LOUISIANA STUDENT STANDARDS MATHEMATICS

Standards Resource Guide

Grade 6

Overview

This guide is designed to support educators in interpreting and implementing the 2025 Louisiana Student Standards for Mathematics (LSSM). It provides descriptions of each standard to clarify its meaning and application to student learning. The document outlines the intended level of rigor and includes coherence to prerequisite and corequisite standards. Examples are provided for illustrative purposes only and do not represent a comprehensive list.

Additional information on the 2025 Louisiana Student Standards for Mathematics, including guidance on reading standards codes, a listing of standards for each grade or course, and links to additional resources, is available on the Louisiana Math Page. Questions may be directed to Math@la.gov.

August 2026

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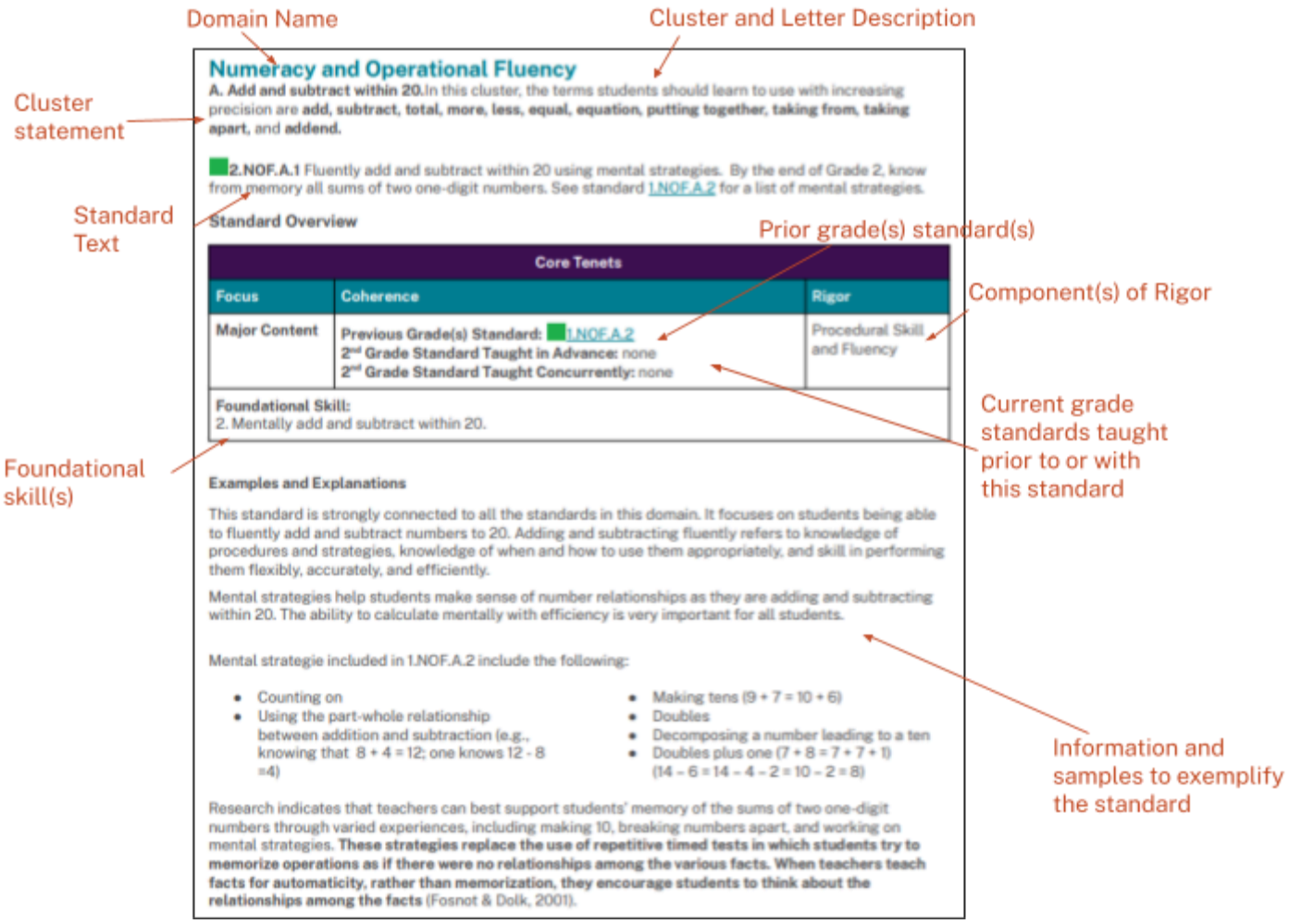
Introduction

How to Read This Guide

The diagram below provides an overview of the information found in all standards resource guides. Definitions and more complete descriptions are provided on the next page.



*Grades 3 through Geometry will also include a section with connections to assessment item types and achievement level descriptors.

Standards Codes: Major Work, Supporting Work, Additional Work

1. **Domain Name and Abbreviation:** A grouping of standards consisting of related content that is further divided into clusters. Each domain has a unique abbreviation, which is provided in parentheses beside the domain name.
2. **Cluster Letter and Description:** Each cluster within a domain begins with a letter. The description provides a general overview of the focus of the standards in the cluster.

3. **Previous Grade(s) Standards:** One or more standards that students should have mastered in previous grades to prepare them for new learning related to the current grade-level standard. For students who have unfinished learning, teachers should build in proactive, just-in-time supports to build essential prerequisite knowledge.
4. **Standards Taught in Advance:** These grade-level standards demonstrate within-grade coherence and include concepts on which the target standard is built. Students should have exposure to these standards before instruction in the target standard. As with previous-grade standards, teachers should plan proactive, just-in-time supports to build within-grade prerequisite knowledge ahead of instruction on the target standard.
5. **Standards Taught Concurrently:** These grade-level standards demonstrate within-grade coherence and include standards that should be taught at the same time as the target standard to provide coherence and connectedness in instruction.
6. **Component(s) of Rigor:** See full explanation on components of rigor below.
7. **Sample Problem:** The sample problem provides an example of how a student might meet the requirements of the standard. Multiple examples are provided for some standards. However, sample problems should not be considered an exhaustive list. Explanations, when appropriate, are also included.
8. **Text of Standard:** The complete text of the targeted Louisiana Student Standards of Mathematics is provided.

Classification of Major, Supporting, and Additional Work

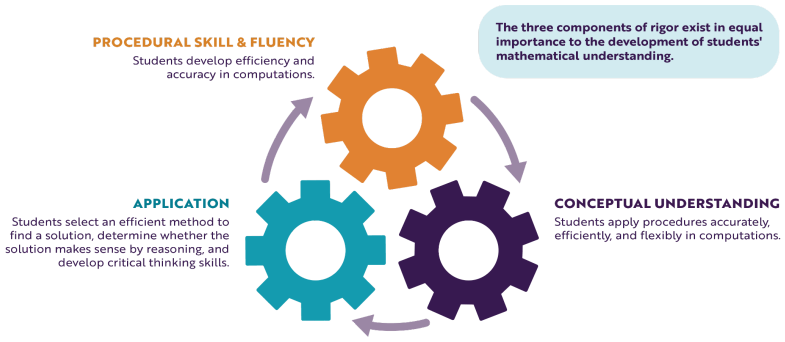
Students should spend the majority of their time on the major work of the grade, supporting work and, where appropriate, additional work engages students in the major work of the grade, often through a change of the **context** within which students are performing mathematics. Each standard is color-coded to quickly and simply determine the focus for the grade. Furthermore, standards from previous grades that provide foundational skills for current grade standards are also color-coded to show whether those standards are classified as major, supporting, or additional in respective grades.

Core Tenets

The 2016 Louisiana Student Standards for Math called for three instructional shifts. Since then, teachers have used these shifts to ensure deep understanding and consistent application in mathematics classrooms across the state. Now, these shifts are recognized as core tenets that serve as the foundation and guiding principles of Louisiana's mathematics standards.

Coherence in mathematics refers to a coherent body of knowledge composed of interconnected concepts, principles, and procedures. These concepts are logically linked, building upon one another, and work together to deepen understanding, support problem solving, and enable learners to apply mathematical ideas consistently and meaningfully across different contexts.

Rigor in mathematics instruction does not simply mean increasing the difficulty or complexity of practice problems. Incorporating rigor into classroom instruction and student learning requires students to engage deeply with standards and grapple meaningfully with the concepts and ideas embedded within them. The **three** components of rigor, listed below,



exist in equal importance to the development of students' mathematical understanding.

- **Conceptual understanding** refers to understanding mathematical concepts, operations, and relations. It is more than knowing isolated facts and methods. Students should be able to make sense of why a mathematical idea is important and the kinds of contexts in which it is useful. It also allows students to connect prior knowledge to new ideas and concepts.
- **Procedural skill and fluency** is the ability to apply procedures accurately, efficiently, and flexibly. It requires speed and accuracy in calculation while giving students opportunities to practice basic skills without dictating the strategy or method chosen. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.
- **Application** provides valuable context for learning and the opportunity to solve problems in a relevant and meaningful way. It is through real-world application that students learn to select an efficient method to find a solution, determine whether the solution makes sense by reasoning, and develop critical thinking skills.

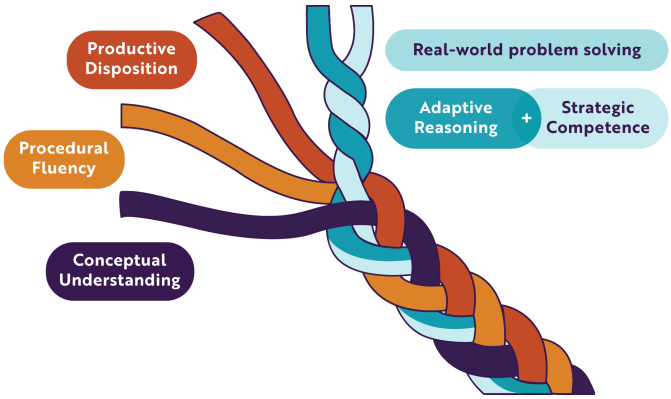
Focus calls for intentional emphasis on specific topics, skills and ideas within grade-level mathematics instruction. Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or the importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Louisiana Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Students should spend the large majority of time on the major ( ) work of the grade, supporting ( ) work, and, where appropriate, additional ( ) work can engage students in the major work of the grade.

The Strands for Mathematical Proficiency

The strands of mathematical proficiency, as defined by the National Research Council (NRC),[1] provide a framework describing what proficiency means for a learner in mathematics.

