**Elementary Algebra Sabbatical Project 2016**

**Resources Organized by Type**

**AMATYC The Right Stuff: Appropriate Mathematics for all students** “Promoting materials that engage students in meaningful activities, promote the effective use of technology to support the mathematics, further equip students with stronger problems solving and critical thinking skills, as well as enhance numeracy. “ <https://amatyc.site-ym.com/?page=therightstuff&hhSearchTerms=%22right+and+stuff+and+materials%22>

* 5.0 Soap Bubbles, Cheesecake Factories, and Cell Phone Towers : Linear Functions

<http://therightstuff.matyc.org/RSmods2009/index.html>

* 7.0 A Slice of Liver: Linear functions <http://therightstuff.matyc.org/RSmods2009/index.html>
* 16.0 Compound Interest: Linear Functions <http://therightstuff.matyc.org/RSmods2009/index.html>
* 18.0 Archimedes’ Law: Linear functions, algebra, and table of values <http://therightstuff.matyc.org/RSmods2009/index.html>

**Connecticut Core Standards**

**Algebra I Curriculum:**  “This model Algebra 1 curriculum created by CT teachers and students for CT teachers and students emphasizes problem solving and mathematical reasoning, incorporates real-world applications and effective use of technology, and uses multiple representations.” Units of instruction are: Patterns, Equations and Inequalities, Functions, Linear Functions, Scatter Plots and Trend Lines, Systems of Equations, Intro to Exponential Functions, Quadratic Functions. <http://ctcorestandards.org/?page_id=6311> Selected Lessons, Activities, and references that are relevant to our Intermediate Algebra curriculum are referenced below:

Unit 3 - Functions:

* [Activity 3.1.1a Representing Relations I](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i1_a311a_represent_relations1.docx)
* [Activity 3.1.1b Representing Relations II](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i1_a311b_represent_relations2.docx)
* [Activity 3.1.2 Is it a Function](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i1_a312_is_it_a_function.docx)
* [Activity 3.2.3 Functions Everywhere](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i2_a323_functions_everywhere.docx)
* [Activity 3.2.5 The Raven and the Jug](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i2_a325_raven_jug.docx) (experiment to collect linear data)
* [Activity 3.3.1 Function Machines](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i3_a331_function_machines.docx)
* [Activity 3.3.4 Hot Air Balloon](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i3_a334_hot_air_balloon.docx) (domain, range, and function values from a graph)
* [Activity 3.4.6 Phone Tree](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i4_a346_phone_tree.doc)
* [Activity 3.4.7 Handshakes](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i4_a347_handshakes.docx)
* [Parent Function Reference](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i4_function_reference.pdf)

Unit 4 – Linear Functions:

* [Activity 4.2.4 Draining a Swimming Pool](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i2_a424_draining_a_pool.docx)
* [Activity 4.4.5 Applications of Slope-Intercept Form](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i4_a445_slope-Inter_form_applied.docx)
* [Activity 4.6.6 Finding and Using Linear Functions](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i6_a466_finding_linear_functions.docx)
* [Activity 4.6.7 You Choose](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i6_a467_you_choose.docx) (finding linear functions to model given situations)

**Algebra II Curriculum:**  “This model Algebra II curriculum created by CT teachers and students for CT teachers and students emphasizes problem solving and mathematical reasoning, incorporates real-world applications and effective use of technology, and uses multiple representations.” Units of instruction are: Functions and Inverse Functions, Quadratic Functions, Polynomial Function, Rational and Power Functions, Exponential and Logarithmic Functions, Trigonometric Functions. <http://ctcorestandards.org/?page_id=9840> Selected Lessons, Activities, and references that are relevant to our Intermediate Algebra curriculum are referenced below:

Unit 1 – Functions and Inverse Functions

* [Activity 1.2.2 What’s Reasonable?](http://ctcorestandards.org/wp-content/uploads/2015/09/Activity_1_2_2.docx) (determine if a situation is a function)

