LHS Math Curriculum

For

Algebra 2

Approved by Instructional Council on 5/19/08

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Algebra 2

Course Overview:
This course provides students with an opportunity to meet the following academic expectations:

- Speak clearly and communicate ideas accurately in a variety of settings
- Employ problem solving skills effectively
- Demonstrate critical thinking skills

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Course Units

Appendices

Appendix F: CT State Frameworks for Information and Technology Literacy

Appendix G: General Guidelines from the Math Alignment and Transition Subcommittee on Algebra 2, 2006.

Key to Coding:

In order to assure that this curriculum document is aligned with the most recent Connecticut State Frameworks, we have adopted a coding method to inform the user of this document of the precise connection to the frameworks.

The Connecticut State Frameworks consists of four strands, Geometry and Measurement (GM), Algebraic Reasoning: Patterns and Functions (AR), Numerical and Proportional Reasoning (NPR) and Working with Data: Probability and Statistics (WD). Each content strand is composed of an Essential Question with two to three components. Each component consists of one to two performance standards. Each standard consists of two to four performance expectations.

Each strand of the Frameworks is divided into a set of Core Content Standards and Expected Performances and a set of Extended Content Standards and Expected Performances. The Core is the set of standards the state expects every student to be able to know by the 10^{th} grade and therefore can be tested on the CAPT. The Extended set of standards is the set of standards that not all students will reach by the 10^{th} grade, if at all.

Several examples of coding used in the document follow:

A Focus Question coded as (**ARCore**:1.2a) refers to the core content strand Algebraic Reasoning: Patterns and Functions (**ARCore**), second component of the strand (1.2) and performance standard (a) within this component.

A Benchmark or Required Activity coded as (F2, **GMCore**:3.3a.4) refers to the Unit Focus Question 2 (F2), the core content strand Geometry and Measurement (**GMCore**), third component of the strand (3.3), performance standard (a) and performance expectation (4).

A Benchmark or Required Activity coded as **GMExtended** refers to the extended content standards for Geometry and Measurement.

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Unit 1: Algebra Concepts

Abstract

This unit begins with a brief review of solving linear equations and inequalities. Students then extend their basic knowledge to solve compound inequalities and absolute value equations and inequalities. Students make connections between solutions to inequalities and their graphical representations on the number line. Students will use "interval notation" to communicate solution sets to inequality problems. The graphs of absolute value equations and inequalities will be discussed using the graphing calculator as a tool. Students' mastery of unit one benchmarks is essential for the comprehension of more rigorous algebraic reasoning and problem solving throughout the course.

Essential Questions:
How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships?

Focus Questions:

1. How are a variety of numerical representations used to described quantitative relationships? (**NPRCore**:2.1a)

2. How can real-world problems be modeled and solved using equations, inequalities and absolute value? (**ARCore**:1.3a, **NPRCore**:2.2a)

Benchmarks:

The student will be able to

1. classify numbers using subsets of the real number system. (F1, **NPRCore**:2.1a.1, 2.1a.2)

2. simplify numerical expressions using the properties of real numbers. (F1, **NPRCore**:2.2a.1)

3. solve multi-step equations involving simplification and inverse operations. (F2, **ARCore**:1.3a.1, 1.3a.2, **NPRCore**:2.2a.1)

4. solve multi-step inequalities and compound inequalities, graph solution sets on the number line, and express solution sets in writing using interval notation. (F2, **ARCore**:1.3a.1, 1.3a.2, **NPRCore**:2.2a.1)

5. solve absolute value equations and graph solution sets on the number line. (F2, **ARCore**:1.3a.1, 1.3a.2, **NPRCore**:2.2a.2)

6. solve absolute value inequalities, graph solution sets on the number line, and express solution sets in writing using interval notation. (F2, **ARCore**:1.3a.1, 1.3a.2, **NPRCore**:2.2a.2)

