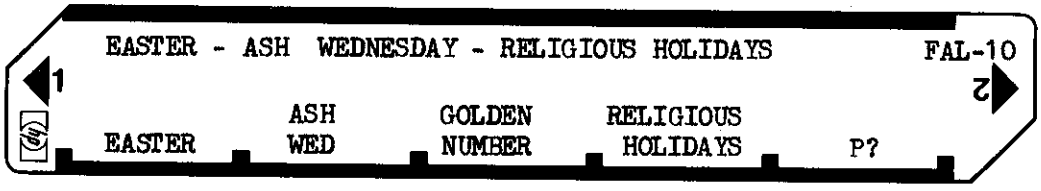
```
1976  [D] → 3.031976 ***   Ash Wednesday
           3.071976 ***   First Sunday in Lent
           4.041976 ***   Passion Sunday
           4.111976 ***   Palm Sunday
           4.161976 ***   Good Friday

           4.181976 ***   Easter

           5.231976 ***   Rogation Sunday
           5.271976 ***   Ascension Day
           6.061976 ***   Whitsunday
           6.131976 ***   Trinity Sunday
```

**Reference(s)**

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Load Side 1 and Side 2 | | | |
| | | | | |
| 2 | Load Data Tape ( or ) | 365.25 | STO A | |
| | | 30.6001 | STO B | |
| | | 122.1 | STO C | |
| | | 241303.22 | STO 0 | |
| | | 10281807.26 | STO 1 | |
| | | 15042312.01 | STO 2 | |
| | | 20092717.06 | STO 3 | |
| | | | | |
| 3 | Select Print Option No 0.00 | | E | 0.00/1.00 |
| | Yes 1.00 | | | |
| | | | | |
| 4 | For EASTER, input year | year | A | EASTER |
| | | | | |
| 5 | For ASH WEDNESDAY (same year) | | B | ASH WED. |
| | | | | |
| 6 | For GOLDEN NUMBER (same year) | | C | GOLD NO. |
| | | | | |
| 7 | For All Holidays, input year | year | D | DATE 1 |
| | | | | DATE 2 |
| | DATE 1 is ASH WEDNESDAY | | | DATE 3 |
| | DATE 2 is FIRST SUNDAY IN LENT | | | DATE 4 |
| | ~~DATE 3 is PASSION SUNDAY~~ | | | DATE 5 |
| | ~~DATE 4 is PALM SUNDAY~~ | | | |
| | DATE 5 is GOOD FRIDAY | | | DATE 6 |
| | ~~DATE 6 is EASTER~~ | | | |
| | | | | DATE 7 |
| | DATE 7 is ROGATION SUNDAY | | | DATE 8 |
| | DATE 8 is ASCENSION DAY | | | DATE 9 |
| | DATE 9 is WHITSUNDAY | | | DATE 10 |
| | ~~DATE 10 is TRINITY SUNDAY~~ | | | |
| 8 | For new case, go to step 4 or step 7. | | | |

# 97 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | Calculate Easter |
| 002 | GSBa | 23 16 11 | |
| 003 | GTOc | 22 16 13 | |
| 004 | *LBLa | 21 16 11 | |
| 005 | STO9 | 35 09 | |
| 006 | RCLA | 36 11 | |
| 007 | X=0? | 16-43 | |
| 008 | ÷ | -24 | |
| 009 | x | -35 | |
| 010 | INT | 16 34 | |
| 011 | 1 | 01 | |
| 012 | 4 | 04 | |
| 013 | 3 | 03 | |
| 014 | + | -55 | |
| 015 | STO4 | 35 04 | |
| 016 | RCL9 | 36 09 | Calculate Golden Number |
| 017 | 1 | 01 | |
| 018 | 9 | 09 | |
| 019 | ÷ | -24 | |
| 020 | FRC | 16 44 | |
| 021 | 1 | 01 | |
| 022 | 9 | 09 | |
| 023 | x | -35 | |
| 024 | 1 | 01 | |
| 025 | + | -55 | |
| 026 | STO5 | 35 05 | |
| 027 | 5 | 05 | |
| 028 | ÷ | -24 | |
| 029 | DSP1 | -63 01 | Select appropriate "packed" register |
| 030 | RND | 16 24 | |
| 031 | STOI | 35 46 | |
| 032 | FRC | 16 44 | |
| 033 | X=0? | 16-43 | |
| 034 | GTO0 | 22 00 | |
| 035 | . | -62 | |
| 036 | 2 | 02 | |
| 037 | X≠Y | -41 | |
| 038 | X=Y? | 16-33 | |
| 039 | GTO1 | 22 01 | |
| 040 | . | -62 | |
| 041 | 4 | 04 | |
| 042 | X≠Y | -41 | |
| 043 | X=Y? | 16-33 | |
| 044 | GTO2 | 22 02 | |
| 045 | . | -62 | |
| 046 | 6 | 06 | |
| 047 | X=Y? | 16-33 | |
| 048 | GTO3 | 22 03 | |
| 049 | RCLi | 36 45 | Decipher Appropriate |
| 050 | 1 | 01 | |
| 051 | GTO5 | 22 05 | |
| 052 | *LBL0 | 21 00 | |
| 053 | RCLi | 36 45 | |
| 054 | EEX | -23 | |
| 055 | 8 | 08 | |
| 056 | GTO5 | 22 05 | |
| 057 | *LBL1 | 21 01 | "packed" register to find Paschal Full Moon |
| 058 | RCLi | 36 45 | |
| 059 | EEX | -23 | |
| 060 | 6 | 06 | |
| 061 | GTO5 | 22 05 | |
| 062 | *LBL2 | 21 02 | |
| 063 | RCLi | 36 45 | |
| 064 | EEX | -23 | |
| 065 | 4 | 04 | |
| 066 | GTO5 | 22 05 | |
| 067 | *LBL3 | 21 03 | |
| 068 | RCLi | 36 45 | |
| 069 | EEX | -23 | |
| 070 | 2 | 02 | |
| 071 | *LBL5 | 21 05 | |
| 072 | ÷ | -24 | |
| 073 | FRC | 16 44 | |
| 074 | EEX | -23 | |
| 075 | 2 | 02 | |
| 076 | x | -35 | |
| 077 | INT | 16 34 | |
| 078 | ST+4 | 35-55 04 | |
| 079 | RCL4 | 36 04 | Determine following Sunday |
| 080 | 5 | 05 | |
| 081 | + | -55 | |
| 082 | 7 | 07 | |
| 083 | ÷ | -24 | |
| 084 | FRC | 16 44 | |
| 085 | 7 | 07 | |
| 086 | x | -35 | |
| 087 | DSP0 | -63 00 | |
| 088 | RND | 16 24 | |
| 089 | 7 | 07 | |
| 090 | - | -45 | |
| 091 | ST-4 | 35-45 04 | |
| 092 | RTN | 24 | |
| 093 | *LBLB | 21 12 | Calculate Ash Wednesday |
| 094 | 4 | 04 | |
| 095 | 6 | 06 | |
| 096 | ST-4 | 35-45 04 | |
| 097 | GTOc | 22 16 13 | |
| 098 | *LBLC | 21 13 | Display Golden Number |
| 099 | RCL5 | 36 05 | |
| 100 | DSP0 | -63 00 | |
| 101 | F0? | 16 23 00 | |
| 102 | PRTX | -14 | |
| 103 | RTN | 24 | |
| 104 | *LBLD | 21 14 | Determine all Religious Holidays |
| 105 | F0? | 16 23 00 | |
| 106 | SPC | 16-11 | |
| 107 | GSBa | 23 16 11 | |
| 108 | 4 | 04 | Ash Wednesday |
| 109 | 6 | 06 | |
| 110 | ST-4 | 35-45 04 | |
| 111 | GSBc | 23 16 13 | |
| 112 | 4 | 04 | |

REGIS...

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| constants | constants | constants | constants | Day No. | Gold No. | used | Month | Day | Year |
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| 365.25 | 30.6001 | 122.1 | | | Control |

# 97 Program Listing II

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | ST+4 | 35-55 04 | First Sunday in |
| 114 | GSBc | 23 16 13 | Lent |
| 115 | 2 | 02 | |
| 116 | 8 | 08 | |
| 117 | ST+4 | 35-55 04 | Passion Sunday |
| 118 | GSBc | 23 16 13 | |
| 119 | 7 | 07 | |
| 120 | ST+4 | 35-55 04 | Palm Sunday |
| 121 | GSBc | 23 16 13 | |
| 122 | 5 | 05 | |
| 123 | ST+4 | 35-55 04 | Good Friday |
| 124 | GSBc | 23 16 13 | |
| 125 | F0? | 16 23 00 | |
| 126 | SPC | 16-11 | |
| 127 | 2 | 02 | Easter |
| 128 | ST+4 | 35-55 04 | |
| 129 | GSBc | 23 16 13 | |
| 130 | PSE | 16 51 | |
| 131 | F0? | 16 23 00 | |
| 132 | SPC | 16-11 | |
| 133 | 3 | 03 | |
| 134 | 5 | 05 | |
| 135 | ST+4 | 35-55 04 | Rogation Sunday |
| 136 | GSBc | 23 16 13 | |
| 137 | 4 | 04 | |
| 138 | ST+4 | 35-55 04 | Ascension Day |
| 139 | GSBc | 23 16 13 | |
| 140 | 1 | 01 | |
| 141 | 0 | 00 | |
| 142 | ST+4 | 35-55 04 | Whitsunday |
| 143 | GSBc | 23 16 13 | |
| 144 | 7 | 07 | |
| 145 | ST+4 | 35-55 04 | Trinity Sunday |
| 146 | *LBLc | 21 16 13 | |
| 147 | RCL4 | 36 04 | Decipher |
| 148 | RCLC | 36 13 | Day Number |
| 149 | - | -45 | of Holiday |
| 150 | RCLA | 36 11 | into Display |
| 151 | ÷ | -24 | mm.ddyyyy |
| 152 | INT | 16 34 | |
| 153 | STO9 | 35 09 | |
| 154 | RCLA | 36 11 | |
| 155 | x | -35 | |
| 156 | INT | 16 34 | |
| 157 | RCL4 | 36 04 | |
| 158 | - | -45 | |
| 159 | CHS | -22 | |
| 160 | STO6 | 35 06 | |
| 161 | RCLB | 36 12 | |
| 162 | ÷ | -24 | |
| 163 | INT | 16 34 | |
| 164 | STO7 | 35 07 | |
| 165 | RCL6 | 36 06 | |
| 166 | X≷Y | -41 | |
| 167 | RCLB | 36 12 | |
| 168 | x | -35 | |
| 169 | INT | 16 34 | |
| 170 | - | -45 | |
| 171 | STO8 | 35 08 | |
| 172 | RCL7 | 36 07 | |
| 173 | 1 | 01 | |
| 174 | RCL8 | 36 08 | |
| 175 | % | 55 | |
| 176 | - | -45 | |
| 177 | - | -45 | |
| 178 | RCL7 | 36 07 | |
| 179 | 1 | 01 | |
| 180 | 4 | 04 | |
| 181 | ÷ | -24 | |
| 182 | INT | 16 34 | |
| 183 | ST+9 | 35-55 09 | |
| 184 | 1 | 01 | |
| 185 | 2 | 02 | |
| 186 | x | -35 | |
| 187 | - | -45 | |
| 188 | RCL9 | 36 09 | |
| 189 | EEX | -23 | |
| 190 | 6 | 06 | |
| 191 | ÷ | -24 | |
| 192 | + | -55 | |
| 193 | DSP6 | -63 06 | |
| 194 | PSE | 16 51 | |
| 195 | F0? | 16 23 00 | |
| 196 | PRTX | -14 | |
| 197 | RTN | 24 | |
| 198 | *LBLE | 21 15 | |
| 199 | F0? | 16 23 00 | Print Option |
| 200 | GTO9 | 22 09 | |
| 201 | SF0 | 16 21 00 | |
| 202 | CLX | -51 | |
| 203 | 1 | 01 | |
| 204 | RTN | 24 | |
| 205 | *LBL9 | 21 09 | |
| 206 | CF0 | 16 22 00 | |
| 207 | CLX | -51 | |
| 208 | RTN | 24 | |
| 210 | | | |
| 220 | | | |

**LABELS**

| | | | | | |
|---|---|---|---|---|---|
| A Easter | B Ash Wed | C Gold No. | D Holidays | E Print | |
| a calc Easter | b | c decipher DN | d | e | |
| 0 0 | 1 0.2 | 2 0.4 | 3 0.6 | 4 | |
| 5 Next Sun | 6 | 7 | 8 | 9 Print | |

**FLAGS**

| | |
|---|---|
| 0 | Print |
| 1 | — |
| 2 | — |
| 3 | — |

**SET STATUS**

| FLAGS | ON | OFF |
|---|---|---|
| 0 | ☐ | ☒ |
| 1 | ☐ | ☒ |
| 2 | ☐ | ☒ |
| 3 | ☐ | ☒ |

| TRIG | |
|---|---|
| DEG | ☒ |
| GRAD | ☐ |
| RAD | ☐ |

| DISP | |
|---|---|
| FIX | ☒ |
| SCI | ☐ |
| ENG | ☐ |
| n | 2 |

# Program Description I

**Program Title** Complete Maya Calendar

**Contributor's Name** Robert Stone and Larry Goynes

**Address** 2112 Guadalupe #808

**City** Austin **State** Texas **Zip Code** 78705

**Program Description, Equations, Variables** Program presents all aspects of the Maya calendar in a pocket calculator format. Program description consists of the following sections: (1) Symbols, (2) Equations, and (3) Tables.

(1) Symbols used.

| | LC date | | CR date | |
|---|---|---|---|---|
| | | | SR date | VY date |
| | B. K. T. U. K' | | C N | D M |
| Typical date as published: | 9.12. 2. 0.16 | | 5 Cib | 14 Yaxkin |
| As input/output here: | 9.12 02 00 16 | | 5. 14 | 14 06(00) |

| | | | | |
|---|---|---|---|---|
| Day Name (N) Codes | 01 = Akbal | 06 = Lamat | 11 = Ben | 16 = Etz'nab |
| | 02 = Kan | 07 = Muluc | 12 = Ix | 17 = Cauac |
| | 03 = Chicchan | 08 = Oc | 13 = Men | 18 = Ahau |
| | 04 = Cimi | 09 = Chuen | 14 = Cib | 19 = Imix |
| | 05 = Manik | 10 = Eb | 15 = Caban | 20 = Ik |
| Month Name (M) Codes | 00 = Pop | 05 = Xul | 10 = Zac | 15 = Pax |
| | 01 = Uo | 06 = Yaxkin | 11 = Ceh | 16 = Kayab |
| | 02 = Zip | 07 = Mol | 12 = Mac | 17 = Cumku |
| | 03 = Zotz | 08 = Ch'en | 13 = Kankin | 18 = Uayeb* |
| | 04 = Zec | 09 = Yax | 14 = Muan | *has only 5 days, 0 to 4 |

Abbreviations.