The strands of mathematical proficiency are intertwined, gradually developed, and deepened over time. When intentionally presented in a connected and balanced way, each strand supports the others, ultimately strengthening the proficiency of learners.

1. **Conceptual Understanding** - Students develop an understanding of key mathematical ideas and relationships and explain why procedures work.



2. **Procedural Fluency** - Students use mathematical procedures with skill and flexibility, guided by a strong grasp of underlying concepts.
3. **Productive Dispositions** - Students view mathematics as coherent, valuable, and meaningful
4. **Real World and Problem Solving** - A combination of both adaptive reasoning and strategic competence, students represent and solve real-world mathematical problems logically, justify solutions, and clearly explain and defend reasoning.

The Relationship Between Mathematical Proficiency and the Components of Rigor

While there is some overlap between the Strands of Mathematical proficiency and the Core Tenets, there is a distinct difference between the two. The strands are a framework that is focused on learner outcomes and what it means for a student to be proficient in mathematics. The Core Tenets provide a framework for how teachers should design instruction to support learning. The core tenets reflect what should be done instructionally, while the proficiency strands represent the outcome, or what students become, as a result of that instruction.

Mathematical Fluency

Fluency in mathematics is the ability to apply foundational skills and concepts flexibly, accurately, and efficiently, grounded in strong conceptual understanding to solve problems, make connections, and reason mathematically across various contexts. While fluency is an essential component of mathematics instruction, it does not represent the full depth of a mathematical standard; it must be developed alongside conceptual understanding, reasoning, and problem-solving to ensure deep and meaningful learning.

Concrete - Representational - Abstract Framework

The Concrete-Representational-Abstract (CRA) Framework describes the instructional processes that students experience to build conceptual understanding of mathematics. The first stage is where students build their concrete understanding of a concept through the use of manipulatives or other physical objects. During the second phase, learners move into visual representations of concepts. Finally, during the abstract phase, students apply their understanding of the concepts abstractly through the use of

[1] ADDING + IT UP HELPING CHILDREN LEARN MATHEMATICS National Academies of Sciences, Engineering, and Medicine. 2001. Adding It Up: Helping Children Learn Mathematics. Washington, DC: The National Academies Press. https://doi.org/10.17226/5109.

numbers and symbols. When students engage in learning that follows this process, it allows them to build a solid understanding of key mathematical concepts and ideas, ensuring comprehension that is transferable and flexibly applied across grade bands.

An example of how this framework is represented across the progression of the Louisiana Student Standards for Mathematics can be seen in the way student learning progresses across a concept, such as linear functions. In fourth grade (4.AR.A.1), students are introduced to multiplicative comparison, where much of the learning is very **concrete**. At this phase, students are using counters and other manipulatives to physically compare quantities to determine the meaning of "times as many." When they move into the middle grades, this becomes more representational as students apply their concrete understanding to recognize and represent proportional relationships. These are represented in various ways, such as ratio tables, double number lines, and graphs (6.PF.A.2, 7.PF.A.2). When students enter high school, the learning becomes **abstract** as they interpret linear functions such as y=kx and come to understand slope as rate of change.

While the example above represents a linear version of this instructional process across multiple grades, it is important to note that the concrete and representational components can occur at different times throughout the progression of learning, and may occur simultaneously across various periods. Additionally, this instructional process may also occur within lessons, units, or within the grade level.

Standards for Mathematical Practice

The Louisiana Standards for Mathematical Practice are expected to be integrated into every mathematics lesson for all students in grades K-12. Below are a few examples of how these practices may be integrated into tasks that students in grade 6 complete.

Louisiana Standards for Mathematical Practice (MP)	
Louisiana Standard	**Explanations and Examples**
6.MP.1 Make sense of problems and persevere in solving them.	In grade 6, 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?"
6.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.
6.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, graphs, tables, and other data displays (i.e., box plots, dot plots, histograms, etc.). 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?" "Does that always work?" They explain their thinking to others and respond to others' thinking.
6.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 all of these representations as appropriate to a problem context.
6.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 similar data sets using dot plots with the same scale 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.
6.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.
6.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 (i.e., $6 + 2x = 2(3 + x)$ by distributive property) and solve equations (i.e., $2c + 3 = 15$, $2c = 12$ 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.
6.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.

Grade Level Expected Foundational Skills

By the end of grade 6, mathematically proficient students can reliably apply the following skills to engage in grade-appropriate mathematical tasks. This list does not represent the full depth of learning expected in grade 6, but consists of the foundational skills required by the standards.

1. Fluently divide multi-digit numbers using standard algorithms.
2. Divide fractions by fractions.
3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.
4. Determine the unknown number in an addition or subtraction equation.
5. Determine the unknown number in a multiplication and division equation.
6. Evaluate expressions with positive, whole number exponents.

Numeracy and Operational Fluency

A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions. In this cluster, the terms students should learn to use with increasing precision are: **reciprocal, multiplicative inverses,** and **visual fraction model**.

6.NOF.A.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 $(\frac{2}{3}) \div (\frac{3}{4})$ and illustrate the quotient by using a visual fraction model;
- use the relationship between multiplication and division to explain that $(\frac{2}{3}) \div (\frac{3}{4}) = \frac{8}{9}$ because $\frac{3}{4}$ of $\frac{8}{9}$ is $\frac{2}{3}$.
- In general, $(\frac{a}{b}) \div (\frac{c}{d}) = \frac{ad}{bc}$.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.AR.B.6, 5.NOF.B.7 **6th Grade Standard Taught in Advance:** none 6th Grade Standard Taught Concurrently: none	Conceptual Understanding, Procedural Skill and Fluency, Application
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 2. Divide fractions by fractions. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

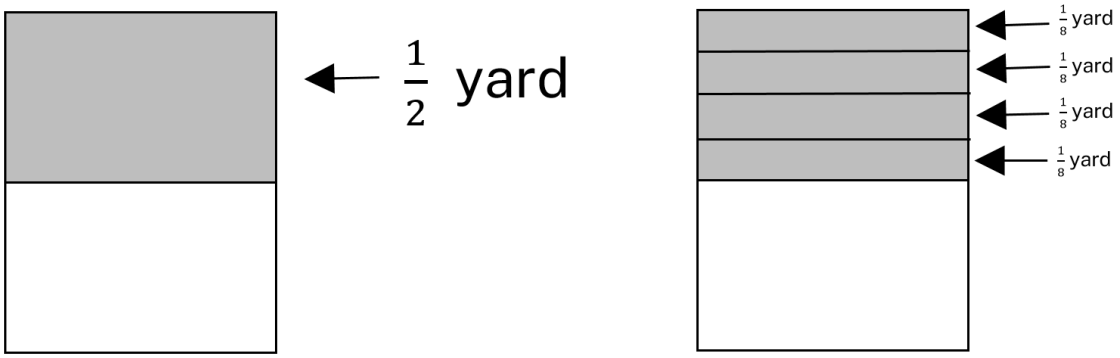
Examples and Explanations

In fifth grade, students divided whole numbers by unit fractions and divided unit fractions by whole numbers. Students continue to develop this concept by using visual models and equations to divide whole numbers by fractions and fractions by fractions to solve word problems. Students deepen their understanding of the relationship between multiplication and division.

Examples:

- Use multiplication to explain why $\frac{3}{4} \div \frac{2}{5} = \frac{15}{8}$. *Solution:* $\frac{15}{8} \times \frac{2}{5} = \frac{30}{40} = \frac{3}{4}$. If I can multiply the quotient by one of the two numbers in the division problem, I should get the other number in the division problem. For example, 4 x 3 =12, so 12 ÷ 3 has to be 4. When I multiplied $\frac{15}{8}$ by $\frac{2}{5}$, I got $\frac{3}{4}$, so I know that the division is correct.

- Manny has $\frac{1}{2}$ yard of fabric to make book covers. Each book cover is made from $\frac{1}{8}$ yard of fabric. How many book covers can Manny make? *Solution*: Manny can make 4 book covers.



- Represent $\frac{1}{2} \div \frac{2}{3}$ in a problem context and draw a model to show your solution.

  Context: You are making a recipe that calls for $\frac{2}{3}$ cup of yogurt. You have $\frac{1}{2}$ cup of yogurt from a snack pack. How much of the recipe can you make?

Explanation of Model:

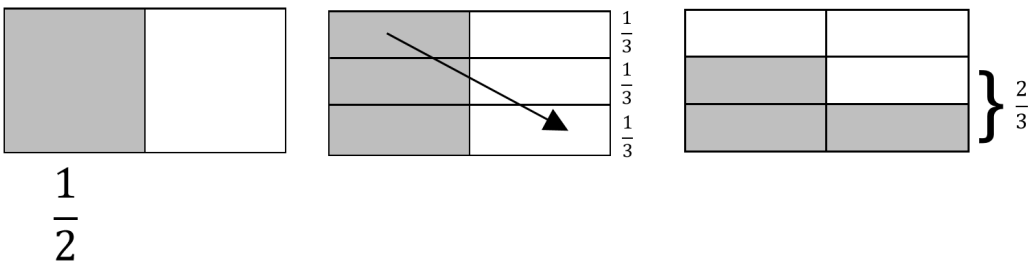
The first model shows $\frac{1}{2}$ cup. The shaded squares in all three models show $\frac{1}{2}$ cup.

The second model shows $\frac{1}{2}$ cup and also shows $\frac{1}{3}$ cups horizontally.

The third model shows $\frac{1}{2}$ cup moved to fit in only the area shown by $\frac{2}{3}$ of the model.

$\frac{2}{3}$ is the new referent unit (whole).

3 out of the 4 squares in the $\frac{2}{3}$ portion are shaded. A $\frac{1}{2}$ cup is only $\frac{3}{4}$ of a $\frac{2}{3}$ cup portion, so you can only make $\frac{3}{4}$ of the recipe.



Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.2, LEAP.II.6.3, LEAP.III.6.1, LEAP.III.6.3

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiply and Divide Fractions 6.NOF.A.1	Divides fractions with unlike denominators and solves word problems.	Divides fractions with **unlike** denominators and solves word problems with scaffolding.	Divides fractions with common denominators **and solves word problems with scaffolding**.	Divides fractions with common denominators.

B. Compute fluently with multi-digit numbers and find common factors and multiples. In this cluster, the term students should learn to use with increasing precision is **algorithm**.

6.NOF.B.2 Fluently divide positive multi-digit whole numbers using a standard algorithm.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** 5.NOF.D.13 **6th Grade Standard Taught in Advance:** none 6th Grade Standard Taught Concurrently: none	Procedural Skill and Fluency
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

Examples and Explanations

Students are expected to fluently and accurately divide multi-digit whole numbers. Divisors can be any number of digits at this grade level.