7. interpret and relate equations with zero solutions and infinitely many solutions to their graphical representations. (F2, **ARCore**:1.3a.1, 1.3a.2, **NPRCore**:2.2a.1, 2.2a.2)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):
1. SAT prep "Writing Gridded Responses", PH Algebra 2 text, p. 46
2. Standardized Test Prep "Reading Comprehension", PH Algebra 2, p.51
3. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:

1. Create a spreadsheet modeling credit card debt. Provided information regarding the original charge amount, the minimum payment due, and monthly interest rate. (reference PH Mathematics Algebra 2, 2009, page 25)

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 1.1-1.5
College Board SAT, The Official SAT Study Guide, 2006

Kaplan, The New SAT, 2005

Connections:
Federal and State Regulations

Pacing: This unit is expected to take approximately seven class periods under the block schedule.

Notes to Teachers:
SAT Study Guide, Absolute Value reference, pg. 247-248
SAT Study Guide, Inequalities reference, pg. 248-249
The use of interval notation is not included in the current textbook. Teachers must incorporate this into the entire course.

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Unit 2: Functions and Relations

Abstract

Functions are a symbolic way to model real world relationships. Building on previously learned concepts involving slope and linear relationships, students will be introduced to function notation and will use it to express relationships between the independent and dependent variables. While familiar with scatter plot applications, students will learn how to use the correlation coefficient, *r*, to measure the accuracy of the linear model and to make meaningful predictions about real world data sets. Students will learn about absolute value as a function and the graphs of linear inequalities on the coordinate plane.

Essential Question:
How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships? How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

Focus Questions:

1. What is a function and its characteristics? (**ARCore**:1.1a, 1.2a)

2. How can real-world situations be represented using functions? (ARCore:1.2a, **ARExtended**:1.1a, **NPRCore**:2.1b, 2.2b, **WWDCore**:4.1a)

3. How can linear and non-linear functions be used to generalize relationships and make predictions? (**ARCore:**1.1a, 1.2a, 1.3a, **ARExtended**:1.1a)

Benchmarks:

The student will be able to

1. evaluate a function at specified values over given specific domain sets. (F1, **ARCore**:1.1a.1, 1.1a.3, 1.2a.1, 1.2a.2)

2. communicate the domain and range of a function using set and/or interval notation. (F1, **ARCore**:1.1a.3, 1.2a.1, 1.2a.2)

3. relate, interpret, and calculate slope as a rate of change in real-life situations. (F2, **ARCore**:1.2a.3, 1.2a. 4, **ARExtended**: 1.1a.2)

4. write linear equations using a variety of forms including slope-intercept, standard, and point-slope forms. (F3, ARCore:1.2a.3, **ARExtended**:1.1a.2)

5. write linear functions of parallel and perpendicular lines. (F3, **ARCore**:1.1a.2, 1.3a.1, **ARExtended**:1.1a.2)

6. use function notation to write linear relationships. (F1, **ARCore**:1.2a.2, F3, **ARExtended**: 1.1a.2)

7. relate the constant of variation, *k*, in direct variation to slope by comparing equation forms and features of a direct variation graph. (F2, **ARExtended**:1.1a.5, **NPRCore**:2.2b.2)

8. use x- and y- intercepts and slope-intercept form of the equation to graph linear relationships. (F3, **ARCore**:1.2a.3)

9. determine whether a linear function should be used to model scatter plot data using the correlation coefficient, *r*. (F2, **NPRCore**:2.1b.1,**WWDCore**:4.1a.2)

10. graph linear inequalities on the coordinate plane using solid/dashed boundary lines and shading on the half plane. (F3, **ARCore**:1.2a.1, 1.3a.1)

11. graph absolute value equations and inequalities on the coordinate plane. (F3, **ARCore**:1.2a.1, 1.3a.1)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):

1. Technology Activity Lab, "Finding a Line of Best Fit" PH, Algebra 2, p. 87. Choose from exercises 1-4.
2. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:

1. DK Activity Lab, "Bridges, Beams, and Tension" PH, Algebra 2, p. 114-115.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 2.1-2.7
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005

Connections:
Chemistry – predict chemical reactions
Architecture
Weather – predict wind and air speed

Pacing: This unit is expected to take approximately ten class periods under the block schedule.

