Algebra 1

Approved by Instructional Council May 5, 2010

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Algebra 1

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

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 10th 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 10th 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.

Ledyard Mathematics Department

Algebra 1

Unit 1: Patterns, Variables, and Operations

Abstract

This is the introductory unit for Algebra I and covers critical foundations for the rest of the Algebra I course and beyond. The intent is to empower students with algebraic methods, while reviewing and building on student understanding of basic operations with variables and rational numbers. The emphasis is on establishing a solid foundation for all types of numerical operations, including operations with signed numbers, fractions, decimals, and exponents and simplifying expressions using the distributive property, combining like terms and the order of operations.

Essential Questions

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

Focus Questions

1. How are a variety of numerical representations used to describe quantitative relationships? (**ARCore:**1.1a,1.3a, **NPRCore:**2.1a,b,2.2a)

2. How can real-world problems be modeled using algebraic expressions?(**ARCore:**1.3a)

Benchmarks

The student will be able to:

1. Write an algebraic expression from a verbal model (F1,F2,**ARCore:**1.1a1)

2. Model relationships with variables, expressions, and equations.(F1,**ARCore:**1.1a1)

3. Simplify expressions (including those containing exponents) using Orders of Operations and the Distributive property. (F1,**NPRCore:**2.2a1)

4. Classify and compare numbers into sets and determine which set of numbers are appropriate for representing real world situations.(F1,F2,**NPRCore:**2.1a1,2)

5. Perform the four basic operations with whole numbers, decimals, fractions and integers without the use of a calculator.(F1,**NPRCore:**2.2a1)
6. Identify properties of real numbers and use deductive reasoning to justify the steps used to simplify algebraic expressions (F1, **NPRCore:**2.2a1)

Technology Education Framework Connection:
Content Standards
Calculators: graphing utility

Required Activities (Common Experiences):

1. CAPT Problems, such as:

   2004 Television Service, NPR
   2003 Telephone Calls, AR

2. Activity in which students utilize the Y1 and TABLE features of the calculator to show that the original expression is equivalent to simplified expressions, such as cited in the Connecticut Algebra One for All document, 4/2009.

Suggested Activities:

1. From Text Section 1-1 Exercises p. 8 #'s 43a,43b and 44.
2. From Text Section 1-2 Exercises p. 14 #'s 63a, 63b and 63c
3. From Text Section 1-3 Exercises p. 22 #'s 74a and 74b(for adv. 75a-d).
4. From Text Activity Lab *Understanding Probability,* Activity #1 and #2 p.92.
5. Exploring Algebra by Key Curriculum Press 2002 page 16 "Exploring the Properties of the Four Arithmetic Operations".
6. Matching/Jigsaw activity using properties and expressions
7. Card Games for adding and subtracting integers

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. The unit test should include the following CAPT tasks:
   2009 Largest Squash Contest, NPR
   2004 History Tests, AR

Instructional Resources and Materials:

Exploring Algebra by Key Curriculum Press 2002
Graphing Calculator (TI-83 or TI-84)
Text Book

Connections:
Consumer products and services

Pacing:
This unit is expected to take approximately 10-11 class periods in a block schedule or _____ class periods in a standard schedule.

Notes to Teachers:

Ledyard Mathematics Department

Algebra I

Unit 2: Equations and Inequalities

Abstract

In this unit, students will learn how to solve linear equations and inequalities in one variable. Linear equations are a common model for real world problem solving and students will solve these types of problems, including problems involving proportions and percents. Methods for solving equations are then extended to solving inequalities and compound inequalities.

Essential Questions:

How do patterns and functions help us to describe data and physical phenomena and solve a variety of problems? How do geometric relationships and measurements help us to solve problems and make sense of our world? How are quantitative relationships represented by numbers?

