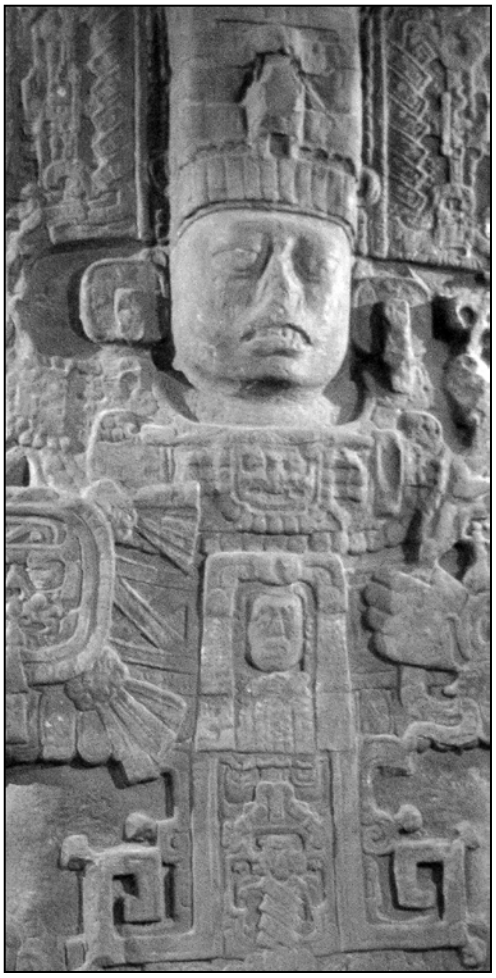


Teacher Guide

for Peabody Museum Class

MAGNIFICENT MAYA

Grades 4–7

60 minutes

Integrates with studies of:

- ✓ Primary characteristics of a civilization
- ✓ The Maya
- ✓ Ancient civilizations
- ✓ Archaeology

PEABODY MUSEUM
of ARCHAEOLOGY & ETHNOLOGY
Harvard University, 11 Divinity Avenue, Cambridge, Massachusetts 02138

www.peabody.harvard.edu/education PMAE-Ed@fas.harvard.edu 617-495-3216

MAGNIFICENT MAYA

LEARNING OBJECTIVES

- Enhance a classroom study of ancient civilizations.
- Define the primary characteristics of a civilization.
- Introduce the Classic Maya as one of the world's great ancient civilizations.
- Identify the Maya world on a modern map.
- Emphasize the term "civilization" as a category, not a value judgment.
- Discuss the role of agriculture and surplus in the development of a civilization.
- Highlight the importance of trade networks in spreading materials and ideas.
- Introduce the natural history of the region.
- Note the continued presence of the Maya today: 6,000,000+ people!
- Introduce the Maya writing and numbering system.
- Foster pride in the accomplishments of indigenous peoples in the Americas.
- Demonstrate the value of artifacts as a research tool.

MASSACHUSETTS FRAMEWORK CORRELATIONS

A. At the Museum – "Magnificent Maya" Class Correlations

History and Social Science Curriculum Framework, August 2003
- Grade 4 Standard 4.25
- Grade 5 Standard 5.2
- Grade 7 Standards 7.4, 7.5, 7.6

Science and Technology/Engineering Curriculum Framework, October 2006
- *Earth and Space Science Strand*
  - Grades 3-5 Standard ESS.14
  - Grades 6-8 Standard ESS.9
- *Life Science Strand*
  - Grades 3-5 Standard LS.10
  - Grades 6-7 Standard LS.17

English Language Arts, June 2001
- *Language*
  - Grades 3-4 Standard 1.2
  - Grades 5-6 Standard 1.3
  - Grade 7 Standard 1.4

Arts Curriculum Framework, November 1999
- *Connections*
  - Grades 3-4 Standard 8.2
  - Grades 5-7 Standards 6.3, 6.4, 7.2, 8.5

