Lighten Up: Designing Lightning Systems

Lesson 1, 2, 3, 4

Title: Count Like an Ancient Egyptian

Grade Level: 3, 4, 5

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Prep Time: Under 15min
Lesson Time (1): 60 Minutes
Lesson Time (2): None

Lesson Description:
Using ancient Egyptian numbers, students will explore place value and the importance of zero.

Strands:

- Number and Operations in Base 10

Standards:

- Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*
- Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

Objective:
The purpose of this lesson is to give students an opportunity to understand how important 0 is in our number system. By using an ancient Egyptian number system that is base 10 without place value, students will be able to see the connections/differences between digits and numbers. The advantages and purpose of place value will be explored.

Materials:

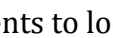
- For the entire class:
  - Display copy of 'The Ancient Egyptian Number System'
  - Several sets of large hieroglyphic numbers. In particular make 10 copies of the symbols for 1 and 10 (You may want to laminate for future use)
    NOTE: for Grade 3 you might want to only use ancient Egyptian symbols up to 100 or 1,000.
  - Individual white boards if available, or math notebooks, or paper to record answers.

- For each group of 2 or 3
    - hieroglyphic cut outs
    - pencil, paper, glue
    - 'Count Like an Ancient Egyptian'
- For each student:
    - 'Count, Ancient Egyptian Style'
    - 'The Ancient Egyptian Number System'

Lesson Plan:

(Note: students may be confused by the distinction between ancient and modern Egyptians. While this lesson explores an ancient Egyptian number system, most modern Egyptians use Arabic numerals and speak Arabic.)

Begin lesson with The Ancient Egyptian Number system displayed on board. If you want, Google "Walk like an Egyptian" and have music playing as an introduction.

