

# GRADE SIX MATHEMATICS OVERVIEW

## **The Number Sense**

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

## **Ratios and Proportional Relationships**

- Understand ratio concepts and use ratio reasoning to solve problems.

## **Geometry**

- Solve real-world and mathematical problems involving area, surface area, and volume.

## **Expressions and Equations**

- Apply and extend previous understandings of arithmetic to algebraic expressions
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

## **Statistics and Probability**

- Develop understanding of statistical variability.
- Summarize and describe distributions.

## **Mathematical Practices**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.



## Semesters at a Glance

### **Semester 1** (~16.5 weeks)

Stanford: YouCubed **Week of Inspirational Math** to support setting class norms, routines, and Mathematical Growth Mindset!

[www.youcubed.org](http://www.youcubed.org) (1 week)

- **Prime Time** (1 weeks)  
Begin at 4.2, distributive property, and 4.3 order of operations. \*\*include 4.4 problem solving with order of operations (2.1 to 3.3 will be embedded in Let's Be Rational, unit 3, and used in Number Talks throughout the semesters including the omitted investigation concepts.)
- **Comparing Bits & Pieces** (5 weeks)  
Combine 1.1 and 1.2; 1.3, 1.4, 1.5 = ratios/rates/equivalent fractions  
Reflection/Quiz \*Use of EngageNY exit tickets for ratios, rates, and proportions  
2.1, 2.2, 2.3 (rates and ratios)

### **Semester 2** (~ 19 weeks)

- **Covering & Surrounding cont'd Investigation 4**  
4.1, 4.2, 4.3  
Reflection/Unit Test
- **Decimal Ops** (3 weeks)  
1.1 and 1.2 (combine)  
1.3  
Reflection/Quiz  
2.1, 2.2, 2.3  
Reflection/Quiz  
3.1, 3.2, 3.3, 3.4  
Reflection/Quiz  
4.1, 4.2, 4.3, 4.4  
Reflection/Test
- **Variables & Patterns** (5 weeks)  
1.1, 1.2, 1.3, 1.4 \*Extension Activity: i)  
Function Carnival for graphing and functions  
ii) Water Line

\*Extension Activity: use Desmos.com—Tile Pile for proportional reasoning and ratio table  
 Reflection/Quiz  
 3.1, 3.2, 3.3, 3.4, 3.5 (extending number line)  
 Reflection/Quiz  
 4.1, 4.2, Omit 4.3 (%) In lieu of 4.3, do from Illustrative Math (Open Resource 6.8 Data Sets lessons 4 and 5 = dot plots with %)  
 Reflection/Unit Test

● **Let's be Rational** (4.5 weeks)

1.1 (play game) and 1.2 combine  
 1.3 (include from Prime Time Investigations 2.1, 2.2, 3.2, and 3.3 = factors and multiples)  
 1.4 (supplement with practice sheet for add/subtract fractions)  
 Reflection/Check up #1

2.1

2.2

2.3 (supplement with practice sheet for multiply fractions)

Reflection/partner quiz

3.1 (divide fractions)

Combine 3.2 and 3.3

3.4

Reflections/partner quiz

4.1 and 4.2 (combine) = all operations

4.3 word problems

Reflection/Unit Test

● **Covering & Surrounding** (4.5 weeks)

1.1, 1.2, 1.3

Reflection/Quiz

2.1 and 2.2 (combine), 2.3, 2.4

Reflection/Quiz

3.1 and 3.2 (combine)

3.3, 3.4

Reflection/Partner Quiz

4.1, 4.2, 4.3

Reflection/Unit Test

**(15 WEEKS)**

**\*\*Common Interim Assessment SBAC**

FIAB Divide Fractions by Fractions

Reflection/Quiz

2.1, 2.2, 2.3, 2.4

Reflection/Quiz \*Extension Activity:

Investigation 3—Desmos.com Sugar Sugar for unit rate, proportional reasoning

3.1, 3.2, 3.3, 3.4

Reflection/Quiz

4.1, 4.2, 4.3, 4.4, 4.5

Reflection/Test

● **Data About Us**

(4 weeks)

1.1, 1.2, 1.3

Reflection/Quiz

2.1, 2.2, 2.3, 2.4

Reflection/Quiz

3.1, 3.2, 3.3

Reflection/Quiz

4.1, 4.2, 4.3

Reflection/Test

**\*\*Common Interim Assessment SBAC**

IAB The Number System

**(13 WEEKS)**

# CRITICAL AREAS

## Grade 6



In grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division, and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

- (1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.
- (2) Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.
- (3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as  $3x = y$ ) to describe relationships between quantities.
- (4) Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in grade 7 by drawing polygons in the coordinate plane.

Mathematica I Practice	Explanation and Examples
<b>MPs aligned to EL/ELD and NGSS: MP 1, 3, 6</b>	
MP.1 Make sense of problems and persevere in solving them.	In grade 6, students solve real world problems through the application of algebraic and geometric concepts. These problems involve ratio, rate, area, and statistics. 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?” Students can explain the relationships between equations, verbal descriptions, tables and graphs. Mathematically proficient students check answers to problems using a different method.
MP.2 Reason Abstractly and quantitatively	In grade 6, 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 6, 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	In grade 6, 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 begin to explore covariance and represent two quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. 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 6 may decide to represent figures on the coordinate plane to calculate area. Number lines are used to understand division and to create dot plots, histograms, and box plots to visually compare the center and variability of the data. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures.
MP.6 Attend to precision	In grade 6, 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 use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations, or inequalities. When using ratio reasoning in solving problems, students are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. Students also learn to determine an appropriate degree of precision when working with rational numbers in a situational problem.
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 recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (e.g., $6 + 2x = 3(2 + x)$ by distributive property) and solve equations (e.g., $2c + 3 = 15$ , $2c = 12$ by subtraction property of equality, $c=6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving area and volume.
MP.8 Look for and express regularity in repeated reasoning	In grade 6, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b \div c/d = ad/bc$ and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between covariance, rates, and representations showing the relationships between quantities.