As students divide, they should continue to use their understanding of place value to describe what they are doing. When using the standard algorithm, students' language should reference place value. For example, when dividing 32 into 8456, as they write a 2 in the quotient, they should say, "there are 200 thirty-twos in 8456," and could write 6400 beneath the 8456 rather than only writing 64.

$\begin{array}{r} 2 \\ 32\overline{)8456} \end{array}$	There are 200 thirty-twos in 8456.
$\begin{array}{r} 2 \\ 32\overline{)8456} \\ -6400 \\ \hline 2056 \end{array}$	200 times 32 is 6400. 8456 minus 6400 is 2056.
$\begin{array}{r} 26 \\ 32\overline{)8456} \\ -6400 \\ \hline 2056 \end{array}$	There are 60 thirty-twos in 2056.

$\begin{array}{r} 264 \\ 32\overline{)8456} \\ -6400 \\ \hline 2056 \\ -1920 \\ \hline 136 \\ -128 \end{array}$	There are 4 thirty-twos in 136. 4 times 32 is equal to 128.

$\begin{array}{r} 264 \\ 32\overline{)8456} \\ -6400 \\ \hline 2056 \\ -1920 \\ \hline 136 \\ -128 \\ \hline 8 \end{array}$	The remainder is 8. There is not a full thirty-two in 8; there is only part of a thirty-two in 8. This can also be written as $\frac{8}{32}$ or $\frac{1}{4}$. There is $\frac{1}{4}$ of thirty-two in 8. 8456 = 264 * 32 + 8

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Operations with Multi-Digit Numbers 6.NOF.B.2	Fluently divide multi-digit numbers using the standard algorithm.	**Fluently** divide multi-digit numbers **using the standard algorithm.**	Divide multi-digit numbers with limited accuracy.	Divide multi-digit numbers with limited accuracy.

6.NOF.B.3 Fluently add, subtract, multiply, and divide positive multi-digit decimals to the thousandths using a standard algorithm for each operation.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** 5.NOF.D.12, 5.NOF.D.13, 5.NOF.D.14 **6th Grade Standard Taught in Advance:** 6.NOF.B.2 **6th Grade Standard Taught Concurrently:** none	Procedural Skill and Fluency
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

Examples and Explanations

Procedural fluency is defined as "skill in carrying out procedures flexibly, accurately, efficiently, and appropriately." In fifth grade, students added and subtracted decimals. Multiplication and division of decimals were introduced in fifth grade (decimals to the hundredth place). At the elementary level, these operations were based on concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. In sixth grade, students become fluent in the use of standard algorithms for each of these operations. The use of standard algorithms should be based on place value understanding. The use of estimation strategies supports student understanding of decimal operations.

Examples:

- Find the sum of 12.3 and 9.75.
  First, estimate the sum of 12.3 and 9.75.
  Solution: An estimate of the sum would be 12 + 10 or 22. Students could also state if their estimate is high or low.

  Answers of 230.5 or 2.305 indicate that students are not considering place value when adding.

- Find the quotient of 25.64 and 0.2
  Teacher Note: Students need to understand that the traditional algorithm for long division is based on using a whole number as the divisor. As a result, students need to think of the problem as the fraction $\frac{25.64}{0.2}$ and to find an equivalent fraction that has a denominator of 2, rather than 0.2. It is important to connect 5.NOF.C.9 (patterns when multiplying by 10), 5.NOF.B.3 (interpret a fraction as

division) and 4.NOF.C.7 (finding equivalent fractions by multiplying by 1) to this process. Thus, $\frac{25.64 \times 10}{0.2 \times 10}$ creates the equivalent fraction, $\frac{256.4}{2}$, allowing the standard algorithm to be used.

1 2) 256.4 –200.0 56.4	There are 100 twos in 256.6 100 times 2 is 200.0 256.4 minus 200.0 is 56.4
12 2) 256.4 –200.0 56.4 40.0 16.4	There are 20 twos in 56.4 20 times 2 is 40.0 56.4 minus 40.0 is 16.4
128 2) 256.4 –200.0 56.4 40.0 16.4 16.0 0 .4	There are 8 twos in 16.4 8 times 2 is 16.0 16.4 minus 16 is 0.4
128.2 2) 256.4 –200.0 56.4 40.0 16.4 16.0 .4 .4 0	There are 2 two-tenths in 0.4 (four-tenths) 2 times 0.2 is 0.4 0.4 minus 0.4 is 0

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Operations with Multi-Digit Numbers 6.NOF.B.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	**Fluently** add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	Add, subtract, **multiply, and divide** multi-digit decimals **using the standard algorithm for each operation** with limited accuracy.	Add and subtract multi-digit decimals with limited accuracy.

6.NOF.B.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.

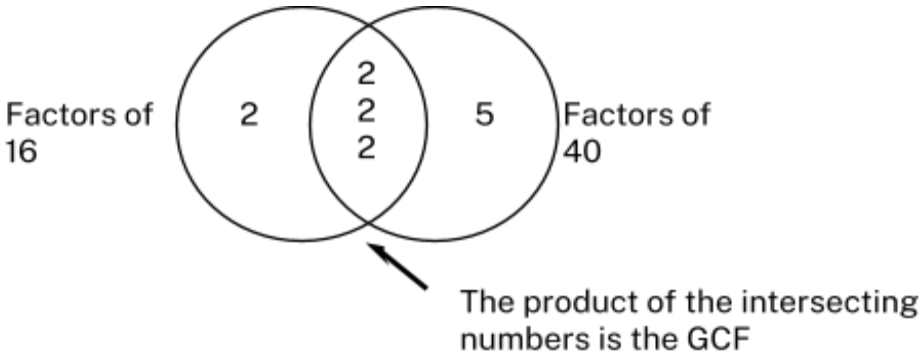
- For example, express 36 + 8 as 4 (9 + 2) because the greatest common factor of 36 and 8 is 4.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional	**Previous Grade(s) Standard:** 4.AR.B.4, 5.AR.A.2 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Procedural Skill and Fluency
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms.		

Examples and Explanations

In elementary school, students identified primes, composites, and factor pairs (4.OA.4). In sixth grade, students will find the greatest common factor of two whole numbers less than or equal to 100. Typical strategies for finding the greatest common factor are 1) listing all factors of each number given and then finding the greatest factor found in each list, and 2) listing the prime factors for each number given and then multiplying the common factors.



Students should also understand that the greatest common factor of two prime numbers is 1.

Examples:

- What is the greatest common factor (GCF) of 24 and 36? How can you use factor lists or the prime factorizations to find the GCF?

Solution: 2^2 x 3 = 12. Students should be able to explain that both 24 and 36 have 2 factors of 2 and one factor of 3, thus 2 x 2 x 3 is the greatest common factor.)

- What is the least common multiple (LCM) of 12 and 8? How can you use multiple lists or the prime factorizations to find the LCM?

Solution: 2^3 * 3 = 24. Students should be able to explain that the least common multiple is the smallest number that is a multiple of 12 and a multiple of 8. To be a multiple of 12, a number must have 2 factors of 2 and one factor of 3 (2 x 2 x 3). To be a multiple of 8, a number must have 3 factors of 2 (2 x 2 x 2). Thus, the least common multiple of 12 and 8 must have 3 factors of 2 and one factor of 3 (2 x 2 x 2 x 3).

Rewrite 84 + 28 by using the distributive property. Did you rewrite the expression using the greatest common factor? How do you know? *Solution: 28(3+1). Explanation: 84 = 7 ×* 2^2 *x 3 and 28 = 7 ×* 2^2*. So both numbers have 7 × 4 as common factors and 7 × 4 =28.*

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Factors and Multiples 6.NOF.B.4	Determines greatest common factors and least common multiples.	**Determines** greatest common factors and least common multiples.	Identifies greatest common factors and least common multiples.	Identifies greatest common factors and least common multiples.
	Uses the distributive property to rewrite 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.	**Uses the distributive property to rewrite 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.**		

C. Apply and extend previous understandings of the system of rational numbers. In this cluster, the terms students should learn to use with increasing precision are: **rational numbers, opposites, absolute value, greater than, >, less than, <, greater than or equal to, ≥, less than or equal to, ≤, origin, quadrants, coordinate plane, ordered pairs, *x*-axis, *y*-axis,** and **coordinates**.

6.NOF.C.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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding

Examples and Explanations

Students use rational numbers (fractions, decimals, and integers) to represent real-world contexts and understand the meaning of 0 in each situation. This standard does not include using opposites in operations.

Examples:

a. Use an integer to represent 25 feet below sea level
b. Use an integer to represent 25 feet above sea level.
c. What would 0 (zero) represent in the scenario above?

Solution:

a. -25
b. +25 or 25
c. 0 would represent sea level

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Rational Numbers 6.NOF.C.5 6.NOF.C.6 6.NOF.C.7 6.NOF.C.8	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line and compared with or without the use of a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line **and compared with or without the use of a number line**.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.
	Understands the concept of **and interprets** the absolute value of a rational number.	**Understands the concept of** absolute value of a rational number.	Determines the absolute value of a rational number.	Determines the absolute value of a rational number.
	Plots ordered pairs on a coordinate plane to solve real-world and mathematical problems.	Plots ordered pairs on a coordinate plane to solve **real-world and** mathematical problems.	**Locates or plots ordered pairs on a coordinate plane to solve mathematical problems.**	
	Recognizes that the locations of points are related by reflections across one or both axes			

	when two ordered pairs differ only by signs.			
	Distinguishes comparisons of absolute value from statements about order.			

6.NOF.C.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.

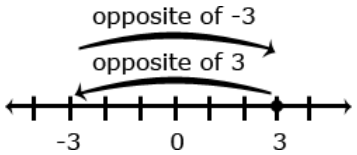
a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.
b. Understand signs of numbers in ordered pairs as indicating locations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

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 3.NOF.A.2, 5.GL.A.1 **6th Grade Standard Taught in Advance:** 6.NOF.C.5 **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding (6, 6a, 6b, 6c), Procedural Skill and Fluency (6c)
Foundational Skills: 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

Examples and Explanations

This is the first time that students will see a number line extended beyond zero to the left to show numbers and their opposites. Both 3 and -3 are 3 units from zero on the number line. Graphing points and reflecting across zero on a number line extends to graphing and reflecting points across axes on a coordinate grid. The use of both horizontal and vertical number line models facilitates the movement from number lines to coordinate grids.