B. Back at School – Teacher Activity Correlations

Maya Mathematics

History and Social Science Curriculum Framework, August 2003
- Grade 5 Standard 5.2
- Grade 7 Standard 7.6

Mathematics Curriculum Framework, November 2000
- *Number Sense and Operations*
  - Grades 3-4 Standards 4.N.1, 4.N.12, 4.N.18
  - Grades 5-6 Standards 6.N.1, 6.N.2, 6.N.9, 6.N.13, 6.N.15

Grade 7 Standards 8.N.4, 8.N.8

Patterns, Relations and Algebra

Grades 3-4 Standards 4.P.1, 4.P.4

Grades 5-6 Standard 6.P.4

Artifact Ethics

Mathematics Curriculum Framework, November 2000

Measurement

Grades 3-4 Standards 4.M.1, 4.M.5

Data Analysis, Statistics and Probability

Grades 3-4 Standard 4.D.1

English Language Arts, June 2001

Language

Grades 3-4 Standards 1.2, 2.2, 3.4, 3.5, 3.7

Grades 5-6 Standards 1.3, 3.8, 3.9

Grade 7 Standards 1.4, 2.4, 3.11

Reading and Literature

Grades 3-4 Standards 7.9, 8.15, 10.2, 13.9, 13.12

Grade 7 Standards 13.20, 13.21, 13.22

Composition

Grades 3-4 Standards 19.11, 24.2

Grades 5-6 Standards 19.16, 19.17, 23.7, 23.8, 24.3

Grade 7 Standards 19.23, 23.10, 24.4

Arts Curriculum Framework, November 1999

Connections

Grades 3-4 Standard 9.1

Designer Civilizations

History and Social Science Curriculum Framework, August 2003

Grade 7 Standards 7.4, 7.5, 7.6

English Language Arts Curriculum Framework, June 2001

Language

Grades 3-4 Standards 1.2, 2.2, 3.4, 3.5, 3.7, 4.13

Grades 5-6 Standards 1.3, 3.8, 3.9, 4.17

Grade 7 Standards 1.4, 2.4, 3.11, 4.20

Composition

Grades 3-4 Standard 19.9

Grades 5-6 Standard 19.14

Grade 7 Standard 19.19

Arts Curriculum Framework, November 1999

Visual Arts

Grades 3-4 Standards 3.3, 4.2

Grades 5-7 Standards 3.6, 4.6, 4.8, 5.6

Connections

Grades 3-4 Standard 10.1

Grades 5-7 Standards 6.3, 6.4, 7.2, 10.2

VOCABULARY

These terms apply to both the museum class and the activities presented in the following pages.

Agriculture: The science of growing crops or raising stock; farming.

Archaeology: The scientific study of people of the past through their material remains.

Artifact: Any object made or altered by humans.

Bar-and-Dot Numerals: The symbols used by the Maya and other Mesoamerican peoples in their arithmetic. In this system, a bar stood for "five," a dot for "one," and a shell symbol for "zero."

Civilization: A type of social organization associated with six basic characteristics: concentration of the population in cities; economy that produces food surpluses; presence of social classes; system of record keeping; presence of geographical boundaries and political institutions; system of religion, learning, art, and architecture.

Classic Period: Originally defined as the time during which Maya monuments with dates were erected, this period falls between AD 200-900. All of the Maya glyphs on the Peabody Museum monuments were carved during this time.

Glyphs: Any of the signs used by the Maya in their writing system, also called "hieroglyphs." Maya glyphs included logographs (signs for whole words) and syllables (signs for sounds).

Maya: An indigenous culture in southern Mexico and Central America, with many different communities, united by common religious beliefs, cultural practices, and historical interactions with non-Mayan speaking peoples.

Mayan: A descriptive term for the family of languages spoken by modern Maya. More than 25 different Mayan languages are still spoken today.

Mesoamerica: A geographic and cultural region that extends south and east from central Mexico and includes parts of Guatemala, Belize, Honduras, and Nicaragua. In pre-Columbian times the area was inhabited by a number of civilizations, including the Maya, the Aztec and the Olmec.

