CMS Lesson Plan

Teacher: McQueen

Lesson Date: 9-15-15

Subject: Math

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| **GSE Assessment Limits/Standards:** *(What are the skills being taught? Which standards are being specifically addressed in this lesson?)***MGSE8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 3= . 2 × 3(–5) = 3(–3) = 313271****MGSE8.EE.2 Use square root and cube root symbols to represent solutions to equations. Recognize that x2 = p (where p is a positive rational number and lxl < 25) has 2 solutions and x3 = p (where p is a negative or positive rational number and lxl < 10) has one solution. Evaluate square roots of perfect squares < 625 and cube roots of perfect cubes > -1000 and < 1000.** **MGSE8.EE.3 Use numbers expressed in scientific notation 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 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.***  | *Please indicate whether this plan is Monday, or Block specific plan. You will need a plan for Monday and one for your Block A days and your Block B days each week.* Block Tuesday  |
| **Lesson Objective/Learning Intention:** *(What will my students KNOW by the end of the lesson? What will they DO to learn it?)** Students know that positive powers of  are very large numbers, and negative powers of  are very small numbers.
* Students know that the exponent of an expression provides information about the magnitude of a number.
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| **TIME** | **INSTRUCTIONAL SEQUENCE** | **FORMATIVE ASSESSMENT** |
|  |  |  Note: A variety of formative assessments should be used at key points throughout the lesson. |
| 5-10min | **Get started/Drill/Do Now:** *(What meaningful activity will students complete as soon as they enter the classroom?)*Students will engage in a class discussion to determine how magnitude is not only used in math but in Science as well (integration): In addition to applications within mathematics, exponential notation is indispensable in science. It is used to clearly display the **magnitude** of a measurement (e.g., *How big? How small?*). We will explore this aspect of exponential notation in the next seven lessons.Understanding magnitude demands an understanding of the *integer* powers of . Therefore, we begin with two fundamental facts about the integer powers of . What does it mean to say that  for large positive integers  are *big* numbers. What does it mean to say that  for large positive integers  are *small* numbers |  |
| 10 min | **Engage/Motivation:** (*How will student interest be sparked? Is there prior knowledge that should be tapped? Is there vocabulary that must be cleared? Is there brainstorming that student need to complete before the lesson begins?)*Have students create a T-Chart to list what they already "know" about exponents and what they "want to know." I will use this as informal assessment to determine where I should begin this part of the unit. | Informal Assessment |
|  20 min | **Whole Group Instruction:** *(Focus lessons [explicit teaching/modeling, strategy demonstration, activate prior knowledge], shared reading, shared writing, discussion, writing process.)* Students will take Cornell Notes on the following 2 Math Concepts: * ***Fact 1:*** The numbers  for arbitrarily large positive integers  are big numbers; given a number  (no matter how big it is), there is a power of  that exceeds .

 * ***Fact 2:*** The numbers  for arbitrarily large positive integers  are small numbers; given a positive number  (no matter how small it is), there is a (negative) power of  that is smaller than .

*Fact 2* is a consequence of *Fact 1*. We address *Fact 1* first. The following two special cases illustrate why this is true.  |  |
|  30 min | **Group Practice/Small Group Instruction:** (teacher-facilitated group discussion, student or teacher-led collaboration, student conferencing, re-teaching or intervention, writing process)**Example 1:** Let  be the world population as of March , . Approximately, . It has  digits and is, therefore, smaller than any whole number with  digits, such as . But , so  (i.e., the 10th power of 10 exceeds this ).**Example 2:**  Let  be the U.S. national debt on March , .  to the nearest dollar. It has  digits. The largest -digit number is . Therefore,  That is, the th power of  exceeds . |  |
| 30 min | **Independent Practice**: *(individual practice, discussion, writing process.)* Students will work through the first two examples above with me, and will complete their classwork independently or with minimal guidance from me. (See Practice Activity in class) |  |
|  10min | **Evaluate Understanding/Assessment:** *(How will I know if students have achieved today’s objective?)* Students will select one problem from today's lesson to explain to me and to the class. This will be an informal assessment of today's learning objectives. |  |
| 10 min | **Closing Activities/Summary/DLIQ:** *(How will I tie up loose ends, reinforce/revisit the objective and connect the lesson to the unit?) DLIQ**Incorporate Box Modeling to represent problem solving skills (Word Problem of the Day)* |  |
|  | **Enrichment/Extension/Re-teaching/Accommodations:** *(How will my lesson satisfy the needs of all learners?)*\*\*\*\* We will continually revisit the rules of exponents that were taught last week. For any student(s) struggling, I will relate the magnitude of exponents to the magnitude of whole numbers in the base 10 number system.  |  |