B = Baktun, 144000 suns
C = Coefficient of N (Gods 1 to 13)
CR = Calendar Round of 18980 days
D = Day of the month (0 to 19)
G = Lords of the Nights (1 to 9)
K = Katun, 7200 suns
K' = K'in, 1 "sun" (day)
LC = Long Count of days
M = "Month" of 20 days
N = Day Name
SR = Sacred Round of 260 days
T = Tun, 360 suns
U = Uinal, 20 suns
VY = Vague Year of 365 days
0 = (Month) "Seated"

**Operating Limits and Warnings** Program will give reliable answers out to a distance number of ± 69000 Baktuns, about 27 million years in the past or future. With major period end dates, however, it can handle computations beyond these limits. See the initialization routine on page 4 for dates in the so-called "expanded" LC.

# Program Description I

| | |
|---|---|
| **Program Title** | Complete Maya Calendar |
| **Contributor's Name** | Robert Stone and Larry Goynes |
| **Address** | 2112 Guadalupe #808 |
| **City** | Austin **State** Texas **Zip Code** 78705 |

**Program Description, Equations, Variables** (2) Equations. Card 1 (1)-(4); Card 2 (5)-(12)

(1) Base 10 to "Base 20" conversion is performed by modulo arithmetic.
(2) LC in Base 10 = 144000B + 7200K + 360T + 20U + K' = nth Day of the LC
(3) nth D of CR = (LC in Base 10 - 1842) modulo 18980
(4) nth D of VY, M, D, nth D of SR, N, and C are found by the same method as (3).
(5) nth D of SR = 40((C - N) + 13q) modulo 260 + N
(6) nth D of VY = D + 20M
(7) nth D of CR = 365((nth D of SR - (nth D of VY + CR Type - 3)) + 260q)mod 18980 + (nth D of VY + CR Type - 3)
(8) r = INT((Nearest Earlier LC date - (nth D of CR + 1842))/18980) + 1
(9) LC in Base 10 = nth D of CR + 1842 + 18980r
(10) JDN = LC in Base 10 + Ahau Constant
(11) Moon Age = JDN (modulo 29.530589) - 9 + 29.530589q
(12) Venus Age = JDN ( modulo 583.921) - 110 + 583.921q

where in (5), (7), (11), (12) q = 0 if equation has a positive value; and 1, 2, . . . if equation has a negative value in order to make it positive.

(3) Tables.

A. To Change CR Type

| Type | Add to D of M |
|---|---|
| 1 | 2 |
| 2 | 1 |
| 3 | 0 |
| 4 | -1 |
| 5 | -2 |

Program uses Type 3 for computation. Example of change:
Type 3: 9.12.2.0.16 5 Cib 14 Yaxkin
Type 4: 9.12.2.0.16 5 Cib 13 Yaxkin

B. Moon Age

| | |
|---|---|
| 0 | New |
| 7 | First Q. |
| 15 | Full |
| 22 | Last Q. |

C. Venus Age

| | |
|---|---|
| 0 | Inferior Conj. |
| 0-292 | Morning Star |
| 146 | Near W. Elong. |
| 292 | Superior Conj. |
| 438 | Near E. Elong. |
| 292-584 | Evening Star |

D. Some Ahau Equations

| | |
|---|---|
| 482699 | Smiley, 1966 |
| 487410 | Owen, 1973 |
| 489138 | Makemson, 1946 |
| 489384 | Spinden, 1924 |
| 584283 | Thompson B2, 1958 |
| 584284 | Thompson B3, 1950 |
| 674265 | Hochleitner, 1970 |
| 679108 | Escalona-Ramos, 1943 |
| 774078 | Weitzel, 1947 |

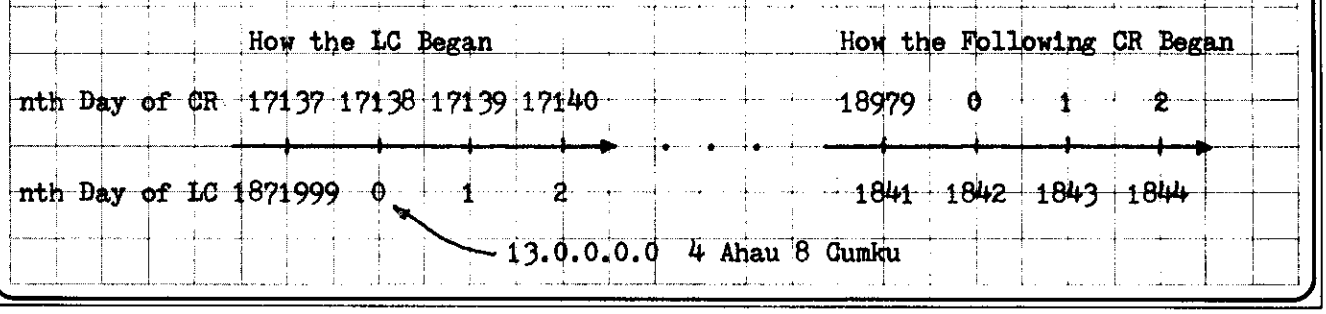
**Operating Limits and Warnings** Before using card 2, the CR type must be determined. Table E shows the Days (D) of the Month of the VY that coincide with four Day Names (N) of the SR--Akbal, Lamat, Ben, Etz'nab--in the various CRs. Use Table E according to this example: To determine CR Type of 5 Ahau 3 Mac. If Ahau--an N--falls on the 3rd, then--looking at the Day Name (N) Codes, p. 1--the following Akbal (3 days later) falls on 6 Mac, thus for Table E D = 06. Table E shows that 06 coincides with one of the four Ns only in a Type 3 CR. Similarly, 2 Manik 4 Pop is Type 4: then Lamat falls on 5 Pop; D = 05.

E. To Determine CR Type

| | | | | | | |
|---|---|---|---|---|---|---|
| In Type | 1 | CR, D = | 03, | 08, | 13, | or 18 |
| " " | 2 | " " = | 02, | 07, | 12, | or 17 |
| " " | 3 | " " = | 01, | 06, | 11, | or 16 |
| " " | 4 | " " = | 00, | 05, | 10, | or 15 |
| " " | 5 | " " = | 04, | 09, | 14, | or 19 |

# Program Description II

**Sketch(es)** Diagram Showing the Relation of the CR to the LC at its Beginning




**Sample Problem(s)** (1) What CR date corresponds to 9.12.2.0.16 ?

(2) Show the transition of one CR to the next; include all of the short month Uayeb. Remember that LC in base 10 = nth Day of CR + 1842. See sketch above and Equation (9).

(3) Find the distance number (the number of days between dates) between 6 Imix 19 Zotz and 4 Ahau 13 Mol. Present answer in the Maya way of writing numbers.

(4) What is the 17138th day of the CR? See sketch.

**Solution(s)**

(1) Load card 1, key 9.12020016, A -- 5.14140600 5 Cib 14 Yaxkin

(2) Key 1842, ENTER, 8, -, f, A -- 5.12171700 5 Ix 17 Cumku

10, hSTI, 1, D -- 6.13181700* 7.14191700* 8.15001800* 9.16011800* 10.17021800 * 11.18031800 * 12.19041800 * 13.20000000 * 1.01010000 * 2.02020000*

(3) Load card 2, key 6.191903, A -- 79, 3, B -- 16139

fP►S, STO 9, fP►S, key 4.181307, A, 3, B -- 12198

RCL E, fP►S, RCL 9, fP►S, -, + -- 15039 Distance No., Base10

Load card 1, STO 0, E -- 0.02011319 2.1.13.19

(4) (Card 1 loaded), key 17138, C -- 4.18081700 4 Ahau 8 Cumku

**Reference(s)** Long, R. C. E., "The Highest Known Maya Number", Man, 19 20 (1919), 39-42.

Satterthwaite, Linton, "Calendrics of the Maya Lowlands", Handbook of Middle American Indians, Vol. 3, Univ. of Texas Press, 1965, 603-631.

Thompson, J. Eric S., Maya Hieroglyphic Writing, 3 rd ed., Univ. of Oklahoma Press, 1971.

# Program Description II

**Sketch(es)** Initialization Routine for the Expanded Long Count

Several Maya LC dates reach millions of years--the largest 1.27 billion years--into the past. To check the accuracy of these remarkable dates, convert the distance number to Base 10, divide by 18980 (in $R_E$) and then repeatedly by 20 (in $R_B$) until the absolute value of the great number is $\leq 400$. Take the integer part of this quotient and multiply it by 18980 and by 20 raised to the power the number of times 20 was divided into the giant number. Now subtract this product from the giant number and treat the difference as a usual distance number--see User Instructions, card 1, step 3a.

**Sample Problem(s)** Quirigua Stela D has the following expanded LC date (Thompson, 316):

A ( 0. 1.13. 0.)9.16.15. 0. 0 7 Ahau 18 Pop

B 6. 8.13. 0. 9.16.15. 0. 0 Subtract

C (13)13. 0. 0. 0. 0. 0. 0. 0 7 Ahau 3 Pop

Since, in line A, the part not in parentheses is the normal LC date in forward time from the epoch, we may discard its equivalent part in the distance number of line B. The difference, 6.8.13.0.0.0.0.0.0, is the amount of time before the epoch. Make it, therefore, negative.

In Base 10 the distance number is $-(13\text{x}144000\text{x}20^2 + 8\text{x}144000\text{x}20^3 + 6\text{x}144000\text{x}20^4)$ $= -(1.482048 \times 10^{11})$. Store this number in a safe place.

**Solution(s)** (1) $-1.482048 \times 10^{11} / 18980 = -7808472.08$

(2) Quotients of repeated division by 20 until the absolute value of the last quotient is $\leq 400$: -390423.60, -19521.18, -976.06, -48.80

(3) Note the four divisions by 20. Call this number "E".

(4) Take the integer part of -48.80 and multiply it by 18980 and by $20^E$.

$(-48)(18980)(20^4) = -1.457664000 \times 10^{11}$

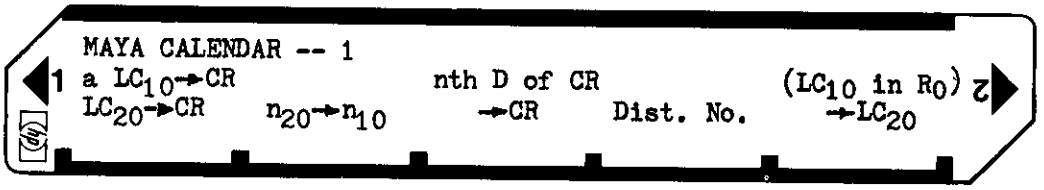
(5) Subtract this from the giant distance number.

$-1.482048 \times 10^{11} - (-1.457664 \times 10^{11}) = -2438400000$

(6) Store in $R_{59}$, load card 1, CLx, A, 1, hSTI, RCL $R_{59}$, D -- 7.18030000 (!)

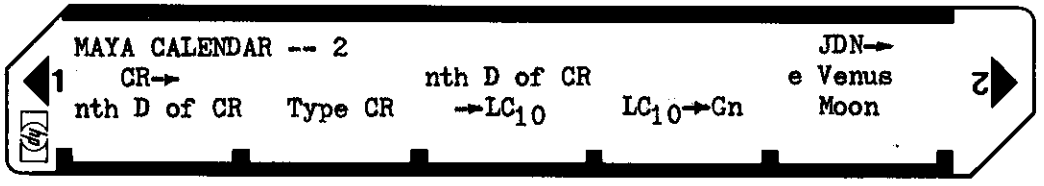
**Reference(s)**

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1a | Load card 1. | | | |
| 2a | Key LC date in "Base 20" form (BB.kkttuuk'k'). | BB.kktt... | A | CC.nnddmm |
| 2b | OR: Key LC date as Base 10 integer x. | x | f A | CC.nnddmm |
| 2c | OR: Key Base 20 number less than 69000 Baktuns | BB.kktt... | B | x Base 10 |
| 2d | OR: Key Base 10 number less than $9.9 \times 10^9$. | x | STO 0 | |
| | | | E | BB.kktt... |
| 2e | OR: Key nth Day of CR. | nth D ofCR | C | CC.nnddmm |
| 3a | Distance Number function (limit: ±69000 B) | | | |
| | After steps 2a or 2b a distance number may be | | | |
| | added t number of times. | | | |
| 4 | If distance number is in base 20, go first to | | | |
| | step 2c to convert the number to Base 10. | | | |
| 5 | Key the number of times the distance number is | | | |
| | to be added. | t | h ST I | t |
| 6 | Key distance number as a Base 10 integer. | ± Dist No. | D | CC.nnddmm |
| 7 | OPTIONAL: For LC date corresponding to any out- | | | |
| | put in step 6, press (E) twice during 5-sec. | | | |
| | pause showing CR date. Program will then | | | |
| | fetch the LC date of the CR date on pause. | | | |
| | After that, program cycles back to step 6 to | | | |
| | generate the next CR date in the t series. | | E E | BB.kktt... |
| 3b | Year Bearer function. After steps 2a or 2b, | | | |
| | do the following: RCL 0, RCL 8, -, 1, +. | | f A | CC.nn0100 |
| | Read output as follows: "The year is CC.nn." | | | |
| 2f | Lord of the Katun or Short Count function | | | |
| | Given any LC date in Base 20, mentally | | | |
| | increase the K by one--if K is 19, make it | | | |
| | 00 and add 1 to the Baktun instead--and make | | | |
| | the T, U, and K' all 00. Key this in. | BB.(kk+1) | A | CC.18ddmm |
| | C is Lord ("Ahau") of the Katun K+1 that is | | | |
| | in the process of being completed. | | | |
| 3c | Conversion of Maya dates to Christian Era | | | |
| | After step 2c, add Ahau Constant (Table D, | | | |
| | p. 2) to obtain the Julian Day Number. | Ahau Con. | | JDN |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1b | Load card 2. | | | |
| 2a | Key CR date. | CC.nnddmm | A | nth D ofVY |
| 3 | Key type of CR--see Operating Limits and Warn- | | | |
| | ings, p. 2. | 1 to 5 | B | nth D ofCR |
| 4 | OPTIONAL: Add or subtract an interval of days, | | | |
| | make this sum less than 18980 (available in | | | |
| | $R_E$), load card 1, perform step 2e on p. 5. | | | |
| 2b | OPTIONAL: Conversion of CR date to LC date. | | | |
| | Load card 1, select nearest earlier LC date | | | |
| | to within 52 years before the given CR date, | | | |
| | convert this to Base 10 by step 2c. | | | |
| 3 | Load card 2, follow steps 2a and 3, and press C | | C | LC Base 10 |
| 2c | OPTIONAL: The Lord of the Night or Glyph G | | | |
| | Given LC in Base 10, press D for the nth lord | | | |
| | of the Nine Lords of the Nights. | $LC_{10}$ | D | Glyph G |
| 2d | OPTIONAL: To compute approximate moon age given | | | |
| | an LC date. If the date is in Base 10, load | | | |
| | card 2; if in Base 20, load card 1 and con- | | | |
| | vert the LC date to Base 10 by step 2c, then | | | |
| | load card 2. | | | |
| 3 | Key Ahau Constant--see Table D, p. 2. | Ahau Con. | + | JDN |
| 4 | | | E | Moon Age |
| 2e | OPTIONAL: To compute the phase of Venus given | | | |
| | an LC date, use the same procedure as step | | | |
| | 2d except that fE is pressed as the last | | | |
| | step. | | f E | Venus Age |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
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| | | | | |
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| | | | | |
| | | | | |
| | | | | |