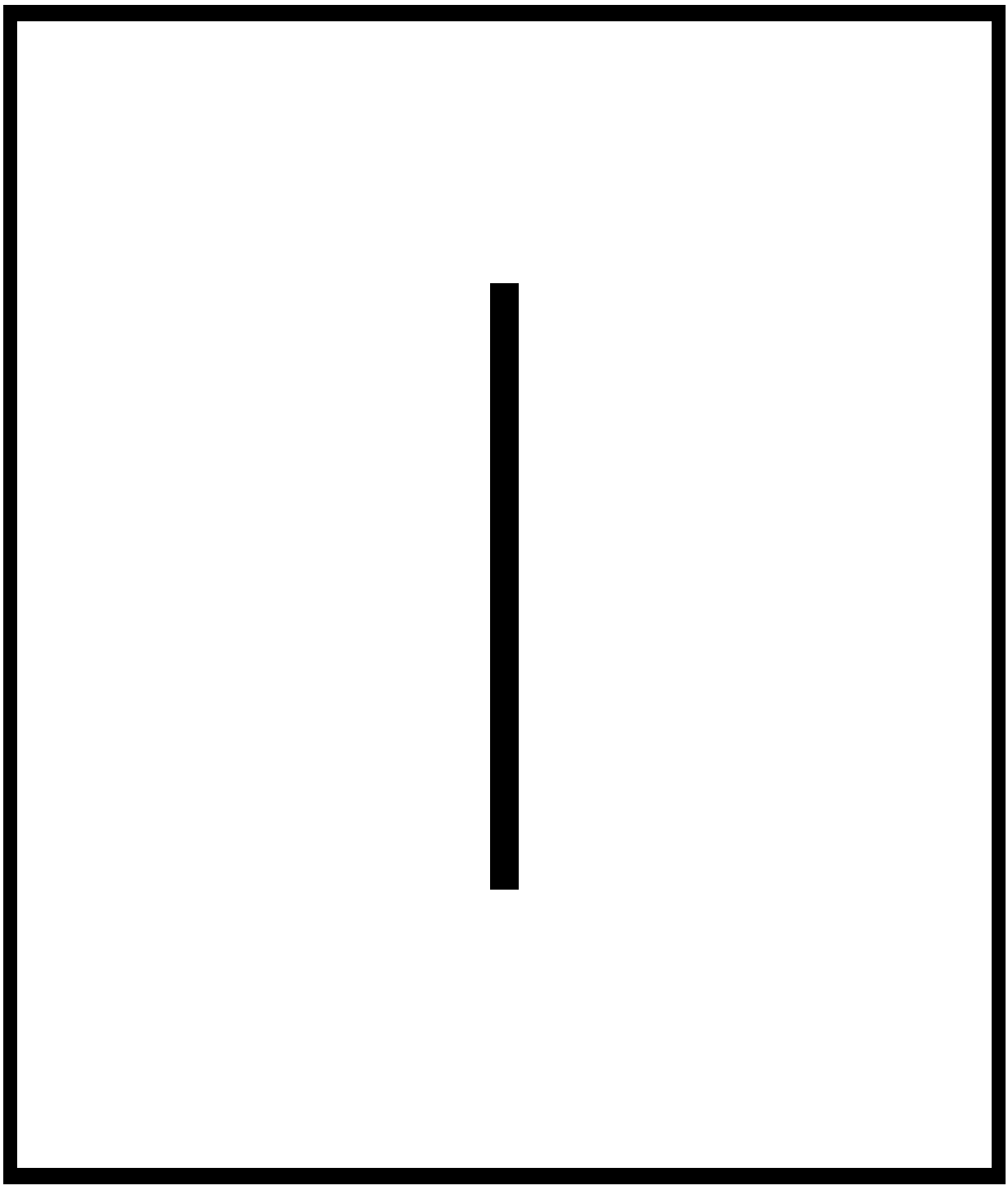
1. Take time to discuss what the symbols mean. Distribute the large ancient Egyptian number cards to students in your class. You will be giving the same symbol to a number of students. For example, in order to show 9 you will need 9 students with the tally mark.
2. Ask, **"What value do you notice is missing when you compare to our number system?"** (*0*) **"Why might that be?"**
3. Select groups of students to come up to the front of the class and display their ancient Egyptian symbols. Students should line up so that the largest value is on the left and smallest values on the right, just like our numbers.
4. Students remaining in their seats will write the value of the symbols on their white boards with standard numbers. Example:  =32
5. Ask students to look at how many digits they needed to write compared to the ancient Egyptians. 32=2 digits, ancient Egyptians needed 5
6. Students can hold up their answers for you to check. Discuss any problems that arise.
7. Try to have students create numbers that require 0 as a place value holder. Example: 407, 3,002 This should gets students thinking about 0,
8. Continue several times until all students have a chance at the front of the room and numerous combinations have come up. Again ask students to think about why we have 0 since the ancient Egyptians did not. Accept all answers and let students know they will be exploring this idea.
9. In groups of 2 or three, students will use the ancient Egyptian cutouts to create addition and subtraction equations. Use the sheet "Count like an Ancient Egyptian' to help organize their work. NOTE: depending on grade level you might choose to only distribute symbols to 100 or 1,000. I have included symbols to 1,000,000. Encourage students to write the equations in our number system as well.
10. Circulate to see that students are able to complete the activity.
11. Call group together to review results. What did they notice? Look for comments such as: " you need so many more symbols to make a number" or "it was hard to have to count each symbol"
12. For homework, or as an activity for day 2 distribute "Count, Ancient Egyptian Style"
13. This worksheet could be used to reinforce the work at home or as an assessment in class on day 2.

