

Unit Title: Who Is the Greatest? The Maya and Inca Empires

Grade Levels: Middle/High School

Subject/Topic Areas: Social Studies, Area Studies, World History

Key Words: Maya and Inca civilizations, history of Pre-Colombian America, Indians of Central America, ancient civilizations, Mexico, Native Americans, Peru

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Time Frame: 6 (40–50 min.) classes; teachers might want to modify the schedule depending on their time constraints

Link to Content Standards: 9–12 Connecticut Standards in Social Studies

Content Standard 1: Historical Thinking

Students will develop historical thinking skills, including chronological thinking and recognizing change over time; contextualizing, comprehending and analyzing historical literature; researching historical sources; understanding the concept of historical causation; understanding competing narratives and interpretation; and constructing narratives and interpretation.

Content Standard 3: Historical Themes

Students will apply their understanding of historical periods, issues and trends to examine such historical themes as ideals, beliefs and institutions; conflict and conflict resolution; human movement and interaction; and science and technology in order to understand how the world came to be the way it is.

Content Standard 4: Applying History

Students will recognize the continuing importance of historical thinking and historical knowledge in their own lives and in the world in which they live.

Content Standard 7: Political Systems

Students will explain that political systems emanate from the need of humans for order, leading to compromise and the establishment of authority.

Content Standard 9: Places and Regions

Students will use spatial perspective to identify and analyze the significance of physical and cultural characteristics of places and world regions.

Content Standard 12: Human and Environmental Interaction

Students will use geographic tools and technology to explain the interactions of humans and the larger environment, and the evolving consequences of those interactions.

Brief Summary of Unit

Unit Goals:

Students will learn to acquire and process information on their own, rather than merely memorize facts.

Students will use a variety of sources, including primary sources.

Students will collaborate in groups during the unit.

Students will acquire skills in comparing and contrasting information.

Students will use public speaking and artistic skills in their presentations.

Students will be able to analyze and to rethink the judging nature of the assignment.

Understanding:

Students will understand that every civilization develops differently depending on its geographical location, climate, environment, etc., but each brings something unique to the development of the human race in general.

Students will know time, location, history, similarities and differences of both civilizations. Students will be able to locate the Maya and Inca Empires on the map, use timelines, gather information using a variety of sources, compare and contrast the results of their research, write a comprehensive response to the essential question of the unit. In addition students will be able to participate in several hands-on activities that will stimulate their interest for the civilizations in question.

Essential Questions:

- How do different environments determine economic and social structures of civilizations?
- What are the particularities of each civilization?
- Is it fair to decide which civilizations/cultures are more important than others?

Performance Tasks:

Students will research their particular topics using a variety of sources. Information will be organized using the Venn diagram, timelines, maps, and other types of presentations. In addition, students will present their findings in class using visual aids, and other materials. Students will be assessed by themselves, their peers, and their teacher with help of self and peer evaluations. Students will be able to explain time periods, location, history and particularities of both civilizations; give examples of social order, religious rituals, state of the arts and science; offer theories on how and why these civilizations had collapsed; describe in detail one or more of particular aspect of Maya and Inca culture; prove the advanced stage of these cultures in one or more areas. Students will avoid common misconceptions, such as considering ancient cultures as barbarous or bloodthirsty.

Students will make sense of and give logical explanation of traditions of human sacrifices, show importance and meaning of the Maya calendar and writing system, Incas' quipu (alternate spelling: khipu), different architectural styles, diet, medicine practices, etc.

In a new situation, students will apply their skills in comparing and contrasting information, will demonstrate appreciation of different points of view, will use the new information in the context of modern countries, and will overcome a constraint, such as viewing Maya and Inca cultures as extinct. Students will see the limits of current knowledge of the ancient civilizations. They will experience directly the challenges of using completely different systems of writing and math. Students will realize that despite a considerable amount of knowledge on these civilizations, we are not able to understand or explain them completely, and therefore we shouldn't be judging them, or drawing conclusions on superiority of one culture over another.