# 67 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | f LBL B | 31 25 12 | Separate parts of |
| 002 | h SF 2 | 35 51 02 | input. |
| 003 | GTO 1 | 22 01 | |
| 004 | f LBL A | 31 25 11 | |
| 005 | STO 0 | 33 00 | |
| 006 | f LBL 1 | 31 25 01 | |
| 007 | 5 | 05 | |
| 008 | h ST I | 35 33 | |
| 009 | 2 | 02 | |
| 010 | 0 | 00 | |
| 011 | STO B | 33 12 | |
| 012 | x | 71 | |
| 013 | STO 6 | 33 06 | |
| 014 | h x≷y | 35 52 | |
| 015 | f LBL 2 | 31 25 02 | Indirect STO loop |
| 016 | ENTER | 41 | |
| 017 | f INT | 31 83 | |
| 018 | STO (i) | 33 24 | |
| 019 | - | 51 | |
| 020 | RCL 6 | 34 06 | |
| 021 | x | 71 | |
| 022 | f DSZ | 31 33 | |
| 023 | GTO 2 | 22 02 | Solve Eq. (2) |
| 024 | 1 | 01 | # Days in Baktun |
| 025 | 4 | 04 | |
| 026 | 4 | 04 | |
| 027 | EEX | 43 | |
| 028 | 3 | 03 | |
| 029 | RCL 5 | 34 05 | #Baktuns |
| 030 | x | 71 | |
| 031 | 7 | 07 | # Days in Katun |
| 032 | 2 | 02 | |
| 033 | 0 | 00 | |
| 034 | 0 | 00 | |
| 035 | RCL 4 | 34 04 | # Katuns |
| 036 | x | 71 | |
| 037 | + | 61 | |
| 038 | 3 | 03 | # Days in Tun |
| 039 | 6 | 06 | |
| 040 | 0 | 00 | |
| 041 | RCL 3 | 34 03 | # Tuns |
| 042 | x | 71 | |
| 043 | + | 61 | |
| 044 | RCL B | 34 12 | |
| 045 | RCL 2 | 34 02 | # Uinals |
| 046 | x | 71 | |
| 047 | + | 61 | |
| 048 | RCL 1 | 34 01 | # K'ins |
| 049 | + | 61 | |
| 050 | STO 0 | 33 00 | LC in Base 10 |
| 051 | h F? 2 | 35 71 02 | |
| 052 | R/S | 84 | --STOP-- |
| 053 | g LBLf a | 32 25 11 | |
| 054 | STO 0 | 33 00 | Solve Eq. (3). |
| 055 | 1 | 01 | LC : CR Constant |
| 056 | 8 | 08 | |
| 057 | 4 | 04 | |
| 058 | 2 | 02 | |
| 059 | - | 51 | |
| 060 | 0 | 00 | |
| 061 | h x≷y | 35 52 | |
| 062 | 1 | 01 | # Days in a CR |
| 063 | 8 | 08 | |
| 064 | 9 | 09 | |
| 065 | 8 | 08 | |
| 066 | 0 | 00 | |
| 067 | STO E | 33 15 | |
| 068 | ÷ | 81 | |
| 069 | gFRAC | 32 83 | |
| 070 | RCL E | 34 15 | |
| 071 | x | 71 | |
| 072 | DSP 0 | 23 00 | |
| 073 | f RND | 31 24 | |
| 074 | f x<0 | 31 71 | |
| 075 | RCL E | 34 15 | |
| 076 | + | 61 | |
| 077 | f LBL C | 31 25 13 | Solve Eq. (4) |
| 078 | STO 7 | 33 07 | nth D of CR |
| 079 | 3 | 03 | # Days in a VY |
| 080 | 6 | 06 | |
| 081 | 5 | 05 | |
| 082 | STO D | 33 14 | |
| 083 | ÷ | 81 | |
| 084 | g FRAC | 32 83 | |
| 085 | RCL D | 34 14 | |
| 086 | x | 71 | |
| 087 | DSP 0 | 23 00 | |
| 088 | f RND | 31 24 | |
| 089 | STO 8 | 33 08 | nth D of VY = |
| 090 | 2 | 02 | nth D of CR |
| 091 | 0 | 00 | (mod 365) |
| 092 | STO B | 33 12 | |
| 093 | ÷ | 81 | |
| 094 | ENTER | 41 | |
| 095 | f INT | 31 83 | |
| 096 | STO 3 | 33 03 | M of VY |
| 097 | - | 51 | |
| 098 | RCL B | 34 12 | |
| 099 | x | 71 | |
| 100 | STO 2 | 33 02 | D of VY |
| 101 | RCL 7 | 34 07 | nth D of SR = |
| 102 | 2 | 02 | nth D of CR |
| 103 | 6 | 06 | (mod 260) |
| 104 | 0 | 00 | |
| 105 | STO C | 33 13 | |
| 106 | ÷ | 81 | |
| 107 | g FRAC | 32 83 | |
| 108 | RCL C | 34 13 | |
| 109 | x | 71 | |
| 110 | f RND | 31 24 | |
| 111 | STO 9 | 33 09 | nth D of SR |
| 112 | RCL B | 34 12 | |

REGISTERS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| $LC_{10}$ | K or N | T or D | U or M | K' | B | Dist. # | nth $D_{CR}$ | nth $D_{VY}$ | nth $D_{SR}$ |
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| 13 | 20 | 260 | 365 | 18980 | Used |

# 67 Program Listing II

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | ÷ | 81 | N = nth D of SR |
| 114 | g FRAC | 32 83 | (mod 20) |
| 115 | RCL B | 34 12 | |
| 116 | x | 71 | |
| 117 | f RND | 31 24 | |
| 118 | f x=0 | 31 51 | |
| 119 | RCL B | 34 12 | |
| 120 | STO 1 | 33 01 | N |
| 121 | RCL 9 | 34 09 | C = nth D of SR |
| 122 | 1 | 01 | (mod 13) |
| 123 | 3 | 03 | |
| 124 | STO A | 33 11 | |
| 125 | ÷ | 81 | |
| 126 | g FRAC | 32 83 | |
| 127 | RCL A | 34 11 | |
| 128 | x | 71 | |
| 129 | f RND | 31 24 | |
| 130 | f x=0 | 31 51 | |
| 131 | RCL A | 34 11 | C |
| 132 | f LBL 4 | 31 25 04 | Collect parts of |
| 133 | h F? 2 | 35 71 02 | CR or LC output. |
| 134 | GTO 5 | 22 05 | LC |
| 135 | GTO 6 | 22 06 | CR |
| 136 | f LBL 5 | 31 25 05 | |
| 137 | RCL 5 | 34 05 | # Baktuns |
| 138 | RCL 4 | 34 04 | # K'ins |
| 139 | 8 | 08 | |
| 140 | g $10^x$ | 32 53 | |
| 141 | ÷ | 81 | |
| 142 | + | 61 | BB.000000k'k' |
| 143 | f LBL 6 | 31 25 06 | Call U or M |
| 144 | RCL 3 | 34 03 | |
| 145 | 6 | 06 | |
| 146 | g $10^x$ | 32 53 | |
| 147 | ÷ | 81 | |
| 148 | + | 61 | |
| 149 | RCL 2 | 34 02 | Call T or D |
| 150 | 4 | 04 | |
| 151 | g $10^x$ | 32 53 | |
| 152 | ÷ | 81 | |
| 153 | + | 61 | |
| 154 | RCL 1 | 34 01 | Call K or N |
| 155 | 2 | 02 | |
| 156 | g $10^x$ | 32 53 | |
| 157 | ÷ | 81 | BB.kkttuuk'k' or |
| 158 | + | 61 | CC.nnddmm00 |
| 159 | DSP 8 | 23 08 | |
| 160 | h F? 0 | 35 71 00 | |
| 161 | GTO 8 | 22 08 | |
| 162 | f-x- | 31 84 | PRINT x |
| 163 | R/S | 84 | --STOP-- |
| 164 | f LBL D | 31 25 14 | Distance Number |
| 165 | STO 6 | 33 06 | |
| 166 | f LBL 7 | 31 25 07 | |
| 167 | RCL 6 | 34 06 | |
| 168 | STO+0 | 33 61 00 | Add Dist. # to LC. |
| 169 | RCL 0 | 34 00 | |
| 170 | h SF 0 | 35 51 00 | |
| 171 | GTOf a | 22 31 11 | |
| 172 | f LBL 8 | 31 25 08 | |
| 173 | f-x- | 31 84 | PRINT x |
| 174 | f DSZ | 31 33 | |
| 175 | GTO 7 | 22 07 | |
| 176 | h CF 0 | 35 61 00 | |
| 177 | R/S | 84 | |
| 178 | f LBL E | 31 25 15 | Base 10 to Base 20 |
| 179 | RCL 0 | 34 00 | #K' = $LC_{10}$ (mod20) |
| 180 | 2 | 02 | |
| 181 | 0 | 00 | |
| 182 | STO B | 33 12 | |
| 183 | ÷ | 81 | |
| 184 | ENTER | 41 | |
| 185 | f INT | 31 83 | |
| 186 | STO 5 | 33 05 | |
| 187 | - | 51 | |
| 188 | RCL B | 34 12 | |
| 189 | x | 71 | |
| 190 | STO 4 | 33 04 | # K' |
| 191 | RCL 5 | 34 05 | # U = INT($LC_{10}$ |
| 192 | 1 | 01 | ÷ 20) mod 18 |
| 193 | 8 | 08 | |
| 194 | ÷ | 81 | |
| 195 | ENTER | 41 | |
| 196 | f INT | 31 83 | |
| 197 | STO 5 | 33 05 | |
| 198 | - | 51 | |
| 199 | 1 | 01 | |
| 200 | 8 | 08 | |
| 201 | x | 71 | |
| 202 | STO 3 | 33 03 | # U |
| 203 | RCL 5 | 34 05 | # T = INT($LC_{10}$ |
| 204 | RCL B | 34 12 | ÷ 360) mod 20 |
| 205 | ÷ | 81 | |
| 206 | ENTER | 41 | |
| 207 | f INT | 31 83 | |
| 208 | STO 5 | 33 05 | |
| 209 | - | 51 | |
| 210 | RCL B | 34 12 | |
| 211 | x | 71 | |
| 212 | STO 2 | 33 02 | # T |
| 213 | RCL 5 | 34 05 | # K = INT($LC_{10}$ |
| 214 | RCL B | 34 12 | ÷ 7200) mod 20 |
| 215 | ÷ | 81 | |
| 216 | ENTER | 41 | |
| 217 | f INT | 31 83 | |
| 218 | STO 5 | 33 05 | # B |
| 219 | - | 51 | |
| 220 | RCL B | 34 12 | |
| 221 | x | 71 | |
| 222 | STO 1 | 33 01 | # K |
| 223 | h SF 2 | 35 51 02 | |
| 224 | GTO 4 | 22 04 | |

**LABELS**

| | | | | | |
|---|---|---|---|---|---|
| A Cmput CR | B Cmput $LC_{10}$ | C nth $D_{CR}$ | D Dist. No. | E Cmput $LC_{20}$ | 0 Series |
| a $LC_{10}$→CR | b | c | d | e | 1 |
| 0 | 1 LC Date | 2 STO loop | 3 nth $D_{LC}$ | 4 Collect | 2 LC vs CR |
| 5 Used | 6 Used | 7 Add Dist# | 8 new LC | 9 | 3 |