**EngageNY.org**: open source materials from New York State Common Core Mathematics Curriculum (also found in Eureka-Math)

Algebra I

* Module 1: Relationships Between Quantities and Reasoning with Equations and Their Graphs
  + Topic A: Introduction to Functions Studies This Year – Graphing Stories
  + Topic B: The Structure of Expressions
  + Topic C: Solving Equations and Inequalities
  + Topic D: Creating Equations to Solve Problems
* Module 3: Linear and Exponential Functions
  + Topic B: Functions and Their Graphs
    - Lesson 9 – Representing, Naming, and Evaluating Functions
    - Lesson 10 – Representing, Naming and Evaluating Functions

**Tasks:**

“Illustrative Mathematics” (tasks that support each CCSS standard) <https://www.illustrativemathematics.org/content-standards>

“Functions” (linear and quadratic) <http://map.mathshell.org/tasks.php?unit=HA07&collection=9>

“Sorting Functions” (match graph, equation, table, and rule) <http://map.mathshell.org/tasks.php?unit=HA16&collection=9>

“Growth Rate” rate of change <http://www.nctm.org/Classroom-Resources/Lessons/Growth-Rate/>

“Real Life Examples Linear Equations y=mx+b <http://www.sharemylesson.com/teaching-resource/real-life-examples-linear-equation-y-equals-mx-b-50016636/>

“Real-life straight line graphs” matching real life situations with equations and graphs of lines <http://www.sharemylesson.com/teaching-resource/real-life-straight-line-graphs-6038551/>

“Get the Math” Videos and challenge for Math in Videogames (finding a linear function) <http://www.thirteen.org/get-the-math/the-challenges/math-in-videogames/introduction/16/>

“Get the Math” Videos and challenge for Math in Restaurants (finding a linear function) <http://www.thirteen.org/get-the-math/video/get-the-math-in-restaurants-introduction/179/>

“Movie Lines” linear function <http://www.nctm.org/Classroom-Resources/Lessons/Movie-Lines/>

“Lost in Space: Bone Density” activity from “Exploring Space Through Math” series from NASA on linear equations in two variables <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_BoneDensity_detail.html>

“Exercising in Space” activity from “Exploring Space Through Math” series from NASA on linear functions (requires TINspire) <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_Exercise_detail.html>

“Suit Yourself” activity from “Exploring Space Through Math” series from NASA on linear functions and systems of equations <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_SuitYourself_detail.html>

“Polynomial Puzzler” <http://www.nctm.org/Classroom-Resources/Lessons/Polynomial-Puzzler/>

Also, see books category below for more tasks

**Lessons:**

“Interpreting Algebraic Expressions” <http://www.sharemylesson.com/teaching-resource/interpreting-algebraic-expressions-50027241/>

“Representing Functions of Everyday Situations” <http://map.mathshell.org/download.php?fileid=1740>

“Patterns and Functions” entire unit <https://www.youcubed.org/task/patterns-and-functions-unit/>

“Building and Solving Linear Equations” <http://map.mathshell.org/download.php?fileid=1688>

“Super Bowl Advertising Regressions & scatter plots” <http://www.sharemylesson.com/teaching-resource/super-bowl-advertising-regressions-and-amp-scatter-plots-50008194/>

Note: <https://illuminations.nctm.org/Lesson> is being updated on a regular basis with new lessons. If you have a specific content area it is easy to search for lessons.