Considering the multitude of topics discussed, it is difficult to assess students' knowledge by giving them traditional tests as assessment. It is preferable to grade this project in three parts: presentation, essay response, and optional quiz.

Description:

Students will be introduced to the topic via a PowerPoint "Who Is the Greatest?" in which the major characteristics of the Maya and Inca cultures are highlighted. Students should be intrigued by the challenge of finding "the greatest civilization." Teacher divides the class into 7 groups. In each group, one student will be in charge of researching the Mayas, another will research the Incas, the third will be a record keeper, who will summarize the information and present a Venn diagram comparing both cultures, other students (depending on the number of students in each group) can be presenters or artists, responsible for the visual aids for the group presentation. Each group will have 4 days to conduct research on a specified topic, and present their findings in a 5- to 10-minute presentation in class. In addition, each group will supply a visual aid to facilitate understanding of the material, and a copy of the Venn diagram with comparison of both cultures. Students also participate in several hands-on activities (writing their names in Maya glyphs, solving math problems using Maya numerals, making quipus, discussing primary sources), and writing a final essay reflecting on what they have learned.

Student Instructions:

Decide on the roles in your group. One of you will do research of the Maya culture, another of the Inca culture, the third will organize the most important information into a Venn diagram, the fourth will decide on the format of the group presentation. You should all work together. Your final project should be well researched, have appealing form, and engage other students. The record keeper, after assembling the information, should be able to identify the similarities and differences between two cultures, and give his/her opinion on which culture displayed the greatest achievement in the group's assigned area. You will have 4 days to work on your project. You should listen carefully to other groups' presentations and take notes if necessary. Your grade will be based on your own evaluation, and on the evaluation of your peers and your teacher. The rubrics for the evaluation are included on your list of recommended sites.

Group 1 will research geography, topography, climate, large cities, capitals (if any), and present their findings in a form of illustrated maps.

Recommended sites:

<http://www.famsi.org/maps/index.html> – Map of the Maya empire

<http://ngm.nationalgeographic.com/2007/08/maya-rise-fall/gugliotta-text> – Maya

<http://www.lost-civilizations.net/mayan-geography.html> – Maya geography

<http://www.geocities.com/CapitolHill/6502/incaempi.htm> – the Inca empire

<http://www.mnsu.edu/emuseum/prehistory/latinamerica/geography/inca.html> – Inca geography

<http://soli.inav.net/%7Erpmic/iowa/rubrics/maprub.htm> – Rubric for the map presentation

Group 2 will research and make a timeline for the Maya and Inca Empires to be presented in class.

Recommended sites:

<http://www.famsi.org/research/pohl/chronology.html> – Maya timeline

<http://www.metmuseum.org/toah/ht/05/caa/ht05caa.htm> – Maya timeline

<http://www.metmuseum.org/toah/ht/08/sanc/ht08sanc.htm> – Inca timeline

<http://soli.inav.net/%7Erpmic/iowa/rubrics/timerub.htm> – Timeline rubric

Group 3 will research the gods and religious rituals for both civilizations. They will also choose one god to talk about in more detail. Presentation could be in a form of a poster or PowerPoint.

Recommended sites:

<http://www.ancientmexico.com/> – Good site on Maya gods, and a timeline

<http://www.jaguar-sun.com/maya.html> – Maya gods

<http://www.mesoweb.com/features/features.html> – Great site on Maya gods

<http://www.crystalinks.com/mayangods.html> – Maya gods

<http://www.ballgame.org/> – Interactive site on Maya ballgame

<http://www.lost-civilizations.net/mayan-gods.html> – Good source on Maya gods

<http://www.civilization.ca/civil/maya/mmc03eng.html> – Good site on Maya religion and sacrifices

http://incas.homestead.com/inca_religion_god.html – Inca religion

<http://www.crystalinks.com/incan.html> – Good site on Inca in general

<http://www.pbs.org/wgbh/nova/peru/worlds/sacrifice1.html> – Inca sacrifices

<http://www.nationalgeographic.com/andes/> – Virtual autopsy of the Ice Maiden (Juanita)

<http://www.ncsu.edu/midlink/rub.pres.html> – Rubric for presentation

Group 4 will research hierarchy (social classes), major crops, and agricultural methods. Presentation could be in the form of a poster or a PowerPoint.