Notes to Teachers:

Benchmark 6 is not included in the Prentice Hall text.
Continue to incorporate interval notation whenever possible.

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Unit 3: Systems of Linear Equations

Abstract

This unit is a natural progression from the previous unit involving linear functions. Students will write and solve systems of linear equations to model real life scenarios using the substitution, elimination, and graphing methods. In addition to using the graphing calculator to view linear systems, students will learn how to use a feature of the calculator to determine the point of intersection. Students will continue using the three-point approach to solving and checking problems (algebraic, numeric, and graphic) by using the graphing calculator throughout this unit.

Essential Question:
How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?

Focus Questions:

1. How can a system of two linear equations be solved using graphical and algebraic methods? (**ARCore**:1.3a)

2. What is the connection between the solutions(s) to a system of linear equations or inequalities and its graphical representation? (**ARCore**:1.2a ,1.3a)

3. How can real world problems be modeled and solved using a system of two linear equations or inequalities? (**ARCore**:1.3a and **ARExtended**:1.1a)

Benchmarks:

The student will be able to

1. solve systems of linear equations by substitution, elimination, and graphing methods. (F1, **ARCore**:1.3a.3; F2, **ARCore**:1.2a.4)

2. correlate the solutions to systems solved algebraically to their graphical representation in the coordinate plane. (F2, **ARCore**:1.3a.3; F2, **ARCore**:1.2a.4)

3. classify the system as consistent and independent, consistent and dependent or inconsistent. (F2, **ARCore**:1.3a.3; F2, **ARCore**:1.2a.4)

4. write and solve systems to model real-life situations. (F3, **ARCore**:1.3a.1, 1.3a.3)

5. solve systems of linear inequalities by graphing. (F1, **ARCore**:1.3a.2)

6. solve linear programming problems by modeling situation constraints with inequality statements, graphing the constraints, identifying possible max/min points, calculate max/min solution. (F3, **ARExtended**:1.1a.6)

Extention: systems of 3

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):
1. Activity Lab, "Solving Systems Using Tables", PH Algebra 2, p. 132.
2. Standardized Test Prep, "Reading Comprehension", PH Algebra 2, p. 165.
3. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:
1. Technology Activity Lab, "Parametric Equations", PH Algebra 2, p. 124.
2. Technology Activity Lab, "Linear Programming", PH Algebra 2, p. 145.
3. Calculator Based Lab (CBL) Activity, “Meet You at the Intersection: Solving a System of Linear Equations”, CBL 2 LabPro, EXPLORATIONS, Texas Instruments, p. 301.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 3.1-3.4, (Advanced 3.5 and 3.6)
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005
Texas Instruments, CBL 2 LabPro, EXPLORATIONS
(2) CBL 2 data collection devices
(2) TI CBR or Venier Motion Detectors
Stopwatch

Connections:
Business – Cost vs. Income; Product Design
Advertising
Standardized Test Scores
Global Positioning System (GPS)

Pacing: This unit is expected to take approximately seven class periods under the block schedule.

Notes to Teachers:
Advanced Level should include systems of three equations with three unknowns.

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Unit 4: Quadratics

Abstract

Students are introduced to the quadratic function and the features of its parabolic graph. Students will continue using the graphing utility to explore the characteristics of the function. They will draw connections between the roots of the function and the x-intercepts, as well as identify the vertex of the parabola as a maximum/minimum value of the function. Students will learn three different methods to solve quadratics. Complex numbers are introduced and used to express solutions to quadratics with imaginary roots. Applications such as projectile motion, free falling objects and maximum/minimum values are embedded in the unit.

Essential Question:
How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships? How do geometric relationships and measurements help us to solve problems and make sense of our world?