**FLAGS**

| | ON | OFF |
|---|---|---|
| 0 | ☐ | ☒ |
| 1 | ☐ | ☒ |
| 2 | ☐ | ☒ |
| 3 | ☐ | ☒ |

**SET STATUS**

| TRIG | DISP |
|---|---|
| DEG ☒ | FIX ☒ |
| GRAD ☐ | SCI ☐ |
| RAD ☐ | ENG ☐ |
| | n 8 |

# 67 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | f LBL A | 31 25 11 | Separate parts of input. |
| 002 | 4 | 04 | |
| 003 | h ST I | 35 33 | |
| 004 | 2 | 02 | |
| 005 | 5 | 05 | |
| 006 | x | 71 | |
| 007 | STO 5 | 33 05 | |
| 008 | h x≠y | 35 52 | |
| 009 | f LBL 1 | 31 25 01 | Indirect STO loop. |
| 010 | ENTER | 41 | |
| 011 | f INT | 31 83 | |
| 012 | STO (1) | 33 24 | |
| 013 | - | 51 | |
| 014 | RCL 5 | 34 05 | |
| 015 | x | 71 | |
| 016 | f DSZ | 31 33 | |
| 017 | GTO 1 | 22 01 | |
| 018 | 4 | 04 | Solve Eq. (5). |
| 019 | 0 | 00 | |
| 020 | RCL 4 | 34 04 | |
| 021 | RCL 3 | 34 03 | |
| 022 | - | 51 | |
| 023 | f x>0 | 31 81 | |
| 024 | GTO 2 | 22 02 | |
| 025 | 1 | 01 | |
| 026 | 3 | 03 | |
| 027 | STO A | 33 11 | |
| 028 | + | 61 | |
| 029 | f x>0 | 31 81 | |
| 030 | GTO 2 | 22 02 | |
| 031 | RCL A | 34 11 | |
| 032 | + | 61 | |
| 033 | f LBL 2 | 31 25 02 | |
| 034 | x | 71 | |
| 035 | 2 | 02 | |
| 036 | 6 | 06 | |
| 037 | 0 | 00 | |
| 038 | STO C | 33 13 | |
| 039 | + | 81 | |
| 040 | g FRAC | 32 83 | |
| 041 | RCL C | 34 13 | |
| 042 | x | 71 | |
| 043 | RCL 3 | 34 03 | |
| 044 | + | 61 | |
| 045 | STO 9 | 33 09 | nth D of SR |
| 046 | 3 | 03 | |
| 047 | 6 | 06 | |
| 048 | 5 | 05 | |
| 049 | STO D | 33 14 | |
| 050 | RCL 1 | 34 01 | Solve Eq. (6). |
| 051 | 2 | 02 | |
| 052 | 0 | 00 | |
| 053 | STO B | 33 12 | |
| 054 | x | 71 | |
| 055 | RCL 2 | 34 02 | |
| 056 | + | 61 | |
| 057 | R/S | 84 | --STOP-- |
| 058 | f LBL B | 31 25 12 | Input CR Type |
| 059 | 3 | 03 | |
| 060 | - | 51 | |
| 061 | + | 61 | |
| 062 | DSP 0 | 23 00 | |
| 063 | f RND | 31 24 | |
| 064 | f x=0 | 31 51 | |
| 065 | GTO 3 | 22 03 | |
| 066 | STO 8 | 33 08 | nth D of VY |
| 067 | GTO 4 | 22 04 | |
| 068 | f LBL 3 | 31 25 03 | If nth D of VY = 0 |
| 069 | RCL D | 34 14 | make it = 365. |
| 070 | STO 8 | 33 08 | |
| 071 | f LBL 4 | 31 25 04 | Solve Eq. (7). |
| 072 | 1 | 01 | |
| 073 | 8 | 08 | |
| 074 | 9 | 09 | |
| 075 | 8 | 08 | |
| 076 | 0 | 00 | |
| 077 | STO E | 33 15 | |
| 078 | RCL D | 34 14 | |
| 079 | RCL 9 | 34 09 | |
| 080 | RCL 8 | 34 08 | |
| 081 | - | 51 | |
| 082 | f x>0 | 31 81 | |
| 083 | GTO 6 | 22 06 | |
| 084 | f LBL 5 | 31 25 05 | |
| 085 | RCL C | 34 13 | |
| 086 | + | 61 | |
| 087 | f x>0 | 31 81 | |
| 088 | GTO 6 | 22 06 | |
| 089 | GTO 5 | 22 05 | |
| 090 | f LBL 6 | 31 25 06 | |
| 091 | x | 71 | |
| 092 | h x≠y | 35 52 | |
| 093 | ÷ | 81 | |
| 094 | g FRAC | 32 83 | |
| 095 | x | 71 | |
| 096 | RCL 8 | 34 08 | |
| 097 | + | 61 | |
| 098 | f RND | 31 24 | |
| 099 | STO 7 | 33 07 | nth D of CR |
| 100 | DSP 2 | 23 02 | |
| 101 | f-x- | 31 84 | PRINT x |
| 102 | h RTN | 35 22 | --STOP-- |
| 103 | f LBL C | 31 25 13 | Compute $LC_{10}$. |
| 104 | STO 7 | 33 07 | Solve Eq. (8). |
| 105 | 1 | 01 | |
| 106 | 8 | 08 | |
| 107 | 4 | 04 | |
| 108 | 2 | 02 | |
| 109 | STO 6 | 33 06 | |
| 110 | + | 61 | |
| 111 | RCL 0 | 34 00 | |
| 112 | h x≠y | 35 52 | |

REGISTERS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| $LC_{10}$ | MM | DD | NN | CC | Syn. Mo. | Venus Pr | nth $D_{CR}$ | nth $D_{VY}$ | nth $D_{SR}$ |
| S0 JDN | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| 13 | 20 | 260 | 365 | 18980 | Used |

# 67 Program Listing II

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | - | 51 | |
| 114 | 1 | 01 | |
| 115 | 8 | 08 | |
| 116 | 9 | 09 | |
| 117 | 8 | 08 | |
| 118 | 0 | 00 | |
| 119 | STO E | 33 15 | |
| 120 | ÷ | 81 | |
| 121 | ENTER | 41 | |
| 122 | g FRAC | 32 83 | |
| 123 | f x=0 | 31 51 | |
| 124 | GTO 7 | 22 07 | |
| 125 | h R↓ | 35 53 | |
| 126 | f INT | 31 83 | |
| 127 | 1 | 01 | |
| 128 | f LBL 7 | 31 25 07 | |
| 129 | + | 61 | r |
| 130 | RCL E | 34 15 | Solve Eq. (9). |
| 131 | x | 71 | |
| 132 | RCL 6 | 34 06 | |
| 133 | RCL 7 | 34 07 | |
| 134 | + | 61 | |
| 135 | + | 61 | |
| 136 | STO 0 | 33 00 | |
| 137 | DSP 2 | 23 02 | |
| 138 | h RTN | 35 22 | --STOP-- |
| 139 | f LBL D | 31 25 14 | Compute glyph G. |
| 140 | 9 | 09 | n = $LC_{10}$ mod. 9 |
| 141 | ÷ | 81 | |
| 142 | g FRAC | 32 83 | |
| 143 | 9 | 09 | |
| 144 | x | 71 | |
| 145 | 0 | 00 | |
| 146 | h x⇄y | 35 52 | |
| 147 | f x=0 | 31 51 | |
| 148 | 9 | 09 | |
| 149 | + | 61 | |
| 150 | f-x- | 31 84 | PRINT x |
| 151 | h RTN | 35 22 | --STOP-- |
| 152 | f LBL E | 31 25 15 | Compute Moon age. |
| 153 | f P⇄S | 31 42 | |
| 154 | STO 0 | 33 00 | |
| 155 | f P⇄S | 31 42 | |
| 156 | 2 | 02 | |
| 157 | 9 | 09 | |
| 158 | . | 83 | |
| 159 | 5 | 05 | |
| 160 | 3 | 03 | |
| 161 | 0 | 00 | |
| 162 | 5 | 05 | |
| 163 | 8 | 08 | |
| 164 | 9 | 09 | |
| 165 | STO 5 | 33 05 | |
| 166 | ÷ | 81 | |
| 167 | g FRAC | 32 83 | |
| 168 | RCL 5 | 34 05 | |
| 169 | x | 71 | |
| 170 | 9 | 09 | Adjust to real time. |
| 171 | - | 51 | |
| 172 | RCL 5 | 34 05 | |
| 173 | h x⇄y | 35 52 | |
| 174 | f x<0 | 31 71 | Make positive. |
| 175 | + | 61 | |
| 176 | f-x- | 31 84 | PRINT x |
| 177 | h RTN | 35 22 | --STOP-- |
| 178 | g LBLf e | 31 25 15 | Compute Venus age. |
| 179 | f P⇄S | 31 42 | |
| 180 | STO 0 | 33 00 | |
| 181 | f P⇄S | 31 42 | Solve Eq. (12). |
| 182 | 5 | 05 | Syn. Per. of Venus |
| 183 | 8 | 08 | |
| 184 | 3 | 03 | |
| 185 | . | 83 | |
| 186 | 9 | 09 | |
| 187 | 2 | 02 | |
| 188 | 1 | 01 | |
| 189 | STO 6 | 33 06 | |
| 190 | ÷ | 81 | |
| 191 | g FRAC | 32 83 | |
| 192 | RCL 6 | 34 06 | |
| 193 | x | 71 | |
| 194 | 1 | 01 | Adjust to real time. |
| 195 | 1 | 01 | |
| 196 | 0 | 00 | |
| 197 | - | 51 | |
| 198 | RCL 6 | 34 06 | |
| 199 | h x⇄y | 35 52 | |
| 200 | f x<0 | 31 71 | Make positive. |
| 201 | + | 61 | |
| 202 | f-x- | 31 84 | PRINT x |
| 203 | h RTN | 35 22 | --STOP-- |
| 210 | | | |
| 220 | | | |

**LABELS**

| | | | | | |
|---|---|---|---|---|---|
| A Sto input | B Type CR | C CR to LC | D Glyph G | E Moon | 0 |
| a | b | c | d | e Venus | 1 |
| 0 | 1 STO loop | 2 Eq. (5) | 3 Last Dyy | 4 Eq. (7) | 2 |
| 5 Eq. (7) | 6 Eq. (7) | 7 Eq. (9) | 8 | 9 | 3 |

**FLAGS**

**SET STATUS**

| FLAGS | | | TRIG | DISP |
|---|---|---|---|---|
| | ON | OFF | | |
| 0 | ☐ | ☒ | DEG ☒ | FIX ☒ |
| 1 | ☐ | ☒ | GRAD ☐ | SCI ☐ |
| 2 | ☐ | ☒ | RAD ☐ | ENG ☐ |
| 3 | ☐ | ☒ | | n 2 |

# Program Description I

Program Title: MOHAMMEDAN (ISLAM) - GREGORIAN CALENDAR CONVERSION — FAL-11

Contributor's Name: Fred A. Lummus, P. E.
Address: Route 2 Box 84
City: Greenville State: Texas Zip Code: 75401

**Program Description, Equations, Variables**

The Mohammedan (Islam) Calendar is a lunar reckoning from the year of the Hegira, 622 A.D. It runs in cycles of 30 years of which the 2nd, 5th, 7th, 10th, 13th, 16th, 18th, 21st, 24th, 26th, and 29th are leap years, having 355 days; the others are common, having 354 days. The following table gives the months of the Mohammedan Year and the number of days each:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | Muhharram | 30 | 5 | Jumada I | 30 | 9 | Ramadan | 30 |
| 2 | Safar | 29 | 6 | Jumada II | 29 | 10 | Shawwal | 29 |
| 3 | Rabia I | 30 | 7 | Rajab | 30 | 11 | Zu'lkadah | 30 |
| 4 | Rabia II | 29 | 8 | Shaban | 29 | 12 | Zu'lhijjah | 29* |

* In leap years, 30 days

The following formulas are applicable for the 10,631 days of the 44th cycle, therefore all dates are referred to that cycle for calculation.

$$DN_m = RND\left[(y')(354.3659)\right] + INT\left[(m')(29.5001) + 0.5\right] + d + \left[INT\left(\frac{y}{30}\right) - 44\right](10631)$$

where $y' = y - 1$ and $m' = m - 1$

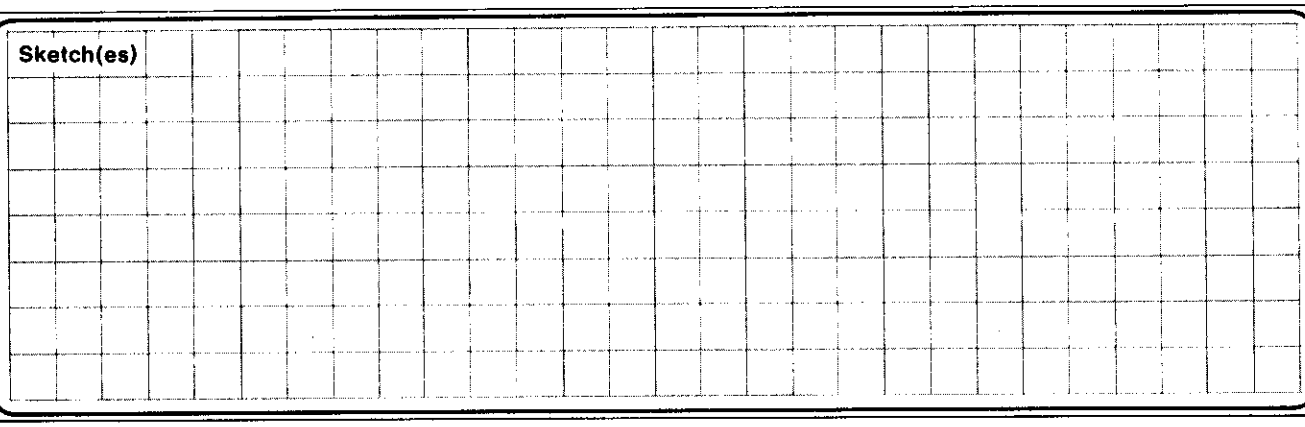
$$J.D._m = DN_m + 1{,}948{,}440$$

**Operating Limits and Warnings**

This program is good for a 400-year Gregorian period of March 1, 1800 through February 28, 2200 which corresponds to the Mohammedan (Islam) period of Shawwal 4, 1214 (10.021214) through Muharram 13, 1627 (1.131627).

# Program Description II

**Sketch(es)**



**Sample Problem(s)** Convert the Mohammedan date of Safar 2, 1391 to the corresponding Gregorian date:

2.021391 [A] → 2.021391 ***

2441041. (Display only) (Julian Day Number)

[E] → 3.301971 ***

Find the corresponding Mohammedan date for July 4, 1976:

7.041976 [D] → 7.041976 ***

2442964. (Display only) (Julian Day Number)

[B] → 7.071396 ***

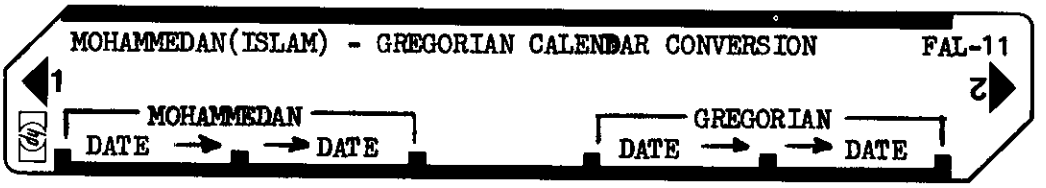
Rajab 7, 1396

**Solution(s)** Additional corresponding dates which can be verified:

| | | | |
|---|---|---|---|
| Zu'lkadah 1,1389 | (11.101389) | and January 9, 1970 | (1.091970) |
| Muharram 1, 1390 | ( 1.011390) | and March 9, 1970 | (3.091970) |
| Rabia I 1, 1390 | ( 3.011390) | and May 7, 1970 | (5.071970) |
| Jumada II 1, 1390 | ( 6.011390) | and August 4, 1970 | (8.041970) |
| Safar 1, 1391 | ( 2.011391) | and March 29, 1971 | (3.291971) |
| Shaban 1, 1391 | ( 8.011391) | and September 22,1971 | (9.221971) |
| Shawwal 1, 1391 | (10.011391) | and November 20, 1971 | (11.201971) |
| Muharram 1, 1398 | ( 1.011398) | and December 12, 1977 | (12.111977) |