Recommended sites:

<http://www.crystalinks.com/incan.html> – Inca civilization

<http://www.ancientsites.com/aw/Article/427711> – Maya social classes

<http://www.crystalinks.com/mayanagriculture.html> – Maya diet

<http://www.wsu.edu/~dee/CIVAMRCA/MAYAS.HTM> – Good site on Maya

<http://trailingincas.info/organization.php> – Good site on Inca political order, farming, etc.

http://incas.homestead.com/inca_agriculture.html – Inca agriculture and more

<http://www.ncsu.edu/midlink/rub.pres.html> – Rubric for presentation

Group 5 will research achievement in astronomy, math, writing systems. Presentation: poster or a PowerPoint.

Recommended sites:

<http://www.michielb.nl/maya/astro.html> – Maya astronomy, math, writing, etc

<http://www.crystalinks.com/incan.html> – Everything on Inca civilization

<http://www.starteachastronomy.com/incan.html> – Small, but good site on Inca astronomy

http://agutie.homestead.com/files/Quipu_B.htm – Site on quipus

<http://www.civilization.ca/civil/maya/mmc04eng.html> – Maya glyphs

<http://www.ancientscripts.com/maya.html> – Maya calendar, glyphs

<http://www.ncsu.edu/midlink/rub.pres.html> – Rubric for presentation

Group 6 will research art and architecture of both civilizations. They will choose an example of a specific artifact and a building to describe specific traits for both cultures. Poster or PowerPoint.

Recommended sites:

<http://www.crystalinks.com/mayanarch.html> – Maya art and architecture

<http://www.smm.org/sln/ma/teacher.html> – Picture archive of Maya

http://www.internet-at-work.com/hos_mcgrane/inca/eg_inca_9.html – Inca architecture

<http://www.rutahsa.com/incaarch.html> – Good site on Inca architecture

<http://incas.perucultural.org.pe/english/galemon202.htm> – Machu Picchu picture archive

<http://incas.perucultural.org.pe/english/histec1.htm> – Inca textiles and more

<http://www.about-peru-history.com/inca-art.html> – Inca art

<http://www.civilization.ca/civil/maya/mmc02eng.html> – Maya architecture

<http://www.ncsu.edu/midlink/rub.pres.html> – Rubric for presentation

Group 7 will research the reasons of decline/collapse of both civilizations and find out the state of modern descendants of the Maya and Inca. You should find out if they still speak similar languages, follow ancient rituals and traditions, etc. Poster or PowerPoint.

Recommended sites:

<http://incas.perucultural.org.pe/english/hiscol1.htm> – Some causes of Inca downfall

<http://incas.perucultural.org.pe/english/hiscol2.htm> – More causes of Inca demise

<http://www.geocities.com/CapitolHill/6502/conquest.htm> – Conquest of Peru (scroll down to Atahualpa ransom)

<http://www.learner.org/interactives/collapse/copan/experts.php> – Some clues on Maya collapse

<http://www.sciencedaily.com/releases/2002/01/020125074106.htm> – Another theory of Maya collapse

<http://earthobservatory.nasa.gov/Study/Maya/> – Very extensive site on Maya collapse

<http://www.civilization.ca/civil/maya/mmc08eng.html> – Maya today

<http://www.jaguar-sun.com/mayanow.html> – Maya today

<http://www.incas.org/index.html> – Inca descendants today

<http://www.vqronline.org/articles/2007/fall/goh-islands-of-titicaca/> – Inca today (Lake Titicaca)

<http://www.ncsu.edu/midlink/rub.pres.html> – Rubric for presentation

Teacher Instructions: Learning Activities

Day 1

Introduction of the unit with a PowerPoint presentation, “Who Is the Greatest” [available for download from this Web site]. Distribution of group assignments. If you have time, students can start their research in the computer lab/library.

