GVC Companion Guide: Math Core 8

- 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:
  - o "My Favorite No" – My favorite wrong answer/Error Analysis
  - o Which one doesn't belong? (WODB)
  - o Which would you rather?
  - o Silent Board Game (How To)
  - o Graphing Stories: Blog-why-how-samples; Desmos Stories; STEMlearning; sample search
  - o Open Middle (open-ended questions)
  - o Estimation 180
  - o Number-Math Talks | Same but Different
  - o Always, Sometimes, or Never | True-False … and why? | Give example(s) and/or counter-example(s) nrich.maths-ASN | true/false routine
  - o Academic Talk protocol (English learners) | Partner A/Partner B (Academic Talk protocol)
  - o Claims-Evidence Writing (graphic organizer support) | Problem-Evidence-Reasoning-Claim (PERC)
  - o Mathematical Mindsets by Jo Boaler (Appendix A pgs. 217-268) Appendix A
- There has been an effort to ensure that we are aligned with the CA State Mathematics Standards and that the concepts are organized in a logical, fluid way, and that we have coherence in the course.
- Units have been named based on the standards of the unit, not the textbook.
- Note "Critical Areas of Instruction" also aligned to content standards for eighth grade.
- **Resources**:
  - OpenUp Resources
  - Math Milestones (8th grade)
  - Desmos Activities for Math 8
  - 📄 FULTON Pattern and Function Connection.pdf

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 FIAB: *Congruence & Similarity*	
Unit 1: Geometric Transformations	**Unit 2: Graphing & Writing Linear Relationships**
OpenUp U1: Rigid Transformations & Congruence **OpenUp U2:** Dilations, Similarity, & Introduction to Slope **CMP3:** Butterflies, Pinwheels, & Wallpaper	**OpenUp U3:** Linear Relationships **CMP3:** Thinking with Mathematical Models **FIAB as end-of-unit assessment**: Proportional Relationships, Lines & Linear Equations

SEMESTER 1

Students should build on **prior knowledge** of…	Students should **master**…	Students should be **developing** and will continue to work on…
Proportional Reasoning	Proportional Reasoning	Multi-step equations in one variable
Rigid Transformations	Rigid Transformations	
Dilations	Dilations	
Congruence/Similarity	Congruence/Similarity	
Linear Relationships: (graphing) $y = mx = b$	Linear Vs non-linear	
Determine slope when given two points	Linear Relationships: (graphing) $y = mx = b$	
Write an equation based on a verbal description or table		

Things to keep in mind for semester 1:
- Rigid Transformations and Scale Factor are part of Unit 1
  "Butterflies, Pinwheels, and transformations" is supplemented with Illustrative Mathematics found in Open-Up Resources: Unit 1 = "Rigid Transformation and Congruence" and Open-Up Unit 2 = "Dilations, Similarity, and Introducing Slope"
- "Thinking with Mathematical Models" of Unit 2 is supplemented with Illustrative Mathematics found in Open-Up Resources: Unit 3 = Linear Relationships and Open-Up Unit 4 = Linear Equations and Linear Systems (systems taught with linear equations)

<table>
<tr><td colspan="4" align="center">**SEMESTER 2**
==**Winter FIAB: *Proportional Relationships, Lines, & Linear Equations***==</td></tr>
<tr>
<td align="center">**Unit 3: Algebraic Expressions, Equations & Systems of Linear Relationships**</td>
<td align="center">**Unit 4: Exponents, Radicals & Scientific Notation**</td>
<td align="center">**Unit 5: Pythagorean Theorem & Rational/Irrational Numbers**</td>
<td align="center">Still Need…</td>
</tr>
<tr>
<td>**OpenUp U4:** Linear Equations & Linear Systems

CMP3: Say It with Symbols, It's in the System

FIAB as end-of-unit assessment: Functions</td>
<td>**OpenUp U7:** Exponents & Scientific Notation

CMP3: Growing, Growing, Growing</td>
<td>**OpenUp U8:** Pythagorean Theorem & Irrational Numbers

CMP3: Looking for Pythagoras</td>
<td>**OpenUp U5:** Functions (Lessons 1-10) & Volume (Lessons 111-22)

Consider doing the Functions L1-10 between U3 & U4.

OpenUp U6: Associations in Data</td>
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</table>

SEMESTER 2

Students should build on **prior knowledge** of…	Students should **master**…	Students should be **developing** and will continue to work on…
Rational Vs Irrational Solving multi-step equations—including distributive property and fractions Scientific Notation Linear Relationships: (graphing) $y = mx = b$ Determine slope when given two points Write an equation based on a verbal description or table	Solving multi step equations with distributive property and fractions Functions with exponents/exponent rules Systems of equations Use of Pythagorean Theorem Volume (cylinders, cones, spheres)	Solving multi step equations for different variables Solving for Systems—simultaneous linear equations using elimination Functions

Things to keep in mind for semester 2:
- Units 5 and 6 bring the course's focus/critical areas together. Barbie Bungee revisits first semester and early second semester work on linear relationships/functions

For Grade Eight Mathematics, instructional time should focus on three critical areas:

(1) Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations.