Examples:

- What is the opposite of 2?

- What is the opposite of $\frac{1}{2}$? Use a number line to explain how you know.
- Place the following numbers on the number line: –4.5, 2, 3.2, $-3\frac{3}{5}$, 0.2, –2, $\frac{11}{2}$.
- Graph the following points in the correct quadrant of the coordinate plane.

$$\left(\frac{1}{2}, -3\frac{1}{2}\right) \left(-\frac{1}{2}, -3\right) (0.25, -0.75)$$

- If you reflected each point across the x-axis, what are the coordinates of the reflected points? What similarities do you notice between the coordinates of the original point and the reflected point?

  Solution: ($\frac{1}{2}$, $3\frac{1}{2}$) (- $\frac{1}{2}$ *, 3)* (0.25, 0.75). *The x-coordinate in each ordered pair stays the same. The y-coordinate is the opposite of the original y-coordinate.*

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.4, LEAP.II.6.5, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Rational Numbers 6.NOF.C.5 6.NOF.C.6 6.NOF.C.7 6.NOF.C.8	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line and compared with or without the use of a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line **and compared with or without the use of a number line**.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.
	Understands the concept of **and interprets** the absolute value of a rational number.	**Understands the concept of** absolute value of a rational number.	Determines the absolute value of a rational number.	Determines the absolute value of a rational number.
	Plots ordered pairs on a coordinate plane to solve real-world and mathematical problems.	Plots ordered pairs on a coordinate plane to solve **real-world and** mathematical problems.	**Locates or plots ordered pairs on a coordinate plane to solve mathematical problems.**	
	Recognizes that the locations of points are related by reflections across one or both axes			

	when two ordered pairs differ only by signs.			
	Distinguishes comparisons of absolute value from statements about order.			

6.NOF.C.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.
b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
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.
d. Distinguish comparisons of absolute value from statements about order.

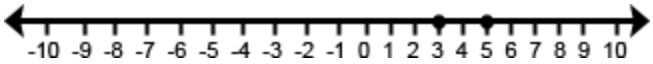
Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding (7, 7a, 7b, 7c, 7d)
Foundational Skills: 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.		

Examples and Explanations
Common models to represent and compare integers include number line models, temperature models, and the profit-loss model. On a number line model, the number is represented by an arrow drawn from zero to the location of the number on the number line; the absolute value is the length of this arrow, with the symbol | | used to represent the absolute value. The number line can also be viewed as a thermometer where each point on the number line is a specific temperature. In the profit-loss model, a positive number corresponds to profit, and a negative number corresponds to a loss. Each of these models is useful for examining values, but can also be used in later grades when students begin to perform operations on integers.

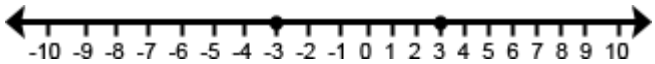
In working with number line models, students internalize the order of the numbers; larger numbers on the right or top of the number line and smaller numbers to the left or bottom of the number line. They use the order to correctly locate integers and other rational numbers on the number line. By placing two numbers on the same number line, they are able to write inequalities and make statements about the relationships between the numbers.

Case 1: Two positive numbers



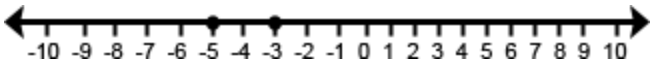
5 > 3
5 is greater than 3

Case 2: One positive and one negative number



3 > -3
positive 3 is greater than negative 3
negative 3 is less than positive 3

Case 3: Two negative numbers

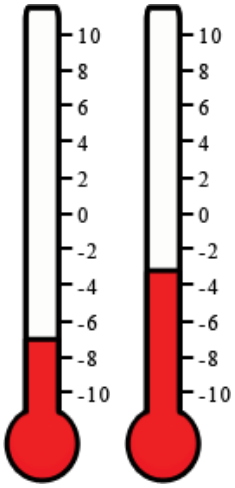


-3 > -5
negative 3 is greater than negative 5
negative 5 is less than negative 3

When working with positive numbers, the absolute value (distance from zero) of the number and the value of the number are the same; therefore, ordering is not problematic. However, negative numbers have a distinction that students need to understand. As the negative number increases (moves to the left on a number line), the value of the number decreases. For example, –24 is less than –14 because –24 is located to the left of –14 on the number line. However, the absolute value is the distance from zero. In terms of absolute value (or distance), the absolute value of –24 is greater than the absolute value of –14. For negative numbers, as the absolute value increases, the value of the negative number decreases.

Examples:

- One of the thermometers shows -3°C and the other shows -7°C. Which thermometer shows which temperature? Which is the colder temperature? How much colder? Write an inequality to show the relationship between the temperatures and explain how the model shows this relationship.



  Students recognize the distance from zero as the absolute value or magnitude of a rational number. Students need multiple experiences to understand the relationships between numbers, absolute value, and statements about order.

- Find the value of $|-3\frac{1}{2}|$. *Solution:* $3\frac{1}{2}$
- The balance in Sue's checkbook was –$12.55. The balance in John's checkbook was –$10.45. Write an inequality to show the relationship between these amounts. Who owes more?

Solution: –12.55 < –10.45, Sue owes more than John. The interpretation could also be “John owes less than Sue”.

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.4, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Rational Numbers 6.NOF.C.5 6.NOF.C.6 6.NOF.C.7 6.NOF.C.8	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line and compared with or without the use of a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line **and compared with or without the use of a number line**.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.
	Understands the concept of **and interprets** the absolute value of a rational number.	**Understands the concept of** absolute value of a rational number.	Determines the absolute value of a rational number.	Determines the absolute value of a rational number.
	Plots ordered pairs on a coordinate plane to solve real-world and mathematical problems.	Plots ordered pairs on a coordinate plane to solve **real-world and** mathematical problems.	**Locates or plots ordered pairs on a coordinate plane to solve mathematical problems.**	
	Recognizes that the locations of points are related by reflections across one or both axes			

	when two ordered pairs differ only by signs.			
	Distinguishes comparisons of absolute value from statements about order.			

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

Standard Overview

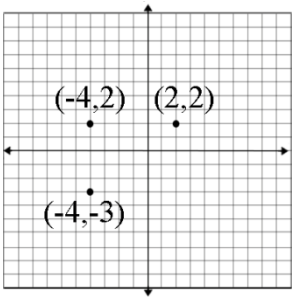
Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 5.GL.A.2 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** 6.GL.A.3	Procedural Skill and Fluency, Application
Foundational Skills: 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

Examples and Explanations

Students find the distance between points when ordered pairs have the same x-coordinate (vertical) or the same y-coordinate (horizontal).

Examples:

- If the points on the coordinate plane below are the three vertices of a rectangle, what are the coordinates of the fourth vertex? How do you know? What is the length and width of the rectangle?



To determine the distance along the x-axis between the point (-4, 2) and (2, 2), a student must recognize that -4 is $|-4|$ or 4 units to the left of 0 and 2 is $|2|$ or 2 units to the right of zero, so the two points are a total of 6 units apart along the x-axis.

- What is the distance between $(3, -5\frac{1}{2})$ and $(3, 2\frac{1}{4})$?

Teacher Note: Students in grade 6 use only non-negative numbers (values greater than or equal to 0) in calculations. In this problem, students should recognize that the distance from $-5\frac{1}{2}$ to 0 is $\left|-5\frac{1}{2}\right|$ and that the distance from $2\frac{1}{4}$ to 0 is $2\frac{1}{4}$. Adding $5\frac{1}{2}$ to $2\frac{1}{4}$ results in the distance between the two points since the *x*-coordinates are the same. Therefore, the distance is $7\frac{3}{4}$.

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.5, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Rational Numbers 6.NOF.C.5 6.NOF.C.6 6.NOF.C.7 6.NOF.C.8	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line and compared with or without the use of a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line **and compared with or without the use of a number line**.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.	Understands that positive and negative numbers describe mathematical or real-world quantities which have opposite values or directions and can be represented on a number line.
	Understands the concept of **and interprets** the absolute value of a rational number.	**Understands the concept of** absolute value of a rational number.	Determines the absolute value of a rational number.	Determines the absolute value of a rational number.
	Plots ordered pairs on a coordinate plane to solve real-world and mathematical problems.	Plots ordered pairs on a coordinate plane to solve **real-world and** mathematical problems.	**Locates or plots ordered pairs on a coordinate plane to solve mathematical problems.**	
	Recognizes that the locations of points are related by reflections across one or both axes			

	when two ordered pairs differ only by signs.			
	Distinguishes comparisons of absolute value from statements about order.			

Algebraic Reasoning

A. Apply and extend previous understandings of arithmetic to algebraic expressions. In this cluster, the terms students should learn to use with increasing precision are: **exponents, base, numerical expressions, algebraic expressions, evaluate, sum, term, product, factor, quantity, quotient, coefficient, constant, like terms, equivalent expressions,** and **variables**.

6.AR.A.1 Understand, write, and evaluate numerical expressions involving whole-number exponents.
a. Identify parts of exponential notation using mathematical terms (base and exponent).
b. Represent and evaluate powers using a whole number or fraction as the base and a whole number as an exponent, and evaluate numerical expressions.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 4.AR.B.4, 5.NOF.C.9 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation. 6. Evaluate expression with positive, whole-number exponents		

Examples and Explanations

Students understand, write, and evaluate expressions involving whole-number exponents. They identify and use the parts of exponential notation, specifically naming the base as the repeated factor and the exponent as the number of times the base is multiplied. The base can be a whole number, a positive decimal, or a positive fraction (i.e., $\left(\frac{1}{2}\right)^5$ can be written $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$ which has the same value as $\frac{1}{32}$). Standard 6.AR.A.2 extends this concept to recognizing that an expression with a variable base represents the same mathematics (i.e., x^5 can be written as $x \cdot x \cdot x \cdot x \cdot x$) and write algebraic expressions from verbal expressions.

Students represent and evaluate powers using whole numbers or fractions as bases and whole numbers as exponents, including interpreting and computing expressions such as 3^4 or $\left(\frac{1}{2}\right)^3$. They apply these understandings to evaluate numerical expressions involving exponents.

Order of operations is introduced throughout elementary grades, including the use of the grouping symbols ( ) and { } in fifth grade. Order of operations with exponents is the focus in sixth grade.

