

## CRITICAL AREAS



### Grade 7



In grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

- (1) Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.
- (2) Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.
- (3) Students continue their work with area from grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
- (4) Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

| <b><u>Mathematical Practice</u></b>                                                                                | <b>Explanation and Examples</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|                                                                                                                    | <b>MPs aligned to EL/ELD and NGSS: MP 1, 3, 6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| MP.1<br>Make sense of problems and persevere in solving them.                                                      | In grade 7, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”                                                                                                                                                                                                                                                                                                      |
| MP.2 Reason Abstractly and quantitatively                                                                          | In grade 7, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.                                                                                                                                                                                                                                                                                                                                                                                                         |
| MP.3 Construct viable arguments and critique the reasoning of others                                               | In grade 7, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (e.g., box plots, dot plots, histograms). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” and “Does that always work?” They explain their thinking to others and respond to others’ thinking.                                                                                                                                                                                           |
| MP.4 Model with mathematics<br> | In grade 7, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students explore covariance and represent two quantities simultaneously. They use measures of center and variability and data displays (e.g., box plots and histograms) to draw inferences, make comparisons, and formulate predictions. Students use experiments or simulations to generate data sets and create probability models. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use any of these representations as appropriate to a problem context. |
| MP.5 Use appropriate tools strategically                                                                           | Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 7 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Students might use physical objects or applets to generate probability data and use graphing calculators or spreadsheets to manage and represent data in different forms.                                                                                                                                                                                                                                                                          |
| MP.6 Attend to precision                                                                                           | In grade 7, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. Students use appropriate terminology when referring to rates, ratios, probability models, geometric figures, data displays, and components of expressions, equations or inequalities.                                                                                                                                                                                                                                                                                                                                     |
| MP.7 Look for and make use of structure                                                                            | Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables making connections between the constant of proportionality in a table with the slope of a graph. Students apply properties to generate equivalent expressions (e.g., $6 + 2x = 2(3 + x)$ by the distributive property) and solve equations (e.g., $2c + 3 = 15$ , $2c = 12$ by the subtraction property of equality; $c=6$ by the division property of equality). Students compose and decompose two- and three-dimensional figures to solve                                                                                                                                                                                              |

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|                                                            | real world problems involving scale drawings, surface area, and volume. Students examine tree diagrams or systematic lists to determine the sample space for compound events and verify that they have listed all possibilities.                                                                                                                                                                                                                                                                                                                                                                                                           |
| MP.8 Look for and express regularity in repeated reasoning | In grade 7, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b = c/d$ if and only if $ad = bc$ and construct other examples and models that confirm their generalization. They extend their thinking to include complex fractions and rational numbers. Students formally begin to make connections between covariance, rates, and representations showing the relationships between quantities. They create, explain, evaluate, and modify probability models to describe simple and compound events. |

## 2013:

### Ratios and Proportional Relationships

- Analyze proportional relationships and use them to solve real-world and mathematical problems.

### The Number Sense

- Apply and extend previous understandings of operations with fractions to add, subtraction, multiply, and divide rational numbers.

### Expressions and Equations

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

### Geometry

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

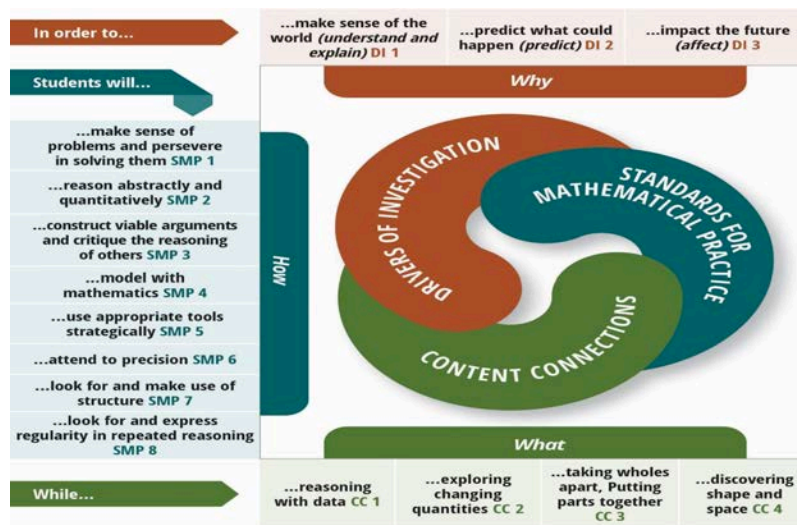
### Statistics and Probability

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use, and evaluate probability models.