Focus Questions:

1. What is a quadratic function and what are its characteristics? (**ARCore**:1.1a, 1.2a, 1.3a and **ARExtended**:1.2a)

2. How are quadratics solved and what do the solutions mean? (**ARCore**:1.2a, 1.3a and **ARExtended**:1.2a and 1.3a)

3. How can real-world situations be modeled by quadratic functions? (**ARCore**: 1.3a and **ARExtended**:1.2a)

Benchmarks:

The student will be able to

1. recognize a quadratic function by its equation and its graphical representation. (F1, **ARCore**:1.1a.4, 1.2a.4 and **ARExtended**:1.2a.1)

2. communicate about quadratics using mathematical terminology such as: parabola, axis of symmetry, vertex, solutions, roots, zeros, x-intercepts, vertical stretch and shrink, reflection, etc. (F1, **ARCore**:1.1a.4, **ARExtended**:1.2a.1 and 1.2a.2)

3. graph a quadratic function written in vertex form, $y = a(x-h)^2 + k$ (F1, **ARCore**:1.1a.4, 1.2a.4 and **ARExtended**:1.2a.1 and 1.2a.2)

4. write the equation of a quadratic in vertex form given its graph. (F1, **ARCore**:1.1a.4, 1.2a.2 1.3a.2 and **ARExtended**:1.2a.1)

5. transform quadratic equations from standard form to vertex form using *a*, the leading coefficient and the vertex $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$. (F1, **ARCore**:1.2a.2, 1.3a.2 and **ARExtended**:1.2a.1)

6. factor quadratics and use the zero-product property to solve quadratic equations. (F2, **ARCore**:1.3a.1, 1.3a.2 and **ARExtended**:1.2a.1)

7. define a complex number with its real and imaginary parts. (F2, **ARExtended**:1.3a.1)

8. add, subtract, multiply and divide complex numbers. (F2, **ARExtended**:1.3a.1)

9. solve quadratics using square roots, factoring, and the quadratic formula. (F2, **ARCore**:1.3a.1, 1.3a.2 and **ARExtended**:1.2a.1)

10. relate the real/imaginary roots determined algebraically to their graphical representation. (F2, **ARCore**:1.2a.4 and **ARExtended**:1.2a.1)

11. apply methods of solving quadratics and finding the vertex to solve real world scenarios modeled by quadratic functions. (F3, **ARCore**:1.3a.1 and **ARExtended**:1.3a.1)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):
1. SAT Prep, "Using a Variable", PH Algebra 2, p. 298.
2. Standardized Test Prep, "Reading Comprehension", PH Algebra 2, p. 303.
3. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:
1. Technology Activity Lab, "Quadratic Inequalities", PH Algebra 2, p. 296-297.
2. Calculator Based Lab (CBL), “That's the Way the Ball Bounces: Height and Time for a Bouncing Ball", CBL 2 LabPro, EXPLORATIONS, Texas Instruments p. 103.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 5.1-5.8
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005
Texas Instruments, CBL 2 LabPro, EXPLORATIONS
CBL 2 data collection device
TI CBR or Vernier Motion Detector
Ball (racquetball or basketball size)

Connections:
Woodworking; framing
Physics – projectile motion
Landscape Architecture

Pacing: This unit is expected to take approximately twelve class periods under the block schedule.

Notes to Teachers:

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Unit 5: Polynomials

Abstract

Students extend their prior knowledge about polynomials to learn about polynomial functions. Students begin by defining and identifying polynomial functions by their equation and graphical representation. Students perform operations on polynomials and learn how to divide polynomials using synthetic division. Several theorems about the roots of polynomial equations are studied including the Fundamental Theorem of Algebra. The second portion of the unit provides students an opportunity to practice skills learned using function operations and function compositions. Finally, students use inverse function relations in order to solve real-world problems.

Essential Question:
How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships?