Mural: A painting or other work of art executed directly on a wall.

Stela: A tall, free-standing stone monument depicting kings engaged in public ceremonies or military activity, usually erected in public plazas.

RECOMMENDED RESOURCES

Audio Visual

Amlin, Patricia, producer. (1989)
Popul Vuh: the Creation Myth of the Maya. VHS. University of California Extension Media Center: Berkeley.

The History Channel Video. (1999)
Mexico: A Story of Courage and Conquest, Volume I. VHS. A&E Television Networks: New York.

Books for Teachers

Aston, Mick and Tim Taylor. (1998)
The Atlas of Archaeology. DK Publishing, Inc.: New York.

Coe, Michael D. (1991)
The Maya, Fourth Ed. Thames & Hudson: New York.

Coe, Michael D. (2007)
Reading the Maya Glyphs. Thames & Hudson: New York.

Culbert, T. Patrick. (1993)
Maya Civilization. Smithsonian Books: Washington, D.C.

D'Acquisto, Linda. (2006)
Learning on Display: Student-Created Museums that Build Understanding. Association for Supervision and Curriculum Development: Alexandria.

Merrill, Yvonne Y. (1997)
Hands-On Latin America. KITS Publishing: Salt Lake City.

Sobel, David. (1998)
Mapmaking with Children: Sense of Place Education for the Elementary Years. Heinemann: Portsmouth.

Books for Students

Eboch, Chris. (2005)
Life Among the Maya. Thompson Gale: Detroit.

Galvin, Irene F. (1997)
The Ancient Maya. Marshall Cavendish: NY.

Greene, Jacqueline D. (1992)
The Maya. Franklin Watts: New York.

Marcos, Subcomandante. (1999)
The Story of Colors/La Historia de los Colores. Cinco Puntos Press: El Paso.

Montejo, Victor. (1991)
The Bird Who Cleans the World and Other Mayan Fables. Curbstone Press: Willimantic, CT.

Montejo, Victor. (1999)
Popul Vuh: A Sacred Book of the Maya. Groundwood Books: Toronto.

Nicholson, Robert. (1994)
The Maya. Chelsea House Publishers: New York.

Scarre, Chris. (1993)
Smithsonian Timelines of the Ancient World. Dorling Kindersley: London.

Westridge Young Writers Workshop. (1992)
Kids Explore America's Hispanic Heritage. John Muir Publications: Santa Fe.

Periodicals

Archaeology. The Archaeological Institute of America: New York.

Dig: The Archaeology Magazine for Kids. Cobblestone Publishing: Peterborough.

Web Sites

anthropology.si.edu/maya/ -- Smithsonian's National Museum of Natural History

www.civilization.ca/civil/maya/mminteng.html -- Canadian Museum of Civilization

www.mayadiscovery.com – "Mundo Maya" online

www.mesoweb.com – Superb Mesoamerican website, permanent and updated weekly

www.pbs.org/wgbh/nova/maya/ -- Nova online, "Lost King of the Maya"

www.peabody.harvard.edu – The Peabody Museum of Archaeology and Ethnology, Harvard University

www.peabody.harvard.edu/CMHI -- The Corpus of Maya Heiroglyphic Inscriptions, Peabody Museum

MAYA MATHEMATICS

The ancient Maya were amazing mathematicians and astronomers. While many Europeans were struggling with the cumbersome Roman numeral system, the Maya were using a sophisticated system of mathematical notation for calendars and calculations. In this activity, students learn the Maya numbering system and try their hands at Maya addition and subtraction.

