

## **NOVA Classroom Activity Lost King of the Maya**

[http://www.pbs.org/wgbh/nova/teachers/activities/2804\\_maya.html](http://www.pbs.org/wgbh/nova/teachers/activities/2804_maya.html)

NOVA follows archeologist Bill Fash and his team as they excavate the burial site of the founder of a Maya dynasty in Copán, Honduras, and explores startling new information about Copán revealed by linguistic analysis and biological anthropology.

The program:

- introduces Yax K'uk Mo', the legendary king who entered Copán as a conqueror and remained to found a dynasty.
- reviews the history of the Maya people, who built towering pyramids and developed sophisticated systems of writing and astronomy more than a thousand years ago.
- reveals the involvement of the Maya in ritual warfare and human sacrifice.
- examines the purpose of Maya observations of the stars and planets.
- recounts how the Maya symbol code was broken in the 1980s.
- chronicles the 400-year dynasty of Maya Holy Lords, founded by Yax K'uk Mo'.
- offers a new historical insight into the collapse of the Maya empire.

### **Objective**

To understand and apply the Maya Long Count calendar system.

### **Materials Needed:**

- copy of "Calendar Count" student handout
- calculator

### **Procedure:**

1. Read the student handout to familiarize yourself with the calculations that students will make.
2. Organize students in groups. Distribute copies of the "Calendar Count" student handout.
3. Tell students they will be calculating the date of their birth in the Maya Long Count calendar system. The Maya Long Count system uses a base 20 number system. Review the difference between the base 10 system, which students are familiar with, and a base 20 system.
4. Assist students in calculating their birth date according to Maya Long Count.
5. As an extension, have student calculate how many days until the Fourth Creation ends (December 21, 2012) and how many total days are in the Fourth Creation.

### **Activity Answers**

The Maya used three different calendar systems. One of them, called the Calendar Round, combined the tzolkin calendar—a sacred count of 260 days—and the haab

calendar, a solar count of 365 days, which when used together could track unique days up to 52 years. In order to track time over a longer period, the Maya coordinated the Calendar Round with the Long Count, which is based on the number of days from a set point: the beginning date of the Fourth Creation (0.0.0.0.0), equivalent to August 13, 3114 B.C.E. in the modern calendar system. (Each zero date is considered the most recent of an infinite series of zero dates, which repeat every five thousand years or so.)

The Long Count works on a base 20 system. The following are the equivalencies for the units necessary to calculate time in a 5,000+-year Creation. However, the Long Count has additional representations for larger units; the largest, an analtun, is equivalent to approximately 64 million years.

**Days from the beginning of the Maya Fourth Creation to December 31, 1979:**

**12.18.6.9.14 =**

12 baktuns x 144,000 days =	1,728,000
18 katuns x 7,200 days =	129,600
6 tuns x 360 days =	2,160
9 uinal x 20 days =	180
14 kin x 1 day =	14
<b>Total =</b>	<b>1,859,955</b>

The number of days to each student's birth date will vary. Check to make sure students include the extra day for each leap year, and the day of their birth. Students will add the number of days from 1980 to their birth date to the number of days they converted in the first part of the activity. Students will then use the conversion chart to convert the number of total days back into Maya Long Count, dividing first by the largest equivalent (baktun at 144,000 days) successively down to the smallest equivalent (kin at 1 day).

The Fourth Creation will be completed on December 22, 2012 C.E., the Maya date of 12.19.19.17.19. Scholars disagree on the precise correlation of the Gregorian and Maya calendars. Their disagreements turn on differences of days, not decades. A correlation is necessary to equate a Gregorian date with a Maya date; this means finding a particular date that is identified by both systems. For this activity, the correlation for the most recent day of Maya Long Count 0.0.0.0.0 is 584,283 days on the Gregorian calendar, thus the first day of the Maya Long Count would be the 584,284th day on the Gregorian calendar. This correlation is incorporated into all Long Count calculation in this activity.

**Resources:**

**Book**

Schele, Linda, and David Freidel. *A Forest of Kings: The Untold Story of the Ancient Maya*. New York: Quill/W. Morrow and Co., 1992.

Brings to life the rulers of the ancient Maya, with scholarly work that reads like short stories.

### **Web Sites**

NOVA Online—Lost King of the Maya

<http://www.pbs.org/nova/maya/>

Provides program-related articles, interviews, interactive activities, resources, and more.

Calendar FAQ

<http://www.landfield.com/faqs/calendars/faq/part1/>

This three-part article answers frequently asked questions about calendars and provides an overview of the Christian, Hebrew, and Islamic calendars in common use. It also provides a historical background for the Christian calendar, plus an overview of the French Revolutionary calendar, the Maya calendar, and the Chinese calendar.

The Maya Calendar

<http://www.mayacalendar.com/mayacalendar/>

Includes links to many Maya-related sites, as well as illustrations of calendar glyphs and number symbols. Links offer routes to extend study into additional aspects of Maya life and culture.