Focus Questions:

1. What are polynomials and the rules for operating with them? (**ARCore**: 1.1a and 1.3a, **NPRCore**:2.2a)

2. What do real zeros of a function look like? (**ARCore**: 1.2a and 1.3a and **ARExtended**: 1.2a)

3. How can function compositions and inverses be used to solve real world problems? (**ARExtended**: 1.1a and 1.3a)

Benchmarks:

The student will be able to

1. classify polynomials by degree and number of terms and write the function in standard form. (F1, **ARCore**:1.1a.4)

2. apply integer rules and combine like terms to add and subtract polynomials. (F1, **ARCore**:1.3a.2)

3. multiply polynomials using the distributive property and laws of exponents. (F1, **ARCore**:1.3a.2)

4. divide polynomials using both long division and synthetic division. (F1, **ARCore**:1.3a.2)

5. apply synthetic division by using the Factor Theorem and the Remainder Theorem. (F1, **NPRCore**: 2.2a.3)

6. factor polynomials in order to find zeros or roots of polynomial functions. Factoring methods include greatest common factor, grouping, trinomials, and sum and difference of cubes. (F2, **ARCore**: 1.3a.2)

7. solve for roots by graphing. (F2, **ARCore**:1.2a.4, **ARExtended**:1.2a.1)

8. use the graphing approach to check solutions solved algebraically. (F2, **ARCore**:1.2a.4, **ARExtended**:1.2a.1)

9. add, subtract, multiply, and divide functions. (F3, **ARExtended**:1.3a.2)

10. find the composite of two functions. (F3, **ARExtended**:1.3a.2)

11. apply function operations and compositions in order to solve real-world problems. (F3, **ARExtended**:1.3a.2)

12. find the inverse of a relation or function. (F3, **ARExtended**:1.1a.5)

13. apply inverse function relations in order to solve real-world problems. (F3, **ARExtended**:1.1a.5)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):
1. Technology Activity, "Graphs of Polynomial Functions", PH Algebra 2, p. 306.
2. Activity, "Counting Zeros", PH Algebra 2, p. 341.
3. Activity, "Inverses", PH Algebra 2, p. 406.
4. Technology Activity Lab, "Graphing Inverses", PH Algebra 2, p. 413
5. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:
1. Extension, "End Behavior", PH Algebra 2, p. 312.
2. DK Activity Lab, "As the Ball Flies", PH Algebra 2, p. 364-365.
3. Standardized Test Prep, "Reading Comprehension", PH Algebra 2, p. 427.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 6.1-6.6, 7.6-7.7
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005

Connections:
Statistics – U.S. Census Bureau
Energy Production
Storage and Design

Pacing: This unit is expected to take approximately twelve class periods under the block schedule.

Notes to Teachers:

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Unit 6: Rational Functions

Abstract

Students develop their understanding of domain and range as they study rational functions and their graphs. Vertical and horizontal asymptotes are graph features that help students make sense of function constraints, a preview to *limit* topics discussed in calculus. Students will perform basic operations on rational expressions and solve rational equations. The unit culminates with students applying learned skills to solve work problems as well as those relating distance, rate, and time.

Essential Question: How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships?

Focus Questions:

1. What are asymptotes and why are they important to the study of rational functions? (**ARCore**:1.1a, 1.2a and **ARExtended**:1.1a and 1.2a)

2. How do the rules for performing operations on rational expressions relate to the rules for operating with simple fractions? (**ARExtended**:1.3a)

3. How can fraction operations help us to solve real world problems? (**ARExtended**:1.1a and 1.3a, **NPRCore**:2.2b)

Benchmarks:

The student will be able to

1. state the domain, range of rational functions using interval notation. (F1, **ARCore**:1.1a.3)
2. given the equation or graph of a rational function, find vertical asymptotes, including points of discontinuity, (F1, **ARCore**:1.2a.1, **ARExtended**:1.1a.1 and 1.1a.7, 1.2a.1 and 1.2a.2)
3. add and subtract rational expressions and express in simplest form. (F2, **ARExtended**:1.3a.1)