**Graphing Calculator Activities**

(Texas Instruments: <https://education.ti.com/en/us/activities-home>)

Building Concepts in Mathematics using TI Nspire (this is new and still under development) <http://www.tibuildingconcepts.com/home>

Fractions

Ratios & Proportional Relationships

Expressions & Equations

What is an exponent

What is a variable

Building Expressions

What is an Equation

Equations and Operations

Using Structure to Solve Equations

Visualizing Equations Using Mobiles

Visualizing Quadratic Expressions (geometric representation)

**Geogebra:** Materials and Downloads **<http://tube.geogebra.org/>**

Workbook assembled by MxCC math instructor Dr. Joseph Murfin for various topics from Elementary Algebra [http://www.geogebra.org/material/simple/id/2946615#](http://www.geogebra.org/material/simple/id/2946615)

“InputOutput Function” linear function where you vary slope and y-intercept and see the impact of each input and output <http://www.geogebra.org/material/simple/id/689605>

“Linear Functions” various applets to explore linear functions <http://www.geogebra.org/material/simple/id/268505>

“Investigating Linear Functions with Geogebra” (<http://www.geogebra.org/material/simple/id/170457>

“Graph of linear function” <http://www.geogebra.org/material/simple/id/163667>

“Exploring Linear Functions - Common Forms of Linear Equations” [http://www.geogebra.org/material/simple/id/1656547#chapter/56569](http://www.geogebra.org/material/simple/id/1656547" \l "chapter/56569)

“Linear function - properties - scenarios” includes domain, range, and x-intercept <http://www.geogebra.org/material/simple/id/2532507>

“Patterns and Equations” mostly linear investigations <http://www.geogebra.org/material/simple/id/82808>

“Linear or NonLinear Functions” from the graph <http://www.geogebra.org/material/simple/id/193003>

“Linear Lesson” comprehensive with multiple lessons on linear topics <http://www.geogebra.org/material/simple/id/315411>

**Desmos Activities** teacher.desmos.com

Central Park – activity that transitions from visual to numeric to algebraic

Function Carnival – graphing how a variable changes over time vs. the movement itself

Water Line – time/height graphs to model

Polygraph: Lines – describe important features of lines

Marbleslides: Lines – graphing, functions, linear, transformations, slope (must know about restricted domains)

**Teacher Resources:**

Visual Equations using Algebra Tiles <http://www.regentsprep.org/Regents/math/ALGEBRA/AE2/TRSolvEq.htm>

Investigate lines with slope <http://www.regentsprep.org/Regents/math/ALGEBRA/AC1/Tlines.htm>

Rotation of Tasks for Solving Systems of Linear Equations <http://www.regentsprep.org/Regents/math/ALGEBRA/AE3/GrSysTR.htm>

Multiplying Polynomials using various methods <http://regentsprep.org/Regents/math/ALGEBRA/AV3/Smul_bin.htm>

**Videos:**

“LearnZillion” Math video lesson library contains short videos to be used as introductions/warm ups/flipped lesson <https://learnzillion.com/resources/75114-math>

“Algebra 25 Linear Equations in the Real World” <https://www.youtube.com/watch?v=8eXb-6wQUks>

“Algebra 35 Systems of Linear Equations in Two Variables” <https://www.youtube.com/watch?v=75m60SxFfJg>

**Books:**

“Implementing the Common Core State Standards through Mathematical Problem Solving – High School”; Theresa J. Gurl, Alice F. Artzt, Alan Sultan 2012 (includes numerous tasks appropriate for Intermediate Algebra)

* Task 1.6, page 13, relationship between a “rule” and the graph – linear function
* Task 2.1, page 20, function vs. not a function
* Task 2.2, page 21, function notation
* Task 2.3, page 21, function vs. not a function common misconceptions
* Task 2.4, page23, function and domain of a function
* Task 2.5, page 25, break even point for a system of linear equations

“Putting Essential Understanding of Functions into Practice 9-12”; Robert Ronau, Dan Meyer, Terry Crites; NCTM 2014 (instructional approach of this book and tasks included is a combination of a student-centered perspective and teaching through problem solving, tasks are found in Appendix 3)

* Function Wall, page 148, understand the definition of a function
* Function Finder, page 150, understand the definition of a function
* Lake Depth, page 151, covariation – patterns in how two variables change together
* Velocity of One Car, page 175, graphs as representations of functions 1
* Comparing Two Cars, Given Distance, page 178, graphs as representations of functions 2
* Comparing Two Cars, Given Speed, page 180, graphs as representations of functions 3
* Two Walks, page 182, graphs as representations of functions 4