Materials:

- Copies of Attachments #1a, #1b, #1c "Maya Math," "More Maya Math" (*optional*) and "Answer Key"
- Bunch of small sticks and pebbles (or beans), about 40 of each
- Bunch of shells, about 20 of each
- Abacus (*optional -- for use in part 2 only*)

Instructions:

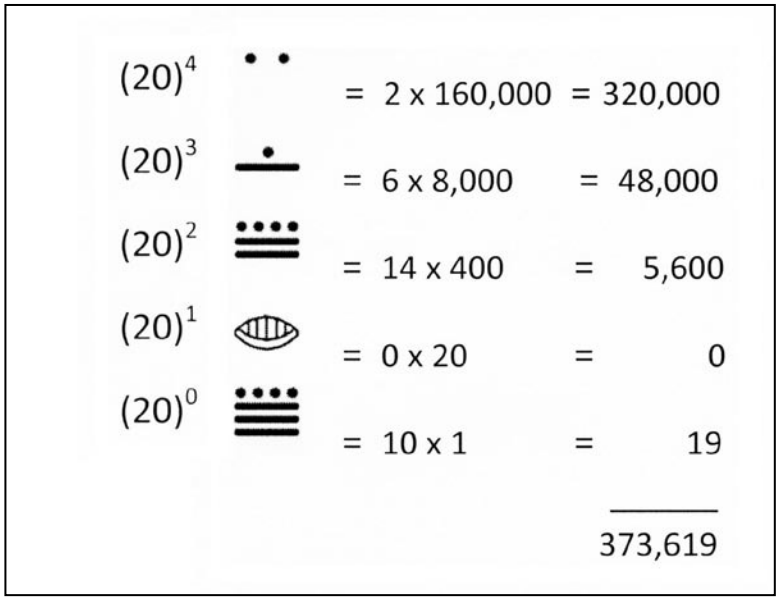
Part 1*:*

- Distribute copies of *Attachment 1a* to the students.
- Introduce the basic Maya numbering system. Explain to students that the Maya used three symbols to express all numbers: a shell shape represented "zero," a dot represented "one," and a bar represented "five." The Maya combined these symbols to represent numbers up to 19 (see attachment).
- Divide students into teams of 3 or 4 and divide the sticks and pebbles between the teams. Explain that the teams will be competing in a Maya Math Bee.
- Quiz students by calling out numbers from 1 to 19. The first team to correctly create the number called wins a point. The first team to reach 20 points wins.
- Now ask students to practice basic Maya addition and subtraction. To add numbers, simply combine their dots and bars (consolidating the resulting dots into bars when necessary). To subtract two numbers, simply remove the dot and bar components of the second number from the first. Refer students to the math problems contained in *Attachment 1a* or make up some of your own (allow students to use their sticks and pebbles). For now, be sure that the numbers you are adding do not result in numbers greater than 19.
- Explain that this system of mathematics and numbering had the advantage of allowing even an illiterate population to do math. Merchants and buyers could use simple materials (usually sticks or bones and cacao beans) to perform basic addition and subtraction simply by combining two or more sets of symbols.

Part 2 *(optional – for a greater math challenge):*

- Once the students are comfortable with the basic concept of Maya numbers and math, introduce the fact that the Maya represented numbers greater than 20 by using a "positional" number system involving "stacked" number groups.
- Explain to students that we use a positional number system as well, but instead of stacking number rows, we write them side by side from right to left. The column on the far right represents numbers from 1-9, the next column to the left represents multiples of 10 from 10-100, the third column to the left represents multiples of 100 from 100-1000, and so on. A column without a number value is "completed" by inserting the zero symbol. Thus, the number "one thousand two hundred and one" is written 1201. This is called a "base 10" numbering system.

