# Common Core Math Units
## Grade 6

<table>
<thead>
<tr>
<th>Unit 1: Ratios Suggested number of days: 12</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>This unit introduces students to the concept of a ratio and engages them in using ratio and rate reasoning to solve problems. It builds upon students’ work in earlier grades with whole number multiplication and division. The multiplicative reasoning required for working with proportional relationships cuts across most Grade 6 mathematical content domains and is therefore a crucial starting point for the course.</td>
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<tr>
<td><strong>Common Core State Standards for Mathematical Content</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ratios and Proportional Relationships — 6.RP</strong></td>
<td></td>
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<tr>
<td>A. Understand ratio concepts and use ratio reasoning to solve problems.</td>
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<tr>
<td>1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, &quot;The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.&quot; &quot;For every vote candidate A received, candidate C received nearly three votes.&quot;</td>
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<tr>
<td>3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</td>
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<tr>
<td>a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.</td>
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<tr>
<td><strong>6.RP.1.1</strong> Identify a ratio.</td>
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<tr>
<td><strong>6.RP.1.2</strong> Write a ratio in different forms (fraction, colon, word form).</td>
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<tr>
<td><strong>6.RP.1.3</strong> Compare two quantities using a ratio.</td>
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<tr>
<td><strong>6.RP.1.4</strong> Explain a ratio by drawing a picture.</td>
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<tr>
<td><strong>6.RP.1.5</strong> Comprehend a given ratio by matching the ratio to a given illustration.</td>
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<tr>
<td><strong>6.RP.1.6</strong> Use things/people in my classroom to develop a ratio.</td>
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</tr>
<tr>
<td><strong>6.RP.3.1</strong> Create a real-world ratio problem.</td>
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<tr>
<td><strong>6.RP.3.2</strong> Demonstrate a real-world ratio problem (not with a worksheet).</td>
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<tr>
<td><strong>6.RP.3.3</strong> Solve a real-world ratio problem.</td>
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<tr>
<td><strong>6.RP.3a.1</strong> Identify equivalent ratios.</td>
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<tr>
<td><strong>6.RP.3a.2</strong> Create a table by using equivalent fractions.</td>
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<tr>
<td><strong>6.RP.3a.3</strong> Find a missing value from a table of ratios.</td>
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<tr>
<td><strong>6.RP.3a.4</strong> Solve proportions using equivalent ratios (ex. by using simple proportions ( \frac{a}{b} = \frac{c}{d} )).</td>
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<tr>
<td><strong>G.RP.A.3a</strong> Students plot pairs of values representing ratios in unit 5.</td>
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<tr>
<td>The content standards for this unit require that students make sense of real-life and mathematical problems (<strong>MP.1</strong>) by modeling relationships with ratios. (<strong>MP.4</strong>) using a variety of tools strategically (e.g., equivalent ratios, tape diagrams, double number line diagrams, or equations) (<strong>MP.5</strong>)</td>
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</tbody>
</table>

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# Common Core Math Units
## Grade 6

- **6.RP.3d.1** Recall English and Metric units of measurement.
- **6.RP.3d.2** Convert units using multiplication and division in multiple ways (proportions, multiplication, division, and moving decimals).
- **6.RP.3d.3** Convert measurement units using ratio reasoning within customary units.
- **6.RP.3d.4** Convert measurement units using ratio reasoning within metric units.
- **6.RP.3d.5** Convert measurement units using ratio reasoning between customary and metric units.
- **6.RP.3d.6** Use T-Charts, Base 10 blocks, and other manipulatives to convert units of measurement.

### Common Core State Standards for Mathematical Practice
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.
## Common Core Math Units
### Grade 6

<table>
<thead>
<tr>
<th>Suggested number of days: 14</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit 2: Rates, including percent</strong></td>
<td>6.NS.3.1 Fluently add multi-digit decimal numbers.</td>
<td><strong>6.N.S.B.3</strong> Students build toward fluency throughout the grade: therefore, this standard is reinforced in future units of study, particularly units 3 and 5. Teachers need to reinforce the use of the standard algorithm for each operation throughout the year.</td>
<td></td>
</tr>
<tr>
<td><strong>Common Core State Standards for Mathematical Content</strong></td>
<td>6.NS.3.2 Fluently subtract multi-digit decimal numbers.</td>
<td>As students work with unit rates and interpret percent as a rate per 100, and as they analyze the relationships among the values, they look for and make use of structure (<strong>MP.7</strong>)</td>
<td></td>
</tr>
<tr>
<td><strong>The Number System — 6.NS</strong></td>
<td>6.NS.3.3 Fluently multiply multi-digit decimal numbers.</td>
<td></td>
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</tr>
<tr>
<td><strong>B. Compute fluently with multi-digit numbers and find common factors and multiples.</strong></td>
<td>6.NS.3.4 Fluently divide multi-digit decimal numbers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.</td>
<td>6.NS.3.5 Recall estimation strategies for adding, subtracting, multiplying and dividing decimals</td>
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</tr>
<tr>
<td><strong>C. Apply and extend previous understandings of numbers to the system of rational numbers.</strong></td>
<td>6.NS.3.6 Recall estimation strategies for adding, subtracting, multiplying and dividing decimals.</td>
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<td></td>
</tr>
<tr>
<td>8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.</td>
<td>6.N.S.8.1 Graph points in all four quadrants of the coordinate plane.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ratios and Proportional Relationships — 6.RP</strong></td>
<td>6.N.S.8.2 Solve real-world problems by graphing points in all four quadrants of a plane (maps, shapes, pictures).</td>
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</tr>
<tr>
<td></td>
<td>6.N.S.8.3 Solve mathematical problems by graphing points in all four quadrants of a plane (maps, shapes, pictures)</td>
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<tr>
<td></td>
<td>6.N.S.8.4 Calculate distances between two points with the same first or second coordinate using absolute values, given only coordinates.</td>
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</tr>
</tbody>
</table>