Maya Calendar Tools

<http://www.pauhtun.org/tools.html>

Includes a number of Maya calendar conversion tools.

### **Standards:**

The "Calendar Count" activity aligns with the following **National Science Education Standards**.

**Grades 6-8      Mathematics Standard: Number and Operations**

**Grades 9-12 Mathematics Standard: Number and Operations**

## Ideas from Teachers

(Gr. 6-8)

This activity could be used with NOVA's "Lost King of the Maya" [program](#).

Topics: math, place value, number theory

Even at these middle grade levels, it is important to revisit previous mathematical ideas to deepen understanding.

All of our 7th grade teachers participated in an integrated unit on the Maya. I created a worksheet which represented a "pure" base 20 system. I wrote about a dozen numbers in Maya notation, and gave the students the Arabic equivalents. Their job as "archeologists" was to determine the structure of the Maya system with no other information than what I had given them. It took one class period (about 60 minutes) for them to determine the basic characteristics of the pure base 20 system, including the "vertical" orientation, the places being powers of 20, the value of the dot and line, and the function of "zero" symbol. During a second class period they completed an exercise converting Maya numerals to Arabic notation and vice-versa.

We then looked at the modified base 20 system used for the Maya Long Count calendar and tried to map the Maya intervals onto our own habits of reporting dates. We had a lot of fun looking at the glyphs found on the stele (copied from a book on Maya Language) and seeing the number components of many of them.

The culminating activity was a letter written by each student to a fictitious sponsoring foundation or university, reporting on the conclusions the student archeologist had formulated about the Maya mathematical system and its similarities to and differences from our own. I also asked them to speculate on what sort of algorithm the Maya might have used to add or subtract, and dared them to try multiplication or division. All managed addition and subtraction, a few attempted multiplication and division. Their letters also were to indicate an area of interest for further research and request further funding.

We scored the letter on a math rubric aimed at accuracy and comprehensiveness of mathematical content, and on our state writing rubric.

# Calendar Count

## NOVA Activity | Lost King of the Maya



If someone asks you when your birth date was, you probably answer them by giving a month, day, and year. But that's not the only way to record passing time.



Different cultures have used different calendar systems to mark time. One such system used by the Maya culture is called the Maya Long Count. In this activity, you'll figure out your birth date in Maya Long Count.



### Part I



Most people today measure time in days, months, years, decades, and centuries, based on what's known as the Gregorian calendar system. The ancient Maya measured time in kins, uinals, katuns, and baktuns based on the Maya Long Count system. The numbers add up to the number of days since the beginning of the Maya Fourth Creation (which is calculated as August 13, 3114 B.C.E., on the Gregorian calendar used today).



### Procedure

- ① Your first task is to convert a Maya Long Count date into days. In Maya Long Count, the date December 31, 1979 is recorded as **12.18.6.9.14**
- ② Use the *Maya Long Count Conversions* chart below to convert each Long Count place value in the date above to days and then add up all five values to calculate the total number of days. Write your answer below.

**Days from the beginning of the Maya Fourth Creation to December 31, 1979 = \_\_\_\_\_**

### Maya Long Count Conversions

Maya Long Count dates are written as a series of numbers separated by periods.

\_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_  
 baktun     katun     tun     uinal     kin

**baktun = 144,000 days**

**katun = 7,200 days**

**tun = 360 days**

**uinal = 20 days**

**kin = 1 day**

### Part II

#### Procedure

- ① Now, using the *Days in Each Month/Year* chart below, calculate how many days there are from January 1, 1980, to the day you were born. Note that leap years have an extra day in February.

**Your Birth Date** \_\_\_\_\_

**Days from January 1, 1980, to your birth date = \_\_\_\_\_**

#### Days in Each Month/Year

(Leap years are noted in **bold**.)

Days in month	Days in year
January = 31	<b>1980 = 366</b>
February = 28/29	1981 = 365
March = 31	1982 = 365
April = 30	1983 = 365
May = 31	<b>1984 = 366</b>
June = 30	1985 = 365
July = 31	1986 = 365
August = 31	1987 = 365
September = 30	<b>1988 = 366</b>
October = 31	1989 = 365
November = 30	1990 = 365
December = 31	

### Part III

#### Procedure

- ① Add the number of days from the beginning of the Maya Fourth Creation to December 31, 1979, and the number of days from January 1, 1980, to your birth date. Write the total in below.

**Days from the beginning of the Maya Fourth Creation to your birth date = \_\_\_\_\_**

- ② Now it's time to convert the number of days since the Maya Fourth Creation to your birth date back into Maya Long Count. Use the *Maya Long Count Conversions* chart to turn the number of days into Long Count. Write the conversions in below.

\_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_  
 baktun     katun     tun     uinal     kin

- ③ Congratulations! Now when somebody asks you when you were born, you can say "Do you want to know by the Gregorian calendar or Maya Long Count?"