Day 2

Research

If possible dedicate this day to students’ research in the computer lab or in groups in class. Answer questions. Monitor the groups’ dynamics.

Day 3

Primary sources

Provide copies of the attached hand-out: Illustrations from the letter of Felipe Guaman Poma de Ayala, “Letter to a King: A Peruvian Chief’s Account of Life Under the Incas and Under Spanish Rule.” (Also available from http://www.peabody.yale.edu/education/ed_curric.html – Go to Machu Picchu: Social Studies Curriculum, Lesson Plans, Handout #5.) Ask students to study the images, read commentaries, and compare the life of children at the time with their life now.

Practice Maya equations

Make copies of the attached explanations and math problems for your students. (Also available from http://www.famsi.org/reports/03075/CKguidebook_english.pdf – p.30–32). Or you can also use an abbreviated version of the hand-out (also attached). If you are lucky to have an enthusiastic math teacher in your school, you can invite him/her to your class to help you with the lesson.

Day 4

Maya glyphs

You can make copies of the Maya glyphs from the site indicated below.

I would recommend reading the entire document: it is wonderfully written, and is geared toward teachers, which is a rare thing, but you may choose to use only the chart of syllables (p.17–22), and the detailed instruction on how to write names in Maya glyphs (p. 33–45): <http://www.famsi.org/research/pitts/MayaGlyphsBook1Sect1.pdf>

Put copies of the chart on a board/transparency, or make copies for groups of students. Explain different ways to write syllables on the board. Let students write their names in Maya glyphs.

Quipu making

Make copies of the attached explanation of the quipu. (Also available from http://www.peabody.yale.edu/education/ed_curric.html – Go to Machu Picchu: Social Studies Curriculum, Lesson Plan 6, Handout #3.) Provide students with several colored yarn pieces. Explain that the quipu consists of one base string, and several other strings of different colors tied to it. Practice several types of knots: single, long, figure eight. Ask students to create a quipu with personal information: birthday, today’s date, etc. Let them explain their quipu technique.

Day 5

Class presentations for Groups 1–4

Fill out evaluation sheets for each group. The student peer evaluation is attached.

Day 6

Class presentations for Groups 5–7.

Students return their evaluation sheets for themselves and the other groups. If you have time you can repeat the introductory PowerPoint, “Who Is the Greatest?,” and ask students/groups to identify all the images with Maya or Inca civilizations.

The final assignment: homework for next class is to write an essay: Do we know enough to judge the achievement of other civilizations? The students should be able to realize incorrectness of the main question of this unit “Who is the greatest?,” and give their point of view on the topic. Conduct final class discussion. Get feedback on the unit. Optional quiz. You can either create your own, or use one of these online quizzes:

http://www.funtrivia.com/quizzes/history/latin_america/maya.html

http://agutie.homestead.com/FiLEs/IncaQuiz_1.htm

V. Lesson Plans

Handout 5: Working with a Primary Source — Illustrations by Felipe Guamán Poma de Ayala

These drawings were made by Felipe Guamán Poma de Ayala, a man who lived in Peru during the first decades of Spanish colonial rule. He wrote a 1400-page “letter” to the king of Spain to educate him about how the native people living in the former Inca Empire were being treated by the Spanish. He described in great detail the Inca Empire, including its history and customs. Guamán Poma probably wrote the letter, addressed to King Philip III of Spain, between 1567 and 1615. He would have been about 90 years old at the time he finished his monumental task, which took over 30 years to complete and involved extensive travel. In order to see how ordinary people lived under the Spanish, the author disguised himself as a poor person.

Guamán Poma, who describes himself as a “person of Indian race” and a Catholic, wrote his work in Spanish. Because he did not have written evidence from Inca sources, he relied on “the colored and knotted cords on which we Indians of Peru used to keep our records.” Guamán Poma was the grandson of Topa Inca Yupanqui, an Inca emperor. His family had ruled what became the province of Chinchaysuyu before it was conquered by the Incas. His father served the Inca emperor Huascar as an ambassador and met Francisco Pizarro before he marched to meet the Inca emperor at Caxamarca. He later fought with the Spanish against Francisco Pizarro’s brother and was given land in return for his loyal service. Guamán Poma was a local chief and described himself as “a protector of the Indians and deputy of the royal [Spanish] administrator.” (Letter to a King, p. 231).