Examples:

- Write the following expressions using exponential notation.
  - 8×8
    - *Solution:* 8^2
  - $\frac{4}{5} \times \frac{4}{5} \times \frac{4}{5}$
    - *Solution:* $\left(\frac{4}{5}\right)^3$
  - $6 \times 6 \times 6 \times 6 \times 6 \times 4$
    - *Solution:* $6^5 \times 4$
- In the expression 7^3, identify each part using mathematical terms.
  - What is the base?
    - *Solution: 7*
  - What is the exponent?
    - *Solution: 3*
  - Explain what the exponent tells you to do with the base.
    - *Solution: The exponent tells us to multiply the base by itself 3 times.*
- Evaluate:
  - 4^3
    - *Solution*: *64*
  - $5 + 2^4 \bullet 6$
    - *Solution*: *101*
  - $7^2 - 24 \div 3 + 26$
    - *Solution*: *67*

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
	Identifies parts of algebraic and numerical expressions using mathematical terms **and views one or more parts of an expression as a single entity**.	Identifies parts of algebraic and numerical expressions using mathematical terms.	Identifies parts of algebraic **and** numerical expressions using mathematical terms.	Identifies parts of algebraic or numerical expressions using mathematical terms.
	Identifies equivalent expressions using properties of operations.	**Identifies equivalent expressions using properties of operations.**		
	Uses variables to represent numbers and writes expressions and single-step equations to solve real-world **and** mathematical problems, **and understands their solutions.**	Uses variables to represent numbers and writes expressions and single-step equations to solve **real-world or** mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.

	Expresses a relationship between dependent and independent variables and relates tables and graphs to equations.	Relates tables and graphs to equations.	**Relates tables and graphs to equations.**	
	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

6.AR.A.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, and 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 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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 5.AR.A.2, 5.AR.B.3 **6th Grade Standard Taught in Advance:** 6.AR.A.1 **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding (2, 2a, 2b), Procedural Skill and Fluency (2, 2b, 2c)

Foundational Skills:

1. Fluently divide multi-digit numbers using standard algorithms.
2. Divide fractions by fractions.
3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.
4. Determine the unknown number in an addition or subtraction equation.
5. Determine the unknown number in a multiplication and division equation.
6. Evaluate expressions with positive, whole-number exponents.

Examples and Explanations

Terms are the parts of a sum. When the term is an explicit number, it is called a constant. When the term is a product of a number and a variable, the number is called the coefficient of the variable.

Variables are letters that represent numbers. There are various possibilities for the numbers they can represent; students can substitute these possible numbers for the letters in the expression for various purposes. Consider the following expression:

$x^2 + 5y + 3x + 6$

The variables are
x and y.
There are 4 terms: x^2, $5y$, $3x$, and 6.

There are 3 variable terms: x^2, $5y$, $3x$. They have coefficients of 1, 5, and 3, respectively.
The coefficient of x^2 is 1, since $x^2 = 1\,x^2$. The term $5y$ represents $5 \cdot y$.
There is one constant term, 6.
The expression shows a sum of all four terms.

Examples:

- Using x for the unknown number, write an expression for
  - "7 more than 3 times a number"
  - "3 times the sum of a number and 5"
  - "7 less than the product of 2 and a number"
  - "Twice the difference between a number and 5"
- Evaluate $5(n + 3) - 7n$, when $n = \frac{1}{2}$.
- The expression c + 0.07c can be used to find the total cost of an item with 7% sales tax, where *c* is the pre-tax cost of the item. Use the expression to find the total cost of an item that costs $25.
- The perimeter of a parallelogram is found using the formula $p = 2l + 2w$. What is the perimeter of a rectangular picture frame with dimensions of 8.5 inches by 11 inches?
- Evaluate $7xy$ when $x = 2.5$ and $y = 9$

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
	Identifies parts of algebraic and numerical expressions using mathematical terms **and views one or more parts of an expression as a single entity**.	Identifies parts of algebraic and numerical expressions using mathematical terms.	Identifies parts of algebraic **and** numerical expressions using mathematical terms.	Identifies parts of algebraic or numerical expressions using mathematical terms.
	Identifies equivalent expressions using properties of operations.	**Identifies equivalent expressions using properties of operations.**		
	Uses variables to represent numbers and writes expressions and single-step equations to solve real-world **and** mathematical problems, **and understands their solutions.**	Uses variables to represent numbers and writes expressions and single-step equations to solve **real-world or** mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.

	Expresses a relationship between dependent and independent variables and relates tables and graphs to equations.	Relates tables and graphs to equations.	**Relates tables and graphs to equations.**	
	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

6.AR.A.3 Apply the properties of operations to generate equivalent expressions, identify when two expressions are equivalent, and explain why two expressions are equivalent.

- For example, we can 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); and apply properties of operations to y + y + y to produce the equivalent expression 3y.

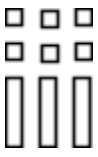
Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 1.AR.B.3, 3.AR.B.5, 5.AR.A.2 **6th Grade Standard Taught in Advance:** 6.NOF.B.4, 6.AR.A.2 **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

Examples and Explanations
Students use the distributive property to write equivalent expressions. Using their understanding of area models from elementary, students illustrate the distributive property with variables. Properties are introduced throughout elementary grades (3.AR.B.5); however, there has not been an emphasis on recognizing and naming the property. In sixth grade, students can use the properties and identify them by name.

Students use their understanding of multiplication to interpret *3 (2 + x) as 3 groups of (2 + x).* They use a model to represent x, and make an array to show the meaning of *3(2 + x).* They can explain why it makes sense that *3(2 + x)* is equal to *6 + 3x.*

An array with 3 columns and x + 2 in each column:



Students interpret y as referring to one y**.** Thus, they can reason that one y plus one y plus one y **must be** $3y$. They also apply the distributive property, the multiplicative identity property of 1, and the commutative property for multiplication to prove that $y + y + y = 3y$

Solution:

$y + y + y$
$y \cdot 1 + y \cdot 1 + y \cdot 1$ Multiplicative Identity
$y \cdot (1 + 1 + 1)$ Distributive Property
$y \cdot 3$ Addition
$3y$ Commutative Property

Assessment Connections

Assessment Item Type(s): I, II, III
Evidence Statement(s): LEAP.II.6.1, LEAP.II.6.7, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
	Identifies parts of algebraic and numerical expressions using mathematical terms **and views one or more parts of an expression as a single entity**.	Identifies parts of algebraic and numerical expressions using mathematical terms.	Identifies parts of algebraic **and** numerical expressions using mathematical terms.	Identifies parts of algebraic or numerical expressions using mathematical terms.
	Identifies equivalent expressions using properties of operations.	**Identifies equivalent expressions using properties of operations.**		
	Uses variables to represent numbers and writes expressions and single-step equations to solve real-world **and** mathematical problems, **and understands their solutions.**	Uses variables to represent numbers and writes expressions and single-step equations to solve **real-world or** mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.

	Expresses a relationship between dependent and independent variables and relates tables and graphs to equations.	Relates tables and graphs to equations.	**Relates tables and graphs to equations.**	
	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

B. Reason about and solve one-variable equations and inequalities. In this cluster, the terms students should learn to use with increasing precision are: **inequalities, equations, greater than, >, less than, <, greater than or equal to, ≥, less than or equal to, ≤, profit,** and **exceed**.

6.AR.B.4 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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** 6.AR.A.2 **6th Grade Standard Taught Concurrently:** 6.AR.A.3	Conceptual Understanding, Procedural Skill and Fluency

Foundational Skills:

1. Fluently divide multi-digit numbers using standard algorithms.
2. Divide fractions by fractions.
3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.
4. Determine the unknown number in an addition or subtraction equation.
5. Determine the unknown number in a multiplication and division equation.
6. Evaluate expressions with positive, whole-number exponents.

Examples and Explanations

In elementary grades, students explored the concept of equality. In sixth grade, students explore equations as expressions being set equal to a specific value. The solution is the value of the variable that will make the equation or inequality true. Students use various processes to identify the value(s) that, when substituted for the variable, will make the equation true.

Examples:

- Substitute the numbers in the set for *n* and determine which values make the equation or inequality true. Explain how you know your answer is correct.

Equation or Inequality	Set of Numbers	*Solution and Sample Explanation*
$n < -4$	$\{0, -\frac{1}{2}, 5, -6, 2\frac{1}{3}, 4, -10\}$	*Solution: —6 and —10* *Numbers to the left of -4 on the number line are less than -4.*[1]
$\frac{2}{3}n = 4$	{0, 2, 6, 9}	Solution: 6

		$\frac{2}{3} \times 6 = (2 \times 6) \times \frac{1}{3} = 12 \times \frac{1}{3} = \frac{12}{3} = 4$, so both sides of the equation equal 4
$5n = 24$	$\{4.8, \frac{24}{5}, 4\frac{4}{5}\}$	Solution: $5 \times 4.8 = 24$. $\frac{24}{5}$ and $4\frac{4}{5}$ are equivalent to 4.8, so all the numbers in the set make the equation true.

[1]*Students in Grade 6 do not solve equations and inequalities using negative numbers. This example reinforces coherence with 6.NOF..C.7a, which requires students to interpret inequality statements in terms of positions on a number line.*

- Solve $26 + n = 100$ for n and provide your reasoning.
  - Possible reasoning strategies:
    - 26 + 70 is 96, and 96 + 4 is 100, so the number added to 26 to get 100 is 74.
    - Use knowledge of fact families to write related equations: $n + 26 = 100$, $100 - n = 26$, $100 - 26 = n$. Select the equation that helps to find n easily.
    - Use knowledge of inverse operations: Since subtraction "undoes" addition, then subtract 26 from 100 to get the numerical value of n.
- Twelve is less than 3 times another number can be shown by the inequality $12 < 3n$. What numbers could possibly make this a true statement? Explain how you know. *Solution: Students provide at least two values greater than 4 and show that the product of the given number and 3 is greater than 12.*

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.6, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
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	Identifies equivalent expressions using properties of operations.	**Identifies equivalent expressions using properties of operations.**		
	Uses variables to represent numbers and writes expressions and single-step equations to solve real-world **and** mathematical problems, **and understands their solutions.**	Uses variables to represent numbers and writes expressions and single-step equations to solve **real-world or** mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.

	Expresses a relationship between dependent and independent variables and relates tables and graphs to equations.	Relates tables and graphs to equations.	**Relates tables and graphs to equations.**	
	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

6.AR.B.5 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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** 6.AR.A.2 **6th Grade Standard Taught Concurrently:** 6.AR.B.6	Conceptual Understanding, Procedural Skill and Fluency, Application
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 2. Divide fractions by fractions. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation. 6. Evaluate expressions with positive, whole-number exponents.		

