



In this application for Unit 3 you will be developing a program that can tell the user in what sign of the zodiac an entered date lies.

Objectives:

- Work with date conversions.
- Use **If** statements to determine the sign of the zodiac for a given date.
- Work with **String** variables.

The Zodiac

In astronomy and astrology the **zodiac** is a division of the sky into 12 equal regions. The regions are named by the constellations that are approximately within these regions. The Babylonians developed this division around 1,000–500 B.C. They began their calendar year with the vernal equinox (the first day of Spring), hence the first sign of the zodiac is Aries and covers the period from March 21 to April 20.

Teacher Tip: The Zodiac is a legitimate astronomical convention as well as an astrological one. Students can research the Zodiac online.

The Program

In this lesson we'll write a program that lets a user enter a month and a day and then the program displays the sign of the zodiac for that date. This program utilizes many **If...Then** statements.

The user will enter the month number and day number according to our calendar, and the program will convert the date into the Babylonian format (March = 1, April = 2, ... , January = 11, February = 12). The tests for each sign can be complex. For example:

If (M=1 and D>20) or (M=2 and D<21)

To simplify the programming we'll develop a single numeric value (a *code*) to represent the dates. This code makes it easier to write the **If** statements rather than have to deal with more complex expressions involving **ands** and **ors**.

Teacher Tip: Writing pseudocode is a form of programming that does not depend on any particular programming language. Writing in pseudocode first means that the programmer can then implement the algorithm in any programming language.

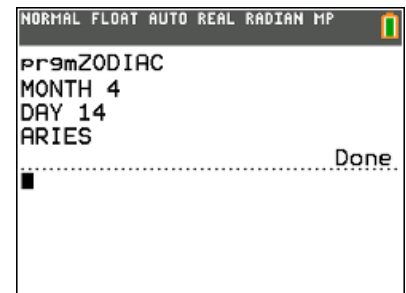
Pseudocode

When developing a large program it is often helpful to start with a plain-English outline of the program. This is called 'pseudocode' because it is not written using a specific programming language. The outline is written in a way that makes it easy to convert to a programming language later on.

Here's an outline (pseudocode) of the zodiac program:

PROGRAM: ZODIAC

Enter the Month	user enters a number from 1 to 12
Enter the Day	user enters a number from 1 to 31





(The zodiac signs begin with Aries so we make March the first month and January and February are months 11 and 12.)

Subtract 2 from the Month.

If the Month is less than 1 then add 12 to the Month.

Create a one-number Code for the date (combine Month and Day into one number, the *Code*, whose first one or two digits are the month and whose last two digits are the day). We accomplish this by multiplying the month by 100 and add the day. For example: July 4 is Babylonian Month 5, Day 4 so the Code is $100 \cdot 5 + 4 = 504$.

Teacher Tip: When we multiply a number by 100 we add two zeros to the end of the number. Then, when adding the day value, the leftmost 1 or 2 digits are the month and the day is the right two digits. This puts the date into a neat numerical form for comparison to the zodiac signs boundary dates.

Multiply the Month by 100 and add the Day and then store the result in the Code variable.

Teacher Tip: String variables store a collection of characters (words) rather than numbers. The TI-84 Plus CE has ten special variables that can store strings. See the notes later in this document.

Store "Invalid" in a **String*** variable. This variable will be used later to display the sign or the word *Invalid*. See ***Strings** below.

Now check to see in which zodiac sign the Code belongs:

if Code ≥ 121 and Code ≤ 220 *this represents the days from March 21 to April 20*

then

 store "Aries" in the string variable **Note the quotation marks!**

end

Write one of these structures for each of the twelve signs of the zodiac.

After the 12 **If** structures the string variable will contain either "INVALID" or one of the signs, so...

Display the string variable.

Here are the dates for each sign:

- Aries: March 21–April 20
- Taurus: April 21–May 21
- Gemini: May 22–June 21
- Cancer: June 22–July 22
- Leo: July 23–August 22
- Virgo: August 23–September 23
- Libra: September 24–October 23
- Scorpio: October 24–November 22
- Sagittarius: November 23–December 21
- Capricorn: December 22–January 20
- Aquarius: January 21–February 19
- Pisces: February 20–March 20

```

NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM: ZODIAC
:
:
: If C≥121 and C≤220
: Then
: "ARIES"→Str1
: End
:
:
:

```



10 Minutes of Code

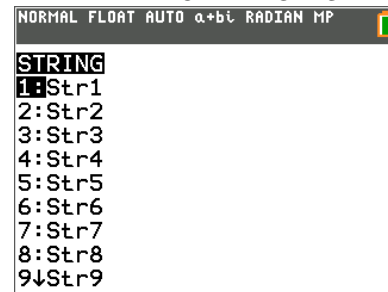
TI-84 PLUS FAMILY

UNIT 3: APPLICATION

TEACHER NOTES

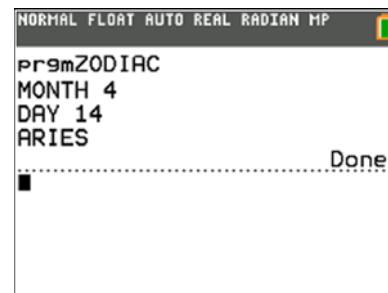
*Strings

This program stores a *string of characters* such as "INVALID" in a **String** variable. The TI-84 has 10 string variables for you to use. To access these variable names press the **[VARS]** key and select the **String...** menu. Be sure to use only one string variable for all the signs of the zodiac.



Your Task

Write the program **ZODIAC** that meets the above specifications. The program should produce something like what is displayed here.



Caution: *Pisces* takes a special condition!

Extension:

The program does not check to see if the month and day entered are legal dates. Add **If** statements after the input section to make sure that the values entered are 'legal'.

Tip: Remember, some months have 30 days, some have 31, and one has only 29. Also, there is no month 13 or 14. See what happens if you enter 14 for the month.

Sample Answer (without the 'extension'):

PROGRAM: ZODIAC

©2015 Texas Instruments Incorporated

If C≥623 and C≤723



10 Minutes of Code

TI-84 PLUS FAMILY

Input "MONTH ",M

Input "DAY ",D

M-2→M

If M<1

Then

M+12→M

End

100M+D→C

"INVALID"→Str1

If $C \geq 121$ and $C \leq 220$

Then

"ARIES"→Str1

End

If $C \geq 221$ and $C \leq 321$

Then

"TAURUS"→Str1

End

If $C \geq 322$ and $C \leq 421$

Then

"GEMINI"→Str1

End

If $C \geq 422$ and $C \leq 522$

Then

"CANCER"→Str1

End

If $C \geq 523$ and $C \leq 622$

Then

"LEO"→Str1

End

Then

"VIRGO"→Str1

End

If $C \geq 724$ and $C \leq 823$

Then

"LIBRA"→Str1

End

If $C \geq 824$ and $C \leq 922$

Then

"SCORPIO"→Str1

End

If $C \geq 923$ and $C \leq 1021$

Then

"SAGITTARIUS"→Str1

End

If $C \geq 1022$ and $C \leq 1120$

Then

"CAPRICORN"→Str1

End

If ($C \geq 1121$ and $C \leq 1219$)

Then

"AQUARIUS"→Str1

End

If ($C \geq 1219$ and $C \leq 1229$) or ($C \geq 101$ and $C \leq 120$)

Then

"PISCES"→Str1

End

Disp Str1

UNIT 3: APPLICATION

TEACHER NOTES