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| **Resources/Instructional Materials Needed:** *(What do I need in order to teach the lesson?)*Student Activity sheet with example problems (as seen above), paper,, pencil, notebook |
| **Notes:**If students are struggling I may incorporate the use of base 10 blocks or virtual manipulatives |

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| **Structure** | **Instructional Strategies Used- Please highlight, bold, or underline** |
| Whole Group | -Anticipatory guides/sets -Book/author talks -Cornell Notes-Close Reading -Questioning the Author (QtA) -Question-Answer-Relationships (QAR)-Text annotation -Think aloud -Think/Pair/Share |
| Guided Practice/Small group | -Anticipatory guides/sets -Book/author talks -Cornell Notes-Close Reading -Literature Circles -Questioning the Author (QtA)-Question-Answer-Relationships (QAR) -Reading conferences -Reciprocal teaching-Strategy groups -Text annotation -Think aloud-Think/Pair/Share -Writing Conferences |
| Independent Practice | -Anticipatory guides/sets -Book/author talks -Cornell Notes-Close Reading -Literature Circles -Questioning the Author (QtA)-Question-Answer-Relationships (QAR) -Reading conferences -Reciprocal teaching-Strategy groups -Text annotation -Think aloud-Think/Pair/Share -Writing Conferences |

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| **Lesson Objective/Learning Intention:** *(What will my students KNOW by the end of the lesson? What will they DO to learn it?)** Students compare and estimate quantities in the form of a single digit times a power of$ 10$.
* Students use their knowledge of ratios, fractions, and laws of exponents to simplify expressions.
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| **TIME** | **INSTRUCTIONAL SEQUENCE** | **FORMATIVE ASSESSMENT** |
|  |  |  Note: A variety of formative assessments should be used at key points throughout the lesson. |
| 5-10min | **Get started/Drill/Do Now:** *(What meaningful activity will students complete as soon as they enter the classroom?)*Discussion (5-10 minutes)Now that we know about positive and negative powers of $10,$ we can compare numbers and estimate how many times greater one quantity is compared to another. With our knowledge of the laws of integer exponents, we can also do other computations to estimate quantities.  |  |
| 10 min | **Engage/Motivation:** (*How will student interest be sparked? Is there prior knowledge that should be tapped? Is there vocabulary that must be cleared? Is there brainstorming that student need to complete before the lesson begins?)*Students will watch LearnZillion video  |  |
|  20 min | **Whole Group Instruction:** *(Focus lessons [explicit teaching/modeling, strategy demonstration, activate prior knowledge], shared reading, shared writing, discussion, writing process.)* We will work through the following problems/scenario together as a whole group.In $1723$, the population of New York City was approximately $7,248$. By $1870$, almost $150$ years later, the population had grown to $942,292$. We want to determine approximately how many times greater the population was in $1870$, compared to $1723$. The word “approximately” in the question lets us know that we do not need to find a precise answer, so we will approximate both populations as powers of $10$. * Population in $1723$: $7,248<9,999<10,000=10^{4}$
* Population in $1870$: $942,292<999,999<1,000,000=10^{6}$