Focus Questions

1. How are equations and inequalities used to solve a variety of problems? (**ARCore:**1.3a)

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

Benchmarks:

The student will be able to:

1. Solve and check solutions of linear equations involving multiple steps (combining like terms, distributive property, clearing fractions or decimals, variables on both sides). (F1, **ARCore:**1.3a.1, 1.3a.2)

2. Justify the steps used to solve an equation with the properties of algebra.((F1, **ARCore:**1.3a.1)

3. Analyze a real-world problem by developing an algebraic equation, solving it, and communicating the solution in writing. (F2, **ARCore:**1.3a.1)

4. Solve problems involving ratios and proportions, including converting units and finding missing sides of similar figures. (F1, F2, **ARCore:** 1.3a.1, 1.3a.2, **GMCore**: 3.3a.2, **NPRCore:** 2.2b.1)

5. Solve linear inequalities involving multiple steps and represent the solutions graphically on a number line. (F1, **ARCore:**1.3a.1, 1.3a.2)

6. Solve compound inequalities and represent the solutions graphically on a number line. (F1, **ARCore:** 1.3a.1, 1.3a.2)

7. Analyze a real-world problem by developing an algebraic inequality, solving it, and communicating the solution in writing. (F2, **ARCore:**1.3a.1)

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

Required Activities (Common Experiences)

1. Use algebra tiles or virtual manipulatives to model an algebraic equation and use the properties of equality to solve it. Such as P. 133 activity in Prentice Hall Algebra 1 2009
2. Graphing calculator investigation to show how simplification of an algebraic expression results in the same values. Students will simplify an expression algebraically, then enter the original expression in Y_1 and the simplified expression in Y_2. The TABLE will then show that the two expressions are equal for all values of X.
3. CAPT Release Problems, such as:

   2007 Martha's Sales, AR
   2006 Canadian Dollars, AR
   2001 Health Club #8, AR
   2001 Health Club #9, NPR
   2009 Bicycle Trip, GM
   2007 Picnic Food, NPR
   2003 Graphic Design Charges, AR

   Other CAPT released items to be considered: Picnic Food (NPR, 2007), CAPT Kendra's Travels (NPR, 2007), CAPT Cereal Boxes (NPR, 2009), CAPT Motorbike Rental (AR, 2005)

Suggested Activities

1. Transform literal equations or formulas to solve for different variables.
2. Solve problems involving percents and percent of change, including percent error. (F1, F2, **ARCore:** 1.3a.1, 1.3a.2, **NPRCore:** 2.1a.2)
3. Use the graphing calculator TABLE feature to do solve equations with variables on both sides.
4. Activity to discover rules for multiplying and dividing negative numbers when solving an inequality. Discovering Algebra, Key Curriculum Press

Assessment Tasks

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. The unit test should include the following CAPT release items:

   2006 Pressure, AR
   2007 Joseph's Final Grade,WD
   2007 Cargo Ship, GM
   2003 Machine Parts, NPR

Other items to consider: City Construction #14 (AR, 2001), Graphic Design Charges (AR, 2003)

Instructional Resources and Materials

http://enlvm.usu.edu/ma/nav/activity.jsp?sid=nlvm&cid=3_2&lid=324
Calculator (TI-30XIIS)

Graphing Calculator (TI-83 or TI-84)
Algebra Tiles
Prentice Hall Algebra 1

Connections

Science - Apply formulas to natural phenomena

Pacing

This unit is expected to take approximately 17 class periods in a block schedule or _____ class periods in a standard schedule.

Ledyard Mathematics Department

Algebra 1

Unit 3: Functions and Graphs

Abstract

This unit emphasizes the power of functions in representing and enlightening real world situations. The goal of this unit is for students to understand the fundamentals of functions: function notation, function terminology, evaluating functions, graphing functions, and using functions as a problem solving tool. The basic concepts of independent and dependent variables, and domain and range are introduced. Three different function families are presented for students to explore and examine. Technology is employed to support student understanding of function concepts, to assist students with function visualization, and to enable students to solve problems in an accelerated way. Finally, students will use functions to model many diverse real world situations.

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

Focus Questions:

1. What is a function?(**ARCore:**1.1a)
2. How can functions be represented through tables, graphs and rules? (**ARCore:** 1.1a)
3. How do functions represent real world applications? (**ARCore:**1.3a)

Benchmarks:

The student will be able to:

1. Identify the independent and dependent variables in a relation. (F1,**ARCore:** 1.1a.3)

2. Determine whether a given set of data is discrete or continuous. (F1,**ARCore:** 1.1a.3)

3. Relate given graphs to events and create graphs to model a verbal description of events. (F3,**ARCore:** 1.3a.2)

4. Determine the domain and range of a function describing a real world problem.(F3,**ARCore:** 1.1a.3)

5. Translate between all representations of a given function (verbal, table, graph, equation) (F2,**ARCore:** 1.2a.1,1.2a.2)