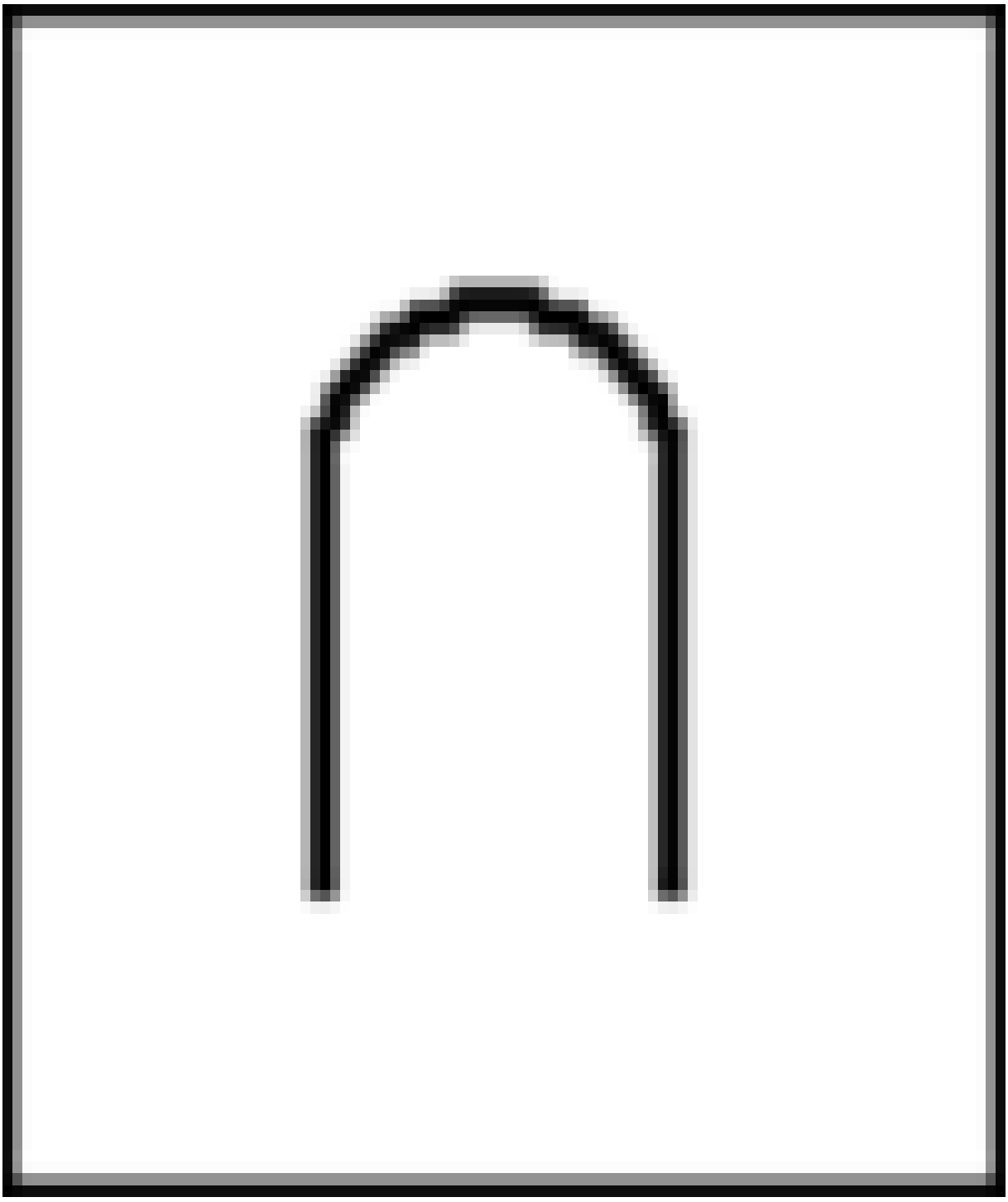
Reflections:

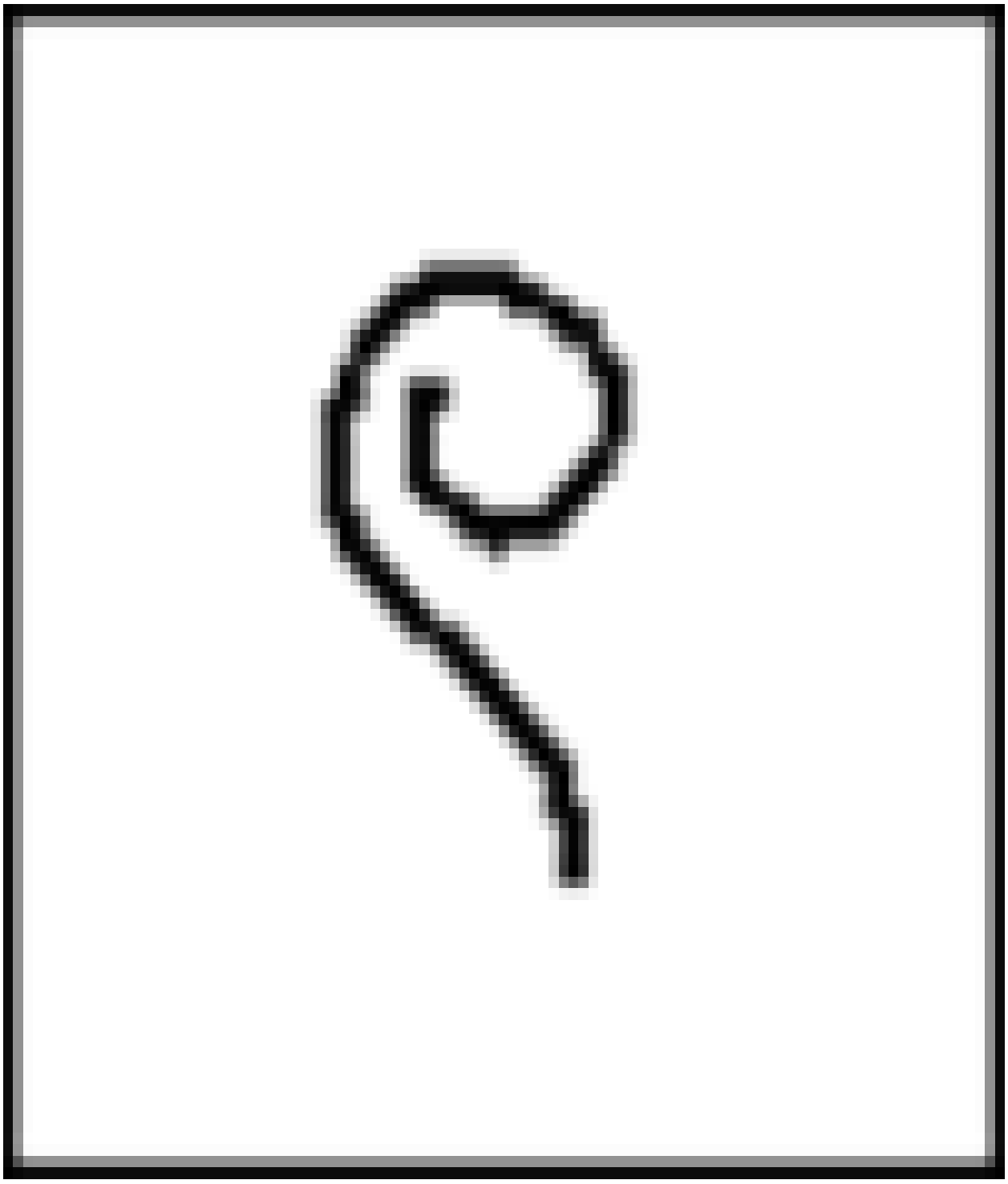
Did students see the importance of 0 in our number system? Could they see the importance of both base 10 and place value?

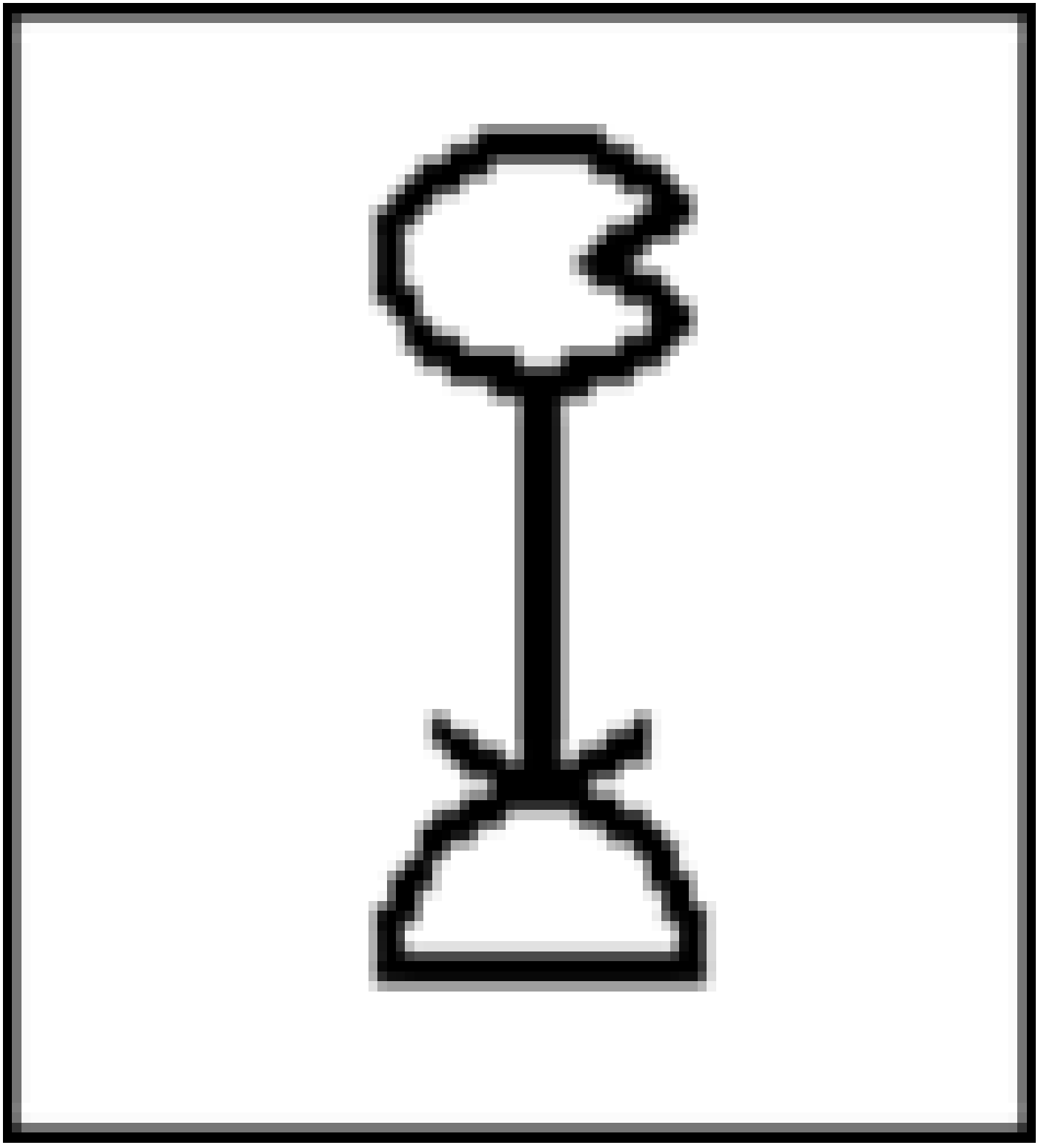
Assessment:

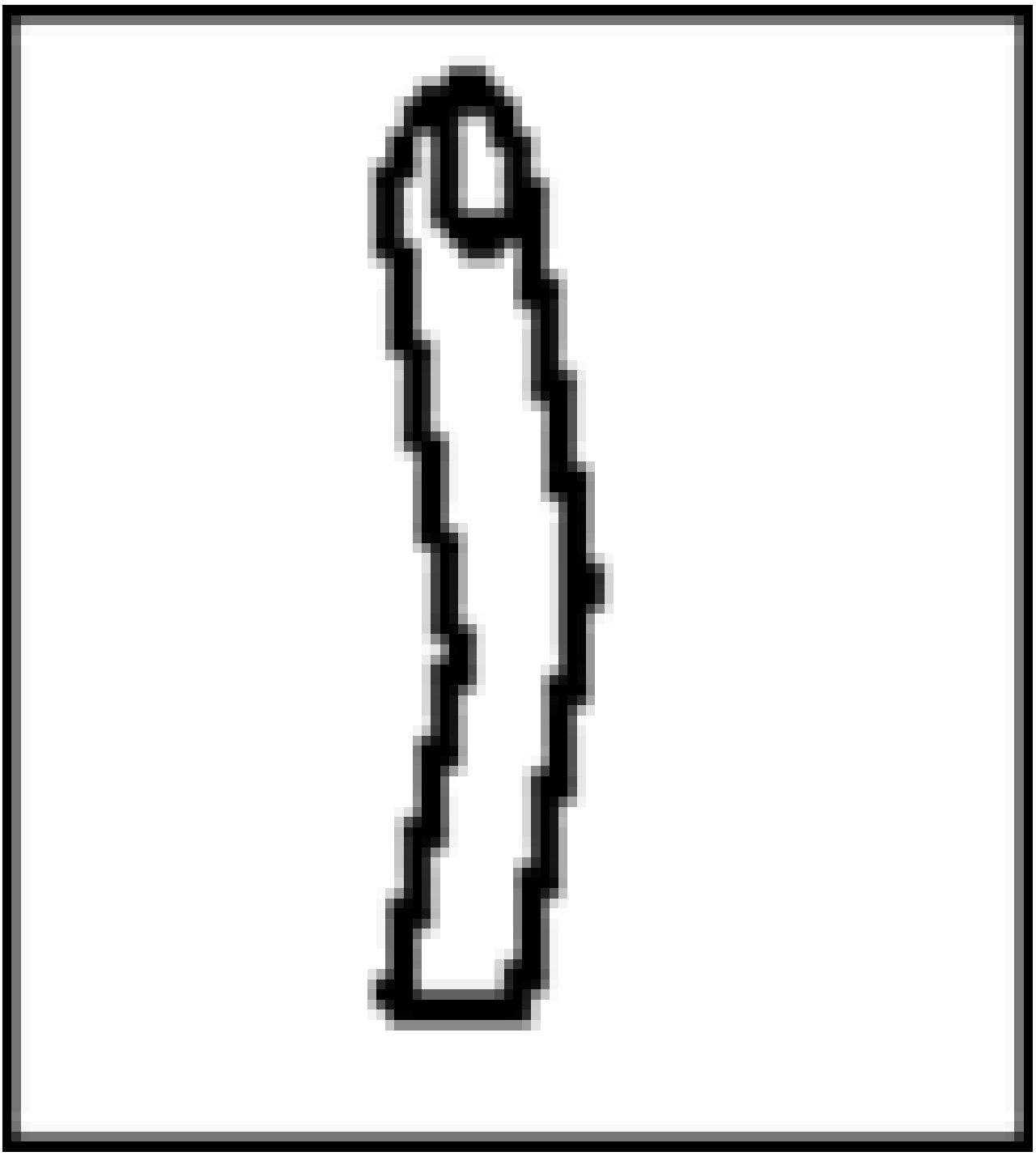
- Informal assessment takes place as students use white boards at beginning of class.
- Observe groups as they make their equations and solve their own problems.
- Use 'Count, Ancient Egyptian Style' as a formal assessment.