**Reference(s)**

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Load Side 1 and Side 2 | | | |
| 2 | Load Data Tape ( or ) | 365.25 | STO 0 | |
| | | 30.6001 | STO 1 | |
| | | 122.1 | STO 2 | |
| | | 1720982 | STO 3 | |
| | | 694097 | STO 4 | |
| | | 767146 | STO 5 | |
| | | 30 | STO A | |
| | | 0.5 | STO B | |
| | | 355 | STO C | |
| | | 12.3 | STO E | |
| | | | f P S | |
| | | 354.3659 | STO 0 | |
| | | 29.5001 | STO 1 | |
| | | 10631 | STO 2 | |
| | | 1948440 | STO 3 | |
| | | | f P S | |
| | | | | |
| 3 | For Mohammedan (Islam) Dates: | | | |
| | • To Find Julian Day Number (J.D.), | $DATE_m$ | A | J.D. |
| | input Date (mm.ddyyyy) | | | |
| | • To Find Mohammedan Date, | J.D. | B | $DATE_m$ |
| | input Julian Day Number | | | |
| | | | | |
| 4 | For Gregorian Dates: | | | |
| | • To Find Julian Day Number, | $DATE_G$ | D | J.D. |
| | input Date (mm.ddyyyy) | | | |
| | • To Find Gregorian Date, | J.D. | E | $DATE_G$ |
| | input Julian Day Number | | | |
| | | | | |
| 5 | To Convert Mohammedan Date to Gregorian Date, | $DATE_m$ | A | |
| | input Date (mm.ddyyyy) | | E | $DATE_G$ |
| | | | | |
| 6 | To Convert Gregorian Date to Mohammedan Date, | $DATE_G$ | D | |
| | input Date (mm.ddyyyy) | | B | $DATE_m$ |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# 97 Program Listing I

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLA | 21 11 | Compute Julian Day Number of Mohammedan Date |
| 002 | P≠S | 16-51 | |
| 003 | GSB0 | 23 00 | |
| 004 | GSB5 | 23 05 | |
| 005 | GSBb | 23 16 12 | |
| 006 | GSB2 | 23 02 | |
| 007 | RCL7 | 36 07 | |
| 008 | GSBb | 23 16 12 | |
| 009 | RCL1 | 36 01 | |
| 010 | × | -35 | |
| 011 | RCLB | 36 12 | |
| 012 | + | -55 | |
| 013 | INT | 16 34 | |
| 014 | + | -55 | |
| 015 | RCL8 | 36 08 | |
| 016 | + | -55 | |
| 017 | RCL3 | 36 03 | |
| 018 | + | -55 | |
| 019 | P≠S | 16-51 | |
| 020 | RTN | 24 | |
| 021 | *LBLB | 21 12 | Decipher Julian Day Number into Display mm.ddyyyy |
| 022 | P≠S | 16-51 | |
| 023 | RCL3 | 36 03 | |
| 024 | - | -45 | |
| 025 | STO4 | 35 04 | |
| 026 | RCL0 | 36 00 | |
| 027 | ÷ | -24 | |
| 028 | INT | 16 34 | |
| 029 | *LBL9 | 21 09 | |
| 030 | STO9 | 35 09 | |
| 031 | GSB5 | 23 05 | |
| 032 | GSB2 | 23 02 | |
| 033 | RCL4 | 36 04 | |
| 034 | X≠Y | -41 | |
| 035 | - | -45 | |
| 036 | RCLC | 36 13 | |
| 037 | X≠Y | -41 | |
| 038 | X=Y? | 16-33 | |
| 039 | GTO6 | 22 06 | |
| 040 | X=0? | 16-43 | |
| 041 | GTO8 | 22 08 | |
| 042 | STO4 | 35 04 | |
| 043 | RCLB | 36 12 | |
| 044 | - | -45 | |
| 045 | RCL1 | 36 01 | |
| 046 | ÷ | -24 | |
| 047 | INT | 16 34 | |
| 048 | STO7 | 35 07 | |
| 049 | RCL1 | 36 01 | |
| 050 | × | -35 | |
| 051 | RCLB | 36 12 | |
| 052 | + | -55 | |
| 053 | INT | 16 34 | |
| 054 | RCL4 | 36 04 | |
| 055 | - | -45 | |
| 056 | CHS | -22 | |
| 057 | EEX | -23 | |
| 058 | 2 | 02 | |
| 059 | ÷ | -24 | |
| 060 | RCL7 | 36 07 | |
| 061 | GSBa | 23 16 11 | |
| 062 | + | -55 | |
| 063 | *LBL7 | 21 07 | |
| 064 | RCL9 | 36 09 | |
| 065 | GSBa | 23 16 11 | |
| 066 | P≠S | 16-51 | |
| 067 | GTO3 | 22 03 | |
| 068 | *LBLE | 21 15 | Decipher Julian Day Number into Display mm.ddyyyy |
| 069 | RCL3 | 36 03 | |
| 070 | - | -45 | |
| 071 | RCL5 | 36 05 | |
| 072 | X≠Y | -41 | |
| 073 | X≤Y? | 16-35 | |
| 074 | GSBb | 23 16 12 | |
| 075 | RCL6 | 36 06 | |
| 076 | X≠Y | -41 | |
| 077 | X>Y? | 16-34 | |
| 078 | GSBa | 23 16 11 | |
| 079 | STO4 | 35 04 | |
| 080 | RCL2 | 36 02 | |
| 081 | - | -45 | |
| 082 | RCL0 | 36 00 | |
| 083 | ÷ | -24 | |
| 084 | INT | 16 34 | |
| 085 | STO9 | 35 09 | |
| 086 | RCL0 | 36 00 | |
| 087 | × | -35 | |
| 088 | INT | 16 34 | |
| 089 | RCL4 | 36 04 | |
| 090 | - | -45 | |
| 091 | CHS | -22 | |
| 092 | STOD | 35 14 | |
| 093 | RCL1 | 36 01 | |
| 094 | ÷ | -24 | |
| 095 | INT | 16 34 | |
| 096 | STO7 | 35 07 | |
| 097 | RCLD | 36 14 | |
| 098 | X≠Y | -41 | |
| 099 | RCL1 | 36 01 | |
| 100 | × | -35 | |
| 101 | INT | 16 34 | |
| 102 | - | -45 | |
| 103 | STO8 | 35 08 | |
| 104 | RCL7 | 36 07 | |
| 105 | 1 | 01 | |
| 106 | RCL8 | 36 08 | |
| 107 | % | 55 | |
| 108 | - | -45 | |
| 109 | - | -45 | |
| 110 | RCL7 | 36 07 | |
| 111 | 1 | 01 | |
| 112 | 4 | 04 | |

## REGISTERS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 365.25 | 1 30.6001 | 2 122.1 | 3 1720982 | 4 Date-G | 5 694097 | 6 767146 | 7 Month-G | 8 Day - G | 9 Year-G |
| S0 354.3659 | S1 29.5001 | S2 10631 | S3 1948440 | S4 Date-M | S5 | S6 used | S7 Month-M | S8 Day - M | S9 Year-M |
| A 30 | B 0.5 | C 355 | D used | E 12.30 | I | | | | |

# 97 Program Listing II



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | ÷ | -24 | |
| 114 | GSB4 | 23 04 | |
| 115 | RCL9 | 36 09 | |
| 116 | GTO3 | 22 03 | |
| 117 | *LBL0 | 21 00 | Break Date into the Individual Components of mm.ddyyyy |
| 118 | PRTX | -14 | |
| 119 | STO4 | 35 04 | |
| 120 | ENT↑ | -21 | |
| 121 | INT | 16 34 | |
| 122 | STO7 | 35 07 | |
| 123 | - | -45 | |
| 124 | EEX | -23 | |
| 125 | 2 | 02 | |
| 126 | x | -35 | |
| 127 | ENT↑ | -21 | |
| 128 | INT | 16 34 | |
| 129 | STO8 | 35 08 | |
| 130 | - | -45 | |
| 131 | EEX | -23 | |
| 132 | 4 | 04 | |
| 133 | x | -35 | |
| 134 | STO9 | 35 09 | |
| 135 | RTN | 24 | |
| 136 | *LBLD | 21 14 | Compute Julian Day Number of Gregorian Date |
| 137 | GSB0 | 23 00 | |
| 138 | RCL7 | 36 07 | |
| 139 | GSBa | 23 16 11 | |
| 140 | ENT↑ | -21 | |
| 141 | 1/X | 52 | |
| 142 | . | -62 | |
| 143 | 7 | 07 | |
| 144 | + | -55 | |
| 145 | CHS | -22 | |
| 146 | GSB4 | 23 04 | |
| 147 | RCL1 | 36 01 | |
| 148 | x | -35 | |
| 149 | INT | 16 34 | |
| 150 | RCL9 | 36 09 | |
| 151 | RCL0 | 36 00 | |
| 152 | x | -35 | |
| 153 | INT | 16 34 | |
| 154 | + | -55 | |
| 155 | RCL8 | 36 08 | |
| 156 | + | -55 | |
| 157 | RCL5 | 36 05 | |
| 158 | X≷Y | -41 | |
| 159 | X≤Y? | 16-35 | |
| 160 | GSBa | 23 16 11 | |
| 161 | RCL6 | 36 06 | |
| 162 | X≷Y | -41 | |
| 163 | X>Y? | 16-34 | |
| 164 | GSBb | 23 16 12 | |
| 165 | RCL3 | 36 03 | |
| 166 | + | -55 | |
| 167 | RTN | 24 | |
| 168 | *LBL2 | 21 02 | |
| 169 | RCL0 | 36 00 | |
| 170 | x | -35 | |
| 171 | DSP0 | -63 00 | |
| 172 | RND | 16 24 | |
| 173 | DSP6 | -63 06 | |
| 174 | RCL6 | 36 06 | |
| 175 | RCL2 | 36 02 | |
| 176 | x | -35 | |
| 177 | + | -55 | |
| 178 | RTN | 24 | |
| 179 | *LBL3 | 21 03 | |
| 180 | EEX | -23 | |
| 181 | 6 | 06 | |
| 182 | ÷ | -24 | |
| 183 | + | -55 | |
| 184 | PRTX | -14 | |
| 185 | RTN | 24 | |
| 186 | *LBL4 | 21 04 | Correct m & y |
| 187 | INT | 16 34 | |
| 188 | ST+9 | 35-55 09 | |
| 189 | 1 | 01 | |
| 190 | 2 | 02 | |
| 191 | x | -35 | |
| 192 | - | -45 | |
| 193 | RTN | 24 | |
| 194 | *LBL5 | 21 05 | Refer to 44th Cycle |
| 195 | RCLA | 36 11 | |
| 196 | ÷ | -24 | |
| 197 | INT | 16 34 | |
| 198 | 4 | 04 | |
| 199 | 4 | 04 | |
| 200 | - | -45 | |
| 201 | STO6 | 35 06 | |
| 202 | RCLA | 36 11 | |
| 203 | x | -35 | |
| 204 | RCL9 | 36 09 | |
| 205 | X≷Y | -41 | |
| 206 | - | -45 | |
| 207 | RTN | 24 | |
| 208 | *LBL6 | 21 06 | |
| 209 | RCLE | 36 15 | |
| 210 | GTO7 | 22 07 | |
| 211 | *LBL8 | 21 08 | |
| 212 | RCL9 | 36 09 | |
| 213 | GSBb | 23 16 12 | |
| 214 | GTO9 | 22 09 | |
| 215 | *LBLa | 21 16 11 | |
| 216 | 1 | 01 | |
| 217 | + | -55 | |
| 218 | RTN | 24 | |
| 219 | *LBLb | 21 16 12 | |
| 220 | 1 | 01 | |
| 221 | - | -45 | |
| 222 | RTN | 24 | |

**LABELS**

| | | | | |
|---|---|---|---|---|
| A Date$_M$ → | B →Date$_M$ | C | D Date$_G$ → | E →Date$_G$ |
| a 1 ÷ | b 1 - | c | d | e |
| 0 Store Date | 1 Compute Greg DN | 2 Mon year sub | 3 used | 4 Correct m & y |
| 5 Chg to Basic Yr | 6 12.30 sub | 7 Rtn pt 12.30 | 8 Lp year repeat | 9 Rtn pt Lp year |

**FLAGS**

| | |
|---|---|
| 0 | — |
| 1 | — |
| 2 | — |
| 3 | — |

**SET STATUS**

| FLAGS | ON | OFF |
|---|---|---|
| 0 | ☐ | ☒ |
| 1 | ☐ | ☒ |
| 2 | ☐ | ☒ |
| 3 | ☐ | ☒ |

| TRIG | |
|---|---|
| DEG | ☒ |
| GRAD | ☐ |
| RAD | ☐ |

| DISP | |
|---|---|
| FIX | ☒ |
| SCI | ☐ |
| ENG | ☐ |
| n | 6 |

# Program Description I

| | |
|---|---|
| **Program Title** | CHINESE YEARS TO/FROM GREGORIAN YEARS |
| **Contributor's Name** | Hewlett-Packard |
| **Address** | 1000 N.E. Circle Blvd. |
| **City** | Corvallis **State** Oregon **Zip Code** 97330 |

**Program Description, Equations, Variables**

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 (1.01) in our machine notations, which falls in the years 1924 and 1924 $\pm$ 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 (2.04) or ( 乙卯 ).

**Operating Limits and Warnings**

Chinese New Years which start the first months may fall in January or February of the Gregorian scale.

The year (2.10), for example, should be interpreted as TWO-TEN nor TWO-ONE. Notice that 2 + 1 = 3 violates the parity.

## CHINESE YEARS TO/FROM GREGORIAN YEARS

| ORDER | YYYY | $Y_1Y_1 \cdot Y_2Y_2$ | 干支 |
|---|---|---|---|
| 1 | 1924 | 1 . 01 | (甲子) |
| 2 | 1925 | 2 . 02 | (乙丑) |
| 3 | 1926 | 3 . 03 | (丙寅) |
| 4 | 1927 | 4 . 04 | (丁卯) |
| 5 | 1928 | 5 . 05 | (戊辰) |
| 6 | 1929 | 6 . 06 | (己巳) |
| 7 | 1930 | 7 . 07 | (庚午) |
| 8 | 1931 | 8 . 08 | (辛未) |
| 9 | 1932 | 9 . 09 | (壬申) |
| 10 | 1933 | 10 . 10 | (癸酉) |
| 11 | 1934 | 1 . 11 | (甲戌) |
| 12 | 1935 | 2 . 12 | (乙亥) |
| 13 | 1936 | 3 . 01 | (丙子) |
| 14 | 1937 | 4 . 02 | (丁丑) |
| ... | ... | ... | ... |
| 59 | 1982 | 9 . 11 | (壬戌) |
| 60 | 1983 | 10 . 12 | (癸亥) |

| | 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 |

# Program Description II

**Sketch(es)**

**Sample Problem(s)**

(1) Convert the years 1924 and 1864 to Chinese years.

