**Session Seven: Estimating and Writing Large Numbers**

**Common Core Standards Addressed**

#### Students in the lower Grades will need to form a strong understanding of the base ten system to utilize techniques like scientific notation later on. The standards for students in these grades center on those foundational skills.

#### Grade 1

#### Understand place value.

[CCSS.Math.Content.1.NBT.B.2](http://www.corestandards.org/Math/Content/1/NBT/B/2/)  
Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

[CCSS.Math.Content.1.NBT.B.2.a](http://www.corestandards.org/Math/Content/1/NBT/B/2/a/)  
10 can be thought of as a bundle of ten ones — called a "ten."

[CCSS.Math.Content.1.NBT.B.2.b](http://www.corestandards.org/Math/Content/1/NBT/B/2/b/)  
The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

[CCSS.Math.Content.1.NBT.B.2.c](http://www.corestandards.org/Math/Content/1/NBT/B/2/c/)  
The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

[CCSS.Math.Content.1.NBT.B.3](http://www.corestandards.org/Math/Content/1/NBT/B/3/)  
Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

#### Grade 2

#### Understand place value.

[CCSS.Math.Content.2.NBT.A.1](http://www.corestandards.org/Math/Content/2/NBT/A/1/)  
Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

[CCSS.Math.Content.2.NBT.A.1.a](http://www.corestandards.org/Math/Content/2/NBT/A/1/a/)  
100 can be thought of as a bundle of ten tens — called a "hundred."

[CCSS.Math.Content.2.NBT.A.1.b](http://www.corestandards.org/Math/Content/2/NBT/A/1/b/)  
The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

[CCSS.Math.Content.2.NBT.A.2](http://www.corestandards.org/Math/Content/2/NBT/A/2/)  
Count within 1000; skip-count by 5s, 10s, and 100s.

[CCSS.Math.Content.2.NBT.A.3](http://www.corestandards.org/Math/Content/2/NBT/A/3/)  
Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

[CCSS.Math.Content.2.NBT.A.4](http://www.corestandards.org/Math/Content/2/NBT/A/4/)  
Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

#### Grade 3

#### Use place value understanding and properties of operations to perform multi-digit arithmetic.¹

[CCSS.Math.Content.3.NBT.A.1](http://www.corestandards.org/Math/Content/3/NBT/A/1/)  
Use place value understanding to round whole numbers to the nearest 10 or 100.

[CCSS.Math.Content.3.NBT.A.2](http://www.corestandards.org/Math/Content/3/NBT/A/2/)  
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.

[CCSS.Math.Content.3.NBT.A.3](http://www.corestandards.org/Math/Content/3/NBT/A/3/)  
Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

#### Grade 4

#### Generalize place value understanding for multi-digit whole numbers.

[CCSS.Math.Content.4.NBT.A.1](http://www.corestandards.org/Math/Content/4/NBT/A/1/)  
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*.

[CCSS.Math.Content.4.NBT.A.2](http://www.corestandards.org/Math/Content/4/NBT/A/2/)  
Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

[CCSS.Math.Content.4.NBT.A.3](http://www.corestandards.org/Math/Content/4/NBT/A/3/)  
Use place value understanding to round multi-digit whole numbers to any place.

#### Grade 5

#### Understand the place value system.

[CCSS.Math.Content.5.NBT.A.1](http://www.corestandards.org/Math/Content/5/NBT/A/1/)  
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.

[CCSS.Math.Content.5.NBT.A.2](http://www.corestandards.org/Math/Content/5/NBT/A/2/)  
Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

[CCSS.Math.Content.5.NBT.A.3](http://www.corestandards.org/Math/Content/5/NBT/A/3/)  
Read, write, and compare decimals to thousandths.

[CCSS.Math.Content.5.NBT.A.3.a](http://www.corestandards.org/Math/Content/5/NBT/A/3/a/)  
Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).

[CCSS.Math.Content.5.NBT.A.3.b](http://www.corestandards.org/Math/Content/5/NBT/A/3/b/)  
Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

[CCSS.Math.Content.5.NBT.A.4](http://www.corestandards.org/Math/Content/5/NBT/A/4/)  
Use place value understanding to round decimals to any place.

#### Grade 6 and Grade 7 continue to work towards mastery of the base ten system, place value, decimals and related topics. Scientific notation may be introduced but not fully explored.

#### Grade 8

#### Expressions and Equations Work with radicals and integer exponents.

[CCSS.Math.Content.8.EE.A.3](http://www.corestandards.org/Math/Content/8/EE/A/3/)  
Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger.

[CCSS.Math.Content.8.EE.A.4](http://www.corestandards.org/Math/Content/8/EE/A/4/)  
Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.