6. Label axes and choose appropriate scales on graphs to represent a real world situation.(F3,**ARCore:** 1.2a.1)

7. Use function notation to evaluate a function for a specified value of its domain. (F2,**ARCore**: 1.1a.3)

8. For a function y = f(x), find range values given values in its domain. (F2,**ARCore:** 1.1a.3)

9. Write a function rule to represent a verbal or tabular model. (F2,**ARCore:** 1.1a.3)

10. Use inductive reasoning to continue arithmetic and geometric patterns. (F2,**ARCore:** 1.1a.3)

11. Represent an arithmetic sequence as a function and use it to generate *n*th terms or to find which term *n* has a given value. (F2,**ARCore:**1.1a.1)

Technology Education Framework Connection:
Content Standards
Calculators: graphing utility

Required Activities (Common Experiences):

1. CAPT Problems:
   2004 Hot Air Ballooning, AR
   2002 How Temperature Varied, WD

   Other CAPT released items to consider: 3 Level Pyramid (AR, 2001), CAPT How Many Stickers? (AR, 2001)

2. Use Graphing calculator for function rules (for example see p. 269 in text).
   p. 272 Exercises 5-4 Problem #22 and/or 24 from text.
   p.295 #55 Pascal investigation.

3. Motion detector activity to show how distance and velocity changes over time. (Distance vs. Time; Speed vs. Time
   Relate to graphs and events – Discovering Algebra

Suggested Activities:

1. Explore patterns and functions using a variety of technologies, (graphing calculator, cbl/cbr, spreadsheets, and on line resources).(F2,F3,**ARCore:**1.1a.1)

Assessment Tasks:

1. Required activities above.

Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. The unit test should include the following CAPT released items:

2007 Hang Gliding, AR
2005 Walk to the Stadium, AR
2009 Crater Lake, AR

Other CAPT released item(s) to consider: Amaryllis Bulb (AR, 2005)

Instructional Resources and Materials:

Graphing Calculator
Algebra 1, Prentice Hall 2009, **Chapter 1 sec 4 and Chapter 5 section 1-4,7.**

Pacing:
This unit is expected to take approximately 10 class periods in a block schedule or _____ class periods in a standard schedule.

Notes to Teachers:

Algebra I

Ledyard Mathematics Department

Unit 4: Linear Functions

Abstract

The goal of this unit is to explore how linear functions are represented, examined and analyzed through the "rule of four": verbally, graphically, numerically and symbolically. Linear relationships are introduced with analysis of slope and rate of change, which leads to detailed work on the multiple algebraic representations of linear functions. In Unit 5, students will apply their understanding of linear functions from this unit to analyze real world problems.

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 the relationship between two variables be represented using the "rule of four"? (**ARCore:** 1.1a,1.2a)
2. How can different forms of a linear equation show the relationship between two variables? (**ARCore:** 1.2a, **ARExtended:** 1.1a)
3. How are the graphs and equations of parallel and perpendicular lines related? (**ARCore:** 1.1a,1.3a)

Benchmarks:

The student will be able to

1. Interpret and calculate rates of change and slopes from tables, graphs and verbal models (F1,**ARCore:**1.2a.3, 1.2a. 4, F2, **ARExtended**: 1.1a.2)

2. Write and graph linear equations using slope-intercept form. (F1, **ARCore:**1.2a.3,F2, **ARExtended**:1.1a.2)

3. Graph a linear equation in standard form using x- and y-intercepts, including horizontal and vertical lines. (F1, **ARCore** :1.1a.1)

4. Write a linear equation in point-slope or slope-intercept form given one point and the slope. (F1,**ARCore:** 1.2a.2)

5. Determine whether two lines are parallel or perpendicular and write equations of lines that are parallel or perpendicular to a given line using point-slope or slope-intercept forms. (F3, **ARCore**:1.1a.2, 1.3a.1, **ARExtended**:1.1a.2)

6. Transform linear equations from one form to another – Standard form, Slope-Intercept form and Point-Slope form. (F3, **ARCore**:1.1a.2, 1.3a.1, **ARExtended**:1.1a.2)

Technology Education Framework Connection
Content Standards

Calculators: TI-83 or TI-84

Calculator-based Ranger and Laboratory (CBR/CBL)

Required Activities (Common Experiences)

1. Graphing calculator investigation to discover slope-intercept form such as Prentice-Hall Algebra I 2009 pg. 316

2. CBR/CBL activity to discover that slope = speed of walker

3. CAPT problem:
   2007 Coffee Special, AR

Suggested Activities

1. Geometer Sketchpad activities such as Exploring Algebra (Key Curriculum Press, 2002) pages 37, 40, 43, 50, 53, 55

2. Investigate slope and y-intercept with CBR activity from Modeling Motion: High School Math Activities with the CBR (ISBN Number: 1-886309-14-0)

Assessment Tasks

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question.

