GVC Companion Guide: Algebra II

COURSE FOCUS: THE STUDY OF TRANSFORMATIONS AND THEIR EFFECTS ON FUNCTIONS

- Set classroom norms and excitement for a great year of mathematics ahead! Start the school year with growth mindset work doing Week of Inspirational Math(s) - youcubed. Consider using these tasks throughout the year with a big kick off week one using parts of any of the "weeks" provided. Work with your PLC to collaborate together on which to use when.
- Use number talks/sense making routines and mini-lessons to bring back past math knowledge. Things to think about including:
    - "My Favorite No" – My favorite wrong answer/Error Analysis
    - Which one doesn't belong? (WODB)
    - Which would you rather?
    - Silent Board Game (How To)
    - Graphing Stories: Blog-why-how-samples; Desmos Stories; STEMlearning; sample search
    - Open Middle (open-ended questions)
    - Estimation 180
    - Number-Math Talks | Same but Different
    - Always, Sometimes, or Never | True-False … and why? | Give example(s) and/or counter-example(s) nrich.maths-ASN | true/false routine
    - Academic Talk protocol (English learners) | Partner A/Partner B (Academic Talk protocol)
    - Claims-Evidence Writing (graphic organizer support) | Problem-Evidence-Reasoning-Claim (PERC)
    - Mathematical Mindsets by Jo Boaler (Appendix A pgs. 217-268) Appendix A

Math Core 8 Milestones as background content knowledge and expectations with which students enter Algebra I

- Algebra Warm Ups for Geometry Teachers, and others… ~ Keeping it Fresh!
- **OpenUp Resources**

- FLTs, Focused Learning Targets have been provided to help inform students of expected learning targets for each unit (Other Resources-1-pg guide)

Guiding Philosophy, CGI, Cognitively Guided Instruction:

- We invite you to consider the following:
    - Students need space and time to make sense of mathematics.
    - Students need time to explain their thinking.
    - Take time to notice, strategically share, and celebrate diverse student thinking.
    - Use questioning to elicit, support, and extend thinking.
    - Facilitate student-centered discussions to deepen understanding and create spaces for sense-making.

Seven Guiding Principles of Cognitively Guided Instruction, CGI:

We tie these principles to the Social Justice Standards, learning for justice anti-bias framework - Learning for Justice Website

1. Every student comes to math class knowing some mathematics
2. Every student is capable of extending their mathematical ideas
3. Knowing the development of children's thinking helps you know how to support learning– "What am I working toward?"
4. Details of children's thinking support instructional decision making
5. Must challenge our assumptions about what students know and are able to do
6. Must create space for the participation of each and honor the different ways in which students are participating
7. Identity shapes participation, so want to position students competently

SEMESTER 1 Fall IAB Algebra and Functions II			
Unit 1 Aug-Sept	**Unit 2 Sept-Oct**	**Unit 3 Oct-Nov**	**Unit 4 Nov-Dec**
Introduction to Transformations **OpenUp Unit 1**	**Quadratic Functions** **OpenUp Unit 3**	**Polynomial Functions** **OpenUp Unit 4**	**Rational Functions + (honors–Conics)** **OpenUp Unit 5**

SEMESTER 1

Students should build on **prior knowledge** of…	Students should **master**…	Students should be **developing** and will continue to work on…
Solving multi-step equations. Graphing and writing linear equations. Transformations within the coordinate plane. Multiplying binomial expressions. Function notation. Domain and range.	Recognizing and applying transformations to parent functions. Factoring quadratics. Solving all quadratics, including with complex solutions. Understanding how to apply and interpret quadratics theoretically and conceptually. Finding all zeros of a polynomial function.	Understanding and manipulating expressions with rational exponents and radicals. Recognizing key characteristics of parent functions. Using interval notation to communicate domain and range. Understanding how transformations affect the domain and range of a parent function.