Key E 1924 A reads 1.01 : row 1& Column 1 ( 甲子 ).

Key E 1864 A reads 1.01 : row 1 & Column 1 ( 甲子 ).

(2) Convert the Chinese year 1.01 ( 甲子 ) to Gregorian year.

Key E 1.01 B reads 1924 (1st year of machine cycle.

C reads 1984, C reads 2044, etc.

or D reads 1864, D reads 1804, etc.

(3) Convert the year 1975 to Chinese year and back.

Key E 1975 A reads 2.04 : row 2 & column 4 ( 乙卯 ),

B reads 1975.

(4) Convert the year 1776 to Chinese year and back.

Key E 1776 A reads 3.09 : row 3 & column 9 ( 丙申 ),

B reads 1956, D D D reads 1776.

(5) Convert the Chinese year "1.02" illegally to Gregorian year.

Actually row 1 and column 2 (1 + 2 = 3) is an empty space in the Table. There is no such a year called 1.02 or ( 甲丑 ). But if we are to carry out the computation illegally:

Key E 1.02 B results in Error indicating an illegal operation.

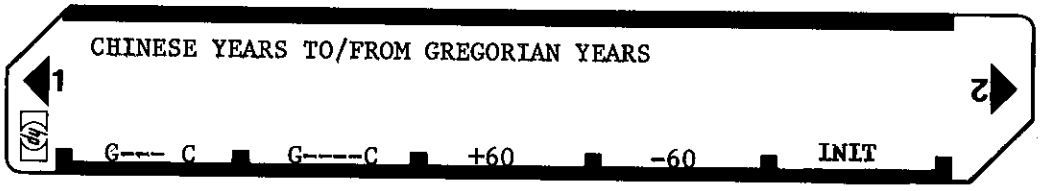
**Reference(s)**

This program is a translation of the HP-65 User Library Program No. 01994A, submitted by Tak Y. Lee.

Encyclopedia Americana

Encyclopedia Britannica

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| | | | | |
| 1 | Enter Program | | | |
| | | | - | |
| 2 | Initialize | | | |
| | | | E | 0. |
| 3 | Gregorian to Chinese | | | |
| | Enter year YYYY | | A | $Y_1Y_1.Y_2Y_2$ |
| | | | | |
| | or | | | |
| | | | | |
| 3 | Chinese to Greg. | | | |
| | Enter $Y_1Y_1.Y_2Y_2$ | | B | Y Y Y Y |
| | Add 60 to result | | C | Y + 60 |
| | ... | | | |
| | Sub. 60 from result | | D | Y - 60 |
| | ... | | | |
| | (For a new case, go to step 2, but for continuous calculations, step 2 may be omitted) | | | |

| LABELS | | | | |
|---|---|---|---|---|
| A G→C | B G←C | C +60 | D -60 | E |
| a | b | c | d | e |
| 0 | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 |

| FLAGS | SET STATUS | | |
|---|---|---|---|
| 0 | FLAGS | TRIG | DISP |
| 1 | ON OFF<br>0 ☐ ☐<br>1 ☐ ☐<br>2 ☐ ☐<br>3 ☐ ☐ | DEG ☐<br>GRAD ☐<br>RAD ☐ | FIX ☐<br>SCI ☐<br>ENG ☐<br>n____ |
| 2 | | | |
| 3 | | | |

# 97 Program Listing I

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBLE | 21 15 | Initialize & enter machine datum yr. |
| 002 | CLRG | 16-53 | |
| 003 | 3 | 03 | 85x60 before 1924 |
| 004 | 1 | 01 | |
| 005 | 7 | 07 | |
| 006 | 6 | 06 | |
| 007 | CHS | -22 | |
| 008 | STO1 | 35 01 | |
| 009 | 1 | 01 | |
| 010 | 0 | 00 | Cycle of $Y_1Y_1$ |
| 011 | STO2 | 35 02 | |
| 012 | 1 | 01 | |
| 013 | 2 | 02 | Cycle of $Y_2Y_2$ |
| 014 | STO3 | 35 03 | |
| 015 | 0 | 00 | |
| 016 | RTN | 24 | |
| 017 | *LBLA | 21 11 | Greg. to Chinese Enter YYYY |
| 018 | RCL1 | 36 01 | |
| 019 | - | -45 | |
| 020 | STO5 | 35 05 | Δ Y = YYYY -(-3176) |
| 021 | RCL5 | 36 05 | |
| 022 | RCL2 | 36 02 | |
| 023 | ÷ | -24 | |
| 024 | INT | 16 34 | |
| 025 | RCL2 | 36 02 | |
| 026 | x | -35 | |
| 027 | - | -45 | |
| 028 | 1 | 01 | |
| 029 | + | -55 | The most significant |
| 030 | RCL5 | 36 05 | |
| 031 | RCL5 | 36 05 | |
| 032 | RCL3 | 36 03 | |
| 033 | ÷ | -24 | |
| 034 | INT | 16 34 | |
| 035 | RCL3 | 36 03 | |
| 036 | x | -35 | |
| 037 | - | -45 | |
| 038 | 1 | 01 | |
| 039 | + | -55 | The least signifi-cant. |
| 040 | EEX | -23 | |
| 041 | 2 | 02 | |
| 042 | ÷ | -24 | |
| 043 | + | -55 | |
| 044 | DSP2 | -63 02 | $Y_1Y_1Y_2Y_2$ Display Chinese yr |
| 045 | RTN | 24 | |
| 046 | *LBLB | 21 12 | Chinese to Greg. Enter $Y_1Y_1Y_2Y_2$ |
| 047 | INT | 16 34 | |
| 048 | STO6 | 35 06 | Store $Y_1Y_1$ |
| 049 | LSTX | 16-63 | |
| 050 | FRC | 16 44 | |
| 051 | EEX | -23 | |
| 052 | 2 | 02 | |
| 053 | x | -35 | -Store $Y_2Y_2$ |
| 054 | X>Y? | 16-34 | Is $Y_2Y_2 > Y_1Y_1$ |
| 055 | GSB0 | 23 00 | |
| 056 | STO7 | 35 07 | |
| 057 | RCL6 | 36 06 | |
| 058 | RCL7 | 36 07 | |
| 059 | - | -45 | |
| 060 | 2 | 02 | |
| 061 | ÷ | -24 | |
| 062 | STO8 | 35 08 | $(Y_1Y_1-Y_2Y_2)/2$ |
| 063 | FRC | 16 44 | |
| 064 | 0 | 00 | |
| 065 | X≠Y? | 16-32 | Parity check |
| 066 | ÷ | -24 | |
| 067 | RCL8 | 36 08 | |
| 068 | RCL3 | 36 03 | |
| 069 | x | -35 | Compute years in |
| 070 | RCL7 | 36 07 | excess of the |
| 071 | + | -55 | datum year |
| 072 | 1 | 01 | |
| 073 | - | -45 | $(\frac{Y_1Y_1-Y_2Y_2}{2})\times 12+Y_2Y_2-1$ |
| 074 | 1 | 01 | |
| 075 | 9 | 09 | |
| 076 | 2 | 02 | |
| 077 | 4 | 04 | |
| 078 | + | -55 | |
| 079 | DSP0 | -63 00 | Display YYYY within |
| 080 | RTN | 24 | the machine cycle |
| 081 | *LBLC | 21 13 | (1924-1983) |
| 082 | 6 | 06 | |
| 083 | 0 | 00 | Add 60 years |
| 084 | + | -55 | |
| 085 | RTN | 24 | |
| 086 | *LBLD | 21 14 | |
| 087 | 6 | 06 | |
| 088 | 0 | 00 | |
| 089 | - | -45 | Subtract 60 years. |
| 090 | RTN | 24 | |
| 091 | *LBL0 | 21 00 | |
| 092 | RCL3 | 36 03 | |
| 093 | - | -45 | |
| 094 | RTN | 24 | |
| 095 | R/S | 51 | |

## REGISTERS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | -3176 | 10 | 12 | | y | $Y_1Y_1$ | $Y_2Y_2$ | $(Y_1Y_1-Y_2Y_2)/2$ | Used 39 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| | | | | | |

# Program Description I

**Program Title** Biorhythm – Biological Cycles + Calendar Functions

**Contributor's Name** Rex H. Shudde

**Address** 27105 Arriba Way

**City** Carmel **State** CA **Zip Code** 93921

**Program Description, Equations, Variables**

1. The Julian Day Number is computed using a modification of the routine given by Fliegel & VanFlandern, Comm ACM, 11 (Oct 1968), 657. For Julian Calendar Dates prior to 15 Oct 1582, the Julian Day Number is given by

$$JD_J = \left\lfloor 1461\left(I+4800+\left\lfloor\frac{J-14}{12}\right\rfloor\div 4\right\rfloor + \left\lfloor 30.59\left(J-2-12\left\lfloor\frac{J-14}{12}\right\rfloor\right)\right\rfloor + K - 32113$$

For Gregorian Calendar Dates from 15 Oct 1582, the Julian Day Number is given by $JD_G = JD_J - \left\lfloor 0.75\left[\left(I+100+\left\lfloor\frac{J-14}{12}\right\rfloor\right)\div 100\right]\right\rfloor + 2$

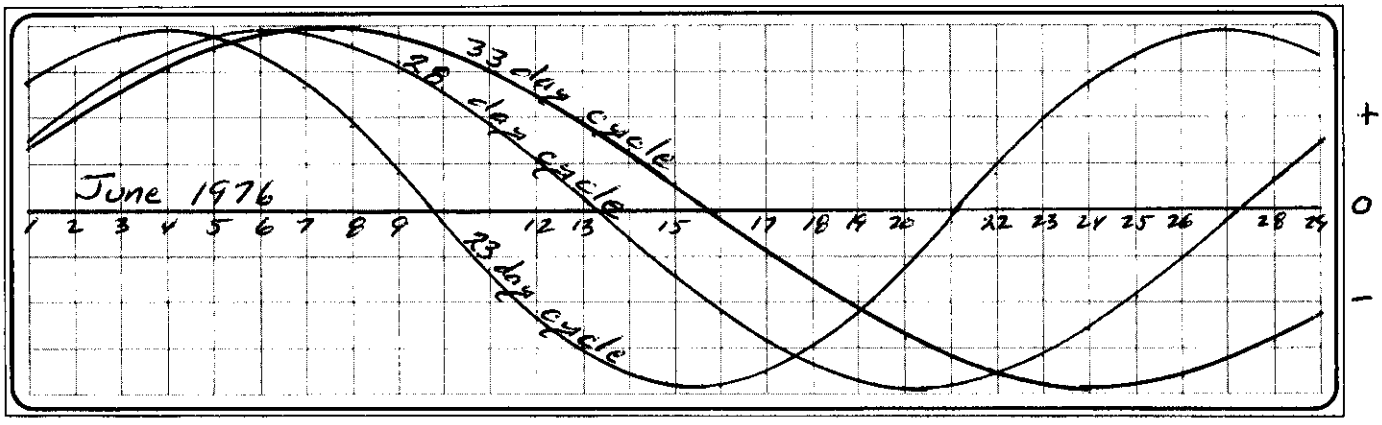
where $I$ = Year, $J$ = month, $K$ = day, and $\lfloor X \rfloor$ is the integer part of $X$.

2. Day-of-week number = JD mod 7
3. For a C-day biorhythm cycle, compute:
   a. "No. of days into cycle" $L = M \bmod C$ where $M = |JD\#2 - JD\#1|$
   b. "Critical Index" $CI = L/C$
   c. Amplitude = $\sin(360\,CI)$
   d. Slope or rate-of-change of cycle = $\cos(360\,CI)$
4. Correction of Julian Day Number for exact time of events: Replace JD by $JD + T/24 + 0.5$ where $T$ is the time of the event in hours.

**Operating Limits and Warnings** For B.C. dates, the following convention must be observed:

| | |
|---|---|
| 3 B.C = −2 | For example, March 27, 935 B.C must |
| 2 B.C = −1 | be entered as −3.270934 (see step |
| 1 B.C = 0 | 2a page 3). The preceding − sign must |
| 1 A.D = 1 | be used for B.C. dates. (From step 2a, obtain |
| 2 A.D = 2 | JD = 1380000.00 for this sample date). |

# Program Description II




**Sample Problem(s)** An individual was born on March 26, 1961 at 1815 hours PST. Find the Julian day number of his birthday and the day of the week. Find the number of days elapsed from his birth until noon PST on June 21, 1976 (also convert this to weeks and days). On June 21, 1976 at noon PST, find how many days of his 23 day-, 28 day-, and 33 day-cycle have elapsed. Also, calculate the "critical index", the amplitude, and the rate-of-change of each of these cycles. The "critical points" are where the cycle cross the zero line, and are easily determined from the "critical index" (the fraction of the cycle which as elapsed). A "critical index" of:

a. less than 0.20 is leaving 0 and going toward +

b. between 0.48 and 0.52 is crossing 0 from + toward -

c. greater than 0.98 is entering 0 from -

Also, a critical index between 0.22 and 0.29 indicates a peak +, and between 0.73 and 0.78 is a trough -.

Graphs may be produced by plotting the amplitude of the cycles (which vary from -1.00 to +1.00) on the vertical axis against the date on the horizontal axis. The date can be incremented by pressing [F] [d] instead of re-entering each new date.

Soln: 3.261961 [A] 2437385.00 (Julian Day Number) [R/S] 6.0 = Sunday. 18.15 [F] [a] 0.26 (fraction of day past previous noon). 6.211976 [B] 2442951.00 (Julian Day Number) [R/S] 0.00 = Monday. [F] [c] 5565.74 = days and fraction of day between the two times. [R/S] 795.07 = 795 weeks ± 0.7 days between dates. 23 day cycle: [C] 22.74 days [R/S] 0.99 = Crit index (See Graph, and part (C) above) [R/S] -0.07 = height of curve [R/S] 1.00 = slope of curve [R/S] Error = R/S pressed once too often [CLX]

28 Bday cycle: [D] 21.74 [R/S] 0.78 [R/S] -0.99 [R/S] 0.17. 33 day cycle: [E] 21.74 [R/S] 0.66 [R/S] -0.84 [R/S] -0.54

**Reference(s)** 1. Thommen, G.S., "Is This Your Day?", Crown Publ. Inc. NY 1973

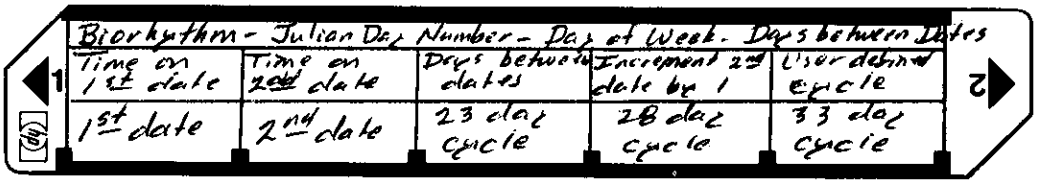
2. O'Neil & Phillips, "Biorhythms. How to Live with Your Life Cycles", Ward Ritchie Press, Pasadena 1975.