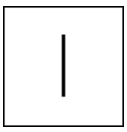
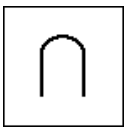
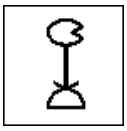
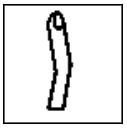


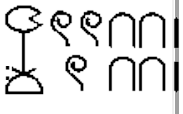




The Ancient Egyptian Number System

The Ancient Egyptians used a base ten number system, but they didn't have place value. So, while they counted in groups of ten, they used different symbols to represent powers of 10. As a result of this, they didn't have a symbol for zero. In the hieroglyphic system, the symbols used were:

1	vertical stroke	
10	heel bone	
100	coiled rope (snare)	
1,000	lotus flower	
10,000	bent finger	
100,000	burbot fish	
1,000,000	kneeling figure	

The number one thousand, three hundred forty two (1,342) would look like: 

In many cases, hieroglyphs were stacked rather than written in a single straight line.

Partner Names: _____

Count Like an Ancient Egyptian

With your partners, use the cut-out ancient Egyptian symbols to create your own addition and subtraction equations. Use the space below to glue your symbols on the paper. Be sure to write an answer to your equation in symbols. Then, under your cutouts, write the equation using our number system. If you get one addition and one subtraction finished, try another equation of your choice. You might even try multiplication or division!

Addition:

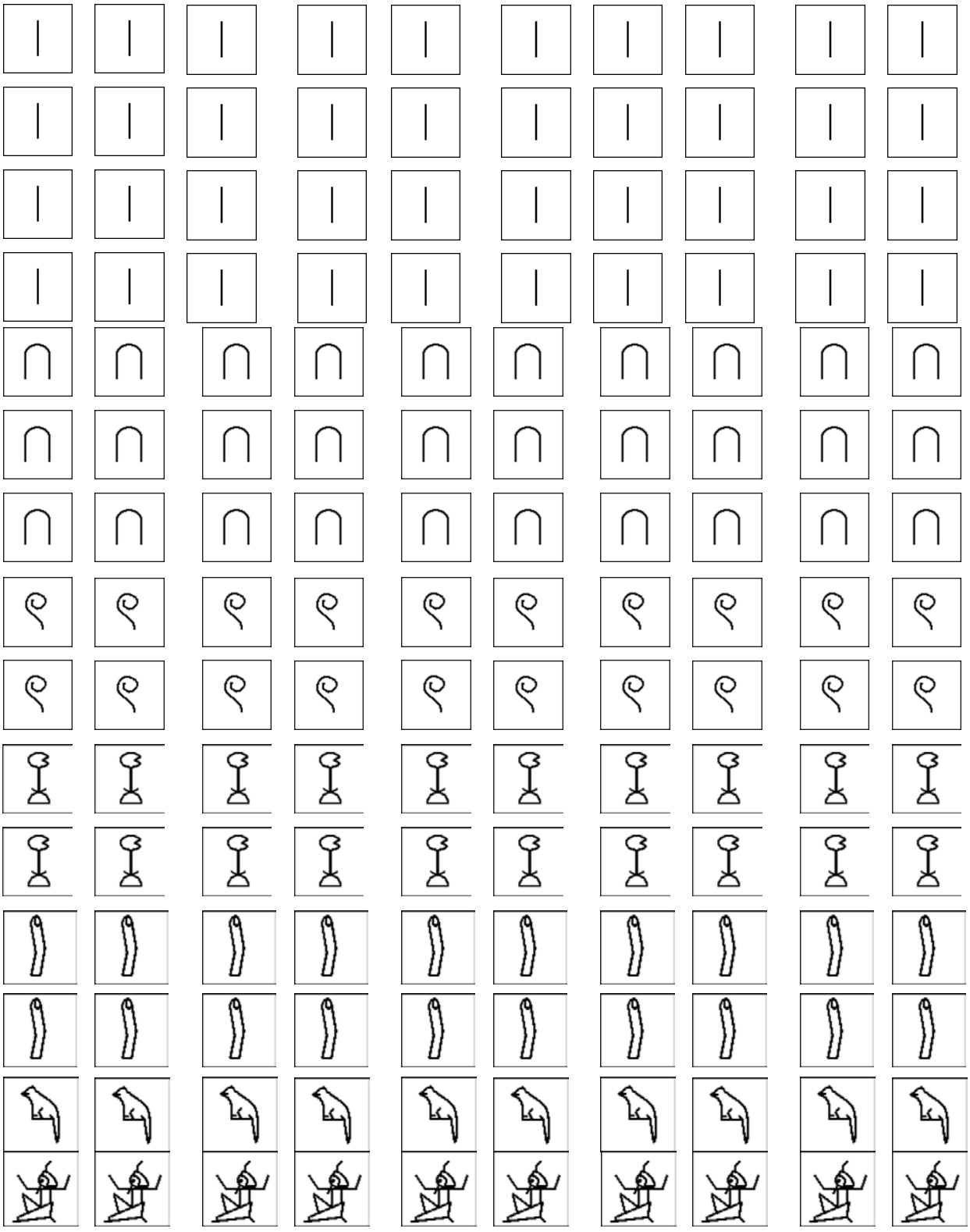
Equation using our numbers: _____

Subtraction:

Equation using our numbers: _____

Hieroglyphic Cut-Outs

Use your chart to find the values of each glyph.

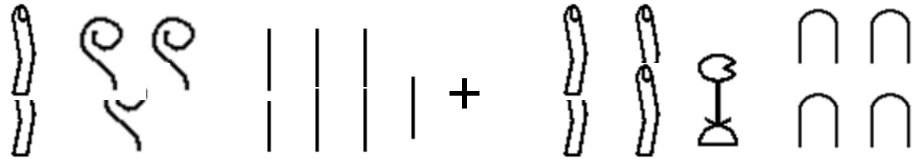


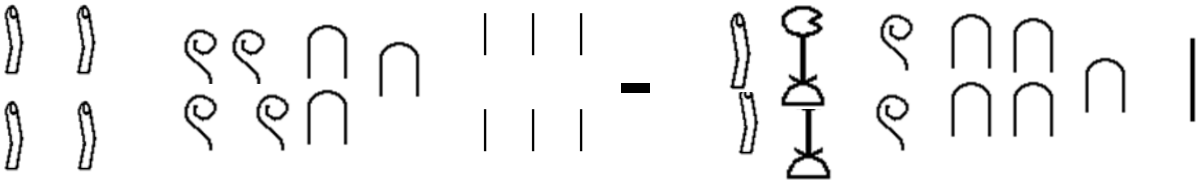
Name: _____ Date: _____

Counting, Ancient Egyptian Style

Directions: Solve each of the following equations written in hieroglyphics. Write your answer in both hieroglyphs and our traditional number system.

1) 

2) 

3) 

4) Write your observations. What differences did you notice between problem 1, 2 and 3? Explain how place value makes our number system different than the ancient Egyptians. What are the advantages? Disadvantages?

_____

_____

_____

_____

_____

_____

_____

_____

5) In the space below, write your own hieroglyphic equation and solve using both hieroglyphics and our number system. You may draw the hieroglyphs on your own, or use the cutouts available.