We want to compare the population in $1870$ to the population in $1723$:$$\frac{10^{6}}{10^{4}}$$Now we can use what we know about the laws of exponents to simplify the expression and answer the question:$$\frac{10^{6}}{10^{4}}=10^{2}$$*Therefore, there were approximately* $100$ *times more people in New York City in* $1870$ *compared to* $1723$*.*  | **Informal Assessment** |
|  30 min | **Group Practice/Small Group Instruction:** (teacher-facilitated group discussion, student or teacher-led collaboration, student conferencing, re-teaching or intervention, writing process)Students will Complete Exercise Activity (attachment) independently or with minimal guidance.  |  |
| 20 min | **Independent Practice**: *(individual practice, discussion, writing process.)* See Above |  |
|  10min | **Evaluate Understanding/Assessment:** *(How will I know if students have achieved today’s objective?)* Students will complete and Anchor Chart  |  |
| 10 min | **Closing Activities/Summary/DLIQ:** *(How will I tie up loose ends, reinforce/revisit the objective and connect the lesson to the unit?)* DLIQBox Model Diagramming Problem Solving |  |
|  | **Enrichment/Extension/Re-teaching/Accommodations:** *(How will my lesson satisfy the needs of all learners?)*Teach the magnitude of numbers with whole numbers for struggling students.  |  |

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| **Resources/Instructional Materials Needed:** *(What do I need in order to teach the lesson?)*Activity Sheet, paper, pencil, anchor chart. |
| **Notes:**Virtual Manipulatives.  |

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| **Structure** | **Instructional Strategies Used- Please highlight, bold, or underline** |
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| Guided Practice/Small group | -Anticipatory guides/sets -Book/author talks -Cornell Notes-Close Reading -Literature Circles -Questioning the Author (QtA)-Question-Answer-Relationships (QAR) -Reading conferences -Reciprocal teaching-Strategy groups -Text annotation -Think aloud-Think/Pair/Share -Writing Conferences |
| Independent Practice | -Anticipatory guides/sets -Book/author talks -Cornell Notes-Close Reading -Literature Circles -Questioning the Author (QtA)-Question-Answer-Relationships (QAR) -Reading conferences -Reciprocal teaching-Strategy groups -Text annotation -Think aloud-Think/Pair/Share -Writing Conferences |

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* Students use their knowledge of ratios, fractions, and laws of exponents to simplify expressions.
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| **TIME** | **INSTRUCTIONAL SEQUENCE** | **FORMATIVE ASSESSMENT** |
|  |  |  Note: A variety of formative assessments should be used at key points throughout the lesson. |
| 5-10min | **Get started/Drill/Do Now:** *(What meaningful activity will students complete as soon as they enter the classroom?)*Students will log onto <http://www.math-play.com/exponent-game.html> to review the laws of exponents. Students must copy problems and identify the law as they play the game. |  |
| 5 min | **Engage/Motivation:** (*How will student interest be sparked? Is there prior knowledge that should be tapped? Is there vocabulary that must be cleared? Is there brainstorming that student need to complete before the lesson begins?)*Students will discuss laws that they still have questions about |  |
|  min | **Whole Group Instruction:** *(Focus lessons [explicit teaching/modeling, strategy demonstration, activate prior knowledge], shared reading, shared writing, discussion, writing process.)* Students will complete an assessment | **Informal Assessment** |
|  min | **Group Practice/Small Group Instruction:** (teacher-facilitated group discussion, student or teacher-led collaboration, student conferencing, re-teaching or intervention, writing process)Students will Complete an assessment.  |  |
| 30 min | **Independent Practice**: *(individual practice, discussion, writing process.)* See Above |  |
|  5min | **Evaluate Understanding/Assessment:** *(How will I know if students have achieved today’s objective?)* Students will complete after reviewing with anchor chart. |  |
| 5 min | **Closing Activities/Summary/DLIQ:** *(How will I tie up loose ends, reinforce/revisit the objective and connect the lesson to the unit?)* DLIQBox Model properties of exponents |  |
|  | **Enrichment/Extension/Re-teaching/Accommodations:** *(How will my lesson satisfy the needs of all learners?)*Teach the magnitude of numbers with whole numbers for struggling students.  |  |

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| **Resources/Instructional Materials Needed:** *(What do I need in order to teach the lesson?)*Assessment Sheet, paper, pencil, anchor chart. |
| **Notes:**Virtual Manipulatives.  |

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