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### Common Core Math Units

#### Grade 6

<table>
<thead>
<tr>
<th>A. Understand ratio concepts and use ratio reasoning to solve problems.</th>
<th>6.RP.2.1 Explain that a ratio is a fraction which is also a division problem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Understand the concept of a unit rate $\text{a:b}$ associated with a ratio $a:b$ with $b\neq0$, and use rate language in the context of a ratio relationship. <em>For example, &quot;This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $\frac{3}{4}$ cup of flour for each cup of sugar.&quot; &quot;We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.&quot;</em> ¹</td>
<td>6.RP.2.2 Write a ratio using letters $a:b$, $a/b$, $a$ to $b$ – where $b$ is not equal to 0 according to the definition of ratio.</td>
</tr>
<tr>
<td>NOTE: ¹ Expectations for unit rates in this grade are limited to non-complex fractions.</td>
<td>6.RP.2.3 Define unit rate.</td>
</tr>
<tr>
<td>3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</td>
<td>6.RP.2.4 Explain in my own words what a unit rate is.</td>
</tr>
<tr>
<td>b. Solve unit rate problems including those involving unit pricing and constant speed. <em>For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</em></td>
<td>6.RP.2.5 Calculate unit rate when given certain quantities.</td>
</tr>
<tr>
<td>6.RP.3.1 Create a real-world ratio problem.</td>
<td>6.RP.3.2 Demonstrate a real-world ratio problem (not with a worksheet).</td>
</tr>
<tr>
<td>6.RP.3.3 Solve a real-world ratio problem.</td>
<td>6.RP.3.4 Solve for rate using real-world situations.</td>
</tr>
<tr>
<td>6.RP.3b.1 Solve for rate using real-world situations.</td>
<td>6.RP.3b.2 Create a tape diagram using a unit rate.</td>
</tr>
<tr>
<td>6.RP.3b.3 Interpret a rate from a tape diagram</td>
<td>6.RP.3b.4 Use a t-chart to compare proportional quantities.</td>
</tr>
<tr>
<td>6.RP.3b.5 Write a proportion correctly.</td>
<td>6.RP.3b.6 Solve an equation using proportions.</td>
</tr>
</tbody>
</table>
### Common Core Math Units
#### Grade 6

<table>
<thead>
<tr>
<th>Common Core State Standards for Mathematical Practice</th>
<th>6.RP.3c.1 Explain that percent is out of 100.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Reason abstractly and computationally.</td>
<td>6.RP.3c.2 Explain how ratio and percent are related.</td>
</tr>
<tr>
<td>5. Use appropriate tools strategically.</td>
<td>6.RP.3c.3 Convert a rate to a percent.</td>
</tr>
<tr>
<td>7. Look for and make use of structure.</td>
<td>6.RP.3c.4 Illustrate what I know about ratios &amp; fractions to define a percent using Base 10 blocks.</td>
</tr>
<tr>
<td></td>
<td>6.RP.3c.5 Calculate percent given the rate and base (Rate of base = part)</td>
</tr>
<tr>
<td></td>
<td>6.RP.3c.6 Design a model using Base 10 blocks showing how a percent is a ratio of 100.</td>
</tr>
<tr>
<td></td>
<td>6.RP.3c.7 Solve problems involving finding the whole, given a part and the percent.</td>
</tr>
</tbody>
</table>
# Common Core Math Units

## Grade 6

### Unit 3: Multi-digit computation and finding common factors and multiples

**Suggested number of days: 11**

Students build on their work in earlier grades in working with factors and multiples (4.OA.B.4, 5.NF.B.4b) as they formalize the concepts and uses of greatest common factor (including the distributive property) and least common multiple. Although students have learned all four operations with multi-digit whole numbers and decimals in earlier grades, in this unit they formalize the related standard algorithms as they build proficiency and fluency.

