Unit 1: The Number System

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 1**
Length: **4 weeks**
Status: **Published**

Unit Overview

Students will begin by reviewing previously learned topics on order of operations, integer rules, and multiplying and dividing fractions. They will then apply these concepts to evaluating algebraic expressions by substituting integers. Students will know the meaning of rational and irrational numbers. They will be able to evaluate rational numbers that are in the form of square roots and cubic roots. They will also be able to estimate irrational numbers when given a square root. Students will be able to convert between the various forms of rational numbers. Finally, students will be able to order rational numbers from least to greatest.

Standards

MA.8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
MA.8.NS.A.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
MA.8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).

Essential Questions

- Why is it imperative to have a strong foundation in basic mathematical operations?
- Why is it important to be able to convert from fractions to decimals and vice a versa?
- How do you recognize an irrational number?

Application of Knowledge: Students will know that...

- a cubic root is a number that produces a given number when cubed.
- a square root is a number that produces a specified quantity when multiplied by itself.
- irrational numbers are numbers that cannot be written as fractions.
- rational numbers are numbers that can be written as fractions.
- the integer rule for adding integers is that if the signs are the same, add the integers then choose the

common sign. If the signs are different, then subtract and choose the sign of the number with the largest absolute value.

- the integer rule for subtracting integers is SAME CHANGE CHANGE, then follow the same rules for addition.
- the integer rules for multiplication and division are that if the numbers have the same sign, the answer is positive. If the numbers have different signs, the answer is negative.
- the order of completing the operations in an expression is: parenthesis, exponents, multiplication, division, addition, and subtraction (PEMDAS).
- to convert a decimal to a fraction, take the number after the decimal and place it as the numerator followed by the denominator as the appropriate power of ten
- to convert a fraction to a decimal, divide the numerator by the denominator.
- when dividing fractions, complete "Same Change Reciprocal" by keeping the first fraction the same, change division to multiplication, take the reciprocal of the second fraction, and then follow rules for multiplication.
- when multiplying fractions, look to cross simplify first followed by multiplying straight across.

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

- apply a systematic approach to evaluating numerical expressions (order of operations).
- apply knowledge of integer rules to evaluate expressions.
- classify numbers as rational or irrational.
- convert between fractions and decimals
- divide fractions.
- estimate square roots that do not contain perfect squares
- evaluate cubic roots containing perfect cubes.
- evaluate square roots containing perfect squares.
- multiply fractions.
- order rational and irrational numbers, including decimals, fractions, and square roots.

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.
- Gallery Walk/Scavenger Hunt: 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 Topic 1 Launches
- Student-centered SMART Board lessons: including features such as virtual manipulatives for integer rules, drag and reveal for ordering rational and irrational numbers, and integrated video for order of operations
- Review games using Communicators
- Multiplying Fractions War: Students work in partners or small-groups and use aces through tens in a deck of cards. Each student draws four cards and uses them to create the numerators and denominator for two fractions. Then, students multiply the fractions together. The student with the higher answer wins the round.
- Clue Review Activity (Gallery Walk): Students will complete review problems that are posted around the room on topics from this unit including order of operations, evaluating expressions, multiplying and dividing fractions, and evaluating/estimating square roots. The theme of the gallery walk is based off of the board game "Clue". Each problem will rule out possibilities for the suspect, weapon, and location. Once all of the problems are completed correctly, students will be left with the suspect, weapon, and location for the fictional crime.

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 list of perfect squares and perfect cubes
    - Provide example list of rational and irrational numbers
    - 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: PEMDAS, integer, inverse, fractions, decimals, numerator, denominator, cross simplify, reciprocal, improper fraction, mixed number, least, greatest

Differentiation to extend learning for gifted students may include:

- Problems containing decimals and fractions with order of operations
- Provide problems containing multiple set of parentheses for order of operations
- Estimating square roots to the tenths place, rather than a whole number
- Converting repeating decimals into fractions

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 "integer rules" to making money and having a bank account.
- **Science/Social Studies:** Relate integer operations to the change in elevation and or temperature

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
- 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.