District IAB in October will be Algebra and Functions II – Quadratic Functions, Equations, and Inequalities

Things to be aware of:

- Functions and Transformations, Unit 1 = introduction and opportunity to review and remind students of recursive notation.
- Finish first semester with conic.
- For Honors Algebra II, reverse the order of Radicals and Conics
- The open-ended modeling of quadratics needs to be shown in our quadratic unit more – in last section of quadratics – use more CAASPP examples.

SEMESTER 2 Winter FIAB Seeing Structure in Expressions/Polynomial Expressions			
Unit 5 January	**Unit 6 February**	**Unit 7 March-April**	**Unit 8 May-June**
Radical Functions **OpenUp Unit 8**	**Exponential, Logarithmic, & Inverses Functions** **OpenUp Units 1 and 2**	**Statistics** **OpenUp Unit 9**	**Trigonometry** **OpenUp Units 6-7**

SEMESTER 2

Students should build on **prior knowledge** of…	Students should **master**…	Students should be **developing** and will continue to work on…
Operations with fractions. Applying exponential properties. Special right triangles. Basic trigonometry (i.e. sine, cosine, and tangent).	Finding and understanding relationships between inverse functions. Graphing and identifying key characteristics of exponential and logarithmic functions. Solving exponential and logarithmic equations. Performing basic operations on rational expressions. Solve rational equations and be able to apply to model real world situations (i.e. distance-rate-time problems) Identifying methods of data collection, and interpreting categorial and quantitative data. Developing and applying the unit circle to evaluate all six trigonometric functions.	Recognizing and applying functions to model real world situations. Identifying the effects of transformations on sinusoidal functions. Solving more complex equations involving exponents and/or logarithms.

District FIAB in February will be Seeing Structures in Expressions and Polynomial Expressions

Things to be aware of:

- Exponential, Logarithmic, & Inverse Functions, Unit 5, must include A-SSE.4 re Sums of Finite Geometric Series. An extra week as been added to include sum of finite geometric series to this unit
- Arithmetic and Geometric Sequences have been removed from Algebra II since this is Algebra I content. (sum of finite geometric series is algebra II content)
- Statistics, Unit 7, must incorporate summation notation. A week has been added to this unit.
- The use of statistics is encouraged when modeling mathematics throughout the course.
- Trigonometry = final unit 8. Half a week has been added in order to provide more time to instruct and learn graphing and transformations.

For the Algebra II course, instructional time should focus on four critical areas:

(1) Relate arithmetic of rational expressions to arithmetic of rational numbers.

(2) Expand understandings of functions and graphing to include trigonometric functions.

(3) Synthesize and generalize functions and extend understanding of exponential functions to logarithmic functions.

(4) Relate data display and summary statistics to probability and explore a variety of data collection methods.