3. Gittelson, B. "Biorhythm. A Personal Science", Arco Publ. Co., NY 1975

4. Wallerstein, M.R. & Roberts, N.L., Human Behavior, April 1973, pp 8-15.

# User Instructions






| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Enter program. Dates are entered in the form MM.DDYYYY where MM is the month number, DD is the 2-digit day, and YYYY is the 4-digit day. Note that a decimal point must separate MM and DD. | | | |
| 2a | Enter 1st date | MM.DDYYYY | A | Jul. Day No. |
| b | Compute day of week | | R/S | 0.0 to 6.0 |
| c | Enter time if other than noon (1200 hours) | HH.MMSS | f A | — |
| 3a | Enter 2nd date | MM.DDYYYY | B | Jul. Day No. |
| b | Compute day of week | | R/S | 0.0 to 6.0 |
| c | Enter time if other than noon (1200 hours) | HH.MMSS | f B | — |
| 4 | Any or all of the following steps may be performed. | | | |
| 5a | Compute days between dates | | f C | DDDD.FF |
| b | Convert to weeks (WW), days (D), & fraction of day F | | R/S | WW.DF |
| 6a | Compute days DD & fraction of days FF of 23 day cycle | | C | DD.FF |
| b | Display critical index | | R/S | 0.XX |
| c | Display amplitude of cycle | | R/S | ±X.XX |
| d | Display slope of cycle | | R/S | ±X.XX |
| 7 | 28 day cycle (see step 6) | | D | DD.FF |
| 8 | 33 day cycle (see step 6) | | E | DD.FF |
| 9a | Enter user defined cycle period (eg. 84 days) | 84. | f E | DD.FF |
| | See 6b, c, d for options | | | |
| 10a | Increment 2nd date by one day | | f D | Jul. Day No |
| b | Compute day of week | | R/S | 0.0 to 6.0 |
| 11 | Repeat from Step 4 as desired | | | |
| | Day of week: 0 = Monday | | | |
| | 1 = Tuesday | | | |
| | etc. | | | |
| | * See Warnings pg 1 for B.C. Dates | | | |

# 67 Program Listing I

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | f LBL 9 | 31 25 09 | Set up constants |
| | 1 | 01 | |
| | 2 | 02 | |
| | STO A | 33 11 | |
| | 1 | 01 | |
| | 4 | 04 | |
| | 6 | 06 | |
| | 1 | 01 | |
| | STO 2 | 33 02 | |
| 010 | 4 | 04 | |
| | 8 | 08 | |
| | 0 | 00 | |
| | 0 | 00 | |
| | STO 3 | 33 03 | |
| | 3 | 03 | |
| | 2 | 02 | |
| | 1 | 01 | |
| | 1 | 01 | |
| | 3 | 03 | |
| 020 | STO 4 | 33 04 | |
| | 1 | 02 | |
| | 2 | 02 | |
| | 9 | 09 | |
| | 9 | 09 | |
| | 1 | 01 | |
| | 7 | 07 | |
| | 0 | 00 | |
| | STO 5 | 33 05 | |
| | EEX | 43 | |
| 030 | 2 | 02 | |
| | STO 6 | 33 06 | |
| | EEX | 43 | |
| | 4 | 04 | |
| | STO 7 | 33 07 | |
| | 3 | 03 | |
| | 6 | 06 | |
| | 0 | 00 | |
| | h STI | 35 33 | |
| | RTN | 35 22 | |
| 040 | f LBL 0 | 31 25 00 | Unpack date and generate Julian Day Number |
| | ↑ | 41 | |
| | h ABS | 35 64 | |
| | ÷ | 81 | |
| | STO 8 | 33 08 | |
| | h LSTX | 35 82 | |
| | ↑ | 41 | |
| | f INT | 33 83 | |
| | STO C | 33 13 | |
| | − | 51 | |
| 050 | RCL 6 | 34 06 | |
| | X | 71 | |
| | ↑ | 41 | |
| | f INT | 31 83 | |
| | STO D | 33 14 | |
| | − | 51 | |
| | RCL 7 | 34 07 | |
| | X | 71 | |
| | RCL 8 | 34 08 | |
| | X | 71 | |
| 060 | RCL C | 34 13 | |
| | 1 | 01 | |
| | 4 | 04 | |
| | − | 51 | |
| | RCL A | 34 11 | |
| | ÷ | 81 | |
| | f INT | 31 83 | |
| | STO 9 | 33 09 | |
| | + | 61 | |
| | STO 8 | 33 08 | |
| 070 | RCL 3 | 34 03 | |
| | + | 61 | |
| | RCL 2 | 34 02 | |
| | X | 71 | |
| | 4 | 04 | |
| | ÷ | 81 | |
| | f INT | 31 83 | |
| | RCL C | 34 13 | |
| | 2 | 02 | |
| | − | 51 | |
| 080 | RCL 9 | 34 09 | |
| | RCL A | 34 11 | |
| | X | 71 | |
| | − | 51 | |
| | 3 | 03 | |
| | 0 | 00 | |
| | . | 83 | |
| | 5 | 05 | |
| | 9 | 09 | |
| | X | 71 | |
| 090 | f INT | 31 83 | |
| | + | 61 | |
| | RCL D | 34 14 | |
| | + | 61 | |
| | RCL 4 | 34 04 | |
| | − | 51 | |
| | RCL 5 | 34 05 | |
| | h X≥Y | 35 52 | |
| | g X≤Y | 32 71 | |
| | RTN | 35 22 | Return from Julian Calendar |
| 100 | RCL 8 | 34 08 | |
| | RCL 6 | 34 06 | Continue for Gregorian Calendar |
| | + | 61 | |
| | h LSTX | 35 82 | |
| | ÷ | 81 | |
| | f INT | 31 83 | |
| | . | 83 | |
| | 7 | 07 | |
| | 5 | 05 | |
| | X | 71 | |
| 110 | f INT | 31 83 | |
| | − | 51 | |
| | 2 | 02 | |

**REGISTERS**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| JD#1 | JD#2 | 1461 | 4800 | 32113 | 2299170 | 100 | 1000 | I/YYY | [J−14/12] |
| S0 | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 |

| A | B | C | D | E | I |
|---|---|---|---|---|---|
| 12 | | J/MM | K/DD | Cycle length | 360 |

# 67 Program Listing II



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | + | 61 | |
| | RTN | 3522 | |
| | ƒLBL 3 | 31 25 03 | Stop and error routine |
| | R/S | 84 | |
| | 0 | 00 | |
| | ÷ | 81 | |
| | GTO 3 | 22 03 | |
| 120 | ƒLBL A | 31 25 11 | Generate first Julian Day Number |
| | STO 0 | 33 00 | |
| | hF? 2 | 35 71 02 | |
| | ƒGSB 9 | 31 22 09 | |
| | RCL 0 | 34 00 | |
| | ƒGSB 0 | 31 22 00 | |
| | STO 0 | 33 00 | |
| | R/S | 84 | |
| | GTO 5 | 22 05 | |
| | ƒLBL B | 31 25 12 | Input 2nd date & generate 2nd Julian Day Number |
| 130 | STO 1 | 33 01 | |
| | hF? 2 | 35 71 02 | |
| | ƒGSB 9 | 31 22 09 | |
| | RCL 1 | 34 01 | |
| | ƒGSB 0 | 31 22 00 | |
| | STO 1 | 33 01 | |
| | R/S | 84 | |
| | ƒLBL 5 | 31 25 05 | Set up for day of week |
| | 7 | 07 | |
| | STO E | 33 15 | |
| 140 | h RX | 35 53 | |
| | GTO 4 | 22 04 | |
| | ƒLBL C | 31 25 13 | Set up for 23-day cycle |
| | 2 | 02 | |
| | 3 | 03 | |
| | STO E | 33 15 | |
| | GTO 1 | 22 01 | |
| | ƒLBL D | 31 25 14 | Setup for 28-day cycle |
| | 2 | 02 | |
| | 8 | 08 | |
| 150 | STO E | 33 15 | |
| | GTO 1 | 22 01 | |
| | ƒLBL E | 31 25 15 | Setup for 33-day cycle |
| | 3 | 03 | |
| | 3 | 03 | |
| | STO E | 33 15 | |
| | ƒLBL 1 | 31 25 01 | Generate # of elapsed days in X-register |
| | RCL 0 | 34 00 | |
| | RCL 1 | 34 01 | |
| | − | 51 | |
| 160 | h ABS | 35 64 | |
| | ƒLBL 4 | 31 25 04 | Compute # of days into cycle |
| | ↑ | 41 | |
| | ↑ | 41 | |
| | RCL E | 34 15 | |
| | ÷ | 81 | |
| | ƒINT | 31 83 | |
| | RCL E | 34 15 | |
| | X | 71 | |

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| | − | 51 | |
| 170 | R/S | 84 | displine |
| | RCL E | 34 15 | Critical Index |
| | ÷ | 81 | |
| | R/S | 84 | |
| | h RC I | 3534 | |
| | X | 71 | |
| | 1 | 01 | |
| | ƒ R↓ | 31 72 | |
| | h X≷Y | 3552 | Amplitude |
| | R/S | 84 | |
| 180 | h X≷Y | 3552 | Slope |
| | GTO 3 | 2203 | |
| | ƒLBL a | 32 25 11 | Time entered for 1st date |
| | ƒGSB 2 | 31 22 02 | |
| | STO+0 | 33 61 00 | |
| | GTO 3 | 22 03 | |
| | ƒLBL b | 32 25 12 | Time entered for 2nd date |
| | ƒGSB 2 | 31 22 02 | |
| | STO+1 | 33 61 01 | |
| | GTO 3 | 23 03 | |
| 190 | ƒLBL 2 | 31 25 02 | Convert time to proper fraction of a Julian date |
| | ƒH↓ | 31 74 | |
| | RCL A | 34 11 | |
| | − | 51 | |
| | 2 | 02 | |
| | 4 | 04 | |
| | ÷ | 81 | |
| | RTN | 3522 | |
| | ƒLBL c | 32 25 13 | Compute days between dates & displac. Compute weeks, days, & fraction of day WWWWD.DF |
| | RCL 0 | 34 00 | |
| 200 | RCL 1 | 34 01 | |
| | − | 51 | |
| | h ABS | 35 64 | |
| | R/S | 84 | |
| | 7 | 07 | |
| | ÷ | 81 | |
| | ƒINT | 31 83 | |
| | h LSTX | 35 82 | |
| | ƒFRAC | 32 83 | |
| | . | 83 | |
| 210 | 7 | 07 | |
| | X | 71 | |
| | + | 61 | |
| | GTO 3 | 22 03 | |
| | ƒLBL d | 32 25 14 | Increment 2nd Julian Day Number |
| | RCL 1 | 34 01 | |
| | 1 | 01 | |
| | + | 61 | |
| | STO 1 | 33 01 | |
| | R/S | 84 | |
| 220 | GTO 5 | 22 05 | |
| | ƒLBL e | 32 25 15 | Set up for user cycle |
| | STO E | 33 15 | |
| | GTO 1 | 22 01 | |
| | R/S | 84 | |

**LABELS**

| | | | | |
|---|---|---|---|---|
| A ✓ | B ✓ | C ✓ | D ✓ | E ✓ |
| a ✓ | b ✓ | c ✓ | d ✓ | e ✓ |
| 0 ✓ | 1 ✓ | 2 ✓ | 3 ✓ | 4 ✓ |
| 5 ✓ | 6 | 7 | 8 | 9 ✓ |

**FLAGS**

| |
|---|
| 0 |
| 1 |
| 2 ✓ |
| 3 |

**SET STATUS**

| FLAGS | | | TRIG | DISP | |
|---|---|---|---|---|---|
| | ON | OFF | | | |
| 0 | ☐ | ☑ | DEG ☑ | FIX ☑ | |
| 1 | ☐ | ☑ | GRAD ☐ | SCI ☐ | |
| 2 | ☑ | ☐ | RAD ☐ | ENG ☐ | |
| 3 | ☐ | ☑ | | n 2 | |

# Program Description I

| | | | | | |
|---|---|---|---|---|---|
| **Program Title** | NEW MOON AND FULL MOON DAY OF MONTH | | | | FAL-50 |
| **Contributor's Name** | Fred A. Lummus, P.E. | | | | |
| **Address** | Route 2 Box 84 | | | | |
| **City** | Greenville | **State** | Texas | **Zip Code** | 75401 |

**Program Description, Equations, Variables** This program follows an empirical algorithm published in a recent 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 a 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 from a single input. The only restriction is due to the input format of the month and year, all dates in B.C. had to be deleted.

**Operating Limits and Warnings** Input interger years only. Output range is from o-30; thus 0 indicates that new moon occurs on the last day of the previous month; the 30th of February is either March 1st or 2nd. The Julian Calender applies to dates prior to 1582; the Gregorian thereafter. Dates are limited to A.D. only.

Out of over 300 dates tested, 62% were correct, 37% were off by one day, and less than 1% were two days in error.