Examples and Explanations
Connecting writing expressions with real-world problems and/or drawing pictures will give students a context for this work. Students need to read algebraic expressions in a manner that reinforces that the variable represents a number.

Examples:

- Maria has three more than twice as many crayons as Elizabeth. Write an algebraic expression to represent the number of crayons that Maria has.
  (*Solution*: $2c + 3$ where *c* represents the number of crayons that Elizabeth has.)
- An amusement park charges $28 to enter and $0.35 per ticket. Write an algebraic expression to represent the total amount spent.
  (*Solution*: $28 + 0.35t$ where *t* represents the number of tickets purchased)
- Bill earned $5.00 mowing the lawn on Saturday. He earned more money on Sunday. Write an expression that shows the amount of money Bill has earned. (*Solution:* $\$5.00 + n$ where n is the amount earned on Sunday.*)*

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.6, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
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	Identifies equivalent expressions using properties of operations.	**Identifies equivalent expressions using properties of operations.**		
	Uses variables to represent numbers and writes expressions and single-step equations to solve real-world **and** mathematical problems, **and understands their solutions.**	Uses variables to represent numbers and writes expressions and single-step equations to solve **real-world or** mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.

	Expresses a relationship between dependent and independent variables and relates tables and graphs to equations.	Relates tables and graphs to equations.	**Relates tables and graphs to equations.**	
	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

6.AR.B.6 Solve real-world and mathematical problems by writing and solving equations and inequalities of the form x + p = q and px = q for cases in which p, q, and x are all nonnegative rational numbers. Inequalities will include >, <, ≥, and ≤.

Standard Overview

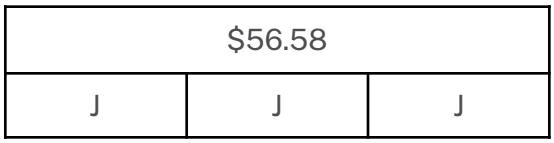
Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**6th Grade Standard Taught in Advance:** 5.NOF.A.1 **6th Grade Standard Taught Concurrently:** 6.AR.B.4, 6.AR.B.5, 6.AR.C.8	Procedural Skill and Fluency, Application
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 2. Divide fractions by fractions. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation. 6. Evaluate expressions with positive, whole number exponents.		

Examples and Explanations

Students create and solve equations and inequalities that are based on real-world situations. It may be beneficial for students to draw pictures that illustrate the equation in problem situations. Solving equations and inequalities using reasoning and prior knowledge should be required of students to allow them to develop effective strategies. Notice that the focus is on the operations of addition and multiplication of nonnegative values with the intent that students solve such problems using inverse operations.

Examples:

- Meagan spent $56.58 on three pairs of jeans. If each pair of jeans costs the same amount, write an algebraic equation that represents this situation and solve to determine how much one pair of jeans costs.



Sample *Solution*: Students might say: "I created the bar model to show the cost of the three pairs of jeans. Each bar labeled *J* is the same size because each pair of jeans costs the same amount of money. The bar model represents the equation 3*J* = $56.58. To solve the problem, I need to divide the total cost of 56.58 between the three pairs of jeans. I know that it will be more than $10 each

because 10 × 3 is only 30, but less than $20 each. After all, 20 × 3 is 60. If I start with $15 each, I am up to $45. I have $11.58 left. I then give each pair of jeans $3. That's $9 more dollars. I only have $2.58 left. I continue until all the money is divided. I ended up giving each pair of jeans another $0.86. Each pair of jeans costs $18.86 ($15 + 3 + 0.86$). I double checked that the jeans cost $18.86 each because $18.86 × 3 is $56.58."

- Julio gets paid $20 for babysitting. He spends $1.99 on a package of trading cards and $6.50 on lunch. Write and solve an equation to show how much money Julio has left.

  (*Solution*: 20 = 1.99 + 6.50 + x, x = $11.51)

$20		
$1.99	$6.50	money left over (m)

- Stephen has saved $45.75. The price for a pair of sneakers that he wants could increase before he saves enough money, but he knows he will need at least $60 to purchase the shoes at the current cost. Write and solve an inequality that will show the minimum amount that Stephen still needs to save to purchase the sneakers.

  (*Solution:* $45.75 + x ≥ 60

  x ≥ 60 - 45.75

  x ≥ $14.25)

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.6, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions including those that contain whole number exponents.**	
	Identifies parts of algebraic and numerical expressions using mathematical terms **and views one or more parts of an expression as a single entity**.	Identifies parts of algebraic and numerical expressions using mathematical terms.	Identifies parts of algebraic **and** numerical expressions using mathematical terms.	Identifies parts of algebraic or numerical expressions using mathematical terms.
	Identifies equivalent expressions using properties of operations.	**Identifies equivalent expressions using properties of operations.**		
	Uses variables to represent numbers and writes expressions and single-step equations to solve real-world **and** mathematical problems **and understands their solutions.**	Uses variables to represent numbers and writes expressions and single-step equations to solve **real-world or** mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.	Uses variables to represent numbers and writes expressions (without exponents) and single-step equations to solve mathematical problems.

	Expresses a relationship between dependent and independent variables and relates tables and graphs to equations.	Relates tables and graphs to equations.	**Relates tables and graphs to equations.**	
	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

6.AR.B.7 Translate a real-world written description into an algebraic inequality in the form of x > c or x < c. Recognize, describe, and interpret the infinitely many solutions for x>c or x<c and graph the solutions on a number line.

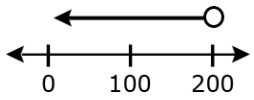
Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught in Advance:** 6.AR.B.4	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

Examples and Explanations
Many real-world situations are represented by inequalities. Inequalities do not use ≤ or ≥. Students write inequalities using "is greater than" or "is less than" to represent real-world and mathematical situations. Students use the number line to represent inequalities from various contextual and mathematical situations.

Examples:

- The Flores family spent less than $200.00 last month on groceries. Write an inequality to represent this amount and graph this inequality on a number line.

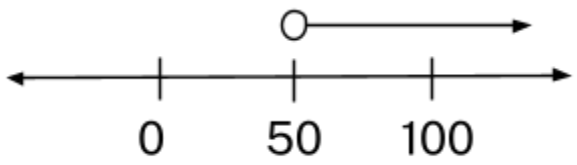


Solution: $200 > x \text{ or } x < 200$, where x is the amount spent on groceries.

- Jonas spent more than $50 at an amusement park. Write an inequality to represent the amount of money Jonas spent. What are some possible amounts of money Jonas could have spent? Represent the situation on a number line.

Solution: x > 50

Some possible amounts of money Jonas could have spent are $55 or $100.



Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.6, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
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	Writes and graphs inequalities to represent a constraint or condition in a real-world or mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a **real-world or** mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.	Writes and graphs inequalities to represent a constraint or condition in a mathematical problem.
	Understands that there are an infinite number of solutions for an inequality.			

C. Represent and analyze quantitative relationships between dependent and independent variables. In this cluster, the terms students should learn to use with increasing precision are: **inequalities, equations, greater than, >, less than, <, greater than or equal to, ≥, less than or equal to, ≤, profit,** and **exceed**.

6.AR.C.8 Use variables to represent two quantities in a real-world problem that change in relationship to one another. 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.

a. 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.
b. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 5.AR.B.3 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** 6.AR.B.6	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 2. Divide fractions by fractions. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation. 6. Evaluate expressions with positive, whole-number exponents.		

Examples and Explanations

The purpose of this standard is for students to understand the relationship between two variables, which begins with the distinction between dependent and independent variables. The independent variable is the variable that can be changed; the dependent variable is the variable that is affected by the change in the independent variable. Students recognize that the independent variable is graphed on the *x*-axis; the dependent variable is graphed on the *y*-axis.

Students are expected to recognize and explain the impact on the dependent variable when the independent variable changes (As the *x* variable increases, how does the y variable change?) *Relationships should be proportional with the line passing through the origin.* Additionally, students should be able to write an equation from a word problem and understand how the coefficient of the dependent variable is related to the graph and /or a table of values.

Students can use many forms to represent relationships between quantities. Multiple representations include describing the relationship using language, a table, an equation, or a graph. Translating between multiple representations helps students understand that each form represents the same relationship and provides a different perspective.

Examples:

- In the table below, *x* represents the number of hours that Henry worked, and *y* represents the pay, in dollars, that Henry received for working that number of hours. Write an equation that represents this situation? *Solution:* $y = 2.5x$

x	1	2	3	4
y	$2.50	$5	$7.50	10

- Chocolate Bar Sales[2]:

  Stephanie is helping her band collect money to fund a field trip. The band decided to sell boxes of chocolate bars. Each bar sells for $1.50, and each box contains 20 bars. Below is a partial table of monies collected for different numbers of boxes sold.

Boxes Sold b	Money Collected m
1	$30.00
2	
3	
4	
5	$150.00
6	
7	
8	

  a. Complete the table above for values of m.
  b. Write an equation for the amount of money, m, that will be collected if b boxes of chocolate bars are sold. Which is the independent variable and which is the dependent variable?
  c. Graph the equation using ordered pairs from the table above.
  d. Calculate how much money will be collected if 100 boxes of chocolate bars are sold.
  e. The band collected $1530.00 from chocolate bar sales. How many boxes did they sell?

[2] https://www.illustrativemathematics.org/content-standards/6/EE/C/9/tasks/806

- Families of Triangles[3]:

  There are a bunch of triangles. They all have one side that is 10 centimeters long, which we will consider as the base of the triangle.

  a. The triangles each have a different height (as measured off the 10-centimeter base) and so have different areas. Fill in the table:

Height (centimeters)	Area (square centimeters)
20	
25	
40	
	250

  b. Plot the ordered pairs from the table in a coordinate plane and label them with their coordinates.
  c. Where can you see the answers to part (a) in the coordinate plane?
  d. If A represents the area and h represents the corresponding height, write an equation using A and h that represents the area of any such triangle.

[3] https://www.illustrativemathematics.org/content-standards/6/EE/C/9/tasks/2206

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.8, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Expressions, Inequalities, and Equations 6.AR.A.1 6.AR.A.2 6.AR.A.3 6.AR.B.4 6.AR.B.5 6.AR.B.6 6.AR.B.7 6.AR.C.8	Writes, reads, and evaluates numerical and algebraic expressions, including those that contain whole number exponents.	**Writes,** reads, **and evaluates** numerical and algebraic expressions, including those that contain whole number exponents.	Reads numerical **and algebraic expressions, including those that contain whole-number exponents.**	
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	Understands that there are an infinite number of solutions for an inequality.			

