Jenison Jr. High- Mrs. Rockey Math 8A- Unit 2- Equations and Expressions

1. **Unit Pace:** 40 Days
2. **Unit Essential Question:**
   a. Given an equation(s) and/or expression(s), the students will be able to explain the process and evaluate them for any real numbers.
3. **Lesson 4-1: Exponents (Review) (Page 162-165)**
   a. Pace: 1 class period (59 minutes)
   b. Learning Target:
      i. I can evaluate expressions with exponents.
   c. Lesson Essential Question:
      i. Given an expression, the student will be able to simplify the expression with exponents as well as explain how to write any integer in the exponential form.
   d. Vocabulary:
      i. Exponential form
      ii. Exponent
      iii. Base
      iv. Power
   e. Background Knowledge
      i. Integers
      ii. Principles of Algebra
      iii. Order of Operations
   f. Standards:
      i. CCSS.MATH.CONTENT.8.EE.A.1
         Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
      ii. CCSS.MATH.CONTENT.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 $\sqrt{2}$ is irrational.
4. **Lesson 4-2: Integer Exponents (Page 166-169)**
   a. Pace: 1 Class period (59 minutes)
   b. Learning Target:
      i. I can simplify expressions with negative exponents and to evaluate the zero exponent.
   c. Lesson Essential Question:
      i. Given an expression, the student will be able to apply the meaning to evaluate powers and expressions containing negative exponents.
   d. Vocabulary:
      i. The Zero Power
   e. Background Knowledge:
      i. Review multiplying and dividing by powers of 10.

        ii. Exponential form

       iii. Exponent

          1. Positive Exponents

          2. Negative Exponents

       iv. Base

        v. Power

       vi. Simplify

      vii. Order of Operations

     viii. Decimals

f. Standards:

        i. CCSS.MATH.CONTENT.8.EE.A.1

          Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

        ii. CCSS.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.

       iii. CCSS.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

5. Lesson 4-3: Properties of Exponents (Page 170-173)

  a. Pace: 2 class periods (59 minutes) – lesson and a review

  b. Learning Target:

      i. I can apply the properties of exponents.

  c. Lesson Essential Question:

      i.

  d. Vocabulary:

      i. Multiplying Powers with the same base

     ii. Dividing Powers with the same base

    iii. Raising a power to a power

  e. Background Knowledge:

      i. Associative Property of Multiplication

     ii. Exponential form

    iii. Exponent

        1. Positive Exponents

        2. Negative Exponents

     iv. Base

      v. Power

     vi. Simplify

    vii. Order of Operations

    f. Standards:
- i. CCSS.MATH.CONTENT.8.EE.A.1
  Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
- ii. CCSS.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 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger.*
- iii. CCSS.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.

6. Quiz #1
- a. Lesson's Covered:
    - i. 4.1- Exponents (Review) (Page 162-165)
    - ii. 4.2- Integer Exponents (Page 166-169)
    - iii. 4.3- Properties of Exponents (Page 170-173)
- b. Date: Friday, September 26th

7. Lesson 4-4: Scientific Notation (Page 174-178)
- a. Pace: 4 class periods (59 minutes)
- b. Learning Target:
    - i. I can translate between standard notation and scientific notation large and compare two numbers written in scientific notation.
- c. Lesson Behavior Objective/Essential Question:
    - i. Given a rational number, the student will be able to translate the number from standard notation to scientific notation and vice versa.
    - ii. Why is Scientific Notation Important?
- d. Vocabulary:
    - i. Scientific Notation
- e. Background Knowledge:
    - i. Review powers of 10.
    - ii. Standard notation
    - iii. Exponential form
    - iv. Exponent
        1. Positive Exponents
        2. Negative Exponents
    - v. Base
    - vi. Power

       vii. Simplify
     viii. Order of Operations
- f. Standards:
  - i. CCSS.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.

8. Test #1
- a. Lesson's Covered:
  - i. 4.1- Exponents (Review) (Page 162-165)
  - ii. 4.2- Integer Exponents (Page 166-169)
  - iii. 4.3- Properties of Exponents (Page 170-173)
  - iv. 4.4- Scientific Notation (Page 174-178)
- b. Date: Friday, October 3rd

9. Lesson 4-5: Squares and Square Roots (Page 182-185)
- a. Pace: 1 class period (59 minutes)
- b. Learning Target:
  - i. I can find square roots.
- c. Lesson Essential Question:
  - i. Given an expression, the student will be able to find the positive and negative square roots of any real number.
- d. Vocabulary:
  - i. Square root
  - ii. Principal square root
  - iii. Perfect Square
- e. Background Knowledge:
  - i. Order of Operations
  - ii. Integers
  - iii. Principles of Algebra
  - iv. Simplify
- f. Standards:
  - i. CCSS.MATH.CONTENT.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 $\sqrt{2}$ is irrational.

10. Lesson 4-6: Estimating Square Roots (Page 186-189)
- a. Pace: 3 class periods (59 minutes) and the review
- b. Learning Target:
  - i. I can estimate square roots and solve problems using square roots.
- c. Lesson Essential Question:
  - i. Given an expression, the students will be able to estimate the square root to any given decimal places and solve problems using square roots.
- d. Vocabulary:

    e. Background Knowledge:
- i. Square root
- ii. Principal square root
- iii. Perfect Square

    f. Standards:
- i. CCSS.MATH.CONTENT.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 $\sqrt{2}$ is irrational.

11. Quiz #2
    a. Lesson's Covered:
- i. 4.5- Squares and Square Roots (Page 182-185)
- ii. 4.6- Estimating Square Roots (Page 186-189)

    b. NO CALCULATORS!
    c. Date: Friday, October 10th

12. Lesson 4-7: The Real Numbers (Page 195-198)
    a. Pace: 3 class periods (59 minutes)
    b. Learning Target:
- i. I can classify numbers.

    c. Lesson Behavioral Objective/Essential Question:
- i. Given an expression, the students will be able to classify and justify real and non-real numbers.
- ii. How does an understanding of classifying numbers help students with expression and equations?

    d. Vocabulary:
- i. Irrational numbers
- ii. Real numbers
- iii. Density Property

    e. Background Knowledge:
- i. Rational numbers
- ii. Whole numbers
- iii. Integers
- iv. Natural numbers
- v. Classifying
- vi. Ordering and Comparing Real numbers

    f. Standards:
- i. CCSS.MATH.CONTENT.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 demonstrate that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

    ii. CCSS.MATH.CONTENT.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).

13. Test #2
- a. Lesson's Covered:
  - i. 4.5- Squares and Square Roots (Page 182-185)
  - ii. 4.6- Estimating Square Roots (Page 186-189)
  - iii. 4.7- The Real Numbers (Page 195-198)
- b. Date: Friday, October 17th

14. Lesson 1-8: Solving Equations by Adding or Subtraction (Page 38-41)
- a. Pace: 1/2 of a class period (30 minutes)
- b. Learning Target:
  - i. I can solve equations using addition and subtraction.
- c. Lesson Essential Question:
  - i. Given am equation, the students will be able to solve equations using addition and subtraction in order to determine the solutions of an equation(s) while balancing equations.
- d. Vocabulary:
  - i. Equation
  - ii. Inverse Property
  - iii. Addition Property of Equality
  - iv. Subtraction Property of Equality
- e. Background Knowledge:
  - i. Equations
  - ii. Addition
  - iii. Subtraction
  - iv. Simplifying
  - v. Substituting
  - vi. Order of Operations
- f. Standards:

  - i. CCSS.MATH.CONTENT.8.EE.C.7
     Solve linear equations in one variable.

  - ii. CCSS.MATH.CONTENT.8.EE.C.7.B
     Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

15. Lesson 1-9: Solving Equations by Multiplying or Dividing (Page 43-47)
- a. Pace: 1/2 class period (29 minutes)
- b. Learning Target:
  - i. I can solve equations using multiplying and dividing.
- c. Lesson Essential Question:

        i. Given am equation, the students will be able to solve equations using multiplication and division in order to determine the solutions of an equation(s) while balancing equations.
- d. Vocabulary:
  - i. Equation
  - ii. Two step equations
  - iii. Multiplying Property of Equality
  - iv. Division Property of Equality
- e. Background Knowledge
  - i. Multiplying
  - ii. Division
  - iii. Simplifying
  - iv. Substituting
  - v. Order of Operations
- f. Standards:
  - i. CCSS.MATH.CONTENT.8.EE.C.7
    Solve linear equations in one variable.
  - ii. CCSS.MATH.CONTENT.8.EE.C.7.B
    Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

16. Lesson 2-7: Solving Equations with Rationales (Page 96-99)
- a. Pace: 1 class period (59 minutes)
- b. Learning Target:
  - i. I can solve algebraic equations with rational numbers.
- c. Lesson Essential Question:
  - i. Given am equation, the students will be able to solve equations using order of operations as well as using rationales numbers in order to determine the solutions of an equation(s).
- d. Vocabulary:
  - i. Equation
  - ii. Two step equations
  - iii. Multiplying Property of Equality
  - iv. Division Property of Equality
- e. Background Knowledge:
  - i. Rationales
  - ii. Fractions
  - iii. Decimals
  - iv. Simplifying
  - v. Substituting
  - vi. Order of Operations

     f. Standards:

         i. <u>CCSS.MATH.CONTENT.8.EE.C.7</u>
Solve linear equations in one variable.

        ii. <u>CCSS.MATH.CONTENT.8.EE.C.7.B</u>
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

17. Lesson 2-8: Solving Two Step Equations (Page 102-105)
    a. Pace: 2 class periods (59 minutes)
    b. Learning Target:
         i. I can solve two step algebraic equations.
    c. Lesson Essential Question:
         i. Given am equation, the students will be able to solve and explain the process to solve two step equations.
    d. Vocabulary:
         i. Equation
        ii. Two step equations
        iii. Multiplying Property of Equality
        iv. Division Property of Equality
    e. Background Knowledge:
         i. One Step Equations
        ii. Simplifying
        iii. Substituting
        iv. Order of Operations
    f. Standards:
         i. <u>CCSS.MATH.CONTENT.8.EE.C.7</u>
Solve linear equations in one variable.
        ii. <u>CCSS.MATH.CONTENT.8.EE.C.7.B</u>
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

18. Quiz #3
    a. Lesson's Covered:
         i. 1.8- Solving Equations by Adding or Subtraction 1.9- Estimating Square Roots (Page 186-189)
        ii. 1.9- Solving Equations by Multiplying or Dividing (Page 43-47)
        iii. 2.7- Solving Equations with Rationales (Page 96-99)
        iv. 2.8- Solving Two Step Equations (Page 102-105)
    b. Date: Friday, October 24th

19. Lesson 11-1: Simplifying Algebraic Expressions (p 588-591)
    a. Pace: 1 class period (59 minutes)
    b. Learning Target:
         i. I can simplify algebraic expressions.

    c. Lesson Behavioral Objective:
- i. Given an expression, the student will be able to combine like terms and rewrite the algebraic expressions in the simplest form.

    d. Vocabulary:
- i. Terms
- ii. Like Terms
- iii. Equivalent Expressions
- iv. Simplify

    e. Background Knowledge:
- i. Commutative Property
- ii. Distributive Property
- iii. Associative Property
- iv. Simplifying
- v. Substituting
- vi. Order of Operations

    f. Standards:
- i. CCSS.MATH.CONTENT.8.EE.C.7.B
  Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

20. Lesson 11-2: Solving Multi-Step Equations (p 592-595)

    a. Pace: 2 class period (59 minutes)

    b. Learning Target:
- i. I can solve multi-step equations.

    c. Lesson Essential Question:
- i. Given an equation, the student can solve multi-step equations with accuracy and be able to check their work.

    d. Vocabulary:

    e. Background Knowledge:
- i. Commutative Property
- ii. Distributive Property
- iii. Associative Property
- iv. Terms
- v. Like Terms
- vi. Equivalent Expressions
- vii. Single Step Equations
- viii. Multiple Step Equations
  1. Two Step Equations
- ix. Simplify
- x. Substituting
- xi. Order of Operations

    f. Standards:
- i. CCSS.MATH.CONTENT.8.EE.C.7.B
  Solve linear equations with rational number coefficients, including

           equations whose solutions require expanding expressions using the
           distributive property and collecting like terms.
    g. Lesson's covered:
        i. 11.1- Simplifying Algebraic Expressions (p 588-591)
        ii. 11.2- Solving Multi-Step Equations (p 592-595)
    h. Date: Thursday, October 30th

21. Sweet Tooth Activity
    a. Pace: 1 class period (59 minutes)

    b. Learning Targets:

        i. Student will Plot marginal and cumulative enjoyment data for two
           siblings.

        ii. Student will discuss qualitative features of the graphs and determine how
           much candy each sibling should eat.

        iii. Students will use information about the marginal enjoyment graph to
           explain behavior of the cumulative graph & vice versa.

    c. Lessons Learning Objective:

        i. Given points from a data set, the student will be able to plot the points and
           interpret the meaning of the graphs.

    d. Standards

        i. CCSS.MATH.CONTENT.8.F.A.2
           Compare properties of two functions each represented in a different
           way (algebraically, graphically, numerically in tables, or by verbal
           descriptions).

        ii. CCSS.MATH.CONTENT.8.F.A.3
           Interpret the equation $y = mx + b$ as defining a linear function,
           whose graph is a straight line; give examples of functions that are
           not linear.

        iii. CCSS.MATH.CONTENT.8.F.B.5
           Describe qualitatively the functional relationship between two
           quantities by analyzing a graph (e.g., where the function is
           increasing or decreasing, linear or nonlinear). Sketch a graph that
           exhibits the qualitative features of a function that has been described
           verbally.

        iv. MP.2 Reason abstractly and quantitatively.

      v. MP.3 Construct viable arguments and critique the reasoning of others.

      vi. MP.4 Model with Mathematics.

22. Lesson 11-3: Solving Equations with Variables on Both Sides(p 597-601)
   a. Pace: 4 class periods (59 minutes)
   b. Learning Target:
      i. I can solve equations with variables on both sides of the equal sign.
   c. Lesson Behavioral Objective:
      i. Given an equation, the students will be able to solve equations with variables on both sides with accuracy and be able to check their work.
   d. Vocabulary:
      i. Literal Equation
      ii. Both Sides
   e. Background Knowledge:
      i. Equal sign
      ii. Equation/Expression
      iii. Commutative Property
      iv. Distributive Property
      v. Associative Property
      vi. Terms
      vii. Like Terms
      viii. Equivalent Expressions
      ix. Single and Multiple Step Equations
      x. Simplify
      xi. Substituting
      xii. Order of Operations
   f. Standards:
      i. CCSS.MATH.CONTENT.8.EE.C.7
         Solve linear equations in one variable.
      ii. CCSS.MATH.CONTENT.8.EE.C.7.B
         Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

23. Test #3
   a. Lesson's Covered:
      i. 1.8- Solving Equations by Adding or Subtraction 1.9- Estimating Square Roots (Page 186-189)
      ii. 1.9- Solving Equations by Multiplying or Dividing (Page 43-47)
      iii. 2.7- Solving Equations with Rationales (Page 96-99)
      iv. 2.8- Solving Two Step Equations (Page 102-105)
      v. 11.1- Simplifying Algebraic Expressions (p 588-591)
      vi. 11.2- Solving Multi-Step Equations (p 592-595)
      vii. 11.3- Solving Equations with Variables on Both Sides(p 597-601)
   b. Date: Friday, November 7th