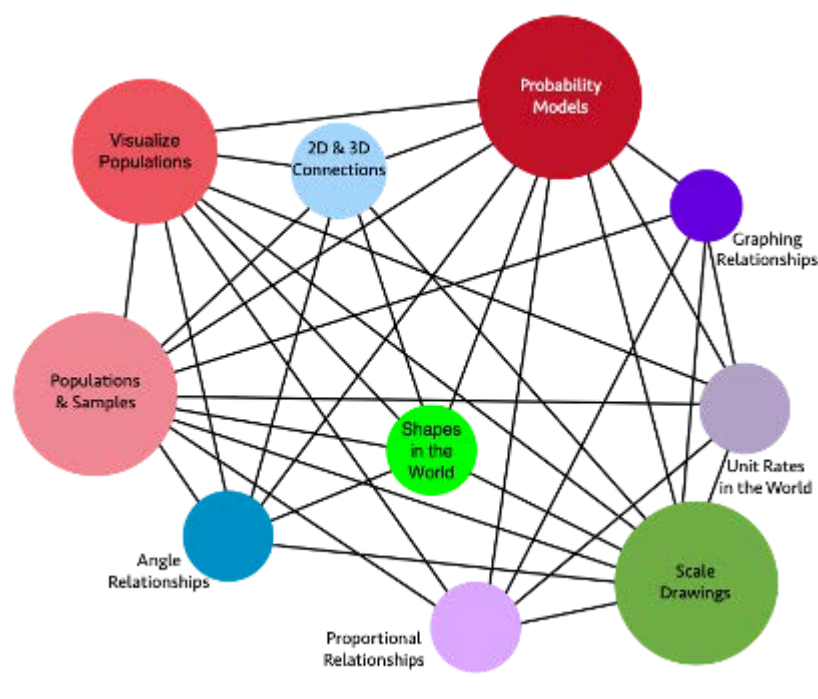
### Modeling with Geometry

- Apply geometric concepts in modeling situations.

## 2023:



## MATH CORE SEVEN **BIG IDEAS** from 2023 CA MATH FRAMEWORK chapter 7



- Angle Relationships directly connects to: Scale Drawings, 2D & 3D Connections, Populations & Samples, Proportional Relationships, Shapes in the World, Visualize Populations, Probability Models
- Scale Drawings directly connects to: 2D & 3D Connections, Graphing Relationships, Populations & Samples, Unit Rates in the World, Proportional Relationships, Visualize Populations, Probability Models, Angle Relationships
- Graphing Relationships directly connects to: Populations & Samples, Unit Rates in the World, Proportional Relationships, Probability Models, Scale Drawings
- 2D & 3D Connections directly connects to: Scale Drawings, Angle Relationships, Probability Models, Proportional Relationships, Visualize Populations, Shapes in the World, Populations & Samples
- Populations & Samples directly connects to: 2D & 3D Connections, Scale Drawings, Angle Relationships, Probability Models, Proportional Relationships, Visualize Populations, Shapes in the World, Unit Rates in the World, Graphing Relationships
- Unit Rates in the World directly connects to: Populations & Samples, Graphing Relationships, Scale Drawings, Proportional Relationships, Probability Models, Visualize Populations



- Shapes in the World directly connects to: Populations & Samples, 2D & 3D Connections, Proportional Relationships, Scale Drawings, Angle Relationships, Probability Models, Visualize Populations
- Visualize Populations directly connects to: 2D & 3D Connections, Scale Drawings, Angle Relationships, Probability Models, Proportional Relationships, Populations & Samples, Shapes in the World, Unit Rates in the World
- Probability Models directly connects to: 2D & 3D Connections, Scale Drawings, Angle Relationships, Proportional Relationships, Visualize Populations, Shapes in the World, Unit Rates in the World, Graphing Relationships, Populations & Samples
- Proportional Relationships directly connects to: 2D & 3D Connections, Scale Drawings, Angle Relationships, Probability Models, Populations & Samples, Visualize Populations, Shapes in the World, Unit Rates in the World, Graphing Relationships