<table>
<thead>
<tr>
<th>Common Core State Standards for Mathematical Content</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Number System — 6.NS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Compute fluently with multi-digit numbers and find common factors and multiples. 2. Fluently divide multi-digit numbers using the standard algorithm.</td>
<td>6.NS.2.1 Apply the rules of division to solve multi-digit problems. 6.NS.2.2 Explain my understanding of place value when dividing a multi-digit number by another multi-digit number. 6.NS.2.3 Use base 10 blocks to illustrate the algorithm. 6.NS.2.4 Use strategies such as T-chart, estimation, etc... to solve division problems.</td>
<td>Students continue building fluency with 6.NS.B.3.</td>
<td></td>
</tr>
<tr>
<td>3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.</td>
<td>6.NS.3.1 Fluently add multi-digit decimal numbers. 6.NS.3.2 Fluently subtract multi-digit decimal numbers. 6.NS.3.3 Fluently multiply multi-digit decimal numbers. 6.NS.3.4 Fluently divide multi-digit decimal numbers. 6.NS.3.5 Recall estimation strategies for adding, subtracting, multiplying and dividing decimals 6.NS.3.6 Recall estimation strategies for adding, subtracting, multiplying and dividing decimals.</td>
<td>As students compute fluently with multi-digit numbers and find common factors and multiples, they need to look for and make use of structure (MP.7). They need to reason abstractly and computationally (MP.2) as they make sense of quantities and relationships in problem situations.</td>
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</tbody>
</table>
4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4 (9 + 2)$.

<table>
<thead>
<tr>
<th>6.NS.4.1</th>
<th>Determine the greatest common factor (GCF) of two numbers less than or equal to 100.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.NS.4.2</td>
<td>Determine the least common multiple (LCM) of two whole numbers less than or equal to 12.</td>
</tr>
<tr>
<td>6.NS.4.3</td>
<td>Explain the difference between LCM and GCF.</td>
</tr>
<tr>
<td>6.NS.4.4</td>
<td>Justify the LCM and GCF of two whole numbers using math.</td>
</tr>
<tr>
<td>6.NS.4.5</td>
<td>Prove that two whole numbers have a common factor based on the distributive property.</td>
</tr>
<tr>
<td>6.NS.4.6</td>
<td>Identify the distributive property.</td>
</tr>
<tr>
<td>6.NS.4.7</td>
<td>Use the distributive property to solve addition problems.</td>
</tr>
</tbody>
</table>

**Common Core State Standards for Mathematical Practice**

2. Reason abstractly and quantitatively.
7. Look for and make use of structure.
## Common Core Math Units
### Grade 6

<table>
<thead>
<tr>
<th>Suggested number of days: 11</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>This unit builds on students’ Grade 5 work with dividing fractions by whole numbers and whole numbers by fractions as students investigate dividing fractions by fractions. This unit sets the stage for students’ future work in finding unit rates involving ratios of fractions (7.RP.A.1).</td>
<td><strong>6.NS.1.1</strong> List the steps to determine the quotient of fractions (1. Keep 2. Change 3. Flip).</td>
<td>Extending previous understandings of multiplication and division to divide fractions by fractions requires that students look for and express regularity in repeated reasoning (MP.8). Dividing fractions typically has been a challenging concept for students; therefore, it is beneficial to require that students construct and critique arguments (MP.3) as they interpret and compute quotients of fractions and that they persevere in solve word problems involving division of fractions (MP.1). This can support their conceptual understanding and development of procedural fluency.</td>
<td><strong>Common Core State Standards for Mathematical Content</strong>&lt;br&gt;&lt;br&gt;<strong>The Number System — 6.NS</strong>&lt;br&gt;A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.&lt;br&gt;1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3; (in general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?</td>
</tr>
</tbody>
</table>
# Common Core Math Units
## Grade 6

<table>
<thead>
<tr>
<th>Unit 5: Representing relationships</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 15</td>
<td></td>
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</tbody>
</table>

The standards addressed in this unit represent major work of Grade 6 and is therefore placed in the first half in the school year. In this unit of study, students extend their understanding of ratio and rate reasoning to represent proportional relationships in multiple ways, including relationships among measurement units such as cups and gallons or meters and kilometers. Students also represent common non-proportional relationships explored in earlier grades, such as area of a square and volume of a cube. In investigating and representing relationships among variables, students continue to build fluency with operations on multi-digit whole numbers, multi-digit decimals, and fractions.

### Common Core State Standards for Mathematical Content

**Expressions and Equations — 6.EE**

8. Reason about and solve one-variable equations and inequalities.

6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

C. Represent and analyze quantitative relationships between dependent and independent variables.

9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation \( d = 65t \) to represent the relationship between distance and time.

