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The following lessons were created by **Katelyn Weil**, a teacher participating in the National Endowment for the Humanities Summer Institute for Teachers entitled Touch the Past: Archaeology of the Upper Mississippi River Region.

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## Numbers

Grade Level: 4th-7th Grade

Subjects: Mathematics

Objectives: Students will be able to

- Appraise at least two strengths and two limitations of the Hindu-Arabic numeral system by comparing it with an alternative system using a poem for two voices.

Standards: 6.NS.C.5- Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; Use positive and negative numbers to represent quantities in real world contexts, explaining the meaning of 0 in each situation.

Duration: 1-3 days (50 minute class periods)

Materials:

- *From Zero to Ten: The Story of Numbers* by Vivian French & Ross Collins
- Computers with internet access

Vocabulary: (as defined by *The History of Counting* by Denise Schmandt-Besserat)

- Base- The unit of a number system that is multiplied by itself in order to create a higher number. Some number systems have more than one base.
- Digits- The first ten numbers, 0 to 9.
- Numeral- A sign to write a number.
- Place Value (also called place notation) - When the number takes a different value according to its place. In the decimal system, the same digit has the value of a unit, ten, hundred, and so on, according to its place in the numeral.

#### Background:

Number sense in the middle grades is an essential skill as students extend their working knowledge of numbers with integers, fractions, and decimals. In today's multicultural classroom many teachers are using the number systems of different cultures to help students develop this key skill of number sense. The topic of the development of number systems worldwide not only provides students with insight as to the workings of their own system, but also insight on the cultures that used them (Zaslavsky 2001).

Today, our Hindu-Arabic number system has become the universal language of mathematics, providing an excellent medium for vast developments from modern computing to calculus and beyond. This base 10 system of numbers has its roots in gestures our ancestors made using their ten "digits" to show "how many." From the development of gestures, words for these numbers developed, which lead to symbols or numerals (Zaslavsky 2001). We began by using our hands to count as did many cultures worldwide. This similar origin provides both many similarities in systems and many different differences though different perspectives.

#### Setting the Stage:

To begin the lesson, have the students share any ways they know people write or have written numbers. If they are struggling, it may be helpful to suggest the students look at page numbers in a textbook- most textbooks will have a few pages written in roman numerals to accompany the arabic numerals. To follow this brief discussion, read to the class pages 10-13 in *From Zero to Ten: The Story of Numbers* by Vivian French & Ross Collins which clearly introduces the concepts of base and place value from a historic perspective. During the reading, have the students try to define base and place value in their own words.

#### Procedure:

1. Divide the students up into pairs and have them follow the webquest found at <https://sites.google.com/a/mes150.org/history-of-numbers-webquest/home>
2. When the students are done have them share their poems with the class.

#### Closure:

To conclude the lesson, students will share their favorite number system from the ones they learned about and provide at least two reasons to support their opinion.

#### Evaluation:

The students' poem for two voices will be evaluated for correctness, completeness, and overall creativity. Students will also be evaluated based on their contributions to the closing discussion.

#### Links/Extension:

- Mathematics
  - Struggling Learners: Create an Incan Quipu: **The Inka Quipu: Positional Notation on a Knotted Cord** by Claudia Zaslavsky; Bianka Crespo *Teaching Mathematics in the Middle School* November 2000 Volume 6 Issue 3 Page 164

- Above level learners: Create a computer program using [Scratch](http://scratch.mit.edu/) (<http://scratch.mit.edu/>) to display numbers using different number systems
- Writing
  - Poetry: Students can analyze their classmates poems
  - Narrative: Write a letter set during the adaptation of the the Hindu-Arabic numeral system describing the arguments for and against its adaptation from the Roman Numeral system

#### References:

- Children's Books:
  - *From Zero to Ten: The Story of Numbers* by Vivian French & Ross Collins
  - *The History of Counting* by Denise Schmandt-Basserat
  - *From 0 to 10 the Story of Numbers* by Vivian French
- Articles:
  - "Exploring Mayan Numerals" by Jeff D. Farmer and Robert A. Powers *Teaching Children Mathematics* September 2005
  - "Developing Number" by Claudia Zaslavsky *Teaching Children Mathematics* February 2001

#### Attachments:

- Poem for two voices template
- Poem for two voices math sample
- Number Systems Webquest
  - Egyption Number Systems- <http://www.childrens university.manchester.ac.uk/interactives/history/egypt/egyptiannumbersystem/>
  - Mayan Number Systems- <http://maya.nmai.si.edu/>
  - Roman Number Systems - [http://www.abcya.com/roman\\_numerals.htm](http://www.abcya.com/roman_numerals.htm)
  - Mathematics Archeology Video- [https://www.youtube.com/watch?v=NYt5c\\_BLNSE](https://www.youtube.com/watch?v=NYt5c_BLNSE)



# Math Poem for Two Voices

## Template

|  | Voice #1: _____ | Voice #2: _____ |
|--|-----------------|-----------------|
| Definition:  |                 |                 |
| Similarity 1:  |                 |                 |
| Similarity 2:  |                 |                 |
| Similarity 3:<br>(optional)                          |                 |                 |
| Difference 1:  |                 |                 |
| Difference 2:  |                 |                 |
| Difference 3:<br>(Optional)                          |                 |                 |
| Advantages (1+)                                      |                 |                 |
| Disadvantages (1+)                                   |                 |                 |
| Application 1<br>(How can it be<br>used?) (Optional) |                 |                 |
| Application 2<br>(How can it be<br>used?) (Optional) |                 |                 |

Sum it up:

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Grading Scale:

A- The poem for two voices is creative and all required parts are completed with correct and detailed information.

B- All required parts of the poem for two voices are completed with correct and detailed information.

C- All required parts of the poem for two voices are completed with correct information.

D- One part of the poem for two voices is missing or incorrect.

F- More than one part of the poem for two voices is missing and/or incorrect.