Unit 8: Exponents and Scientific Notation

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 31**
Length: **4 weeks**
Status: **Published**

Unit Overview

In this unit students will work extensively with exponents and learn how to apply their skills with them when working with scientific notation. Students will begin by learning the rules of exponents. They will be able to simplify expressions with exponents that contain multiplication, division, and powers. They will then continue these skills when working with negative exponents. Then, students will learn about scientific notation including how to convert between it and standard form and how it is used in real-world scenarios. They will be able to complete calculations in scientific notation, including addition, subtraction, multiplication, and division. Lastly, students will be able to apply the skills in order to solve real-world problems that contain scientific notation.

Standards

MA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
MA.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.
MA.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.

Essential Questions

- How can exponents be used to model real-life situations?
- How is knowledge of integer rules necessary when working with exponents?
- How can scientific notation be useful in math and science?

Application of Knowledge: Students will know that...

- any expression to a negative power is equal to the reciprocal of the expression to the positive power.
- exponent rules can be utilized when performing operations on numbers written in scientific notation.
- scientific notation is used to write very large and very small numbers.

- to divide terms containing exponents with like bases one must subtract the exponents.
- to multiply terms containing exponents with like bases one must add the exponents.
- to raise a power to a power one must multiply the exponents.
- with expressions containing exponents, the number being multiplied is represented as the base and the amount of times of the multiplication is represented as the exponent.

Application of Skills: Students will be able to...

- add and subtract numbers written in scientific notation.
- convert between scientific notation and standard form.
- multiply and divide numbers written in scientific notation.
- order numbers written in scientific notation.
- simplify expressions containing powers of terms with powers.
- simplify expressions involving dividing terms containing exponents.
- simplify expressions involving multiplying terms containing exponents.
- simplify expressions that contain negative exponents.
- solve real-world problems containing measurements written in scientific notation.

Assessments

- Do-Now: These daily assessments will be used to check for prior knowledge and to determine mastery of particular topics. If needed, remediation will be completed on an as needed basis.
- Communicator practice: This will be used as a quick whole-class assessment tool to check for complete comprehension.
- Exit Tickets: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic.
- Exponent Rules Gallery Walk: An activity that can be used as a formative assessment (see description in activity section).
- Super Bowl Ads Activity: An activity that can be used as a formative assessment (see description in activity section).
- Practice using IXL
- Mid-Unit Quiz
- Unit Test
- Information from this unit will be included on a locally developed, mid-year or end of year benchmark assessment that may take the form of a test, performance based project, or other summative assessment.

Suggested Activities

- Grade 8 Digits Topics 3 and 4 Launches
- Student-centered SMART Board lessons: including reveals for rules of exponents and drag and drop

for converting between scientific notation and standard form
- Review games using Communicators
- Rules of Exponents Exploratory Activities: (from the Activity Generator) Students discover the rules of exponents on their own and list them in written form.
- Exponent Rules Gallery Walk: Students will complete problems posted around the room that require students to simplify expressions containing exponents. The answer to each poster will lead students to the next poster. This will create a sequence that students will complete in a specific order.
- Super Bowl Ads Activity: Students will use the price of a 30 second ad from the latest Super Bowl game in order to find the price of ads that are longer. They will need to perform operations with numbers written in scientific notation in order to do so.

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments

- Content specific modifications may include:
    - Provide personal handout for integer rules
    - Provide mnemonic device (LARS for Left Add Right Subtract) to assist in how to adjust exponents when moving a decimal to put a number in proper scientific notation
    - Provide numbers in scientific notation with smaller exponents for problems involving performing numerical operations
    - Provide completed problems for practice work and homework

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan
    - Collaboration with ELL Teacher

- Content specific vocabulary important for ELL students to understand include: standard form, base,

exponent, add, subtract, multiply, divide, terms, expression, power of ten

Differentiation to extend learning for gifted students may include:

- Provide problems that require multiple uses of exponent rules in order to simplify the expression
- Provide problems involving operations with scientific notation that have negative exponents and require using integer rules
- Provide problems involving operations with scientific notation that require students to adjust the final answer into proper scientific notation

Technology Integration

- iPads or Chromebooks as appropriate to the activity.
- Online learning components including use of the Digits digital textbook and resources.
- Teacher integration of the SMART board to facilitate active student engagement throughout the course of the lesson.
- Software or online programs that teachers may use to create students materials or generate problems such as Kuta software.
- Additional practice provided through the use of IXL.

Integrated/Cross-Disciplinary Instruction

- **ELA:** Practice formulating complete and grammatically correct responses to open-ended questions.
- **Math/Economics:** Apply the concept of scientific notation to the cost of a 30 second Super Bowl ad and calculating the cost for longer ads.
- **Science:** Relate rules of exponents to calculating the amount of atoms in compounds
- **Science/Social Studies:** Include scientific notation problems involving country populations, distances between planets, and size of bacteria

Resources

- Digits student access and support: www.MyMathUniverse.com
- Digits teacher materials and support: www.pearsonrealize.com
- IXL: www.ixl.com
- SMART Exchange: http://exchange.smarttech.com/index.html#tab=0
- SMART Board lessons
- McDougel Littell Activity Generator CD-ROM
- Punchline/Pizzazz worksheets (self-correcting)

- Kuta software generated worksheets

21st Century Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.