**Elementary Algebra Sabbatical Project 2016**

**Resources Organized by Instructional Unit**

**Real Numbers**

**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 B: The Structure of Expressions

**Tasks:**

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

**Lessons:**

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

**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

**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#>

**Desmos Activities** teacher.desmos.com

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

**Videos:**

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

**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>

**Other Resources:**

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)

* Cooking in the Kitchen; Working with Fractions

Volume II Activity Sampler

* Scale Models #1; Working with Proportional Thinking

**Linear Equations and Inequalities in One Variable**

**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 C: Solving Equations and Inequalities
  + Topic D: Creating Equations to Solve Problems

**Lessons:**

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

**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>

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#>

**Teacher Resources:**

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

**Videos:**

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

**Interactive Online Activities:**

“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>

**Linear Equations and Functions**

**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
* 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>

**Lessons:**

“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/>

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

**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#>

“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

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:**

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

**Other Resources:**

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

**Systems of Linear Equations**

**Task:**

“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>

**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#>

**Teacher Resources:**

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

**Videos:**

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

**Other Resources:**

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)

* Travel Options – Florida; Working with Linear Systems

**Exponents and Polynomials**

**Tasks:**

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

**Teacher Resources:**

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

**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#>

**Interactive Online Activities:**

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

**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>

**Additional Information Regarding the Importance of Pedagogy:**

### [Dylan Wiliam-Pedagogy Trumps Curriculum - YouTube](https://www.youtube.com/watch?v=-y3tN_1CiRk)

<https://www.youtube.com/watch?v=-y3tN_1CiRk>

“Taking College Teaching Seriously: Pedagogy Matters! Fostering Student Success Through Faculty-Centered Practice Improvement” Gail Mellow, Diana Woolis, Marisa Klages-Bombich, Susan Restler <https://takingcollegeteachingseriously.kpublic.net/home>