In addition to describing life in the Inca Empire, Guamán Poma chronicled acts of torture and murder committed by the Spanish against the native population. His lengthy work was in part a plea to the Spanish king to provide “good government” in Peru. There is no evidence that the king ever read the three-volume document.

What aspects of Guamán Poma’s life enabled him to provide valuable information about life during the Inca Empire? During Spanish colonial rule?

In what ways might Guamán Poma have been biased against the Incas? The Spanish?

Study the following illustrations and read the captions. What do the drawings tell us about the life of Inca children? How were their lives similar to yours. Different?

■✘ POR DON PHELIPPE GVAMANI POMA DE AYALA

Study the following illustrations and read the captions. What do the drawings tell us about the life of Inca children? How were their lives similar to yours. Different?

Figure 1

"The first category consisted of newborn babies up to the age of a month or two and still being rocked in the cradle by their mothers, who are the proper source of milk and affection for these tiny creatures."

The bandage on the baby's head was used to shape the skull and make it narrower.



Figure 2

"(C)hildren who were feeding at their mother's breasts and learning to walk...in their first years of life were incapable of looking after themselves and were often put in the care of elder children so that they should not fall or burn themselves or come to any other harm."

This one-year-old girl is accompanied by her pet dog.



Figure 3

"(G)irls...between five and nine...were sometimes able to do jobs about the house.... Some of them gathered herbs, helped to make maize spirit or looked after babies."

This five-year-old girl is carrying corn beer in a large jar called an *aryballo*.



Figure 4

"When they were not playing for their own amusements, they were used to look after the younger children or rock the cradles of the newborn."

This five-year-old boy is learning to hunt birds with a sling. Inca games often taught children to do useful tasks.



Note: Quotations are taken from "Letter to a King: A Peruvian Chief's Account of Life Under the Incas and Under Spanish Rule," by Felipe Guamán Poma de Ayala, translated from *Nueva Corónica y Buen Gobierno* by Christopher Dilke (New York: E.P. Dutton, 1978).

■ ✕ POR DON PHELÍPE GVAMANI POMA DE AIALA

Figure 5

"The boys [between the ages of 9 and 12] were employed in trapping small birds.... Only small tasks like watching the flocks, carrying wood, weaving and twisting thread were entrusted to them. [Most] boys got their education in the fields and were not sent to any other school."

Only sons of the Inca elite were sent to the *Yachayhuasi*, or school.



Figure 6

"The main occupation of the girls [between the ages of 9 and 12] was picking the large variety of wild flowers in the countryside. These flowers were used for dyeing the fine cloth called *cunbe*, among other purposes. The girls also gathered nutritious herbs which were dried and stored for a period of up to one year."

Girls often wore their hair short.



Figure 7

"Coro Tasque serves her superiors and the community."

This 12-year-old girl is spinning yarn at the same time she is herding llamas and carrying wood for fuel.



Figure 8

"The fifth category were those between the ages of about 12 and 18.... Boys of this age were employed in the personal service of the rulers and their divinities.... The young girls... performed various useful jobs in and out-of-doors for their parents and grandparents, such as cooking and cleaning the house or helping about the farm. Being submissive and respectful, they quickly learned whatever was expected of them."

This 18-year-old boy is working as a *chasqui*, a runner who is carrying a *quipu* and an official letter (*carta*). He is required to perform half the labor services of an adult subject of the empire.





Purpose: TO TEACH STUDENTS HOW TO DO MATH EQUATIONS USING THE BASE-20 SYSTEM OF THE ANCIENT MAYA.

THE VIGESIMAL (BASE 20) NUMBERING SYSTEM

The ancient Maya developed the concept of zero, had a base-20 computational system, and were able to do very complex mathematical calculations. Practice using Maya math to learn how the Maya system works; notice how the Maya and Arabic systems differ.