- This can also be demonstrated with the help of an abacus. Explain to students that an abacus is made up of "stacked" rows of beads, with 10 beads on each row. On the bottom row, each bead represents the number 1; on the second row, each bead represents the number 10; on the third row, each bead represents the number 100, and so on. Therefore, the number 111 is represented by one bead on each of the bottom three rows.
- Explain to students that the ancient Maya used a "base 20" positional system (many scientists believe that the ancient Mesoamericans were the very first to invent the concept of a positional system of mathematics!). In this system, the first line or "floor" was used to represent the numbers 1-19. On the second floor, a dot represented the number 20, thus the dots and bars represented multiples of 20 up to 400 (20x20). On the third floor, dots then represented 400, with dots and bar combinations representing multiples of 400 up to 8000 (40x20), and so on up (see below for an example). To complete a floor without a number value, the Maya used a shell (or shell shape) as a place holder (many scientists also believe that the ancient Mesoamericans may have been the first to invent the concept of "zero").
- Have the students practice representing numbers above 20 by holding another math bee.
- Once students seem comfortable with the idea of representing numbers using stacked number sets, demonstrate how to add and subtract these number sets. To add two or more large numbers, start by adding (combining) the numbers on the first floor and work up, carrying a dot (stone or bean) up to the second floor whenever you reach 20. To subtract one number from another, again start at the bottom and work up, borrowing groups of twenty from the floor above whenever necessary (always remember that a dot on the floor above represents 20 dots on the floor below).
- Challenge the students to attempt some of the math problems on *Attachment 1b.*



ARTIFACT ETHICS

Imagine you are an archaeologist who is in charge of excavating the remains of a never-before-discovered civilization. You've just uncovered an ancient site filled with artifacts… what do you do? In this activity, students learn proper scientific collection techniques and explore the issue of artifacts and ethics.

Materials:

- Notebook paper, pencils and pens
- Objects brought from students' homes
- Measuring tools (such as rulers, tape measures, compasses, protractors, scales, etc.)
- Small labels or tags for inventorying artifacts
- Camera

Instructions:

- Ask students to bring an object from home.
- In class, have the students imagine that they are archaeologists who have just discovered a site filled with these artifacts.

  To whom do these objects belong? Should the archaeologists be allowed to return home with them, or should the artifacts stay in the "country" where they were found?

  Ask students to offer their viewpoints, then discuss the fact that countries around the world are deeply concerned about losing their heritage. In the early days of archaeology, countries often did not realize that their treasures were vanishing. Now, all nations are concerned about what happens to artifacts discovered on their lands and archaeological excavations are strictly monitored. Collections are usually kept inside the country where they were found.

  Let the class brainstorm ways that they could still gain from a new discovery without taking the artifacts home with them. Could they make reproductions? Could they set up a special program that allowed scientists from other countries travel to and study the site? Could they arrange for a loan?

  Discuss the fact that by recording every piece of information they can before returning the artifacts, archaeologists can still gain tremendous scientific knowledge.

- Ask students to inventory (list) all artifacts and assign each a unique number. Attach numbered tags to each corresponding object.
- Distribute an object to each student (make sure that students don't get the same objects they brought). Ask students to measure, describe, photograph, draw (to scale), and research their artifacts. Make sure that students record all of the information they can.
- Once all of the objects have been researched and recorded, ask students to work together to create a museum display and a final collection report. In creating their display, students should consider both information (making sure all objects have labels and some associated interpretive text) and aesthetics. In creating their report, students should include all of the artifact information, as well as hypotheses about the "culture" they've discovered (How do the objects fit together as a whole? What can students say about the culture the objects represent?).
- At the end of the project, have students disassemble the museum display and return all objects to their original owners. Keep the collection report.

DESIGNER CIVILIZATIONS

In this activity, students design their own civilization.

Materials:

- Copies of Attachment #2 -- "Designer Civilizations"
- Pencils, one per student
- Other craft supplies, depending on which map and art projects students undertake

Instructions:

- Review the characteristics of a civilization: concentration of the population in cities; economy that produces food surpluses; presence of social classes; system of record keeping; presence of geographical boundaries and political institutions; system of religion, learning, art and architecture.
- Discuss other civilizations students have learned about. Does our society qualify as a civilization?
- Divide students into groups of 3-4 and distribute Attachment #2 to each group.
- Explain to the groups that they are going to design their own civilizations and ask them to start by answering the questions on the attachment.
- Once the groups have come up with a rough idea for their civilizations, ask them to create their civilizations. Tasks could include a combination (or all) of the following:
    1. Create a map of an important city or area.*
    2. Create a recipe that uses foods produced and eaten.
    3. Create a timeline of important events.
    4. Write a history or mythology that describes the civilization's beginnings.
    5. Create a "lexicon" of up to 20 words.
    6. Create a piece of art that is typical of the civilization.
- Once civilizations are completed, ask groups to present them to the class and discuss. Some questions:
    Does this civilization remind you of any actual ancient or modern ones?
    Would you want to live in this civilization?
    Is this civilization located near any of the other groups' civilizations? If so, would you foresee any problems? Any advantages?
- Bring the class together for a final discussion about outdated notions of "civilized" versus "uncivilized." When students hear the word "civilization," how does this make them feel? Is it a positive word? A negative word? Neither? Today, scientists emphasize that the term "civilization" shouldn't carry a notion of superiority or inferiority - it's simply a descriptive term for a social structure that possesses specific characteristics.

Other Topics for Discussion:

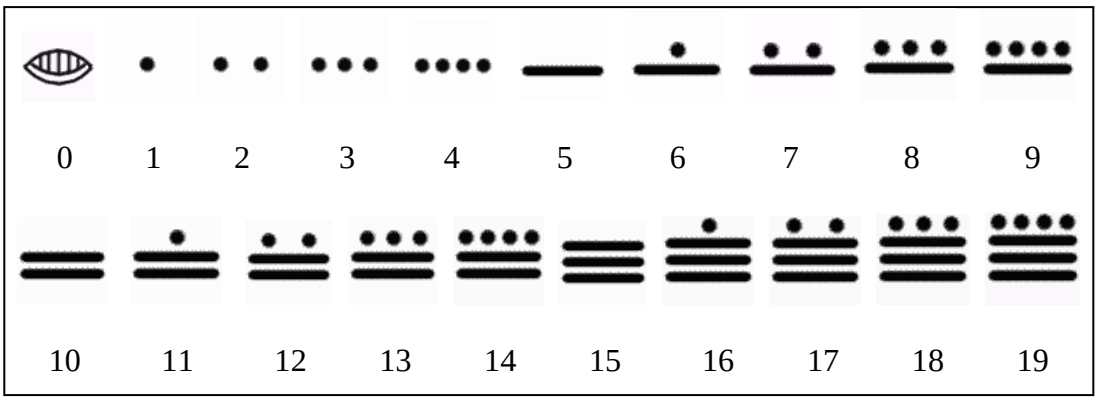
- Besides a "civilization," what are other types of social structures? What type of society would you like to live in?
- Why do you think writing is a necessary "ingredient" for a civilization?
- What problems do you think are facing our own civilization? Were any of these faced by civilizations before us? Can we learn anything from them?

*Mapmaking With Children, by David Sobel, is a wonderful "how to" manual for making a variety of maps for every developmental stage.

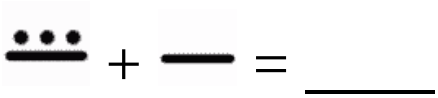
Attachment #1a

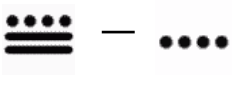
MAYA MATH

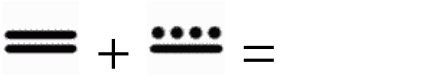
Try your hand at some Maya Mathematics!