4. multiply and divide rational expressions and express in simplest form. (F2, **ARExtended**:1.3a.1)
5. solve rational equations and identify extraneous solutions. (F3, **ARExtended**:1.3a.1)
6. solve problems involving inverse functions, distance/rate/time, and work problems. (F3, **ARExtended**:1.1a.2 and 1.1a.5 and **NPRCore**:2.2b.2)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):
1. Technology Activity Lab, "Graphing Rational Functions", PH Algebra 2, p. 494
2. SAT Prep, "Eliminating Answers", PH Algebra 2, p. 538
3. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:
1. Technology Activity Lab, "Rational Inequalities", PH Algebra 2, p. 528-529
2. Standardized Test Prep, "Reading Comprehension", PH Algebra 2, p. 543
3. Calculator Based Lab (CBL) Activity, "Under Pressure: The Inverse Relationship between Pressure and Volume", CBL 2 LabPro, EXPLORATIONS, Texas Instruments, p. 145.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 9.1-9.6
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005
Texas Instruments, CBL 2 LabPro, EXPLORATIONS
CBL 2 data collection device
Vernier Gas Pressure Sensor or Pressure Sensor with syringe included

Connections:
Zoology – heart rate & life span
Health Care – Weight and Body Mass Index (BMI)
Music - pitch

Pacing: This unit is expected to take approximately eight class periods under the block schedule.

Notes to Teachers:

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Unit 7: Radical Expressions and Rational Exponents

Abstract

In this unit students extend their study of radicals beyond square root. They learn how to simplify and perform basic operations on radical expressions, and solve radical equations. The discussion about extraneous roots continues as students check solutions in original equations and view graphs of radical equations using the graphing calculator. A major component of the unit is the relationship between radicals and rational exponents. Students will utilize this relationship to rewrite and efficiently solve equations. Formulas from real life situations containing radical and rational exponents are incorporated throughout this unit

Essential Question: How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships?

Focus Questions:

1. How do the rules for performing operations on radical expressions relate to the rules for operating with rational expressions? (**NPRExtended**:2.1a)

2. Why do we need both radical form and rational form to express the same number? (**ARExtended**:1.3a and **NPRExtended**:2.1a)

3. How are radicals and numbers written with rational exponents used in our everyday lives? (**ARExtended**:1.3a and **NPRExtended**:2.1a)

Benchmarks:

The student will be able to

1. find all real roots of a given number. (F1, **NPRExtended**:2.1a.2)

2. simplify radical expressions. (F1, **NPRExtended**:2.1a.2)

3. multiply and divide radical expressions. (F1, **NPRExtended**:2.1a.2)

4. add and subtract radical expressions. (F1, **NPRExtended**:2.1a.2)

5. apply operations with radicals in order to solve real-world problems. (F3, **NPRExtended**:2.1a.2)

6. write radical expressions using rational exponents; write numbers written with rational exponents as radical expressions. (F2, **ARExtended**:1.3a.1 and **NPRExtended**:2.1a.2)

7. simplify expressions written with rational exponents. (F2, **ARExtended**:1.3a.1 and **NPRExtended**:2.1a.2)

8. solve square root and other radical equations; identify extraneous roots. (F3, **ARExtended**:1.3a.1)

9. solve equations with rational exponents; identify extraneous roots. (F3, **ARExtended**:1.3a.1)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):

1. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.
2. Technology Activity, "Checking for Extraneous Solutions", PH Algebra 2, 2009, p. 394.

Suggested Activities:

1. Geometry Review, "Radical Expressions in Formulas", PH Algebra 2, 2009, p. 397.
2. SAT Prep, "Finding Multiple Correct Answers", PH Algebra 2, 2009, p. 422.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 7.1-7.5
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005

Connections:
Packaging
Physics - Energy and Acceleration
Golden Ratio – Growth patterns, Art

Pacing: This unit is expected to take approximately ten class periods under the block schedule.