The Arabic number system we use today has 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. If we want to write a number greater than 9, we use combinations of these digits placed in a particular order. The order gives value to the numbers in multiples of 10. This is called place notation. For instance, 328 means 3 units of 100s, 2 units of 10s, and 8 units of 1s.

The Maya also had a system based on place value and zero, but with one major difference. Their system is base 20. The Maya wrote the numbers from 1 to 19 using bars and dots; a dot symbolizes units of 1 and a bar has the value of a unit of 5. Shown this page are the numbers from 0 to 19.

To express larger numbers, the Maya used the same kind of place notation as we do. However, in a base-20 system, each place is based on a multiple of 20. Thus, the number 328 in a base-20 system represents 3 times a unit of 400 (20 x 20), plus 2 times a unit of twenty, plus 8 times a unit of one. The base-20 number 328 represents 1248 if written using a decimal system.

In the Casa K'inich

The ancient Maya wrote their base numbers (0 to 19) with three symbols: a shell-like oval for zero, a dot to stand for 1 unit, and a bar to represent 5 units.

Now see if YOU can do "Maya Math"

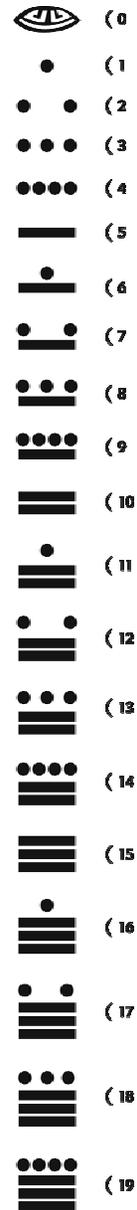
- 1) Turn the left knob to find a Maya math equation.
- 2) Turn the knob on the right to find the answer using Maya numbers.
- 3) Check your answer by lifting the small door on the lower left side.

WHAT WOULD YOU BE IF YOU STUDIED MATHEMATICS?

A **MATHEMATICIAN** is a person who studies mathematics.

Out at the Site

Find bar-and-dot numbers carved on the stelae in the Great Plaza. Ask your students to record any series of numbers they find out at the site and translate into our number system. What numbers are recorded on these monuments?



WRITE THESE NUMBERS USING A BASE-20 SYSTEM

As you might have discovered, the Maya could write numbers up to 399 using only two places because they used a base-20 numerical system. The highest we can go in two places is 99, using our base-10 system. To write higher numbers we must use three places, for example, 100.

back in the classroom

number of 400s				
number of 20s				
number of 1s				
decimal system	406	421	821	1000

TRY ADDING THESE MAYA NUMBERS

number of 20s				
number of 1s		+		=
decimal system	22	+	56	= 78

ANOTHER EQUATION TO TRY

number of 20s				
number of 1s		+		=
decimal system	39	+	18	= 57

Find the answers on page 65.

USE THIS CHART TO HELP YOU DO MAYA MATH

number of 400s					•	• •
number of 20s	•	• •	—	==	•	••••
number of 1s		••• ==	==	••• ==	==	==
decimal system	20	53	110	208	430	890

HERE ARE SOME SAMPLES OF MAYA NUMBERS

number of 20s	•	• •	—	• —
number of 1s	• •	•• —		• •
decimal system	22	47	100	122

Sometimes the Maya represented numbers by using hieroglyphs rather than bars and dots. These could take the form of the heads or entire figures of gods who were the "patrons" of the numbers. The ancient scribes at Copan are famous for writing numbers using these "head variant" or "full-figure" hieroglyphs to record numbers. Look for these on the stelae in the Main Plaza at the site. They often are found at the beginning of the long texts carved on the side and back of the stelae.

