**The Illinois Amistad Commission
and The DuSable Museum of African American History**
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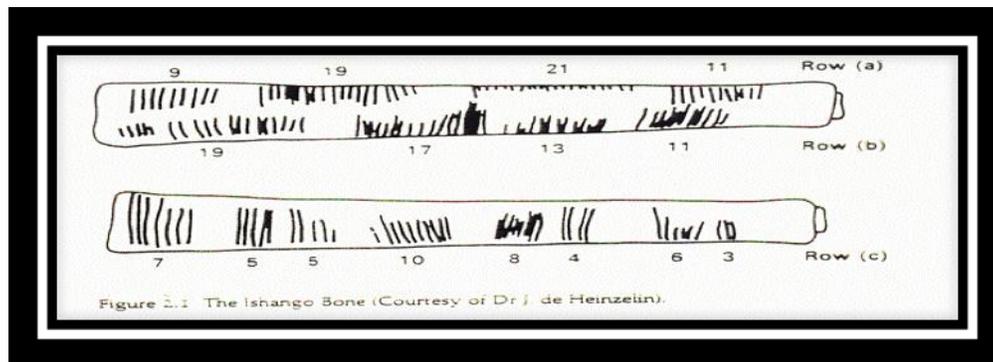
African Women and the Origins of Mathematics

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Lesson 1

Vocabulary Words: archaeology, excavation, radiocarbon dating, lunar

Figure 1.1 The Ishango Bone (Courtesy of Dr J. de Heinzelin).

The Ishango Bone

In the late 1950s, a Belgian archaeologist named Jean de Heinzelin conducted an archaeological excavation in the Ishango District of Congo, Central Africa. De Heinzelin found many interesting harpoon heads and a bone that captured his attention immediately because it contained groups of peculiar markings. This bone would become known as the Ishango bone. Originally, de Heinzelin dated the bone via a carbon-dating process to be from 8500 BCE. Later dating with more sensitive radiocarbon instruments found that the Ishango bone dates to 25,000 BCE! It should be noted that since that time, a much older bone with similar markings, known as the Lembombo bone, has been discovered in modern-day Swaziland. It easily dates to 35,000 BCE. Much more study has been done on the Ishango bone, however, so it remains the focus of this lesson

What Is So Fascinating about the Ishango Bone?

The markings on the Ishango bone were intentionally arranged in a mathematical pattern. Based on his close examination of the Ishango bone, de Heinzelin was relatively certain that whoever made the bone was familiar with prime numbers, decimals, and addition by duplication. The Ishango bone was studied by Alexander Marshack, an archaeologist from Harvard University. Marshack did not believe that there was a high level of mathematics in Africa 27,000 years ago, but he did conclude that the markings on the Ishango bone constituted the charting of a lunar (moon) cycle. The Egyptian scholar Charles S. Finch states that there is no reason that the Ishango bone cannot be both a lunar calendar and a sophisticated math tool.

Although some researchers feel that the markings on the Ishango bone and other such bones are merely decorative, more evidence to the contrary is being revealed. Dr. Finch reports that later versions of the Ishango bone can be found all way up the Nile River, even in Syrio-Palestine. Based on these findings, de Heinzelin concludes that the technology of the Ishango bone began in Central Africa and spread northward to Egypt and the Near East.

What Does This All Mean?

- Whereas the birth of mathematics was previously thought to have taken place in Mesopotamia and Egypt, accurate mathematical history must begin in central and southern Africa.
- The method of addition by duplication, which the archaeologist Jean De Heinzelin found to be present on the Ishango bone, is also utilized in the Rhind Papyrus of Egypt, which dates back to 4000 BCE. It is at least possible that the mathematicians of central Africa carried their mathematical genius up the Nile River and into ancient Egypt.
- If Alexander Marshack is right that the Ishango bone records lunar cycles, then African women may be the originators of mathematics in Africa. Women have an unmistakable connection to the moon. A woman's menstrual cycle, like the moon, reoccurs every twenty-eight days. This is the most obvious reason that lunar or moon charting would be necessary for early humans. By charting their own bodies' cycles, which are analogous to the moon's cycles, African women may well have developed the time consciousness and time sensitivity that are necessary for agriculture to develop.
- Dr. Charles Finch reports that when the predynastic graves of ancient Egypt were opened, the field researchers made note of the superior wealth in the graves of the females. In addition, the female figurines added to the graves of the deceased outnumbered the male figurines. There has been speculation that this is because of the work that women do in a family setting, but it may also be because women were greatly honored by many African communities for having introduced basic mathematical understanding.