(2) Grasping the concept of a function and using functions to describe quantitative relationships.

(3) Analyzing two- and three- dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem

Reference Math Milestones as examples of tasks that promote student thinking around the grade's big ideas.

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

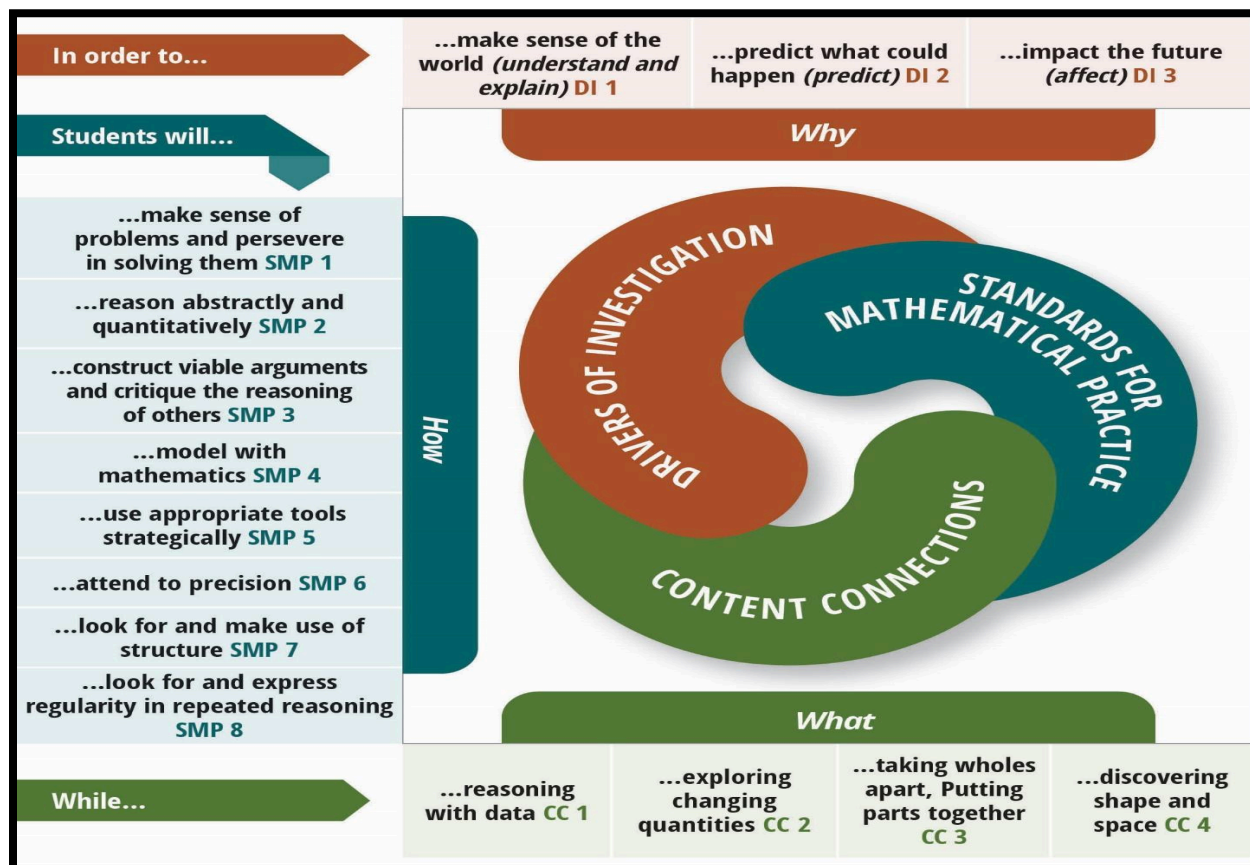MP4: Model with mathematics

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

MATH CORE EIGHT BIG IDEAS from 2023 CA MATH FRAMEWORK chapter 7

· Data Explorations directly connects to: Slopes & Intercepts, Linear Equations, Multiple Representations of Functions, Data Graphs & Tables, Interpret Scatter plots, Big & Small Numbers

· Slopes & Intercepts directly connects to: Linear Equations, Multiple Representations of Functions, Data Graphs & Tables, Interpret Scatter plots, Data Explorations

· Linear Equations directly connects to: Slopes & Intercepts, Data Explorations, Multiple Representations of Functions, Data Graphs & Tables, Interpret Scatter plots

· Multiple Representations of Functions directly connects to: Data Graphs & Tables, Interpret Scatter plots, Data Explorations, Slopes & Intercepts, Linear Equations