<table>
<thead>
<tr>
<th>6.EE.6.1</th>
<th>Write an expression to represent a real-world or mathematical situation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.EE.6.2</td>
<td>Represent a number with a variable.</td>
</tr>
<tr>
<td>6.EE.6.3</td>
<td>Justify that a variable can represent an unknown number or any number in a specified set.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.EE.9.1</th>
<th>Use variables to represent two quantities in a real world situation that change in relationship to one another.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.EE.9.2</td>
<td>Distinguish between dependent and independent variables.</td>
</tr>
<tr>
<td>6.EE.9.3</td>
<td>Write an equation to express one quantity (dependent variable) in terms of the other quantity (independent variable).</td>
</tr>
<tr>
<td>6.EE.9.4</td>
<td>Relate the data between the dependent and independent variables using graphs and tables and relate these to the equation.</td>
</tr>
</tbody>
</table>

6.RP.A.3.a Students apply their ratio reasoning from earlier units of study as they investigate and represent proportional relationships.

6.NS.B.3 In investigating and representing relationships among variables, students continue to build fluency with operations on multi-digit whole numbers, multi-digit decimals, and fractions.

Students look for and express regularity in repeated reasoning (MP.8) as they generate algebraic models (MP.4) to represent relationships.

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## Common Core Math Units
### Grade 6

**Ratios and Proportional Relationships — 6.RP**

**A. Understand ratio concepts and use ratio reasoning to solve problems.**

3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
   a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

**The Number System — 6.NS**

**B. Compute fluently with multi-digit numbers and find common factors and multiples.**

3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

### Common Core State Standards for Mathematical Practice

4. Model with mathematics.
8. Look for and express regularity in repeated reasoning.

| 6.RP.3.1 | Create a real-world ratio problem. |
| 6.RP.3.2 | Demonstrate a real-world ratio problem (not with a worksheet). |
| 6.RP.3.3 | Solve a real-world ratio problem. |
| 6.RP.3a.1 | Identify equivalent ratios. |
| 6.RP.3a.2 | Create a table by using equivalent fractions. |
| 6.RP.3a.3 | Find a missing value from a table of ratios. |
| 6.RP.3a.4 | Solve proportions using equivalent ratios (ex. by using simple proportions $\frac{a}{b} = \frac{c}{d}$). |
| 6.NS.3.1 | Fluently add multi-digit decimal numbers. |
| 6.NS.3.2 | Fluently subtract multi-digit decimal numbers. |
| 6.NS.3.3 | Fluently multiply multi-digit decimal numbers. |
| 6.NS.3.4 | Fluently divide multi-digit decimal numbers. |
| 6.NS.3.5 | Recall estimation strategies for adding, subtracting, multiplying and dividing decimals. |
| 6.NS.3.6 | Recall estimation strategies for adding, subtracting, multiplying and dividing decimals. |

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January 13, 2013
## Common Core Math Units

**Grade 6**

<table>
<thead>
<tr>
<th>Unit 6: Extending the number system</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This unit builds on students’ earlier study of systems of numbers (natural numbers, whole numbers, and positive fractions and decimals) as students investigate values less than zero. They formalize an understanding of integers and their relationship to the set of rational numbers. Students develop an understanding of how integers are used in real-world contexts, including the meaning of absolute value. In Grade 7, students learn to operate with positive and negative rational numbers.

### Common Core State Standards for Mathematical Content

**The Number System — 6.NS**

**C. Apply and extend previous understandings of numbers to the system of rational numbers.**

5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

   a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., \(-(-3) = 3\), and that 0 is its own opposite.

<table>
<thead>
<tr>
<th></th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.NS.5.1</td>
<td>Understand the meaning of 0.</td>
<td>The content standards for this unit of study require that students’ exploration of rational numbers include how they model real life situations (MP.4). Students reason abstractly and quantitatively (MP.2) in precise ways when they write, interpret, and explain (MP.3, MP.6) statements of order in real-world contexts. Number lines (both vertical and horizontal), the coordinate plane, and the content-specific notation within this unit are all tools with which students need explicit practice so that, over time, they are able strategically select and use them to solve problems with positive and negative rational numbers (MP.5).</td>
</tr>
<tr>
<td>6.NS.5.2</td>
<td>Identify positive and negative numbers using a number line.</td>
<td></td>
</tr>
<tr>
<td>6.NS.5.3</td>
<td>Label a number line with positive and negative numbers.</td>
<td></td>
</tr>
<tr>
<td>6.NS.5.4</td>
<td>Interpret the use of negative and positive numbers to represent real world situations.</td>
<td></td>
</tr>
<tr>
<td>6.NS.5.5</td>
<td>Use positive and negative numbers to represent quantities in the real world (ex. temperature above zero and below zero)</td>
<td></td>
</tr>
<tr>
<td>6.NS.6a.1</td>
<td>Locate a number and its opposite using a coordinate plane.</td>
<td></td>
</tr>
<tr>
<td>6.NS.6a.2</td>
<td>Recognize that 0 is its own opposite.</td>
<td></td>
</tr>
<tr>
<td>6.NS.6a.3</td>
<td>Locate a rational number on a number line (ex. 5 and its opposite -5).</td>
<td></td>
</tr>
<tr>
<td>6.NS.6a.4</td>
<td>Demonstrate that the opposite of the opposite of a number is the number itself (ie. (-(-4)=4)).</td>
<td></td>
</tr>
</tbody>
</table>