Notes to Teachers:

Ledyard Mathematics Department

Algebra 2

Unit 8: Exponential and Logarithmic Functions

Abstract

The previous unit involving rational exponents is a natural lead-in to this unit. The inverse relationship of exponential and logarithmic functions is learned and utilized to solve for unknown values of powers. Use of the graphing calculator enhances the instruction of this unit with students having the ability to view tables and graphs of functions involving extreme values. Students will have the opportunity to work with exponential and logarithmic functions that are used to model financial and natural phenomena in our world.

Essential Question: How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? How do numbers represent quantitative relationships?

Focus Questions:

1. What is an exponential function and what are its characteristics? (**ARExtended**:1.2a, 1.3a and **NPRCore**:2.2a)

2. How are exponential and logarithmic functions related? (**ARExtended**:1.1a, 1.2a, 1.3 and **NPRCore**:2.2a)

3. How can exponential functions be used to model events or situations found in our everyday lives? (**ARExtended**:1.1a, 1.3a, **NPRExtended:**2.1a).

Benchmarks:

The student will be able to

1. identify the role of constants in an exponential function of the form $y = ab^{cx}$ by analyzing graphs. (F2, **ARExtended**:1.1a.1, 1.2a.1 and 1.2a.2)

2. apply the exponential function to model and solve real-world problems involving exponential growth and decay. (F3, **ARExtended**:1.1a.2, 1.1a.4, **NPRExtended**:2.1a.4)

3. write an exponential as its inverse logarithmic function; write a logarithmic function as its inverse exponential function. (F1 and F2, **ARExtended**:1.3a.1 and 1.3a.2)

4. relate exponential and logarithmic functions as inverses of each other in three ways: numerically, algebraically and graphically. (F1 and F2, **ARExtended**:1.2a.1, 1.2a.2, 1.3a.1, 1.3a.2 and 1.3a.3)

5. apply the logarithmic function to model and solve real-world problems involving Seismology and chemistry. (F3, **ARExtended**:1.3a.3)

6. use properties of logarithms to simplify and evaluate logarithmic expressions. (F1, **ARExtended**:1.3a.1, 1.3a.2 and 1.3a.3 and **NPRCore**:2.2a.2)

7. use properties of logarithms to simplify and solve exponential and logarithmic equations. (F2, **ARExtended**:1.3a.1, 1.3a.2 and 1.3a.3 and **NPRCore**:2.2a.2)

Technology Education Framework Connection:
Content Standards
Calculators: TI-30XIIS; TI-83 or TI-84

Required Activities (Common Experiences):
1. Activity, "Tournament Play", PH Algebra 2, p. 432.
2. Technology Activity Lab, "Fitting Exponential Curves to Data", PH Algebra 2, p. 438
3. SAT Prep, "Testing Multiple Choices", PH Algebra 2, p. 478
4. SAT prep, problems from The Official SAT Study Guide, 2006 or The New SAT, 2005, Kaplan.

Suggested Activities:
1. Activity, "Properties of Logarithms", PH Algebra 2, p. 454
2. Technology Activity Lab, "Exponential and Logarithmic Inequalities", PH Algebra 2, p. 476-477
3. DK Activity Lab, "A Crowded House", PH Algebra 2, p. 484-485
4. Calculator Based Lab (CBL) Activity, "Chill Out: How Hot Objects Cool", CBL 2 LabPro, EXPLORATIONS, Texas Instruments, p. 165.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. Problems are drawn from the *ExamView Pro* question bank found in the Prentice Hall Teacher's Resource pack.

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Mathematics Algebra 2, 2009, Lessons 8.1-8.6
College Board SAT, The Official SAT Study Guide, 2006
Kaplan, The New SAT, 2005
Texas Instruments, CBL 2 LabPro, EXPLORATIONS
CBL 2 data collection device
Temperature probe

Connections:
Population
Economics
Medicine
Earthquakes

Pacing: This unit is expected to take approximately ten class periods under the block schedule.

Notes to Teachers: