**Unit #5**

**Family of functions**

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| **Literacy Strategies**  (Check all that apply.) | **Habits of Success**  (Check one per unit.) | **Multiple Intelligence Areas** |
| * Admit/Exit slips * Graphic organizer * Know/Want to Know/Learn chart (KWL) * Open-response questions * Double-entry/Two-column notes * Retelling * Reflection * Jigsaw reading * Anticipation guide * RAFT (Role/Audience/Format/Topic) * Interactive reading guide * Concept definition maps * Frayer model * Visual prediction guide * Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | * Create relationships * Teamwork, responsibility, effective communication) * Study, manage time, organize * (Organization, time management, study skills) * Improve reading/writing skills * (Use reading and writing to learn strategies) * Improve mathematics skills * (Estimate, compute, solve, synthesize) * Set goals/plan * (Set goals, plan, monitor progress) * Access resources * (Research, analyze, utilize) * USE OF TECHNOLOGY | * Logical/Mathematical * Spatial * Musical * Bodily—Kinesthetic * Interpersonal * Intrapersonal * Naturalist * Linguistic |

**UNIT Assessments:**

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| Pre-Assessment: |
| Daily/Weekly: (Included on daily activities plans) |
| Post-Assessment: |

State Standards and Benchmarks:

**A.1.10 Solve radical equations involving one radical**

**A.1.11 Describe the properties of rational exponents and apply these properties to simplify algebraic expressions**

**A.2.9 Graph exponential functions and identify their key characteristics as related to contextual situations (specifically y = 3x and y = a\* bx)**

**A.2.10 Identify and describe symmetries of graphs**

**A.2.3 Translate among tabular, symbolic, and graphical representations of functions and relations(review only)**

**Day 1**

Benchmark: **A.2.3 Translate among tabular, symbolic, and graphical representations of functions and relations(review only)**

Learning Objective: Understand the definition of a relation

Understand the definition of a function

Decide whether an equation defines a function

Use function notation

Apply function concepts in applications

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mathdude video – Properties of Functions

Mini-lecture 9.5 Introduction to Functions

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| **Strategy** | **Time** | **Activity** |
| Bell work | 15 min. | Show mathdude video – Properties of Functions |
| Introduction/Engage |  | Explain to students that before we can actually get into the heart of dealing with functions we need to build some necessary math skills, which may take several class periods.  Open a discussion with students about the different types of functions, including absolute value, functions with radicals, quadradics, and exponential functions. Include in the discussion about a major experiment planned at the end of the study of Functions. The experiment I have in mind is a balloon launch, which will require some real understanding of functions, especially quadratic functions. It might even include the actual building of the balloon launch and a competition among groups to see who can hit me with a balloon that is launched from their individual balloon launchers. |
| Explore/Review |  | Introduce functions to students by having them complete a table of values resulting in coordinate points on a graph (see Mini-lecture 9.5)  Discuss domain, range, and how to determine if a relation represents a function.  Provide samples from mini-lecture for students to practice. |
| Assessment |  | Have students do a KWL on Functions, with a special emphasis on the type of experiment we could do with functions. |

Reflection: If your discussion about functions and the planned experiment do not take up the remaining time in the

Class period, you may want to begin the next lesson.

**Day 2**

Benchmark: **A.1.10 Solve radical equations involving one radical (mastery of this benchmark requires some background work on basic math skills involving roots of numbers, this benchmark will be carried over for several daily lessons.)**

Learning Objective: Find square roots

Decide whether a given root is rational, irrational, or not a real number

Find decimal approximations for irrational square roots

Use the Pythagorean formula

Find cubes, fourth, and other roots

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mini-lecture 8.1 – Evaluation Roots

Individual white boards

Dry-erase markers

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Practice problems involving roots to find out what the students already know. Discuss results with students |
| Introduction/Engage |  | Introduce the subject of square roots.  Provide problems from Mini-lecture 8.1 for students to practice on individual white boards |
| Explore/Review |  | Explore using calculators or a square root table to approximate square roots to the nearest thousandth. Evaluate higher order roots to the nearest thousandth.  Provide practice problems for students to do on individual white boards. |
| Assessment |  | Draw a diagram and have students use the Pythagorean theorem to solve word problems to check for understanding application of square roots. |
| Closure |  |  |

Reflection: Many students find the signs confusing with these problems.