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January 13, 2013
7. Understand ordering and absolute value of rational numbers.
   a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret \(-3 > -7\) as a statement that \(-3\) is located to the right of \(-7\) on a number line oriented from left to right.
   b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write \(-3 \, ^\circ C > -7 \, ^\circ C\) to express the fact that \(-3 \, ^\circ C\) is warmer than \(-7 \, ^\circ C\).
   c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of \(-30\) dollars, write \(\| -30 \| = 30\) to describe the size of the debt in dollars.
   d. Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than \(-30\) dollars represents a debt greater than 30 dollars.

Common Core State Standards for Mathematical Practice
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.

6.NS.7a.1 Compare negative and positive numbers.
6.NS.7a.2 Understand ordering of rational numbers.
6.NS.7a.3 Order rational numbers on a number line.
6.NS.7a.4 Understand absolute value of rational numbers.
6.NS.7a.5 Use a number line to find the absolute value of any number.
6.NS.7b.1 Write an inequality to show the relationship between rational numbers in real world situations.
6.NS.7b.2 Explain in my own words how to compare rational numbers (written or spoken).
6.NS.7c.1 Define and identify absolute value.
6.NS.7c.2 Use a number line to find the absolute value of any number.
6.NS.7c.3 Understand absolute value as the distance from zero on the number line.
6.NS.7c.4 Apply absolute value to real world situations.
6.NS.7c.5 Recognize the symbol (\(\|\)) as representing absolute value.
# Common Core Math Units
## Grade 6

<table>
<thead>
<tr>
<th>Unit 7: Relationships in the coordinate plane</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Students expand their understanding of rational numbers as they extend the coordinate plane to include all four quadrants. Students apply their understanding of absolute value to determine distances in the coordinate plane.

### The Number System — 6.NS

**C. Apply and extend previous understandings of numbers to the system of rational numbers.**

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the

<table>
<thead>
<tr>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.NS.6b.1 Choose the quadrant for any ordered pair.</td>
<td>As students explore how the signs of the coordinates indicate locations in the coordinate plane, they apply the practice of looking for and making use of structure (MP.7).</td>
<td></td>
</tr>
<tr>
<td>6.NS.6b.2 Predict the quadrant for an ordered pair.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.6b.3 Use the signs of numbers (negative, positive) to predict the quadrant of a reflection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.6b.4 Justify that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.6b.5 Use reflections to correctly plot ordered pairs and their opposites.</td>
<td></td>
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</tr>
<tr>
<td>6.NS.6c.1 Order rational numbers on a number line horizontally or vertically.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.6c.2 Plot all integers and other rational numbers on number lines (vertically and horizontally) and coordinate planes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.6c.3 Find the position of integer pairs and other rational numbers on a coordinate plane.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.8.1 Graph points in all four quadrants of the coordinate plane.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Common Core Math Units

**Grade 6**

<table>
<thead>
<tr>
<th>Common Core State Standards for Mathematical Practice</th>
<th>6.NS.8.2</th>
<th>6.NS.8.3</th>
<th>6.NS.8.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Look for and make use of structure.</td>
<td>Solve real-world problems by graphing points in all four quadrants of a plane (maps, shapes, pictures).</td>
<td>Solve mathematical problems by graphing points in all four quadrants of a plane (maps, shapes, pictures)</td>
<td>Calculate distances between two points with the same first or second coordinates using absolute values, given only coordinates.</td>
</tr>
</tbody>
</table>

**Geometry — 6.G**

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

3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

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January 13, 2013
Common Core Math Units
Grade 6

<table>
<thead>
<tr>
<th>Unit 8: Algebraic expressions</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In earlier grades, students have worked extensively with numerical expressions and have been using letters to represent unknowns in problem-solving situations since Grade 3 (3.OA.D.8, 4.OA.A.3, 5.MD.C.5b). Students also have experience in prior grades with investigating and applying properties of operations in numerical contexts, such as the associative, distributive, and commutative properties. In this unit, students build on their work from earlier grades by working systematically with algebraic expressions, thereby laying the groundwork for more formal work in writing and solving equations in later grades.

