# **Numbers Discussion Guide (for use during or after reading)**

1. Describe how humans used numbers even before they began writing them. (Early Counting Methods, p. 6-7)
   1. Humans used and thought about numbers before they found a way to write and record them. Humans likely counted on their fingers and toes. Humans also grouped things together. Over time people began using tally marks to represent those groups. All of this occurred before humans developed names for numbers and counting!
2. What is the base ten number system? (Early Counting Methods, p. 6-7)
   1. A number system is used to organize and think about numbers. It can be especially helpful when dealing with larger numbers. We use the base ten system, which includes 10 numerals (or digits) that make up all other numbers. The value of each digit depends on its place. The base ten number system uses groups of ten to make counting and using numbers faster and easier.
3. Look at the images on pages 10 and 11. What patterns do you notice here? (Number Words, p. 8-11)
   1. Students’ answers will vary. For example, they might comment on the changing digits in the tens place; even though each digit only increases by 1, its value increases by 10. Students might recognize the number 100 as a 10 starting in the tens and hundreds place with a zero in the ones place (just as 90 has a 9 in the tens place and a zero in the ones place). Finally, students might extend their pattern-based thinking to understanding 1,000 as 10 groups of 100.
4. Think about the ancient Egyptians described on pages 12 and 13. Analyze how their number system was similar to and different from the one we use today. (Early Counting Systems, p. 12-13)
   1. The ancient Egyptians also used a base ten number system. They grouped objects into 10s and 100s just as we do! The ancient Egyptians used special symbols to represent their numbers. Unlike us, however, the order of the symbols in a number did not matter. For example, two tens and three ones represented 23 just as three ones followed by two tens would. The order of the symbols or digits matters in our number system. For example, 23 is not equivalent to, or the same as, 32.
5. Compare the descriptions of different ancient number systems. What information stood out to you? Why? (Early Counting Systems, Ancient Times, Roman Numerals, p. 12-17)
   1. The ancient Egyptians, Greeks, and Chinese all used number systems based on groups of 10. They also all represented their digits with different symbols. However, not all ancient groups used a base ten number system. For example, the Maya used groups of twenty, whereas the Babylonians used groups of 60.
   2. The ancient Romans also used a number system based on groups of ten as well as other mathematical concepts, such as one more or one less. Order of the digits began to matter here, which relates to what we know about place value in the base ten number system we use today.
6. What is an abacus and how is it used? (Counting Devices, p. 18-21)
   1. An abacus is a tool mathematicians used in ancient times. Today, many students use it to learn about numbers, too! It contains a frame with rows of counters or beads. Each row represents a new place value. An abacus can be used to represent numbers as well as complete arithmetic, such as adding.
7. Explain how the numerals we use today relate to ancient Hindu numerals from around A.D. 100. (Hindu-Arabic Numerals, p. 22-23)
   1. The numerals (1-9) we use today look quite similar to the ones used by ancient Hindus around A.D. 100. Our digits have evolved over time. The Arabs began using these Hindu numbers. When they conquered Spain, they brought this numeral system to Europe. People in Europe began to adopt the Arabic numerals instead of using Roman numerals because they are easier to understand and can be more efficient. Arabic numerals rely on place value and so do we!
8. What is place value? (Place Value, p. 24-25)
   1. Place value is the value of a digit as determined by its place in a number. For example, in the number 47, the 4 represents 4 tens (or 40) and the 7 represents 7 ones (or 7). Place value helps us organize and better use numbers.
9. Describe how an abacus’s rows relate to what you already know about numbers and place value. (Place Value, p. 24-25)
   1. Each row on an abacus represents a specific place value. One row represents ones, another represents tens, another represents hundreds, and so on. An abacus can be used to help us understand regrouping to a new place value by showing visually how a group of ten ones can become a ten, a group of ten tens can become a hundred, and so on.
10. Who was Hypatia and what was her claim to fame? (Who’s Who: Hypatia, p. 32-33)
    1. Hypatia was born in Alexandria, Egypt, in 370. She lectured on math and astronomy and was the first noted woman in mathematics!