“Principles to Actions: Ensuring Mathematical Success for All” Steven Leinwand, et al; NCTM 2014

* Task in Figure 12, page 31, proportional reasoning
* Task in Figure 25, pages 86-88, systems of linear equations
* Task in Figure 27, page 93, equations and percent

**Interactive Online Activities:**

Adding Signed Numbers (flashcards, matching, concentration) <https://www.quia.com/jg/1666.html>

Subtracting Signed Numbers (flashcards, matching, concentration) <https://www.quia.com/jg/1668.html>

Multiply and Divide Signed Numbers (flashcards, matching, concentration) <https://www.quia.com/jg/1668.html>

Mixed Operations with Signed Numbers (flashcards, matching, concentration) <https://www.quia.com/jg/1668.html>

Working with Like Terms (flashcards, matching, concentration) <https://www.quia.com/jg/332031.html>

“Algebra Tiles” <http://illuminations.nctm.org/Activity.aspx?id=3482>

Solving Equations Jeopardy Style – equations are a mix of one step, two step, etc. including literal equations <https://www.quia.com/cb/77775.html>

“Pan Balance – Expressions” input two expressions (somewhat limited) and when you vary the value of x you see the point on the graphs – good to visualize solutions to equations graphically <http://illuminations.nctm.org/Activity.aspx?id=3529>

Battleship style game for adding and subtracting polynomials <https://www.quia.com/ba/28820.html>

**Other Resources:**

Free Worksheets (skill and drill) <http://kutasoftware.com/freemain.html>

Volume I Activity Sampler (free download of math acitivities, books of activities available for purchase) Make It Real Learning Company [www.makeitreallearning.com](http://www.makeitreallearning.com)

* Choosing a Cell Phone Plan – Verizon; Investigating Linear Equations
* Cooking in the Kitchen; Working with Fractions
* Travel Options – Florida; Working with Linear Systems

Volume II Activity Sampler

* Scale Models #1; Working with Proportional Thinking

Mathematical Models (free download contains numerous linear, quadratic, exponential, etc. sets of data for modeling) Make It Real Learning Company [www.makeitreallearning.com](https://www.mail.commnet.edu/owa/redir.aspx?C=YUfa5DLYoEmUWv6x5b5_ze0kScZLOdMIBg9A4lEH61_w40IyZTgYnxRKcq7z_XSK3CyPSWM9sjA.&URL=http%3a%2f%2fwww.makeitreallearning.com)

**Alternatives to Elementary/Intermediate Algebra:**

New Mathways Project, Charles A. Dana Center, University of Texas <http://www.utdanacenter.org/higher-education/new-mathways-project/>

* The New Mathways Project Curricular Materials <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/>
* NMP Curriculum Design Standards <http://www.utdanacenter.org/wp-content/uploads/NMP_curriculum_design_standards_Sept2013.pdf>
* Courses:
  + “Foundations of Mathematical Reasoning” course <http://www.utdanacenter.org/wp-content/uploads/NMP_curriculum_design_standards_Sept2013.pdf> (available as a MyMathLab course through Pearson)
  + “Frameworks for Mathematics and Collegiate Learning” course - a first year experience type course which is a co-requisite to the Foundations course <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/frameworks-for-mathematics-and-collegiate-learning/>
  + “Quantitative Reasoning” course <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/quantitative-reasoning-course/> (available as a MyMathLab course through Pearson)
  + “Statistical Reasoning” course <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/statistical-reasoning-course/> (available as a MyMathLab course through Pearson)
  + STEM-Prep Pathway <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/stem-prep-pathway-i-and-ii/>
    - “Reasoning with Functions I” under development but the pilot is available as a MyMathLab course through Pearson (Spring 2016)
    - “Reasoning with Functions II” to be developed

Complete College America “Transform Remediation – the Co-Requisite Course Model” <http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final(1).pdf>