Common Core State Standards for Mathematical Content

Expressions and Equations — 6.EE

A. Apply and extend previous understandings of arithmetic to algebraic expressions.

1. Write and evaluate numerical expressions involving whole-number exponents.

2. Write, read, and evaluate expressions in which letters stand for numbers.
   a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*
   b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*
   c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the*

| I Can Statements |          |Teachers should use caution when introducing mnemonic devices such as PEMDAS (Parentheses, Exponents, Multiplication, Division, Addition, Subtraction) for remembering Order of Operations (6.EE.A.2c), because they have the potential to cause students to focus on the device, rather than on the underlying mathematical meaning of an expression. This can lead to serious misconceptions in future study.*
|-----------------|----------|------------------------------------------------|
6.EE.1.1 Write a numerical expression involving whole numbers using exponents. |          | As students apply properties of operations to generate equivalent expressions or identify when two expressions are equivalent, they must reason abstractly and computationally (MP.2) while looking for and making use of structure (MP.7). As students construct and critique arguments (MP.3) related to whether or not a given set of expressions is equivalent, they deepen their conceptual understanding and fluency with this content. Working with |
6.EE.1.2 Write and solve expressions involving whole-number exponents. |          | |
6.EE.1.3 Evaluate a numerical expression involving whole numbers using exponents. |          | |
6.EE.2a.1 Write numbers and variables to represent desired operations. |          | |
6.EE.2a.2 Rewrite a numerical expression using variables. |          | |
6.EE.2b.1 Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient). |          | |
6.EE.2b.2 Identify one or more parts of an expression as a single entity. |          | |
6.EE.2c.1 Write and evaluate algebraic expressions from real-world situations. |          | |
6.EE.2c.2 Apply order of operations to solve expressions and equations. (no parenthesis) |          | |
6.EE.2c.3 Substitute specific value for variables in order to evaluate the expression. |          | |

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January 13, 2013
### Common Core Math Units

#### Grade 6

<table>
<thead>
<tr>
<th>Formulas</th>
<th>6.EE.3.1 Identify the properties of operations.</th>
<th>6.EE.3.2 Apply the properties of operations to generate equivalent expressions.</th>
<th>Exponents and the coefficients of variable are both tools for expressing regularity in repeated reasoning (MP.8).</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = M$</td>
<td>6.EE.4.1 Identify when two expressions are equivalent.</td>
<td>6.EE.4.2 Identify the properties of operations.</td>
<td>6.EE.4.3 Apply the properties of operations to generate equivalent expressions.</td>
</tr>
<tr>
<td>3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.</td>
<td>4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number $y$ stands for.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Common Core State Standards for Mathematical Practice**

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.
# Common Core Math Units

## Grade 6

**Unit 9: Understanding, writing, and solving equations and inequalities**  
**Suggested number of days: 16**

In earlier grades, students have written numerical expressions and equations. In this unit, students extend their learning to solving one-variable equations and inequalities. This unit further develops students’ understanding of the meaning of variables, including determining whether a variable represents a specific number or a set of numbers.

### Common Core State Standards for Mathematical Content

**Expressions and Equations — 6.EE**

- **B. Reason about and solve one-variable equations and inequalities.**
  - 5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
  - 6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
  - 7. Solve real-world and mathematical problems by writing and solving equations of the form \( x + p = q \) and \( px = q \) for cases in which \( p, q \) and \( x \) are all nonnegative rational numbers.

### I Can Statements

- **6.EE.5.1** Understand solving an equation or inequality as a process of answering a question.
- **6.EE.5.2** Recognize that the correct answer to an equation or inequality makes it true.
- **6.EE.5.3** Use substitution to check the answer or determine if a given number is a solution.
- **6.EE.6.1** Write an expression to represent a real-world or mathematical situation.
- **6.EE.6.2** Represent a number with a variable.
- **6.EE.6.3** Justify that a variable can represent an unknown number or any number in a specified set.
- **6.EE.7.1** Solve a simple equation and explain how I solved it.
- **6.EE.7.2** Write an equation from real-world situations and then use inverse operations to solve the equation.
- **6.EE.7.3** Write and solve equations of the form \( x+p = q \) (in which \( p, q, \) and \( x \) are non-negative rational numbers).

### Notes/Comments

As with the previous unit, when students reason about and solve one-variable equations and inequalities, they reason abstractly and computationally (MP.2) while looking for and making use of structure (MP.7)—for example, recognizing that solving the equation \( 5 + x = 10 \) is the same thing as \( x = 10 - 5 \). Solving real-world problems by writing and solving equations is new at Grade 6 and requires students’ perseverance and careful analysis of the given information (MP.1).

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January 13, 2013  
Page 17
**Common Core Math Units**  
**Grade 6**

8. Write an inequality of the form \( x > c \) or \( x < c \) to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form \( x > c \) or \( x < c \) have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

<table>
<thead>
<tr>
<th>Common Core State Standards for Mathematical Practice</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Make sense of problems and persevere in solving them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Reason abstractly and computationally.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Look for and make use of structure.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.EE.8.1</th>
<th>6.EE.8.2</th>
<th>6.EE.8.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write an inequality to represent a constraint or condition in a real-world or mathematical situation.</td>
<td>Recognize and justify that inequalities have infinitely many solutions.</td>
<td>Represent solutions of inequalities on a number line (graph).</td>
</tr>
</tbody>
</table>
Common Core Math Units
Grade 6

<table>
<thead>
<tr>
<th>Unit 10: Problem solving with area in 2-D shapes</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This unit builds upon students' learning in earlier grades with finding areas of rectangles (4.MD.A.3, 5.NF.B.4b) as they investigate triangles, special quadrilaterals, and polygons. It also provides students with opportunities to develop their understanding and use of equations in geometric contexts.