Instructional Resources and Materials

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Algebra 1

Connections

Science – Mixture problems

Economics – Break-even point problems

Pacing

This unit is expected to take approximately 10 class periods in a block schedule or _____ class periods in a standard schedule.

Ledyard Mathematics Department

Algebra 1

Unit 5: Applications of Linear Functions

Abstract

In the previous unit, students learned to write the equation of a line in its various forms given two points. This unit has the students apply this skill to data sets containing several ordered pairs. Students will construct scatter plots using the points and draw reasonable trend lines to classify the relationship and make predictions. Subsequently, students will write the equation of their trend lines by calculating the slope and y-intercept and explain their meanings within the context of the problem. After learning how to analyze data by hand, student will use the graphing calculator to create scatter plots, calculate the equation of the line of best fit to interpolate and extrapolate, as well as calculate and analyze the correlation coefficient. As a result, the students will understand the role of linear models in the real-world, in disciplines such as science, health, and athletics.

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

Focus Questions:

1. How can linear equations be used to model and solve real world situations?**(ARCore:** 1.2a, **ARCore:** 1.3a)

2. How can collected two-variable data be graphed and analyzed to determine whether the situation can be modeled with a linear equation?(**WDCore:** 4.1a)

3. How can the graphing calculator be used to display two-variable data and determine the strength of the correlation and the best-fit linear model? (**WDCore:** 4.1a, **WDExtended:** 4.1a)

4. How can linear models be used to solve problems and make predictions from real world data? (**ARCore:** 1.3a, **WDCore:** 4.2a)

Benchmarks:

The student will be able to

1. Write the equations in slope intercept form from a graph, identify and interpret the real world meaning of the slope and y-intercept.(F1, **ARCore:** 1.2a.3,4,1.3a.1)

2. Given two points, write the equation of the line in point-slope form. (F1, **ARCore:** 1.2a.3,4,1.3a.1)

3. Determine whether a set of data is linear by analyzing slope/rate of change. (F1, **ARCore:** 1.2a.3,4,1.3a.1)

4. Construct a scatter plot for two groups of data and analyze the relationship between them; discuss strength of correlation by viewing the graph. (F3,**WDCore:** 4.1a.1)

5. Draw a reasonable trend line and use it to interpolate.(F4, **WDCore:** 4.2a.1)

6. Write the equation of a hand drawn trend line in point-slope and/or slope-intercept form and use it to make predictions. (F1, ARCore: 1.3a.1, F4, **WDExtended:** 4.1a.1)

7. Use the STAT and WINDOW features of the graphing calculator to construct a scatter plot with appropriate viewing window. (F3, **WDCore:** 4.1a.1, **WDExtended:** 4.1a.1)

8. Use the STAT and Y-VARS features of the graphing calculator to find equation of best fit. (F3, **WDExtended:** 4.1a.2)

9. Use the STAT and Y-VARS features of the graphing calculator to find the value of the correlation coefficient to determine the strength of the relationship between the variables; revisit discussion on linear relationships. (F3, **WDExtended:** 4.1a.2)

Technology Education Framework Connection:
Content Standards
Calculators: graphing utility

Required Activities (Common Experiences):

1. CAPT Problems:
   2007 Coffee Special, AR (revisit)
   2007 Population of New London County, WD (revisit)

   Other CAPT released items to be considered: Historical Documents (AR, 2002)

2. p. 357 Activity lab #1-9
3. Hooke's Law activity

Suggested Activities: *Instructor's Resource Center (ICR)*
1. p.240 from PH 1998 Algebra book(Or similar)
2. "Cockroach" computer game

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. The unit test should include the following CAPT released item:

   2006 Frog Population, AR (revisit)

Instructional Resources and Materials:
Text Sections 6-3, 1-5, 6-7
Graphing Calculator (TI-83 or TI-84)

Pacing:
This unit is expected to take approximately 9 class periods in a block schedule or _____ class periods in a standard schedule.