## 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 Seven Content Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reasoning with Data | <b>Populations and Samples</b> | <b>SP.1, SP.2, RP.1, RP.2, RP.3, NS.1, NS.2, NS.3, EE.3:</b><br>Study a population by taking random samples and determine if the samples accurately represent the population. <ul style="list-style-type: none"> <li>Analyze and critique reports by examining the sample and the claims made to the general population</li> <li>Use classroom simulations and computer software to model repeated sampling, analyzing the variation in results.</li> </ul>                                                                 |
| Reasoning with Data | <b>Visualize Populations</b>   | <b>SP.3, SP.4, NS.1, NS.2, NS.3, EE.3:</b> Draw comparative inferences about populations - consider what visual plots show, and use measures of center and variability <ul style="list-style-type: none"> <li>Students toggle between the mathematical results and their meaningful interpretation with their given context, considering audiences, implications, etc.</li> </ul>                                                                                                                                           |
| Reasoning with Data | <b>Probability Models</b>      | <b>SP.5, SP.6, SP.7, SP.8, RP.1, RP.2, RP.3, NS.1, NS.2, NS.3, EE.3:</b> Develop a probability model and use it to find probabilities of events and compound events, representing sample spaces and using lists, tables, and tree diagrams. <ul style="list-style-type: none"> <li>Compare observed probability and expected probability.</li> <li>Explore potential bias and over-representation in real world data sets, and connect to dominating narratives and counter narratives used in public discourse.</li> </ul> |

| Content Connection                                                             | Big Idea                          | Grade Seven Content Standards                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exploring Changing Quantities                                                  | <b>Proportional Relationships</b> | EE.2, EE.3, RP.1, RP.2, RP.3: Explore, understand, and use proportional relationships: - using fractions, graphs, and tables.                                                                                                                                                                                                             |
| Exploring Changing Quantities                                                  | <b>Unit Rates in the World</b>    | RP.1, RP.2, RP.3, EE.1, EE.2, EE.3, EE.4: Solve real world problems using equations and inequalities, and recognize the unit rate within representations.                                                                                                                                                                                 |
| Exploring Changing Quantities                                                  | <b>Graphing Relationships</b>     | EE.4, RP.1, RP.2, RP.3: Solve problems involving proportional relationships that can lead to graphing using geometry software and making sense of solutions.                                                                                                                                                                              |
| Taking Wholes Apart, Putting Parts Together and<br>Discovering Shape and Space | <b>2-D and 3-D Connections</b>    | G.1, G.2, G.3, NS.1, NS.2, NS.3: Draw and construct shapes, slice 3-D figures to see the 2-D shapes. Compare and classify the figures and shapes using area, surface area, volume, and geometric classifications for triangles, polygons, and angles. Make sure to measure with fractions and decimals, using technology for calculations |
| Taking Wholes Apart, Putting Parts Together and<br>Discovering Shape and Space | <b>Angle Relationships</b>        | G.5, G.6, NS.1, NS.2, NS.3: Explore relationships between different angles, including complementary, supplementary, vertical, and adjacent, recognizing the relationships as the measures change. For example, angles A and B are complementary. As the measure of angle, A increases, the measure of angle B decreases.                  |
| Discovering Shape and Space and<br>Exploring Changing Quantities               | <b>Scale Drawings</b>             | G.1, EE.2, EE.3, EE.4, NS.2, NS.3, RP.1, RP.2, RP.3: Solve problems involving scale drawings and construct geometric figures using unit rates to accurately represent real world figures. (Use technology for drawing)                                                                                                                    |
| Discovering Shape and Space and<br>Exploring Changing Quantities               | <b>Shapes in the World</b>        | G.1, G.2, G.3, G.4, G.5, G.6, NS.1, NS.2, NS.3: Solve real life problems involving triangles, quadrilaterals, polygons, cubes, right prisms, and circles using angle measures, area, surface area, and volume.                                                                                                                            |

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)