Common Core State Standards for Mathematical Content

Geometry — 6.G
A. Solve real-world and mathematical problems involving area, surface area, and volume.
   1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

| 6.G.1.1   | List formulas for solving the area of various polygons.                                      |
| 6.G.1.2   | Apply the formulas and calculate area of various polygons.                                    |
| 6.G.1.3   | Determine the area of a triangle using a formula.                                             |
| 6.G.1.4   | Determine the area of a rectangle using a formula.                                            |
| 6.G.1.5   | Recognize how to compose and decompose polygons into triangles and rectangles.                |
| 6.G.1.6   | Find the area of certain polygons by composing into rectangles and decomposing into triangles and other shapes. |
| 6.G.1.7   | Determine the area of a triangle by constructing diagrams.                                    |
| 6.G.1.8   | Determine the area of real world shapes.                                                     |
| 6.G.1.9   | Discuss the area of triangles and parallelograms in mathematical problems.                   |
| 6.G.1.10  | Justify formulas of the area of a triangle.                                                  |

The standards in this unit require that students persevere in solving problems (MP.1) and model real-world scenarios with mathematical models, including equations (MP.4), with a degree of precision appropriate for the given situation (MP.6).
Common Core Math Units
Grade 6

Expressions and Equations — 6.EE
A. Apply and extend previous understandings of arithmetic to algebraic expressions.
   2. Write, read, and evaluate expressions in which letters stand for numbers.
   c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas V = s^3 and A = 6 s^2 to find the volume and surface area of a cube with sides of length s = M.*

Common Core State Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them.
4. Model with mathematics.
6. Attend to precision.

<table>
<thead>
<tr>
<th>6.EE.2c.1</th>
<th>Write and evaluate algebraic expressions from real world situations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.EE.2c.2</td>
<td>Apply order of operations to solve expressions and equations. (no parenthesis)</td>
</tr>
<tr>
<td>6.EE.2c.3</td>
<td>Substitute specific value for variables in order to evaluate the expression.</td>
</tr>
</tbody>
</table>
### Common Core Math Units
#### Grade 6

<table>
<thead>
<tr>
<th>Unit 11: Problem solving with volume and surface area</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suggested number of days: 11</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building on their knowledge of volume from earlier grades (S.MD.C.5), students learn how to find volume of rectangular prisms with fractional side lengths. Students also model 3-D figures with nets and use the nets to find surface area. Students apply their ability to evaluate expressions as they calculate area, surface area, and volume using appropriate formulas.</td>
<td>6.G.2.1 Recall the formula for finding the volume of a rectangular prism.</td>
<td>As students investigate volume of surface area of 3-D figures, they select and use appropriate tools—such as formulas, nets, and unit cubes—strategically (MP.5). Understanding how net models of 3-D figures relate to their surface areas requires that students look for and make use of structure (MP.7). Applying formulas to find volumes with fractional edge lengths requires that students attend to the degree of precision appropriate for a given situation (MP.6).</td>
<td></td>
</tr>
<tr>
<td><strong>Common Core State Standards for Mathematical Content</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Geometry — 6.G</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Solve real-world and mathematical problems involving area, surface area, and volume.</td>
<td>6.G.2.2 Calculate the volume of a right rectangle prism.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas ( V = l \times w \times h ) and ( V = b \times h ) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.</td>
<td>6.G.2.3 Tell what volume is in relation to its formula.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.G.2.4 Construct unit cubes to find volume.</td>
<td>6.G.2.5 Justify that the “modeled volume” is equal to the “formula volume”.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.G.2.6 Apply volume formulas for right rectangular prisms to solve real-world problems.</td>
<td>6.G.2.7 Model the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.</td>
<td>6.G.4.1 Give examples of 3 dimensional shapes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.G.4.2 Recognize that 3 dimensional shapes can be represented using nets.</td>
<td>6.G.4.3 Solve problems to determine the surface area of figures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.G.4.4 Construct three-dimensional figures using nets made up of rectangles and triangles.</td>
<td>6.G.4.5 Use nets to calculate surface area of figures in a given situation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Expressions and Equations — 6.EE

**A.** Apply and extend previous understandings of arithmetic to algebraic expressions.

2. Write, read, and evaluate expressions in which letters stand for numbers.
   - c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$."