Activity One
Geography — Discuss the reading. Have students fill in the exact location of the Lake Edward/Ishango District in Congo on the attached map (see appendix).

Activity Two
Recall — Have students answer the following questions:
1. What is the Ishango bone?
2. What is the significance of the bone?
3. What is the possible role of women in the origin of mathematics?

Activity Three
Portfolio — Creation of a Portfolio Submission. Gain access to the book *In Praise of Black Women Volume 1: Ancient African Queens* by Simone Schwarz-Bart. Based on the book, students should choose one black woman from antiquity on which to create a one-page report. The report should highlight that woman's contribution to early civilization in Africa. The report should also include pictures of the woman. The pictures may be hand-drawn or researched and copied from a book or online source.

Activity Four
Science — Students will learn what radiocarbon dating is by exploring the website at http://www.kidspot.org/discover/creation/carbon4.html. Once students have gone through the definition a couple of times, they should gather into groups of two or three. Each group should discuss what they understood by the definition given and submit the definition in their own words. It should not be longer than one paragraph.

Activity Five
Science — Students should visit the website http://africa.si.edu/exhibits/cosmos/moon.html. There they will learn about the African proverb that states, "Without the moon, there is no life." After reading the information, students should discuss the ways that African people respect and celebrate the moon. To have students develop awareness of the moon, the entire class can be involved in the creation of a moon calendar. Each day, a student is assigned to observe the moon that evening. The next day he or she will draw in on a blank calendar the exact formation of the moon as it appeared in the night sky. If there is no moon in the night sky, students should leave those dates blank. At the end of a twenty-eight- to thirty-day cycle, students should analyze the calendar and point out moon patterns such as the new moon, the waxing moon, the full moon, and the waning moon.

Resources

For Teachers
"Nile Genesis: Continuity of Culture from the Great Lakes to the Delta" by Charles Finch, in *Egypt: Child of Africa*, edited by Ivan Van Sertima
Africa Counts: Numbers and Patterns in African Culture by Claudia Zaslavsky
"Tracing the Roots of Civilization" by Robert Trotter, *Science News* 101, no. 8 (1972), pp. 124–126
African Fractals: Modern Computing and Indigenous Design by Ron Eglash
Blacks in Science: Ancient and Modern (Journal of African Civilization) edited by Ivan Van Sertima
Diloggún Tales of the Natural World: How the Moon Fooled the Sun and Other Santería Stories by Ócha'ni Lele
African Cosmos by Christine Mullen Kreamer
Moon Gazer's Wheel by Bob Crelin

For Students
African Cosmos by Christine Mullen Kreamer
Moon Gazer's Wheel by Bob Crelin
Math Games and Activities from around the World by Claudia Zaslavsky

Appendix

Blank Map of Africa

Lesson Plan

	African Women and the Origin of Mathematics
Grade Level(s)	Grade 6
Unit and Time Frame	Two 50-minute periods
Common Core State Standards	• CCSS. ELA-Literacy. RI.6.4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings. • CCSS. ELA-Literacy. RI.6.7: Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue. • CCSS. ELA-Literacy. W.6.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. • CCSS. ELA-Literacy. SL.6.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
Lesson Goals	• Increase students' understanding of the role of women in the origin of mathematics. Students will be able to: 1. Identify and discuss the possible role of women in the origin of mathematics. 2. Identify the significance of the Ishango bone. 3. Find the exact location of the Lake Edward/Ishango District in Congo on the attached map. 4. Describe the processes involved in radiocarbon dating. 5. Describe the workings of the lunar calendar based on the moon.
Materials/Resources	• "Nile Genesis: Continuity of Culture from the Great Lakes to the Delta" by Charles Finch, in *Egypt: Child of Africa*, edited by Ivan Van Sertima • *Africa Counts: Number and Patterns in African Culture* by Claudia Zaslavsky • *Tracing the Roots of Civilization* Robert Trotter • *African Fractals: Modern Computing and Indigenous Design* by Ron Eglash • *Blacks in Science: Ancient and Modern (Journal of African Civilization)* edited by Ivan Van Sertima • *Diloggun Tales of the Natural World: How the Moon Fooled the Sun and Other Santería Stories* by Ocha'ni Lele • *Math Games and Activities from around the World* by Claudia Zaslavsky • *African Cosmos* by Christine Mullen Kreamer • *Moon Gazer's Wheel* by Bob Crelin
Key Terms and Concepts	**Ishango bone**: an ancient bone tool. Some scientists have suggested that the groupings of notches indicate a mathematical understanding that goes beyond counting.