Geometric Reasoning and Logic

A. Solve real-world and mathematical problems involving area, surface area, and volume. In this cluster, the terms students should learn to use with increasing precision are: **area, surface area, volume, decomposing, edges, dimensions, net, vertices, face, base, height, trapezoid, isosceles, right triangle, quadrilateral, rectangles, squares, parallelograms, rhombi, kites, right rectangular prism,** and **diagonal.**

6.GL.A.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.

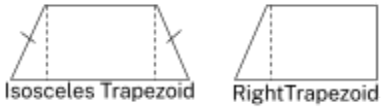
Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Supporting	**Previous Grade(s) Standard:** 4.DM.A.3, 4.DM.D.7, 5.NOF.B.4 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding, Procedural Skill and Fluency, Application
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 2. Divide fractions by fractions. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation. 6. Evaluate expressions with positive, whole-number exponents.		

Examples and Explanations
Students continue to understand that area is the number of squares needed to cover a plane figure. Sixth-grade students should know the formula for the area of a rectangle from having been used in grade 4; however, "knowing the formula" does not mean memorization of the formula. To "know" means to have an understanding of **why** the formula works and how the formula relates to the measure (area) and the figure. This understanding should be for *all* students.

In grade 6, finding the area of triangles is introduced in relation to the area of rectangles – a rectangle can be decomposed into two congruent triangles. Therefore, the area of the triangle is ½ the area of the rectangle. The area of a rectangle can be found by multiplying base × height; therefore, the area of the triangle is $\frac{1}{2}bh$ or $\frac{(b\times h)}{2}$.

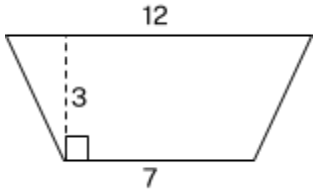
Students decompose shapes into rectangles and triangles to determine the area. For example, a trapezoid can be decomposed into triangles and rectangles (see figures below). Using the trapezoid's dimensions, the area of the individual triangle(s) and rectangle can be found and then added together. Special quadrilaterals include rectangles, squares, parallelograms, trapezoids, rhombi, and kites.



Students recognize the marks indicating that two sides of the same figure have equal lengths. This is the students' first exposure to the term *diagonal*.

Examples:

- Find the area of a triangle with a base length of three units and a height of four units.
- Find the area of the trapezoid shown below using the formulas for rectangles and triangles.



- A rectangle measures 3 inches by 4 inches. If the lengths of each side double, what is the effect on the area?
- The sixth-grade class at Hernandez School is building a giant wooden H for their school. The H will be 10 feet tall and 10 feet wide, and the thickness of the block letter will be 2.5 feet.
  - How large will the H be if measured in square feet?
  - The truck that will be used to bring the wood from the lumber yard to the school can only hold a piece of wood that is 60 inches by 60 inches. What pieces of wood (how many pieces and what dimensions) are needed to complete the project?

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP.III.6.3

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Solve Area, Surface Area, and Volume Problems 6.GL.A.1 6.GL.A.2 6.GL.A.3 6.GL.A.4	Solves real-world and mathematical problems involving area of polygons by composing into rectangles or decomposing into triangles and other shapes.	Solves **real-world and** mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by composing into rectangles.
	Determines measurements of polygons in the coordinate plane.	Determines measurements of polygons in the coordinate plane.	**Determines measurements of polygons in the coordinate plane.**	
	Identifies and uses nets of three-dimensional figures to find surface area.	**Identifies and** uses nets of three-dimensional figures to find surface area.	Uses nets of three-dimensional figures to find surface area.	
	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes and using formulas.	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes **and using formulas.**	**Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes.**	
	Uses volume formulas to find unknown measurements.	**Uses volume formulas to find unknown measurements.**		

	Applies concepts of area and volume to solve problems without scaffolding.	**Applies concepts of area and volume to solve problems with scaffolding.**		

6.GL.A.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 $V = Bh$ and $V = lwh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Supporting	**Previous Grade(s) Standard**: 5.DM.C.5 **6th Grade Standard Taught in Advance**: none **6th Grade Standard Taught Concurrently**: none	Conceptual Understanding, Procedural Skill and Fluency, Application
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 2. Divide fractions by fractions. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.		

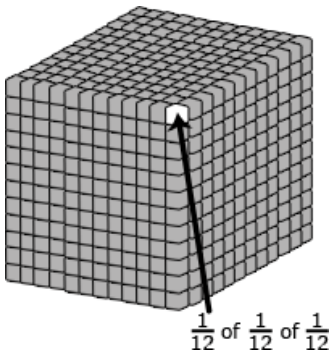
Examples and Explanations

Previously, students calculated the volume of right rectangular prisms (boxes) using whole-number edges. In sixth grade, the unit cube will have fractional edge lengths. (i.e., $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$) Students find the volume of the right rectangular prism with these unit cubes.

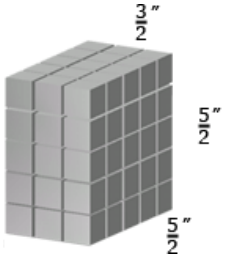
Students can draw diagrams to represent fractional side lengths, connecting with multiplication of fractions. This process is similar to composing and decomposing two-dimensional shapes.

Examples:

- The model shows a cubic foot filled with cubic inches. The cubic inches can also be labeled as a fractional cubic unit with dimensions of $\frac{1}{12}\text{ft}^3$.



- The models show a rectangular prism with dimensions $\frac{3}{2}$ inches, $\frac{5}{2}$ inches, and $\frac{5}{2}$ inches. Each of the cubic units in the model is $\frac{1}{8}$ in^3. Students work with the model to illustrate $\frac{3}{2} \times \frac{5}{2} \times \frac{5}{2} =$ $(3 \times 5 \times 5) \times \frac{1}{8}$. Students reason that a small cube has a volume of $\frac{1}{8}$ cubic inch because each cube has an edge length of $\frac{1}{2}$ inch.



Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Solve Area, Surface Area, and Volume Problems 6.GL.A.1 6.GL.A.2 6.GL.A.3 6.GL.A.4	Solves real-world and mathematical problems involving area of polygons by composing into rectangles or decomposing into triangles and other shapes.	Solves **real-world and** mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by composing into rectangles.
	Determines measurements of polygons in the coordinate plane.	Determines measurements of polygons in the coordinate plane.	**Determines measurements of polygons in the coordinate plane.**	
	Identifies and uses nets of three-dimensional figures to find surface area.	**Identifies and** uses nets of three-dimensional figures to find surface area.	Uses nets of three-dimensional figures to find surface area.	
	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes and using formulas.	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes **and using formulas.**	**Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes.**	
	Uses volume formulas to find unknown measurements.	**Uses volume formulas to find unknown measurements.**		

	Applies concepts of area and volume to solve problems without scaffolding.	**Applies concepts of area and volume to solve problems with scaffolding.**		

6.GL.A.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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Supporting	**Previous Grade(s) Standard**: 5.GL.A.2 **6th Grade Standard Taught in Advance**: none **6th Grade Standard Taught Concurrently**: 6.NOF.C.8	Conceptual Understanding, Procedural Skill and Fluency, Application
Foundational Skills: 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation.		

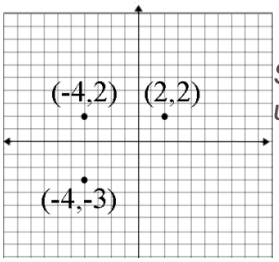
Examples and Explanations

Students are given the coordinates of polygons to draw in the coordinate plane. If both *x*-coordinates are the same (2, -1) and (2, 4), then students recognize that a vertical line has been created, and the distance between these coordinates is the distance.
between -1 and 4, or 5. If both the *y*-coordinates are the same (-5, 4) and (2, 4), then students recognize that a horizontal line has been created and the distance between these coordinates is the distance between -5 and 2, or 7. Using this understanding, students solve real-world and mathematical problems, including finding the area and perimeter of geometric figures drawn on a coordinate plane. This standard can be taught in conjunction with 6.GL.A.1 to help students develop the formula for the triangle by using the squares of the coordinate grid. Given a triangle, students can make the corresponding square or rectangle and realize that the triangle is $\frac{1}{2}$ the rectangle or square.

Examples:

- On a map, the library is located at (-2, 2), the city hall building is located at (0,2), and the high school is located at (0,0). Represent the locations as points on a coordinate grid with a unit of 1 mile.
    - What is the distance from the library to the city hall building? The distance from the city hall building to the high school? How do you know?
    - What shape is formed by connecting the three locations? The city council is planning to place a city park in this area. How large is the area of the planned park?

- If the points on the coordinate plane below are the three vertices of a rectangle, what are the coordinates of the fourth vertex? How do you know? What is the length and width of the rectangle? Find the area and the perimeter of the rectangle.



Solution: The fourth vertex would be (2, -3). The area would be 5×6 *or 30 units*^{2}*. The perimeter would be 5 + 5 + 6 + 6 or 22 units.*

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Solve Area, Surface Area, and Volume Problems 6.GL.A.1 6.GL.A.2 6.GL.A.3 6.GL.A.4	Solves real-world and mathematical problems involving area of polygons by composing into rectangles or decomposing into triangles and other shapes.	Solves **real-world and** mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by composing into rectangles.
	Determines measurements of polygons in the coordinate plane.	Determines measurements of polygons in the coordinate plane.	**Determines measurements of polygons in the coordinate plane.**	
	Identifies and uses nets of three-dimensional figures to find surface area.	**Identifies and** uses nets of three-dimensional figures to find surface area.	Uses nets of three-dimensional figures to find surface area.	
	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes and using formulas.	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes **and using formulas.**	**Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes.**	
	Uses volume formulas to find unknown measurements.	**Uses volume formulas to find unknown measurements.**		

	Applies concepts of area and volume to solve problems without scaffolding.	**Applies concepts of area and volume to solve problems with scaffolding.**		

6.GL.A.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.

Standard Overview

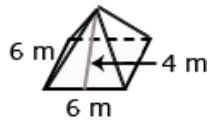
Core Tenets		
Focus	**Coherence**	**Rigor**
Supporting	**Previous Grade(s) Standard**: none **6th Grade Standard Taught in Advance**: 6.GL.A.1 **6th Grade Standard Taught Concurrently**: none	Conceptual Understanding, Procedural Skill and Fluency, Application
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms. 4. Determine the unknown number in an addition or subtraction equation. 5. Determine the unknown number in a multiplication and division equation. 6. Evaluate expressions with positive, whole-number exponents.		