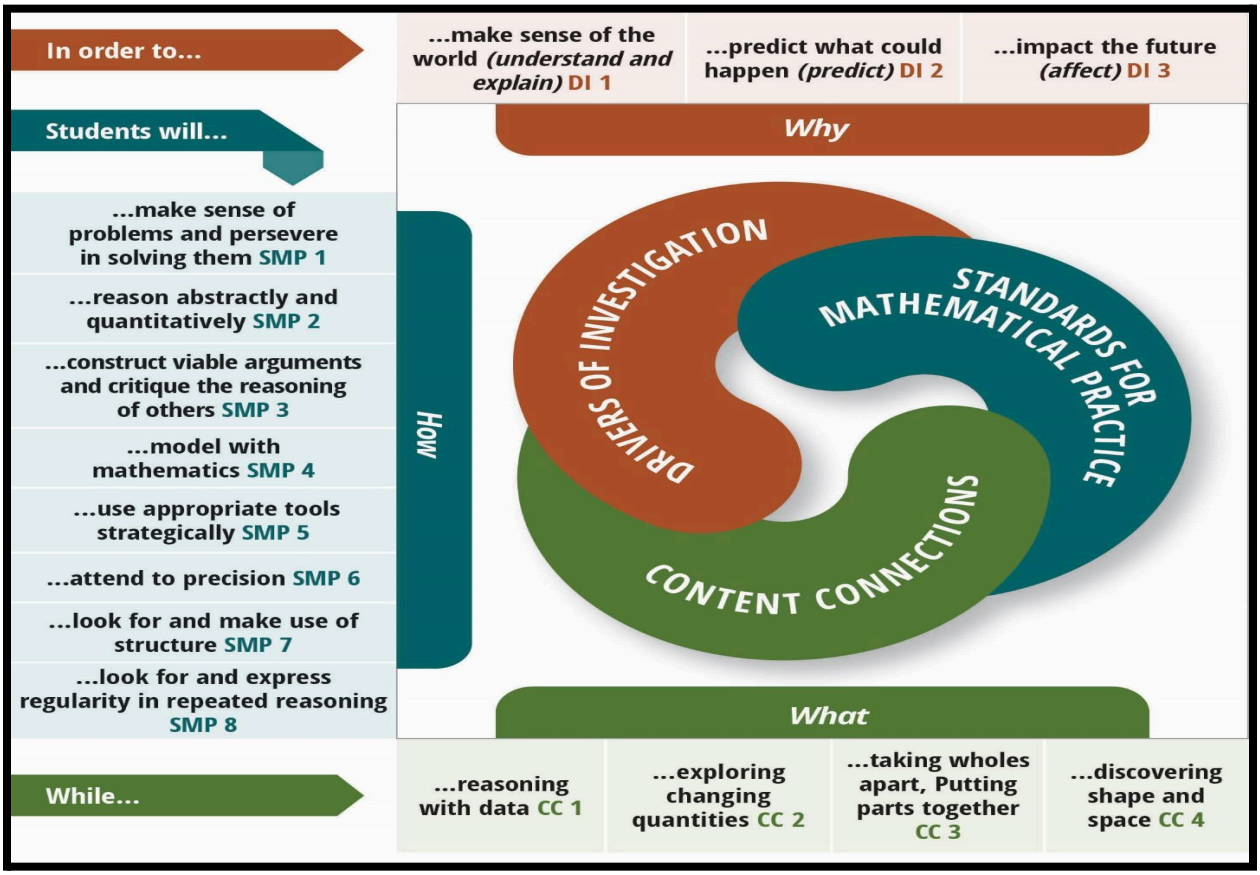
Algebra Warm Ups for Geometry Teachers, and others… ~ Keeping it Fresh!

Math Core 8 Milestones as background content knowledge and expectations with which students enter Algebra I

Standards for Mathematical Practices = the how-to of the content standards

MP1: Make sense of problems and persevere in solving them
MP2: Reason abstractly and quantitatively
MP3: Construct viable arguments and critique the reasoning of others
MP4: Model with mathematics
MP5: Use appropriate tools
MP6: Attend to precision
MP7: Look for and make use of structure
MP8: Look for and express regularity in repeated reasoning

Mathematical Practices 1-3-6 = connections to EL/ELD and NGSS standards: See Critical Areas for details of grade expectations



ALGEBRA II BIG IDEAS from 2023 CA MATH FRAMEWORK chapter 8

The standards in the Algebra II course come from the conceptual categories of Modeling, Functions, Number and Quantity, Algebra, and Statistics and Probability. Building on their work with linear, quadratic, and exponential functions, students in Algebra II extend their repertoire of functions to include polynomial, rational, and radical functions.

Students work closely with the expressions that define the functions and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms. Based on their previous work with functions, and on their work with trigonometric ratios and circles in geometry, students now use the coordinate plane to extend trigonometry to model periodic phenomena. They explore the effects of transformations on graphs of diverse functions, including functions arising in applications, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of underlying function. They identify appropriate types of functions to model a situation, adjust parameters to improve the model, and compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit.

CONTENT CONNECTIONS ~ BIG IDEAS ~ CONTENT STANDARDS

CC1~reasoning with data CC2~exploring changing quantities
CC3~taking wholes apart, putting parts together CC4~discovering shape and space

Drivers of Investigation. Unifying reasons that both elicit curiosity and provide the motivation for deeply engaging with authentic mathematics.

D1~make sense of the world (understand and explain)

D2~predict what could happen (predict)

D3~impact the future (affect)