	Jean de Heinzelin: a geologist and a remarkable observer. Africa was his main area of work, but he also worked in the Middle East, Europe, and the United States. His discovery of the Ishango bone brought him international fame. **archaeology**: the scientific study of material remains (such as fossil relics, artifacts, and monuments) of past human life and activities. **Charles S. Finch III**: a scholar, author, doctor, researcher, and master teacher who has conducted independent studies in African antiquities, comparative religion, anthropology, and ancient science since 1971. **excavate**: to dig out and remove a covering or surface with the intention of viewing what is underneath. **lunar**: something that relates to or is based on the moon. **Alexander Marshack**: an archaeologist who studied the Ishango bone microscopically and concluded that it may represent a six-month lunar calendar. **radiocarbon dating**: the determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon 14 it contains.
Interdisciplinary Connections	**Geography** – Teacher will discuss reading with students. Teacher will have students fill in the exact location of the Lake Edward/Ishango District in Congo on the attached map. **Comprehension** – Have students answer the following questions: What is the Ishango bone? What is the significance of the bone? What is the possible role of women in the origin of mathematics? **Activity Three – Creation of a Portfolio Submission** – Gain access to the book *In Praise of Black Women Volume 1: Ancient African Queens by* Simone Schwarz-Bart. Based on the book, students should choose one black woman from antiquity on which to create a one-page report. The report should highlight that woman's contribution to early civilization in Africa. The report should also include pictures of the woman. The pictures may be hand-drawn or researched and copied from a book or online source. **Science** – Students will learn what radiocarbon dating is by exploring website http://www.kidspot.org/discover/creation/carbon4.html. Once students have gone through the definition a couple of times, they should break up into groups of two or three. Each group should discuss what they understood by the definition given, and they should submit definition in their own words, not be longer than one paragraph. – Students should visit the website http://africa.si.edu/exhibits/cosmos/moon.html. There they will learn about the African proverb that states, "Without the moon, there is no life." After reading

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1. Lesson Opening: Teacher will set the scene by stating that many ancient societies had excellent astronomers and builders, skills that require the knowledge of mathematics. Teacher will introduce the Ishango bone and explain why it is highly probable that it was used as a calendar.

2. Introduction to New Material:
- Main Idea: Foundations in mathematics were created in Africa (and Asia). Mathematics is not an exclusively European product.
- Activate Prior Knowledge: Teacher will ask students if they think they use mathematics in their day-to-day activities. Teacher will discuss the importance of mathematics in the lives of humans, both ancient and contemporary.

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3. Discussion: Students will respond to the following questions:
   - What is the possible role of women in the origin of mathematics?
   - What is the Ishango bone, and why is it significant?

4. Critical Reflection Activity: Students will complete the following:
   - Define (a) radiocarbon dating, (b) excavation, and (c) lunar.
   - Describe the Ishango bone and explain its significance.
   - Identify the following people and their contributions to the study of the Ishango bone: (a) Alexander Von Wuthenau, (b) Ivan Van Sertima (c), Jean de Heinzelin, and (d) Alexander Marshack.
   - In your own words, discuss the possible role of women in the origin of mathematics.

	5. Recap: Teacher will reiterate the highlights of the lesson.
Assessment	Observation, critical reflection activity, participation in class discussion, writing, geography, and math/science activities
Extensions (Homework, Projects)	Observation, critical reflection activity, participation in class discussion, writing, geography, and math/science activities