· Data Graphs & Tables directly connects to: Multiple Representations of Functions, Linear Equations, Slopes & Intercepts, Data Explorations, Interpret Scatter plots, Shape Number & Expressions, Big & Small Numbers, Pythagorean Explorations

· Pythagorean Explorations directly connects to: Data Graphs & Tables, Interpret Scatter plots, Cylindrical Investigations, Transformational Geometry, Shape Number & Expressions, Big & Small Numbers

· Big & Small Numbers directly connects to: Pythagorean Explorations, Data Graphs & Tables, Interpret Scatter plots, Data Explorations, Cylindrical Investigations, Transformational Geometry, Shape Number & Expressions

· Shape Number & Expressions directly connects to: Big & Small Numbers, Pythagorean Explorations, Data Graphs & Tables, Interpret Scatter plots, Cylindrical Investigations

· Transformational Geometry directly connects to: Big & Small Numbers, Pythagorean Explorations, Cylindrical Investigations

· Cylindrical Investigations directly connects to: Big & Small Numbers, Pythagorean Explorations, Shape Number & Expressions, Transformational Geometry

Interpret Scatter plots directly connects to: Data Explorations, Slopes & Intercepts, Linear Equations, Multiple Representations of Functions, Data Graphs & Tables, Pythagorean Explorations, Big & Small Numbers, Shape Number & Expressions

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

Content Connection	Big Idea	Grade Eight Content Standards
Reasoning with Data and Exploring Changing Quantities	**Interpret Scatter plots**	SP.1, SP.2, SP.3, EE.2, EE.5, F.1, F.2, F.3: Construct and interpret data visualizations, including scatter plots for bivariate measurement data using two-way tables. Describe patterns noting whether the data appear in clusters, are linear or nonlinear, whether there are outliers, and if the association is negative or positive. Interpret the trend(s) in change of the data points over time.

Content Connection	Big Idea	Grade Eight Content Standards
Reasoning with Data	**Data Explorations**	**SP.1, SP.2, SP.3, SP.4, EE.4, EE.5, F.1, F.2, F.3, F.4, F.5:** Conduct data explorations, such as the consideration of seafloor spreading, involving large data sets and numbers expressed in scientific notation, including integer exponents for large and small numbers using technology. • Identify a large dataset and discuss the information it contains • Identify what rows and columns represent in a spreadsheet
Exploring Changing Quantities	**Linear Equations**	**EE.5, EE.7, EE.8, F.2, F.4, F.5:** Analyze slope and intercepts and solve linear equations including pairs of simultaneous linear equations through graphing and tables and using technology.
Exploring Changing Quantities	**Multiple Representations of Functions**	**EE.5, EE.6, EE.7:** Move between different representations of linear functions (i.e., equation, graph, table, and context), sketch and analyze graphs, use similar triangles to visualize slope and rate of change with equations containing rational number coefficients.
Exploring Changing Quantities	**Slopes and Intercepts**	**EE.5, SP.1, SP.2, SP.3:** Construct graphs using bivariate data, comparing the meaning of parallel and non-parallel slopes with the same or different y-intercepts using technology.
Taking Wholes Apart, Putting Parts Together and Discovering Shape and Space	**Cylindrical Investigations**	**G.9, G.6, G.7, G.8, NS.1, NS.2:** Solve real world problems with cylinders, cones, and spheres. Connect volume and surface area solutions to the structure of the figures themselves (e.g., why and how is the area of a circle formula used to find the volume of a cylinder?). Show visual proofs of these relationships, through modeling, building, and using computer software.
Taking Wholes Apart, Putting Parts Together and Discovering Shape and Space	**Pythagorean Explorations**	**G.7, G.8, NS.1, NS.2, EE.1, EE.2:** Conduct investigations in the coordinate plane with right triangles to show that the areas of the squares of each leg combine to create the square of the hypotenuse and name this as the Pythagorean Theorem. Using technology, use the Pythagorean Theorem to solve real world problems that include irrational numbers.
Taking Wholes Apart, Putting Parts Together	**Big and Small Numbers**	**EE.1, EE.2, EE.3, EE.4, NS.1, NS.2:** Use scientific notation to investigate problems that include measurements of very large and very small numbers. Develop number sense with integer exponents (e.g., $1/27 = 1/3^3 = 3^{-3}$).

Content Connection	Big Idea	Grade Eight Content Standards
Discovering Shape and Space	Shape, Number, and Expressions	**G.9, G.6, G.7, G.8, EE.1, EE.2, NS.1, NS.2:** Compare shapes containing circular measures to prisms. Note that cubes and squares represent unit measures for volume and surface area. See and use the connections between integer exponents and area and volume.
Discovering Shape and Space	Transformational Geometry	**G.1, G.2, G.3, G.4, G.5, G.6, G.7, G.8:** Plot two dimensional figures on a coordinate plane, using geometry software, noting similarity when dilations are performed and the corresponding angle measures maintain congruence. Perform translations, rotations, and reflections and notice when shapes maintain congruence.

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)