# Program Description 11

**Sketch(es)**

| R | | L | | | M | |
|---|---|---|---|---|---|---|
| 9 | | 9 | 19 | 29 | 0 | March |
| 25 | 17 | 28 | 8 | 18 | 2 | April |
| 10 | 3 | 17 | 27 | 7 | 2 | May |
| 26 | 19 | 6 | 16 | 26 | 4 | June |
| 12 | 4 | 25 | 5 | 15 | 4 | July |
| 28 | 20 | 14 | 24 | 4 | 6 | August |
| 13 | 6 | 3 | 13 | 23 | 7 | September |
| 29 | 22 | 22 | 2 | 12 | 8 | October |
| 15 | 7 | 11 | 21 | 1 | 9 | November |
| 1 | 23 | 30 | 10 | 20 | 10 | December |
| | | | | | 11 | January |
| | | | | | 12 | February |

**Sample Problem(s)**

(1) Find the date of the New Moon in:

July 1974

February 1963

May 1970

(2) Find the date of the Full Moon in:

July 1974

March 1963

November 1966

**Solution(s)**

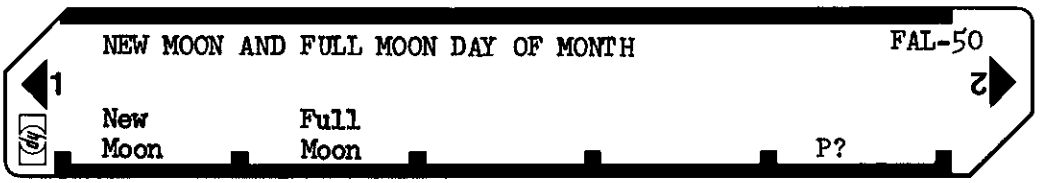
| | | | | | |
|---|---|---|---|---|---|
| (1) | 7.1974 | [A] → | 7.1974 | *** | |
| | | | 7.191974 | *** | Date is correct. |
| | 2.1963 | [A] → | 2.1963 | *** | |
| | | | 2.231963 | *** | Correct date is February 24. |
| | 5.1970 | [A] → | 5.1970 | *** | |
| | | | 5.051970 | *** | Date is correct. |
| (2) | 7.1974 | [B] → | 7.1974 | *** | |
| | | | 7.041974 | *** | Date is correct. |
| | 3.1963 | [B] → | 3.1963 | *** | |
| | | | 3.101963 | *** | Date is correct. |
| | 11.1969 | [B] → | 11.1969 | *** | |
| | | | 11.241969 | *** | Correct date is November 23. |

**Reference(s)**

Harvey, O.L., A THUMBNAIL ALMANAC FOR THE MOON, Sky & Telescope, Vol. 47, No. 6, June 1974, p. 384.

Vanderburgh, Richard G., "New Moon Day of Month", HP-65 Users' Library Program 00908A

# User Instructions




| STEP | INSTRUCTIONS | INPUT DATA/UNITS | KEYS | OUTPUT DATA/UNITS |
|---|---|---|---|---|
| 1 | Load Side 1 and Side 2 | | | |
| 2 | Load Data Tape ( or ) | .0925102612 | STO 0 | |
| | | .2813291501 | STO 1 | |
| | | .1703190420 | STO 2 | |
| | | .06220723 | STO 3 | |
| | | .11130002 | STO 4 | |
| | | .02040406 | STO 5 | |
| | | .07080910 | STO 6 | |
| | | | f P⇄S | |
| | | .301020 | STO 0 | |
| | | .112101 | STO 1 | |
| | | .220212 | STO 2 | |
| | | .031323 | STO 3 | |
| | | .142404 | STO 4 | |
| | | .250515 | STO 5 | |
| | | .061626 | STO 6 | |
| | | .172707 | STO 7 | |
| | | .280818 | STO 8 | |
| | | .091929 | STO 9 | |
| | | | f P⇄S | |
| | | | | |
| 3 | Select Print Option 1.00 yes/0.00 no | | E | 1.00/0.00 |
| | | | | |
| 4 | For Date of New Moon, input month and year | mm.yyyy | A | $Date_N$ |
| | | | | |
| 5 | For Date of Full Moon, input month and year | mm.yyyy | B | $Date_F$ |

# 97 Program Listing I



| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 001 | *LBL B | 21 12 | |
| 002 | SF2 | 16 21 02 | **Full Moon** |
| 003 | *LBL A | 21 11 | **New Moon** |
| 004 | DSP4 | -63 04 | |
| 005 | F0? | 16 23 00 | |
| 006 | PRTX | -14 | |
| 007 | INT | 16 34 | |
| 008 | STO A | 35 11 | **Print and Store Input** |
| 009 | LSTX | 16-63 | |
| 010 | FRC | 16 44 | |
| 011 | STO C | 35 13 | |
| 012 | EEX | -23 | |
| 013 | 4 | 04 | |
| 014 | × | -35 | |
| 015 | STO B | 35 12 | |
| 016 | 2 | 02 | |
| 017 | RCL A | 36 11 | **Check for Jan or Feb** |
| 018 | X≤Y? | 16-35 | |
| 019 | GSB 0 | 23 00 | |
| 020 | RCL E | 36 12 | |
| 021 | *LBL 1 | 21 01 | |
| 022 | 0 | 00 | |
| 023 | STO 7 | 35 07 | **Check for year before 1582** |
| 024 | 1 | 01 | |
| 025 | 5 | 05 | |
| 026 | 8 | 08 | |
| 027 | 2 | 02 | |
| 028 | RCL B | 36 12 | |
| 029 | X≤Y? | 16-35 | |
| 030 | GTO 3 | 22 03 | |
| 031 | 1 | 01 | |
| 032 | 3 | 03 | |
| 033 | STO 7 | 35 07 | **Check for Year after 1582** |
| 034 | 1 | 01 | |
| 035 | 5 | 05 | |
| 036 | 8 | 08 | |
| 037 | 0 | 00 | |
| 038 | STO D | 35 14 | |
| 039 | *LBL 2 | 21 02 | |
| 040 | RCL B | 36 12 | |
| 041 | RCL D | 36 14 | |
| 042 | X≤Y? | 16-35 | |
| 043 | GTO 3 | 22 03 | |
| 044 | EEX | -23 | |
| 045 | 2 | 02 | |
| 046 | - | -45 | |
| 047 | STO D | 35 14 | |
| 048 | 1 | 01 | |
| 049 | ST-7 | 35-45 07 | |
| 050 | GTO 2 | 22 02 | |
| 051 | *LBL 3 | 21 03 | |
| 052 | RCL B | 36 12 | **Calculate Julian Year** |
| 053 | 4 | 04 | |
| 054 | 7 | 07 | |
| 055 | 1 | 01 | |
| 056 | 2 | 02 | |

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 057 | + | -55 | |
| 058 | 7 | 07 | |
| 059 | 6 | 06 | |
| 060 | ÷ | -24 | |
| 061 | INT | 16 34 | |
| 062 | STO D | 35 14 | |
| 063 | LSTX | 16-63 | |
| 064 | FRC | 16 44 | |
| 065 | 7 | 07 | |
| 066 | 6 | 06 | |
| 067 | × | -35 | |
| 068 | RND | 16 24 | |
| 069 | 4 | 04 | |
| 070 | ÷ | -24 | |
| 071 | INT | 16 34 | |
| 072 | STO E | 35 15 | |
| 073 | LSTX | 16-63 | ← **Entry Point to Table R** |
| 074 | FRC | 16 44 | |
| 075 | 4 | 04 | |
| 076 | × | -35 | |
| 077 | STO 6 | 35 06 | |
| 078 | RCL D | 36 14 | ← **Difference in Table L** |
| 079 | 4 | 04 | |
| 080 | ÷ | -24 | |
| 081 | INT | 16 34 | |
| 082 | ST-7 | 35-45 07 | |
| 083 | RCL E | 36 15 | |
| 084 | 5 | 05 | |
| 085 | ÷ | -24 | |
| 086 | STO I | 35 46 | |
| 087 | FRC | 16 44 | |
| 088 | 1 | 01 | |
| 089 | 0 | 00 | |
| 090 | × | -35 | |
| 091 | STO 9 | 35 09 | |
| 092 | GSB 9 | 23 09 | |
| 093 | STO E | 35 15 | ← **Number from Table R** |
| 094 | 1 | 01 | |
| 095 | 0 | 00 | |
| 096 | ÷ | -24 | |
| 097 | FRC | 16 44 | |
| 098 | 1 | 01 | |
| 099 | 0 | 00 | |
| 100 | × | -35 | |
| 101 | LSTX | 16-63 | |
| 102 | + | -55 | |
| 103 | STO I | 35 46 | |
| 104 | 0 | 00 | |
| 105 | STO 9 | 35 09 | **Search for Number from Table R in Table L** |
| 106 | GSB 9 | 23 09 | |
| 107 | RCL E | 36 15 | |
| 108 | X=Y? | 16-33 | |
| 109 | GTO 8 | 22 08 | |
| 110 | 2 | 02 | |
| 111 | ST+ 9 | 35-55 09 | |
| 112 | GSB 9 | 23 09 | |

**REGISTERS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 Table R | 1 Table R | 2 Table R | 3 Table R | 4 Table M | 5 Table M | 6 Table M | 7 Days | 8 L No. | 9 Control |
| S0 Table L | S1 Table L | S2 Table L | S3 Table L | S4 Table L | S5 Table L | S6 Table L | S7 Table L | S8 Table L | S9 Table L |

| | | | | | |
|---|---|---|---|---|---|
| A Month | B Y or Y−1 | C .yyyy | D 1900 or less | E R No. | I Control |

# 97 Program Listing II

| STEP | KEY ENTRY | KEY CODE | COMMENTS |
|---|---|---|---|
| 113 | RCLE | 36 15 | |
| 114 | X=Y? | 16-33 | |
| 115 | GTO8 | 22 08 | |
| 116 | 2 | 02 | |
| 117 | ST+9 | 35-55 09 | |
| 118 | GSB9 | 23 09 | |
| 119 | *LBL8 | 21 08 | |
| 120 | RCLI | 36 46 | |
| 121 | RCL8 | 36 08 | Count down in table L by difference from step 77 |
| 122 | - | -45 | |
| 123 | 1 | 01 | |
| 124 | 0 | 00 | |
| 125 | X>Y? | 16-34 | |
| 126 | GTO6 | 22 06 | |
| 127 | R↓ | -31 | |
| 128 | STOI | 35 46 | |
| 129 | *LBL7 | 21 07 | |
| 130 | GSB9 | 23 09 | |
| 131 | ST+7 | 35-55 07 | |
| 132 | RCLA | 36 11 | ← Number from Table L |
| 133 | 1 | 01 | |
| 134 | - | -45 | |
| 135 | 4 | 04 | |
| 136 | ÷ | -24 | |
| 137 | 4 | 04 | |
| 138 | + | -55 | |
| 139 | STOI | 35 46 | |
| 140 | FRC | 16 44 | |
| 141 | 8 | 08 | |
| 142 | × | -35 | |
| 143 | STO9 | 35 09 | |
| 144 | GSB9 | 23 09 | ← Number from Table M |
| 145 | ST-7 | 35-45 07 | |
| 146 | F2? | 16 23 02 | Check for Full Moon inquiry |
| 147 | GSBe | 23 16 15 | |
| 148 | RCL7 | 36 07 | |
| 149 | 3 | 03 | Check date for range between 0 and 30 |
| 150 | 0 | 00 | |
| 151 | X≤Y? | 16-35 | |
| 152 | GSB5 | 23 05 | |
| 153 | 0 | 00 | |
| 154 | RCL7 | 36 07 | |
| 155 | X>Y? | 16-34 | |
| 156 | GTO4 | 22 04 | |
| 157 | 3 | 03 | |
| 158 | 0 | 00 | |
| 159 | RCL7 | 36 07 | |
| 160 | + | -55 | |
| 161 | GTO4 | 22 04 | |
| 162 | *LBL5 | 21 05 | |
| 163 | - | -45 | |
| 164 | RTN | 24 | |
| 165 | *LBL0 | 21 00 | |
| 166 | RCLB | 36 12 | |
| 167 | 1 | 01 | |
| 168 | - | -45 | |
| 169 | STOB | 35 12 | |
| 170 | RTN | 24 | |
| 171 | *LBL9 | 21 09 | |
| 172 | RCL9 | 36 09 | |
| 173 | $10^x$ | 16 33 | Obtain appropriate Number from selected register |
| 174 | RCLi | 36 45 | |
| 175 | × | -35 | |
| 176 | FRC | 16 44 | |
| 177 | EEX | -23 | |
| 178 | 2 | 02 | |
| 179 | × | -35 | |
| 180 | INT | 16 34 | |
| 181 | RTN | 24 | |
| 182 | *LBL6 | 21 06 | |
| 183 | + | -55 | |
| 184 | STOI | 35 46 | Check for return to start of table L |
| 185 | 5 | 05 | |
| 186 | RCL9 | 36 09 | |
| 187 | 2 | 02 | |
| 188 | + | -55 | |
| 189 | X>Y? | 16-34 | |
| 190 | 0 | 00 | |
| 191 | STO9 | 35 09 | |
| 192 | GTO7 | 22 07 | |
| 193 | *LBL4 | 21 04 | |
| 194 | EEX | -23 | Complete Calculations for day of month into mm.ddyyyy display |
| 195 | 2 | 02 | |
| 196 | ÷ | -24 | |
| 197 | RCLC | 36 13 | |
| 198 | LSTX | 16-63 | |
| 199 | ÷ | -24 | |
| 200 | + | -55 | |
| 201 | RCLA | 36 11 | |
| 202 | + | -55 | |
| 203 | DSP6 | -63 06 | |
| 204 | F0? | 16 23 00 | |
| 205 | PRTX | -14 | |
| 206 | RTN | 24 | |
| 207 | *LBLE | 21 15 | |
| 208 | F0? | 16 23 00 | Print Option |
| 209 | GTOa | 22 16 11 | |
| 210 | SF0 | 16 21 00 | |
| 211 | 1 | 01 | |
| 212 | RTN | 24 | |
| 213 | *LBLa | 21 16 11 | |
| 214 | CF0 | 16 22 00 | |
| 215 | CLX | -51 | |
| 216 | RTN | 24 | |
| 217 | *LBLe | 21 16 15 | Add for full Moon Inquiry |
| 218 | 1 | 01 | |
| 219 | 5 | 05 | |
| 220 | ST+7 | 35-55 07 | |
| 221 | RTN | 24 | |

## LABELS

| | | | | | |
|---|---|---|---|---|---|
| A New | B Full | C | D | E Print | 0 Print |
| a No Print | b | c | d | e Full Moon | 1 ——— |
| 0 Y−1 | Determine y | 2 Repeat | 3 Calc | 4 Display | 2 Full |
| 5 −30 | 6 Move to next Col | 7 Calc Day | 8 Table L | 9 Select No. | 3 ——— |

## FLAGS

| | ON | OFF |
|---|---|---|
| 0 | ☐ | ☒ |
| 1 | ☐ | ☒ |
| 2 | ☐ | ☒ |
| 3 | ☐ | ☒ |

## SET STATUS

**TRIG**

DEG ☒
GRAD ☐
RAD ☐

**DISP**

FIX ☒
SCI ☐
ENG ☐
n 4

# NOTES

NOTES

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CALENDAR DATE/JULIAN DATA CONVERSION

DAYS TO DATES AND DATES TO DAYS; DAY OF WEEK

DAY OF YEAR - DAY OF WEEK

NUMBER OF WEEKDAYS BETWEEN TWO DATES

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

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

HOLIDAYS

EASTER - ASH WEDNESDAY - RELIGIOUS HOLIDAYS

COMPLETE MAYA CALENDAR

MOHAMMEDAN (ISLAM) - GREGORIAN CALENDAR CONVERSION

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