### Common Core State Standards for Mathematical Practice

5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.G.4.6</td>
<td>Use area of a 2 dimensional shape to determine the surface area of 3 dimensional shapes.</td>
</tr>
<tr>
<td>6.G.4.7</td>
<td>Explain the surface area of objects in the classroom.</td>
</tr>
<tr>
<td>6.EE.2c.1</td>
<td>Write and evaluate algebraic expressions from real world situations.</td>
</tr>
<tr>
<td>6.EE.2c.2</td>
<td>Apply order of operations to solve expressions and equations. (no parenthesis)</td>
</tr>
<tr>
<td>6.EE.2c.3</td>
<td>Substitute specific value for variables in order to evaluate the expression.</td>
</tr>
</tbody>
</table>
Common Core Math Units
Grade 6

<table>
<thead>
<tr>
<th>Unit 12: Understanding data distributions</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This unit is the first of two Grade 6 units addressing data and statistics. While this content could be organized coherently in different ways, this suggested sequence begins with this unit focused on developing understanding of statistical variability. In this unit, students investigate and describe the variability of given data, including center, spread, and overall shape. They also discuss and explore how measures of center can be used to summarize a set of data, using data sets and representations of data that are provided to them. This unit lays a foundation for the following unit in which students use their understanding to create the own representations for a given set of data, and analyze data, including determining measures of center and variability.

**Common Core State Standards for Mathematical Content**

**Statistics and Probability — 6.SP**

A. Develop understanding of statistical variability.

1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students’ ages.

2. Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape.

3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

<table>
<thead>
<tr>
<th>I Can Statements</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>6.SP.1.1 Recognize variability.</td>
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<tr>
<td>6.SP.1.2 Ask statistical questions.</td>
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<tr>
<td>6.SP.1.3 Recognize a statistical question as one that</td>
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<tr>
<td>anticipates variability.</td>
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<tr>
<td>6.SP.2.1 Design a survey.</td>
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<tr>
<td>6.SP.2.2 Collect data from a survey.</td>
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<tr>
<td>6.SP.2.3 Interpret data gathered from a survey.</td>
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<tr>
<td>6.SP.2.4 Construct a histogram.</td>
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<tr>
<td>6.SP.2.5 Use a histogram to answer a statistical question</td>
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<tr>
<td>showing the distribution of its center, spread, and</td>
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<tr>
<td>overall shape.</td>
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<tr>
<td>6.SP.2.6 Describe a set of data by its center, spread,</td>
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<td></td>
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<tr>
<td>and overall shape.</td>
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</tr>
<tr>
<td>6.SP.3.1 Use mean to describe data.</td>
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<tr>
<td>6.SP.3.2 Understand that there is variation in data.</td>
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<tr>
<td>6.SP.3.3 Distinguish between “measure of center” and</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>“measure of variation”.</td>
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</tbody>
</table>

The development of students’ understanding of statistical variability requires that they persevere in making sense of given data sets (MP.1). They also investigate how measures of center and variability model and summarize data (MP.4).
## Common Core Math Units
### Grade 6

**Common Core State Standards for Mathematical Practice**

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.

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January 13, 2013
Common Core Math Units
Grade 6

<table>
<thead>
<tr>
<th>Unit 13: Analyzing data</th>
<th>I Can Statements</th>
<th>Notes/Comments</th>
<th>Unit Materials and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested number of days: 13</td>
<td>6.SP.4.1 Illustrate data using a variety of graph types. (number line, dot plot, histogram, &amp; box plot)</td>
<td>Summarizing and describing distributions requires that students use appropriate statistical measures strategically (MP.5) and attend to precision in finding and applying those measures (MP.6). Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered requires that students construct and critique arguments (MP.3). Students look for and apply regularity in repeated reasoning when they explore how adding or removing data points from a data set effects the measures of center and variability (MP.8).</td>
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<tr>
<td></td>
<td>6.SP.5c.1 Explain data in terms of measures of center and measures of variability.</td>
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<td></td>
<td>6.SP.5c.2 Calculate quantitative measures of variance (i.e. range, interquartile range, mean absolute deviation).</td>
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<td>6.SP.5c.3 Identify outliers in data.</td>
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</tbody>
</table>

This unit builds on the understanding developed in the previous unit as students represent and analyze data sets and determine the measures of variability and center.

Common Core State Standards for Mathematical Content

Statistics and Probability — 6.SP
B. Summarize and describe distributions.

4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

5. Summarize numerical data sets in relation to their context, such as by:
   a. Reporting the number of observations.
   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
   c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
   d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

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January 13, 2013
### Common Core Math Units
#### Grade 6

<table>
<thead>
<tr>
<th>Common Core State Standards for Mathematical Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Construct viable arguments and critique the reasoning of others.</td>
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<tr>
<td>5. Use appropriate tools strategically.</td>
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<tr>
<td>6. Attend to precision.</td>
</tr>
<tr>
<td>8. Look for and express regularity in repeated reasoning.</td>
</tr>
</tbody>
</table>

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