

Mesoamerican Solar Calendar

Introduction:

This is a multi-day lesson designed to compare our current, western 12-month calendar to the 18-month calendar used in many parts of Mesoamérica prior to colonization, to understand the math that went into creating this calendar and to appreciate the advanced mathematical and scientific identity of indigenous peoples in the Americas prior to colonization. There are many possible connections with other subject areas in this lesson, particularly science and art. The mathematics content in this lesson will focus on skip counting, multiplication and division with remainders and solving complex word problems involving calendars.

Background For Teachers:

Many Mesoamerican cultures used 2 calendars to track time- a solar calendar with 365 days, similar to the calendar we use today, and a religious calendar, which had 260 days. This lesson will focus on the solar calendar. Unlike the 12 months calendar we use today, Mesoamerican civilizations such as the Olmecs, Zapotecs, Mayans, Mixtecs and Aztecs used a solar calendar that was split into 18 months. Each month had 20 days in it, resulting in a calendar with 360 days. The 5 extra days were known, and were considered by some groups as unlucky days that one should not work on. Some groups, such as the Mazatecs, still create calendars with 18 months to this day. Prior to Spanish colonization, weeks were 5 day periods instead of 7 day periods. This matches the vigesimal counting system that was used throughout Mesoamerican cultures. This idea of counting weeks as 5s (one day for each finger) and months as 20s (one day for each digit of both hands and feet) can be a very intuitive concept for children and will provide an engaging entrance into both the mathematical concepts and the cultural history of indigenous people in Mesoamerica.

Additional Information: [Mesolore: Solar Calendar](http://mesolore.org/tutorials/learn/18/Counting-Tomorrow-The-Day-After-Tomorrow/46/The-Solar-Calendar)

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On the next page are some lessons organized by grade level for grades 2-5, with suggestions on how to teach this calendar to students in a hands-on, discussion-rich way.

2nd Grade

Introduce the fact that our calendar with 12 months is not the only type of calendar there is. In fact, in Mesoamerica there were and still are people who use a calendar with 18 months instead of 12. Before the Spanish came and introduced the names of the 7 days of the week (en español), the names we know now, the indigenous people of Mesoamerica had weeks with 5 days in them.

Ask students: *"Why do you think people would have 5 days in their week? Why do you think 5 is an easy number to use to keep track of time?"* (fingers on one hand)

Show students a generic example of our contemporary calendar (Some easily printable examples available here: http://lrt.ednet.ns.ca/PD/BLM/table_of_contents.htm). Show how each week consists of 7 days, and how this calendar is drawn. Ask students to draw one row (week) of a calendar on a whiteboard, but with only 5 days, instead of 7. Once students can do this, have them extend their drawing to have 4 weeks of 5 days. If students are able to do this on a whiteboard, have them then re-create their 5 day/week, 4 week calendar on a blank paper.

Ask students to count how many days are in one of these months. Look for students skip counting by 5, and promote this strategy, even if students have already counted by ones to 20.

Ask students: *"Why do you think having 20 days in a month would be easy for people to count?"* (number of all toes + fingers)

Prompt students to see how many days are in one year for us, and if anyone knows why. Tell students that 365 days is the time it takes our planet to travel around the sun one time, if they are not able to come up with this knowledge as a class.

As a class, have students put the month calendars they've created together to see how many months (and weeks) it takes to get to get close to 365 days, encouraging skip counting by 5's, 10's or 20's to try to get all the way to 360. Have a discussion about the extra 5 days in a year, informing students that these were considered extra days. People were not supposed to work on these days, it was considered bad luck.

Explore what patterns students noticed when making this year calendar, and consider labeling the months using the Nahuatl names (found at the link below), or possibly even making the connection between which days match which months that we have.

<http://en.wikipedia.org/wiki/Xiuhpohualli>

If place value and the Mesoamerican vigesimal counting system have been taught before, make explicit link to glyphs of numerals. Consider having students draw 5 dots for each week, and have students put a line through each group of 5, and circle each group of twenty to show how smart this calendar was.

3rd Grade

A nearly identical lesson to the second grade lesson can be taught, but extended further by having students write multiplication problems to show how many weeks are in one month & one year. Also, as many third graders are learning of the orbit of the Earth around and the sun and what this means for seasons, a more challenging project could be to then look at the ways to split these months into seasons that more or less correspond with our seasons.

4th Grade

In 4th grade, students should be challenged to find out how many months there would be in a year if each month had 20 days instead of ~30. Have students decide if weeks should still be made up of 7 days or if there should be a different number of days in a week, facilitating a discussion on the pros and cons of 7 day weeks vs. perhaps 4 or 5 day weeks. Reveal that many indigenous people of Mesoamerica in fact had 5 days in a week prior to the arrival of the Spanish in 1521. Discuss how counting all the toes and fingers makes 20 and that this was likely a convenient way to divide the year for people. Challenge students to find out how many months it would take to make 360 days. Highlight the 5 leftover days and their significance, and that the prehispanic civilizations were all aware there were 365 days in a solar year.

5th Grade

In 5th grade, challenge students to divide the 365 day year into 18 equal months instead of 12. Give more information with follow up questions to lead small groups to discover the nature of the Mesoamerican solar calendar:

- All of the month have exactly the same number of days, unlike our calendar where some have 30 and some have 31. How many days will be leftover?
- Each of these months had 4 weeks before the Spanish introduced their calendar, so how many days were in one week?

Include more complex questions:

- What day of the year is the 3rd day of the 4th month of Mixtec calendar? (using multiple operations)
- Which number months was the 17th week in?

Have students explore the relation between our calendar and the Mixtec/Aztec calendar and find out what day their birthday would have been on in this solar calendar.

<http://en.wikipedia.org/wiki/Xiuhpohualli>

Some general discussion questions for any grade, to help conclude the lesson:

- How would this make our life different if we had 5 day weeks instead of 7 day week? 18 months instead of 12? 20 days in a month, instead of 30/31?
- What sort of things would stay the same?
- Which calendar do you think is better, and why?