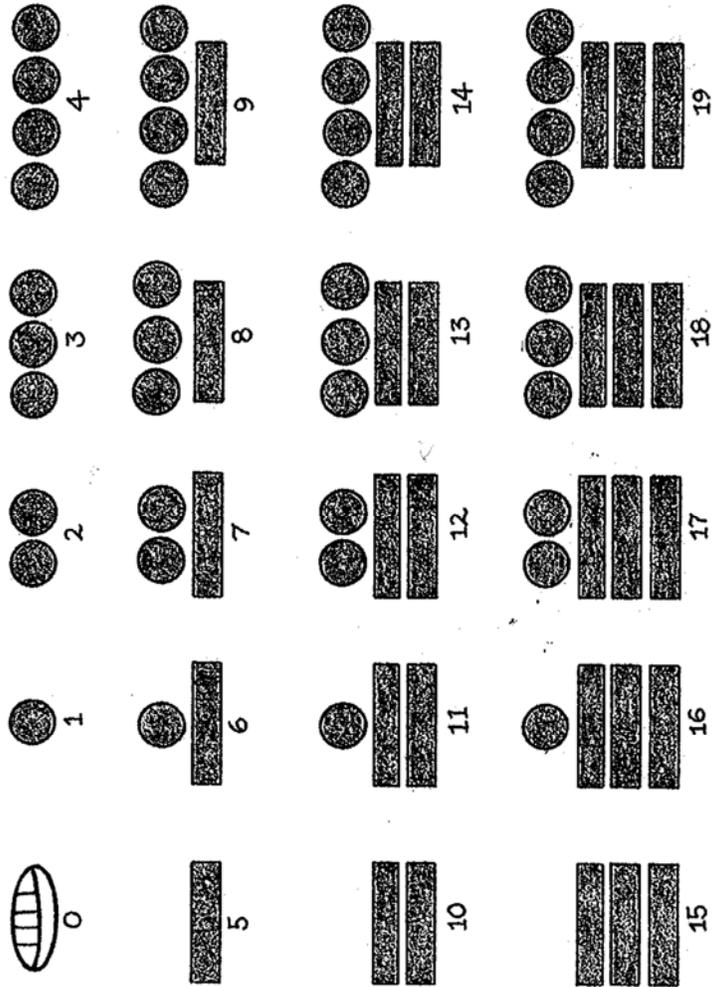
extra teacher information

ASK YOUR STUDENTS TO WRITE THESE NUMBERS USING MAYA NOTATION (BARS AND DOTS)

number of 20s						
number of 1s						
decimal system	87	106	119	300	380	399

MATH

The ancient Maya had a number system in place by A.D. 200. They used a base 20 system of counting. (The decimal system is a base 10 counting system.) The Maya, along with the ancient Babylonians and the ancient Hindus from India, was one of the few early civilizations that used the concept of zero. Because the Maya used zeros, they were able to write and calculate large numbers. Dots, rectangular-shaped bars, and a shell image represented the numbers. The shell image stood for zero, dots represented 1 through 4, and the bar represented 5. Different combinations of bars and dots represented 6 through 19.



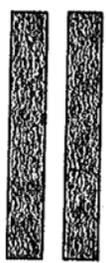


Maya Math Lesson

Learning Maya math was not that hard. The bars and dots enabled the Maya to quickly count or calculate any number problem. Maya merchants could figure out the change owed to someone by laying cacao beans and corn kernels on the ground to represent the dots and bars, then adding or subtracting to get the right change or the correct total amount due.

Since the Maya numbers are base 20, larger numbers are written in powers of 20. For example, the number 32 could be written as 1×20 (because you have one 20) + 12 (because you have twelve 1s). Thus 1×20 equals 20, and $20 + 12$ equals 32. By comparison, 32 in the decimal system would be 3×10 (because you have three 10s) + 2 (because you have two 1s). So 3×10 equals 30, and $30 + 2$ equals 32. The Maya wrote their numbers in a vertical column, so 32 was written as shown here.