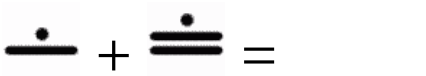
(Maya numbers courtesy of Michiel Berger)

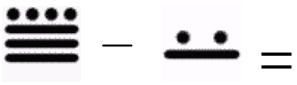
1.  = _____

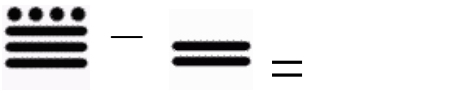
2.  = _____

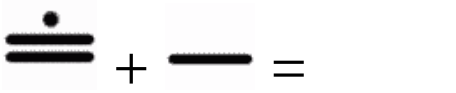
3.  = _____

4.  = _____

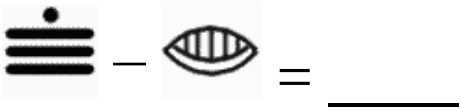
5.  = _____

6.  = _____

7.  = _____

8.  = _____

9.  = _____

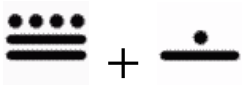
10.  = _____

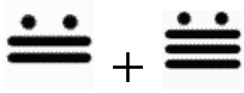
Attachment #1b

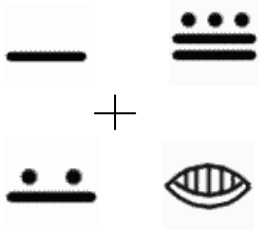
MORE MAYA MATH

Looking for a challenge, eh? Give these problems a try….

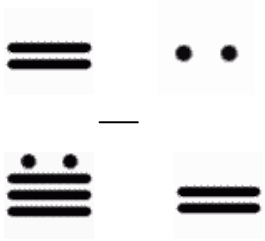
(Maya numbers courtesy of Michiel Berger)

11.  = _____

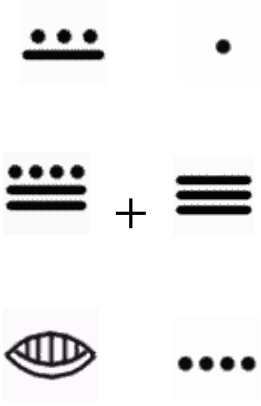
12.  = _____

13. 

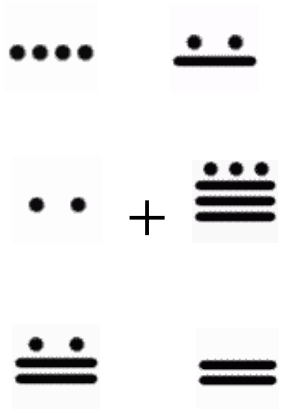
Answer: _____

14. 

Answer: _____

15. 

Answer: _____

16. 

Answer: _____

Attachment #1c

MAYA MATH ANSWER KEY

1.  (13)

2.  (10)

3.  (19)

4.  (15)

5.  (17)

6.  (12)

7.  (9)

8.  (16)

9.  (10)

10.  (16)

11.  (20)

12.  (29)

13.  (367)

14.  (167)

15.  (4,184)

16.  (4,822)

Attachment #2

Designer Civilizations

What's the recipe for a "civilization"? You need six ingredients:

- Cities
- An economy that produces food surpluses
- Social classes
- A system of record keeping
- Defined geographical boundaries and political institutions
- A system of religion, learning, art and architecture

Now, design your own civilization. The following questions will help you get started:

What is the climate like where your civilization is located? Is it hot or cold? Wet or dry? Does the weather change over the course of the year (seasons)?

What is the geography like? Is your civilization in the mountains? The desert? The rainforest? Is it near the coast or on an island? Are there rivers or lakes? Grasslands or forests?

When in time does your civilization exist?

What is the name of your civilization?

Who are the rulers? Are they chosen by the people or is their power hereditary (from parent to child)?

How do most people get their food (hunting, gathering, agriculture)? What types of foods are found in your civilization?

What are the major products produced in and traded between cities within your civilization?

Can everyone in your civilization read and write? If not, who can?

What do written documents say about your civilization? How old is it? What are some of the important episodes in its history?

What is the name of the largest city in your civilization? How many people live there?

What types of homes do you find in your cities? Outside of your cities?

What are some common occupations? Do men and women do the same jobs?

How do people obtain goods or services? Do they trade goods or is there a currency?

What language is spoken in your civilization (make up a language of your own)? Is it written using an alphabet or hieroglyphs?