Notes to Teachers:

Algebra I

Ledyard Mathematics Department

Unit 6: Systems of Linear Equations and Inequalities

Abstract

This unit is a progression from the previous unitS 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 "rule of four" to solve and check problems throughout this unit. The concept of systems of linear functions will be extended to introduce systems of linear inequalities and their applications.

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 or inequalities be solved using numerical, graphical and algebraic methods? (**ARCore**:1.2a, 1.3a)

2. What is the connection between the solution(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, graphed and solved using a system of two linear equations or inequalities? (**ARCore**:1.3a and **AREextended**: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. Use the graphing calculator to determine (or approximate) the solution to a system of linear equations or inequalities using GRAPH, TRACE, TABLE and/or INTERSECTION and INEQUALZ features (F1, ARCore: 1.2a.4, 1.3a.1, 1.3a.3

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

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

5. Graph linear inequalities and systems of inequalities on the coordinate plane using solid/dashed boundary lines and shading on the half plane. (F1, **ARCore:**1.2a.1, 1.3a.1,2)

6. Write and solve systems of linear inequalities by graphing to model real-life situations, identify possible solutions, and analyze their meanings in context to the situation. (F3, ARCore: 1.3a.1, ARExtended: 1.3a.1)

Technology Education Framework Connection
Content Standards

Calculators: TI-30XIIS, TI-83 or TI-84

Required Activities (Common Experiences)

1. Graphing calculator investigation to show relationship between algebraic, tabular and graphical representations of a system of linear equations (similar to Activity Lab on page 380 of Prentice-Hall Algebra I 2009)

2. CAPT Release Problems such as:

   2002 Industrial Electricity Use, AR
   2002 How the Temperature Varied, WD
   2001 Two Water Sources, WD

Suggested Activities

Assessment Tasks

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. The unit test should include the following CAPT released items:

   2003 Graphic Design Charges, AR (revisit)
   2007 Martha's Sales, AR

Instructional Resources and Materials

Calculator (TI-30XIIS)

Graphing Calculator (TI-83 or TI-84)
Prentice Hall Algebra 1

Connections

Science – Mixture problems

Pacing

This unit is expected to take approximately 10 class periods in a block schedule or _____ class periods in a standard schedule.

Ledyard Mathematics Department

Algebra 1

Unit 7: Exponents and Exponential Functions

Abstract

This unit provides students with the opportunity to explore exponential functions, which is the first nonlinear function family they will encounter. Exponential functions have a wide variety of applications that are accessible and relevant for students, such as finance and biology. The unit begins with the reinforcement of the rules for negative and zero exponents and scientific notation. Work is then extended to include laws of exponents. Then the symbolic model for exponential growth and decay is introduced via geometric sequences. Finally, students will be exposed to data intended to expose the differences between the linear and exponential families. Graphing calculators and the Rule of Four will be used extensively to make the connection between the various representations of the function. Finally, students will examine real-world data to determine whether or not the data can be reasonably modeled with a linear or an exponential model, or neither, and if so, to write and use that model to answer questions or make predictions.

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

Focus Questions:

1. How are algebraic expressions involving exponents simplified.(**ARCore:** 1.3a)

2. How is scientific notation used to simplify calculations in algebraic expressions.(**NPRCore:** 2.1a,2.2a)

3. How are exponents are used to write geometric sequences and exponential functions.(**ARCore:** 1.1a)

4. How can exponential relationships represented using the rule of four.(**ARCore:** 1.2a)

Benchmarks:

The student will be able to

1. Use exponent rules to simplify algebraic expressions. (Zeros, negative, multiplication, power, division rules.)(F1,**ARCore:** 1.3a.2)

2. Write and perform multiplication and division operations on numbers written in scientific and standard notation.(F2, **NPRCore:** 2.1a.2,2.2a.2)

3. Analyze geometric sequences/exponential functions and write them symbolically in the form y=ab^x.(F3,**ARCore:** 1.1a.1)

4. Explain the difference between linear functions, which represent constant arithmetic change, and exponential functions, which represent constant multiplicative change.(F3,**ARCore:** 1.1a.4,F4,**ARCore:** 1.2a.2)

5. Analyze how changes in the parameters, *a* and *b*, affect the graph of an exponential function.(F4, **ARCore:** 1.2a.4)

6. Evaluate and graph an exponentional function. (F4, **ARCore:** 1.2a.1,1.2a.2,1.2a.4)

7. Identify exponential growth/decay by its function and its graph. Write the growth/decay factor using percent change. (F4, **ARCore:** 1.2a.1,1.2a.2,1.2a.4)

