

## Teacher Guide for Ancient Mathematics

### Special notes and timing

The two units of Egyptian mathematics and Maya mathematics are independent of each other—you may choose to use one or both units. One question on Lesson 4 of the Maya math refers to the Egyptian unit, but that question is optional.

If it works better for your students, you may use the Egyptian Math Worksheet and they can record their answers on the worksheet. The worksheet is in a slightly different order than the other lessons, and does not include extension activities.

The Maya math is base 20 and is more abstract than the Egyptian math, so is more appropriate for advanced students.

### Learning Objectives

Students will:

- Translate numbers between our number system and an ancient number system
- Perform basic arithmetic in ancient number systems
- Compare the modern ideas of carrying in addition and regrouping in subtraction to ancient arithmetic

### Materials

- Math journal or notebook

### Helping Questions

How might you begin?

How does that number translate?

Look back at the table of number symbols. Does that help you?

Is this similar to the arithmetic you are familiar with?

What do you notice? What else do you notice?

What did you try that didn't work? Can you learn something from that?

Have you compared your answers with a classmate's answers?

Can you explain it in a different way?

### Assessment Options

- Look at the students' math journals. Ensure that they write down enough details so that they could look back and understand their work without having the lesson cards available.
- Students should be able to describe ancient arithmetic operations using the symbols of that arithmetic, without translating to our number system.
- Students should recognize the similarities and differences between our number system and the chosen ancient number system.

### Mathematical Notes

Converting numbers from Maya to our number system is fairly straightforward. It takes some more sophisticated reasoning to convert numbers from our number system to the Maya system. If students are struggling with the task, you can ask questions like, "How many 400s are in that number? If you group all of the 400s together, what is left? Now how many 20s are in what is left?"

## Extensions

In both units, lesson 4 includes several ideas of extension activities.

Students could choose their favorite ancient or tribal culture and study the mathematics of that culture.

Students could research the ancient Maya calendar.

The Maya had hieroglyphics in addition to the number symbols, while the Egyptians also had hieratic numerals in addition to their hieroglyphics. Have students research other number representations in both cultures.

## Teacher Reflection

- Which students were able to see learn the new number systems quickly, and which students struggled to understand the new systems?
- Were students able to make the appropriate comparisons to arithmetic in our familiar number systems? What should be the next activity for the students who struggled with the comparisons?
- Which students struggled with regrouping or carrying in other number systems? What is the next instructional step for these students? (It is possible that these students don't fully understand the same topics in our own number system.)
- How did introducing new symbols for numbers affect how the students discussed numbers? (Did they say, "three hundreds and 4 tens" versus "340," for example?)
- Did the students learn anything about our number system by studying a different system?
- Did some students work better individually or in pairs/small groups? What support can you provide to the students to work outside their comfort zone?

## Standards Addressed

### Common Core State Standards (and Colorado Academic Standards in Mathematics)

1. Number Sense, Properties, and Operations
2. Patterns, Functions, and Algebraic Structures

### NCTM (National Council of Teachers of Mathematics) Content Standards

Number and Operations

Algebra

### NCTM Process Standards

Problem Solving

Reasoning and Proof

Communication

Connections

Representation

## References Used

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Charles D. Miller, Vern E. Heeren, and John Horsby, *Mathematical ideas*, 9<sup>th</sup> edition. Addison Wesley, Boston, 2001.

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