

Source File: lab36.asm
Input: Standard Input
Output: Standard Output
Value: 4

A procedure for determining the date of Easter is as follows:

Divide	by	Quotient	Remainder
the year x	19		a
the year x	100	b	c
b	4	d	e
$b + 8$	25	f	
$b - f + 1$	3	g	
$19a + b - d - g + 15$	30		h
c	4	i	k
$32 + 2e + 2i - h - k$	7		l
$a + 11h + 22l$	451	m	
$h + l - 7m + 114$	31	n	p

Then

n = number of the month (3 = March, 4 = April),

$p + 1$ = day of that month upon which Easter Sunday falls.

This method is valid for all years in the Gregorian calendar; that is, for all years later than 1582.

Write an assembly language procedure that implements the algorithm described above for determining the date of Easter Sunday for a given year. The input will consist of a single integer that represents the year for which the date of Easter Sunday is to be determined. You may assume that the year is valid; that is, it is greater than 1582. The format of the output is shown below.

A prototype of the procedure as well as client code for testing your implementation is shown in Figure 1, and a sample execution sequence is shown in Figure 2. To use the Makefile as distributed in class, add a target of lab36 to targets2AsmFiles.

```

1  [list -]
2  %INCLUDE "Along32.inc"
3  %INCLUDE "Macros_Along.inc"
4  [list +]
5
6  ;-----
7  extern  EasterSunday
8  ; HLL prototype:
9  ;   void EasterSunday(uint year);
10 ; Receives an unsigned 32-bit integer representing a year.
11 ; Determines the date of Easter Sunday in year. The date is written
12 ; to stdout.
```

Figure 1. /usr/local/3304/src/lab36main.asm (Part 1 of 2)

```

13 ; Receives: EAX = year
14 ; Returns: Nothing
15 ;-----
16
17 SECTION .data
18 hrule   times 25 db ('-')
19         db    10,0
20 header  times 2 db ' '
21         db    'Year   Easter Sunday',10,0
22
23 SECTION .bss
24 h       resd  1
25
26 SECTION .text
27         global _start
28 _start:
29         call  ReadDec           ; read an unsigned integer
30         mov   [h],eax          ; move the integer to h
31
32         mov   edx,hrule        ; write hrule
33         call  WriteString
34         mov   edx,header       ; write headings
35         call  WriteString
36         mov   edx,hrule        ; write hrule
37         call  WriteString
38
39 .L0:
40         cmp   dword [h],0      ; while h > 0 do
41         jle   .L1
42
43         call  ReadDec           ; read an unsigned int
44         call  EasterSunday
45
46         dec   dword [h]        ; decrement h
47         jmp   .L0              ; end while
48 .L1:
49         mov   edx,hrule        ; write hrule
50         call  WriteString
51
52         Exit   {0}

```

Figure 1. /usr/local/3304/src/lab36main.asm (Part 2 of 2)

```
1 newuser@csunix ~/3304/36> cp /usr/local/3304/data/36/* .
2 newuser@csunix ~/3304/36> cp /usr/local/3304/src/Makefile .
3 newuser@csunix ~/3304/36> cp /usr/local/3304/src/lab36main.asm .
4 newuser@csunix ~/3304/36> touch lab36.asm
5 newuser@csunix ~/3304/36> make
6 nasm -f elf32 -l lab36main.lst -o lab36main.o lab36main.asm -I/usr/local/3304/include/ -I.
7 nasm -f elf32 -l lab36.lst -o lab36.o lab36.asm -I/usr/local/3304/include/ -I.
8 ld -m elf_i386 --dynamic-linker /lib/ld-linux.so.2 -o lab36 lab36main.o lab36.o \
9 /usr/local/3304/src/Along32.o -lc
10 newuser@csunix ~/3304/36> ../irvine_test.sh lab36 01.dat
11 -----
12 Year      Easter Sunday
13 -----
14 2024      March 31
15 2025      April 20
16 2026      April 5
17 2027      March 28
18 2028      April 16
19 2029      April 1
20 2030      April 21
21 2031      April 13
22 2032      March 28
23 2033      April 17
24 2034      April 9
25 -----
26 newuser@csunix ~/3304/36> ../irvine_test.sh lab36 01.dat > my.out
27 newuser@csunix ~/3304/36> diff 01.out my.out
28 newuser@csunix ~/3304/36>
```

Figure 2. Commands to Assemble, Link, & Run Lab 36