Technology Education Framework Connection:
Content Standards
Calculators: graphing utility

Required Activities (Common Experiences):

1. Activity Lab #1 p. 466 Use with lesson 8-7, PH Algebra, 2009

2. CBR activity Basketball Bounce

3. CAPT Release Problems such as:

   2007 Bloodhound, NPR
   2007 Organism Lengths, NPR
   2002 Bacterial Growth, AR
   2002 Used Car Values, AR
   2004 Car Depreciation, AR
   2003 Increasing Population, AR

Suggested Activities:

Goldfish or M&M's activity that models exponential growth/decay.

Assessment Tasks:

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question. The unit test should include the following CAPT released items:

   2008 Moore's Prediction, NPR
   2003 College Trust, WWD

Instructional Resources and Materials:

Graphing Calculator (TI-83 or TI-84)
Algebra 1, Prentice Hall 2009, **Chapter 8**

Connections:

Pacing:
This unit is expected to take approximately 14 class periods in a block schedule or _____ class periods in a standard schedule.

Notes to Teachers:

Ledyard Mathematics Department

Algebra I

Unit 8: Polynomials and Quadratic Functions

Abstract

Unit 8 is an extended unit to introduce polynomials and quadratic functions to more advanced classes that may have extra time. Level II classes using block scheduling are not expected to have time for this unit. The unit introduces polynomial vocabulary, extends operations beyond linear terms and introduces the concept of factoring. Students are then introduced to the characteristics of quadratic functions and graphs and the connections between them. Students then learn four methods for solving quadratic equations, graphing, square roots, factoring and quadratic formula, giving them the tools they need to solve real world quadratic applications like vertical motion problems.

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

Focus Questions:

1. What are polynomials and how can the four basic operations be performed on them? (**ARCore** :1.1a, 1.3a)

2. What does it mean to factor a polynomial and how can factoring be used to solve an equation of degree greater than one? (**ARCore:**1.3a)

3. How are the graph, equation and solutions of a quadratic function related?(**ARExtended:** 1.1a,1.2a,**ARCore:** 1.2a)

4. How can real world problems be modeled and solved using quadratic equations? (**ARCore:** 1.3a)

5. How can square roots be used to solve equations such as those used in the Pythagorean Theorem.(**GMCore:** 3.3a)

Benchmarks:

The student will be able to

1. Classify polynomials by degree and number of terms.(F3, **ARExtended:** 1.1a.1)

2. Add and subtract polynomials.(F1, **ARCore:** 1.3a.2)

3. Multiply a polynomial by a monomial, two binomial using FOIL, or a binomial by a trinomial.(F1, **ARCore:** 1.3a.2)

4. Factor a greatest common factor monomial from a polynomial.(F2, **ARCore:** 1.3a.2)

5. Factor a trinomial of the form $x^2 + bx + c$ (a = 1).(F2, **ARCore:** 1.3a.2)

6. Factor a difference of two squares.(F2, **ARCore:** 1.3a.2)

7. Graph quadratic functions of the form $y = ax^2 + bx + c$ and understand how the values of *a* and *c* affect the graph.(F3, **ARCore:** 1.2a.4, F3,**ARExtended:** 1.2a.1,2)

8. Explain the relationship between the x-intercepts of a graph and the number of solutions for a quadratic function.(F3, **ARCore:** 1.2a.3)

9. Solve quadratic equations using graphing, square roots, factoring and the quadratic formula.(F4, **ARCore:** 1.3a.1)

10. Solve square root problems using the Pythagorean Theorem.(F5, **GMCore:** 3.3a.2)

Technology Education Framework Connection
Content Standards

Calculators: TI-30XIIS, TI-83 or TI-84

Required Activities (Common Experiences)

Use the graphing calculator to investigate the effect of changing a, b or c on the graph of a quadratic function.

CAPT problems:

Suggested Activities

Assessment Tasks

1. Required activities above.

2. Teacher generated tests and quizzes that align to unit benchmarks, focus questions and the essential question.

Instructional Resources and Materials

Calculator (TI-30XIIS)

Graphing Calculator (TI-83 or TI-84)
Algebra Tiles
Prentice Hall Algebra 1

Connections

Science - Apply formulas to natural phenomena

Pacing

This unit is expected to take approximately 12 class periods in a block schedule or _____ class periods in a standard schedule.