Although the square root of a negative number is included here, it is recommended that students not deal with complex numbers and imaginary numbers yet. They should just be reminded that there is no real number solution.

Encourage students to memorize the squares of the numbers 1 through 12.

**Day 3**

Benchmark: **A.1.10 Solve radical equations involving one radical (mastery of this benchmark requires some background work on basic math skills involving roots of numbers, this benchmark will be carried over for several daily lessons.)**

Learning Objective: Multiply square root radicals

Simplify radicals using the product rule

Simplify radicals using the quotient rule

Simplify radicals involving variables

Simplify other roots

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mini-lecture 8.2 – Multiplying, Dividing, and Simplifying Radicals

Individual white boards

Dry-erase markers

“I have \_\_\_\_\_, who has\_\_\_\_\_\_?” cards (Ivy or Rick will make these and put them in the file)

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Distribute “I have \_\_\_\_\_, who has \_\_\_\_\_\_\_\_” cards with square root problems for students to practice their square root skills. |
| Introduction/Engage |  | Introduce the product rule for radicals and the quotient rule for radicals to students.  Provide sample problems from mini-lecture 8.2 for students to practice on individual white boards. |
| Explore/Review |  | Explore the process of simplifying radicals involving variables and other roots.  Provide practice problems for students to solve on individual white boards. |
| Assessment |  | Ticket out the door – Have students write about how to simplify radicals |
| Closure |  |  |

Reflection: Many students have trouble simplifying radicals

Encourage students to write non-perfect square numbers as the product of the highest possible perfect square and another number

Most students need a lot of practice finding wquare roots of variables with odd exponents

**Day 4**

Benchmark: **A.1.10 Solve radical equations involving one radical (mastery of this benchmark requires some background work on basic math skills involving roots of numbers, this benchmark will be carried over for several daily lessons.)**

Learning Objective: Add and subtract radicals

Simplify radical sums and differences

Simplify more complicated radical expressions

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mini-lecture 8.3 Adding and subtracting radicals

Individual white boards

Dry-erase markers

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Practice problems involving multiplying and dividing radicals  Discuss results |
| Introduction/Engage |  | Introduce the process for adding and subtracting radicals  Provide practice problems for students to practice on Individual white boards |
| Explore/Review |  | Explore processes for simplifying and combining radicals by adding and subtracting, and solving applied problems  Provide practice problems for white board practice |
| Assessment |  | Ticket out the door – Compare and contrast the processes for adding and subtracting radicals and for multiplying and dividing radicals. |
| Closure |  | Talk about tomorrow’s quiz and begin preparation |

Reflection: Most students find adding and subtracting radicals easy once they realize that adding and subtracting like radicals is analogous to adding and subtracting like terms.

Many students have trouble at first with the examples where the square root has a coefficient other than 1 before simplification.

**Day 5**

Benchmark: **A.1.10 Solve radical equations involving one radical (mastery of this benchmark requires some background work on basic math skills involving roots of numbers, this benchmark will be carried over for several daily lessons.)**

Learning Objective: Rational denominators with square roots

Write radicals in simplified form

Rationalize denominators with cube roots

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mini-lecture 8.4 – Rationalizing the Denominator

Individual white boards

Dry-erase markers

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Quiz on Radicals |
| Introduction/Engage |  | Introduce rationalizing the denominator  Provide practice problems from Mini-lecture for practice on the individual white boards  Insure that students are writing the results in simplified form |
| Explore/Review |  | Explore the answer students are getting to check for understanding then move on to more complicated problems, such as cube roots  Provide practice problems for white boards. |
| Assessment |  | Have students do a JIST writing exercise by summarizing the process of rationalizing the denominator in 20 words or less. |
| Closure |  |  |

Reflection: Some students need to see several examples of how √a \* √a =a before applying it to rationalizing a denominator

**Day 6**

Benchmark: **A.1.10 Solve radical equations involving one radical (mastery of this benchmark requires some background work on basic math skills involving roots of numbers, this benchmark will be carried over for several daily lessons.)**

Learning Objective: Simplify products of radical expressions

Use conjugates to rationalize denominators of radical expressions

Write radical expressions with quotients in lowest terms

Solving Equations with Radicals

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mini-lecture 8.5 More Simplifying and Operations with Radicals.