20's (1)  20

1's (12) 

 + 12
 32

Place value was shown vertically with the lowest value in the bottom position and the highest at the top. In the base 20 number system, here's how place value would look:

8000s  You have 2 eight thousands 16,000

400s  You have 6 four hundreds 2,400

20s  You have 1 twenty 20

1s  You have 5 ones 5

18,425

The bottom position represents the 1s place. Above that is the 20s place value, followed by the 400s, then the 8,000s. What place value would be above 8,000? It's easy. Here's how it's figured out. To get to the 400s place value from the 20s place value, you multiply the base 20 number by 20, so 20×20 equals 400. To get to the 8,000s place value from the



400s place value, you take the base 20×20 (which you did to get 400) and multiply that by 20. So, it's $20 \times 20 \times 20$, which equals 8,000. Now it's easy to figure out the next place value. Just multiply by another 20, and you get 160,000 ($20 \times 20 \times 20 \times 20$). With this formula, the Maya could calculate into the millions.

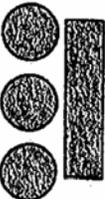
if you write the numbers for each place value in a column, then add them up as you did in the example. Good luck!

Maya math examples:

8000s  0

400s  0

20s  60

1s  +  8
68

**MASTER
MAYA MATH**

Now have fun doing some Maya math on your own.

SUPPLIES

paper
pencil

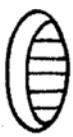
calculator (optional)

STEPS

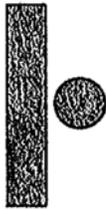
- 1 Work through the first two Maya math examples to make sure you understand the process. Once you are confident, try the other Maya math problems. It's easier

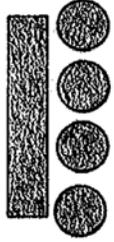


Maya math problem # 1

8000s  0

400s  800

20s  120

1s  + 

 929

8000s 

400s 

20s 

1s  + 

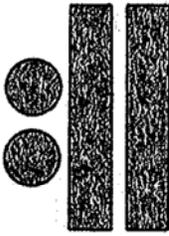
(Answer on page 110.)

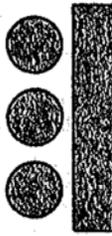


Maya math problem #2

8000s 

400s 

20s 

1s 

_____ + _____ = _____

(Answer on page 110.)

V. Lesson Plans

Handout 3: Making a Quipu

Quipu means "knot" in Quechua. *Quipus* are made of strings consisting of cotton or llama wool. One person who has studied the *quipu* in detail describes them as looking like worn out mops!

Many anthropologists have studied *quipus* extensively. But while they can describe them, they cannot know for sure what they are counting. So the meaning of the remaining *quipus* is still a puzzle. They are like a code that has not yet been broken.

Quipus consist of a main string with other strings hanging from it. The main string has a knot at one end and is twisted at the other end, so that the reader knows which end is the beginning and which is the end. The attached strings are looped over the main string, so that the person who is tying the knot has two strands of the string to work with (see illustration, Figure A). There are three types of knots—the single knot (B), the long knot (C) and the figure 8 (D).

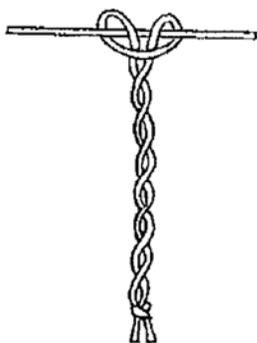


Figure A

Main string



Figure B

Single overhead knot



Figure C

Long knot



Figure D

"Figure Eight" knot

Source: *Code of the Quipu Databooks*, Marcia Ascher and Robert Ascher, <http://instruct1.cornell.edu/research/quipu-ascher/>. Used with permission.

Student Peer Assessment

Project: [Project title]

Participants: [Project participants]

Due Date: [Project due date]

I contributed to my group's success by:

Next time, I would:

On a scale from 1 to 5, rate your group on the following items.

	1 = Strongly Disagree	2 = Disagree	3 = Agree	4 = Strongly Agree	5 = Couldn't agree more!
All members contributed equally to the project.	1	2	3	4	5
Our group worked well together.	1	2	3	4	5
Disagreements were settled quickly and politely.	1	2	3	4	5
Our group met deadlines and did not procrastinate.	1	2	3	4	5
I felt encouraged by my group members to work on the project.	1	2	3	4	5
I would like to work with this group again.	1	2	3	4	5