**Unit 3:** **Application: ZODIAC**

In this Application for Unit 3, you will learn about the signs of the zodiac and write a program that will tell your sign. Skill Builders for Unit 3 should be completed prior to this activity.

**Objectives:**

- Use *If… Then… ElseIf… Then…Else… EndIf* in a program
- Work with date conversions (**dbd**( ) function)

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**Teacher Tip:** The **zodiac** is a legitimate astronomical convention as well as an astrological one. For additional information about the signs of the zodiac and constellations, see https://spaceplace.nasa.gov/starfinder2/en/. Students can research the zodiac online.

**The Zodiac**

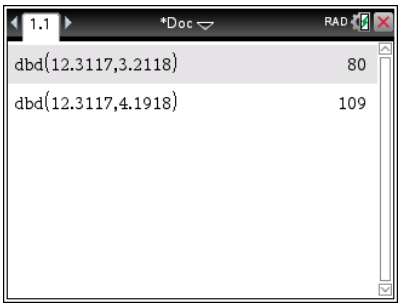
In astronomy and astrology, the **zodiac** is a division of the sky into 12 equal regions. The regions are named by the constellations that are approximately within these regions. The Babylonians developed this division around 1000 - 500BC, and they began their calendar year with the vernal equinox (the first day of Spring).

**The Program**

In this activity, we will write a program that prompts the user to enter a month number and a day number (according to our calendar). The program will determine the day number of the year (e.g., April 14 is the 104th day of the year) and use **If** statements to determine the correct Zodiac sign. The program then displays the sign of the zodiac for that date.

We first need to convert the dates in the table below into day-of-year numbers. On the TI-Nspire™ CX, we can use the **dbd( )** function:

dbd*(12.3117,03.2118)* returns the number of days from Dec 31, 2017 (12.*3117*) to March 21,2018 (03.2118).




As seen in the image to the right, March 21 is the 80th day of the year.

Complete the two day# columns of the table below using your TI-Nspire CX and the **dbd( )** function. This function returns the number of days between day 1 and day 2.

The date intervals shown for each sign of the zodiac correspond to those found in many horoscopes:

| Sign | Interval | From day# | To day# |
|---|---|---|---|
| Aries: | March 21 – April 19 | 80 | 109 |
| Taurus: | April 20 – May 20 | 110 | |
| Gemini: | May 21 – June 20 | | |
| Cancer: | June 21 – July 22 | | |
| Leo: | July 23 – August 22 | | |
| Virgo: | August 23 – September 22 | | |
| Libra: | September 23 – October 22 | | |
| Scorpio: | October 23 – November 21 | | |
| Sagittarius: | November 22 – December 21 | | |
| Capricorn: | December 22 – January 19 | | |
| Aquarius: | January 20 – February 18 | | |
| Pisces: | February 19 – March 20 | | |

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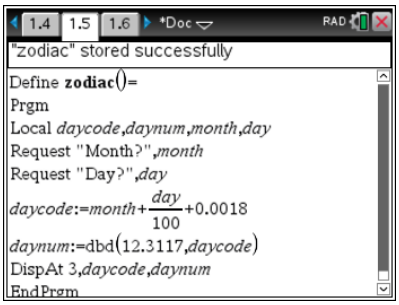
**Teacher Tip:** If doing this activity in a group, students can complete different sections of the table.

In our program we need to convert a user-entered month and day into the format **MM.DDYY** that the **dbd( )** function requires.




You can do this by:

**daycode := month + day/100 + .00*18*** *(for 20**18**)*

Then we can determine the day number by:

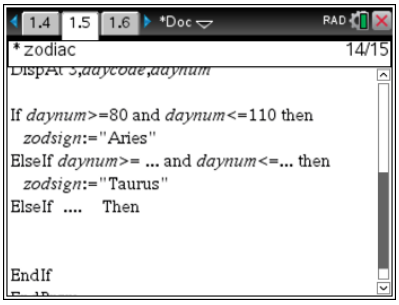
**daynum := dbd(12.31*17*, daycode)** *(for # of days since 12/31/30**17**)*

To the right is a test program that only displays the *daycode* and the *daynum* values. This test assures us that these expressions are working properly.

*Optional: Input the year as well and use that variable in the two formulas above.*

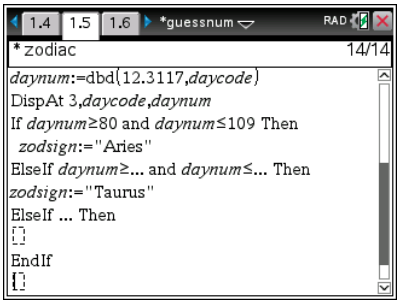
**Teacher Tip:** The value of *daynum* is displayed as a decimal and not a fraction because there are decimal points in the expressions above.

We're now ready to write the rest of the zodiac program. The program utilizes the **If…Then…Else…EndIf** and **ElseIf…Then** structures.




Build one long **If…Then…ElseIf…Then…ElseIf…** statement to decide which sign is correct. Complete the missing parts of the program.

```
If daynum >= 80 and daynum <= 109 Then
   zodsign := "Aries"
ElseIf daynum >=  ... and daynum <= ... Then
   zodsign := "Taurus"
ElseIf....    Then
…
EndIf
```




Each '**Then** action' stores the corresponding sign into the variable **zodsign**. This provides another opportunity to take advantage of Copy and Paste. However, be careful with Capricorn.

Test your program thoroughly referring to the Zodiac chart above. At the end of all the **If** statements, simply display *zodsign*.

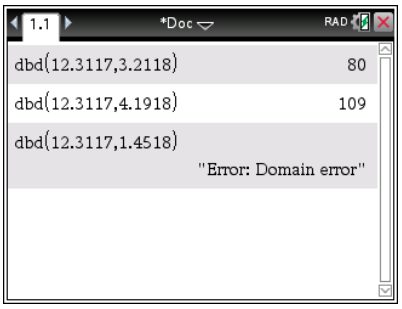
**Teacher Tip:** Capricorn requires a twist:

If daynum>= *356* or daynum<=20 then…..

(*December 22 is day 356 and January 20 is day 20*.)

*Note that in the Program Editor you can enter '**>=**' and the **'Check Syntax & Store'** operation converts the symbols to the single symbol **≥**.*

If the **dbd( )** function receives invalid information (such as month 13 or day 45), then an error occurs and the program terminates.




In order to be sure valid information is entered, we would need to build a *loop* to repeatedly ask for the data until valid numbers are entered. We'll discuss loops in the next unit.