Mini-lecture 8.6 Solving Equations with Radicals

Individual white boards

Dry-erase markers

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Practice problems involving addition, subtraction, multiplication and division of radicals |
| Introduction/Engage |  | Introduce students to more complicated forms of radicals, such as, distributive property and rationalizing with a conjugate  Provide practice problems for students to work on individual white boards. |
| Explore/Review |  | Explore solving equations with radicals (Mini-lecture 8.6)  Provide practice problems for students to work on individual white boards |
| Assessment |  | Ticket out the door – Provide an equation to solve prior to the end of class |
| Closure |  |  |

Reflection: Some students still are confused when solving for the leg of a right triangle rather than the hypotenuse

Encourage students to draw and label a diagram for the applied problems

Show students a simple example of an extraneous solution, such as:√y+9 = y+3 yields the answers: 0 and -5. -5 does not work as a solution when you check your answer, so it is extraneous.

**Day 7**

Benchmark: **A.1.10 Solve radical equations involving one radical**

**A.1.11 Describe the properties of rational exponents and apply these properties to simplify algebraic expressions**

Learning Objective: Solving Equations with Radicals

Simplify algebraic expressions involving rational exponents

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mini-lecture 8.6 Solving Equations with Radicals

Individual white boards

Dry-erase markers

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Practice problems dealing with solving equations with radicals |
| Introduction/Engage |  | KWL on radicals and solving equations with radicals  Practice solving problems dealing with Pathageorn thereom  Find an activity dealing with radicals and application problems with radicals. Provide problems for students to practice on individual white boards. |
| Explore/Review |  | Explore the idea of having exponents that are in the form of a fraction (rational exponents) Have students discuss how they would deal with this type of exponent.  Introduce the process of converting fractional exponents to radicals and radicals to fractional exponents  Provide sample problems for students to convert and simplify on the individual white boards. |
| Assessment |  | Prepare for assessment on solving equations with radicals  Have the students reflect on how they can use conversion of rational exponents to simplify some problems. |
| Closure |  |  |

Reflection: This should be a logical tie in to rational exponents. Students may need more practice converting back and forth between radicals and rational exponents. They need to understand that they convert from one to the other at their own convenience (whichever makes it easier for them to manipulate and solve the equation or simplify the solution.

**Day 8**

Benchmark: **A.1.11 Describe the properties of rational exponents and apply these properties to simplify algebraic expressions**

Learning Objective: Students will become proficient in using the properties of rational exponents so simplify expressions and solve equations

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Individual white boards

Dry-erase markers

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Practice problems converting between fractional exponents and radicals |
| Introduction/Engage |  | Review properties of Rational Exponents (In file), including multiplying, raising to a power, dividing, and negative exponents.  Provide practice problems for students to practice on individual white boards. |
| Explore/Review |  | Explore several ways that expressions and equations can be simplified by using the properties of rational exponents and converting back and forth to from rational exponents to radicals and from radicals to rational exponents.  Provide additional sample problems for students to practice. |
| Assessment |  | Short assessment on solving equations with radicals |
| Closure |  |  |

Reflection: Remind students that the properties of integer exponents also apply to rational exponents

**Day 9 - 10**

Benchmark: **A.2.9 Graph exponential functions and identify their key characteristics as related to contextual situations (specifically y = 3x and y = a\* bx)**

Learning Objective: Students will identify why exponential functions model exponential growth and decay

Assessment:

Accommodations:

Tier 2:

Tier 3:

Materials: Mathdude video on Exponential Functions

Graphing Paper white boards

Dry-erase markers

Laptop computers for students

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| **Strategy** | **Time** | **Activity** |
| Bell work |  | Show Mathdude Video on Exponential Functions |
| Introduction/Engage |  | Provide students with graphing paper and ask them to graph the following functions: y = 2x , y = 3x , y = (1/2)x , and (1/3)x  Discuss the results of the graphs, asking pointed questions about compare, contrast, etc. This should lead to some interesting discussion. Insure that the discussion leads to the identification of the key characteristics as related to contextual situations. |
| Explore/Review |  | Hand out the “Tower of Hanoi” handout and have students workin groups to answer to the questions. After a few minutes of work, stop and facilitate a discussion about the answers students are coming up with to insure they are making adequate progress. |
| Assessment |  | This activity will take up to 2 class periods. The Hanoi worksheet could serve as the assessment. |
| Closure |  |  |

Reflection:

We still need to add a lesson on graphing of the Family of Functions!!!!