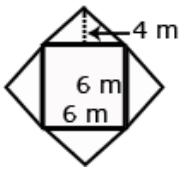
Examples and Explanations

A net is a two-dimensional representation of a three-dimensional figure. Students represent three-dimensional figures whose nets are composed of rectangles and triangles. Students recognize that parallel and perpendicular lines on a net form rectangles. Using the dimensions of the individual faces, students calculate the area of each rectangle and/or triangle and add these sums together to find the surface area of the figure. Students also create nets to form a specified three-dimensional figure.

Examples:

- Describe the shapes of the faces needed to construct a rectangular pyramid. Cut out the shapes and create a model. Did your faces work? Why or why not?
- Create the net for a given prism or pyramid, and then use the net to calculate the surface area.





Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Solve Area, Surface Area, and Volume Problems 6.GL.A.1 6.GL.A.2 6.GL.A.3 6.GL.A.4	Solves real-world and mathematical problems involving area of polygons by composing into rectangles or decomposing into triangles and other shapes.	Solves **real-world and** mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by either composing into rectangles or decomposing into triangles and other shapes.	Solves mathematical problems involving area of polygons by composing into rectangles.
	Determines measurements of polygons in the coordinate plane.	Determines measurements of polygons in the coordinate plane.	**Determines measurements of polygons in the coordinate plane.**	
	Identifies and uses nets of three-dimensional figures to find surface area.	**Identifies and** uses nets of three-dimensional figures to find surface area.	Uses nets of three-dimensional figures to find surface area.	
	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes and using formulas.	Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes **and using formulas.**	**Determines volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes.**	
	Uses volume formulas to find unknown measurements.	**Uses volume formulas to find unknown measurements.**		

	Applies concepts of area and volume to solve problems without scaffolding.	**Applies concepts of area and volume to solve problems with scaffolding.**		

Data Analysis

A. Develop understanding of statistical variability. In this cluster, the terms students should learn to use with increasing precision are: **statistics, data, variability, distribution, dot plot, histograms, box plots, median, mean, range,** and **spread** (as it relates to data).

6.DA.A.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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional	**Previous Grade(s) Standard**: 5.DM.B.2 **6th Grade Standard Taught in Advance**: none **6th Grade Standard Taught Concurrently**: none	Conceptual Understanding

Examples and Explanations

Statistics are numerical data relating to an aggregate of individuals; statistics is also the name for the science of collecting, analyzing, and interpreting such data. A statistical question anticipates an answer that varies from one individual to the next and is written to account for the variability in the data. Data are defined as numbers that are produced in response to a statistical question. Data are frequently collected through surveys or other sources (e.g., documents).

Questions can result in a narrow or wide range of numerical values. For example, asking classmates “How old are the students in my class in years?” will result in less variability than asking “How old are the students in my class in months?”

Students might want to know about the fitness of the students at their school. Specifically, they want to know about the exercise habits of the students. So rather than asking "Do you exercise?" they should ask about the amount of exercise the students at their school get per week. A statistical question for this study could be: “How many hours per week on average do students at Jefferson Middle School exercise?”

To collect this information, students might design a survey question that anticipates variability by providing a variety of possible anticipated responses that have numerical answers, such as 3 hours per week, 4 hours per week, and so on. Be sure that students ask questions that have specific numerical answers.

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Statistical Variability and Data Distributions 6.DA.A.1 6.DA.A.2 6.DA.A.3 6.DA.B.4 6.DA.B.5	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	**Recognizes a statistical question and** understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.
	Understands the purpose of center **and variability** and the center of a set of data can be summarized with a single number.	Understands the purpose of center and the center of a set of data can be summarized with a single number.	Understands **the purpose of center and** the center of a set of data can be summarized with a single number.	Understands the center of a set of data can be summarized with a single number.
	Displays numerical data in plots on a number line, including dot plots, histograms, and box plots.	Displays numerical data in plots on a number line, including dot plots, histograms, **and box plots**.	Displays numerical data on a number line, including dot plots **and histograms**.	Displays numerical data on a number line, including dot plots.
	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing the nature of the attributes under investigation, and using	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, **describing the nature of the attributes under investigation, and**	**Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing and using measures of center, and using the interquartile**	

	measures of center and variability.	**using measures of center and variability.**	**range as a measure of variability.**	
	Determines which measures of center and variability are the most appropriate for a set of data.			

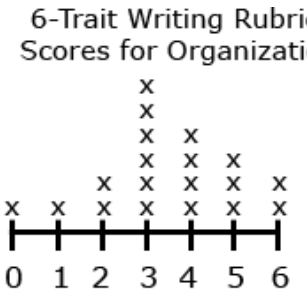
6.DA.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional	**Previous Grade(s) Standard**: 5.DM.B.2 **6th Grade Standard Taught in Advance**: none **6th Grade Standard Taught Concurrently**: none	Conceptual Understanding

Examples and Explanations
The distribution is the arrangement of the values of a data set. Distribution can be described using center (median or mean) and spread. Data collected can be represented on graphs, which will show the shape of the distribution of the data. Students examine the distribution of a data set and discuss the center, spread, and overall shape with dot plots, histograms, and box plots.

Example:
The dot plot shows the writing scores for a group of students on organization. Describe the data.



Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Statistical Variability and Data Distributions 6.DA.A.1 6.DA.A.2 6.DA.A.3 6.DA.B.4 6.DA.B.5	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	**Recognizes a statistical question and** understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.
	Understands the purpose of center **and variability** and the center of a set of data can be summarized with a single number.	Understands the purpose of center and the center of a set of data can be summarized with a single number.	Understands **the purpose of center and** the center of a set of data can be summarized with a single number.	Understands the center of a set of data can be summarized with a single number.
	Displays numerical data in plots on a number line, including dot plots, histograms, and box plots.	Displays numerical data in plots on a number line, including dot plots, histograms, **and box plots**.	Displays numerical data on a number line, including dot plots **and histograms**.	Displays numerical data on a number line, including dot plots.
	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing the nature of the attributes under investigation, and using	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, **describing the nature of the attributes under investigation, and**	**Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing and using measures of center, and using the interquartile**	

	measures of center and variability.	**using measures of center and variability.**	**range as a measure of variability.**	
	Determines which measures of center and variability are the most appropriate for a set of data.			

6.DA.A.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.

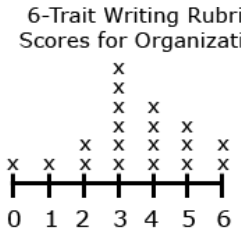
Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional	**Previous Grade(s) Standard**: none **6th Grade Standard Taught in Advance**: 6.DA.A.1, 6.DA.A.2 **6th Grade Standard Taught Concurrently**: none	Conceptual Understanding

Examples and Explanations
Data sets contain many numerical values that can be summarized by one number, such as a measure of center. The measure of center gives a numerical value to represent the center of the data (i.e., midpoint of an ordered list or the balancing point). Another characteristic of a data set is the variability (or spread) of the values. Measures of variability are used to describe this characteristic.

Example:
Consider the data shown in the dot plot (sometimes called line plot) of the six trait scores for organization for a group of students.

- How many students are represented in the data set?
- What are the mean and median of the data set? What do these values mean? How do they compare?
- What is the range of the data? What does this value mean?



Solution:

- 19 students are represented in the data set.
- The mean of the data set is 3.5. The median is 3. The mean indicates that if the values were equally distributed, all students would score a 3.5. The median indicates that 50% of the students scored a 3 or higher; 50% of the students scored a 3 or lower.
- The range of the data is 6, indicating that the values vary by 6 points between the lowest and highest scores.

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Statistical Variability and Data Distributions 6.DA.A.1 6.DA.A.2 6.DA.A.3 6.DA.B.4 6.DA.B.5	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	**Recognizes a statistical question and** understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.
	Understands the purpose of center **and variability** and the center of a set of data can be summarized with a single number.	Understands the purpose of center and the center of a set of data can be summarized with a single number.	Understands **the purpose of center and** the center of a set of data can be summarized with a single number.	Understands the center of a set of data can be summarized with a single number.
	Displays numerical data in plots on a number line, including dot plots, histograms, and box plots.	Displays numerical data in plots on a number line, including dot plots, histograms, **and box plots**.	Displays numerical data on a number line, including dot plots **and histograms**.	Displays numerical data on a number line, including dot plots.
	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing the nature of the attributes under investigation, and using	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, **describing the nature of the attributes under investigation, and**	**Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing and using measures of center, and using the interquartile**	

	measures of center and variability.	**using measures of center and variability.**	**range as a measure of variability.**	
	Determines which measures of center and variability are the most appropriate for a set of data.			

B. Summarize and describe distributions. In this cluster, the terms students should learn to use with increasing precision are: **statistics, data, variability, distribution, dot plot, histograms, box plots, median, mean, range,** and **spread** (as it relates to data).

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

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional	**Previous Grade(s) Standard:** 5.DM.B.2 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** 6.DA.B.5	Procedural Skill and Fluency

Examples and Explanations

In order to display numerical data in dot plots (sometimes called line plots), histograms, or box plots, students need to make decisions and perform calculations. Students are expected to display data graphically in a format appropriate for that data set, as well as read data from graphs generated by other students or contained in reference materials. Students can use applets to create data displays.

Dot plots are simple plots on a number line where each dot represents a piece of data in the data set. Dot plots are suitable for small to moderate-sized data sets and are useful for highlighting the distribution of the data, including clusters, gaps, and extreme values.

In most real data sets, there is a large amount of data, and many numbers will be unique. A graph (such as a dot plot) that shows how many ones, how many twos, etc., would **not** be meaningful; however, a histogram can be used. Students organize the data into convenient ranges and use these intervals to generate a frequency table and histogram. Note that changing the size of the range changes the appearance of the graph and the conclusions you may draw from it.

Box plots are another useful way to display data and are plotted horizontally or vertically on a number line. Box plots are generated from the five-number summaries of a data set consisting of the minimum, maximum, median, and two quartile values. Box plots display the degree of spread of the data and the skewness of the data.

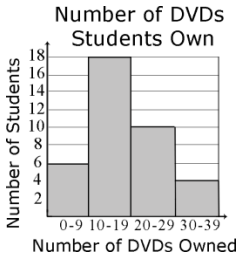
Examples:

- Grade 6 students were collecting data for a math class project. They decided they would survey the other two grade 6 classes to determine how many DVDs each student owns. A total of 48 students were surveyed. The data are shown in the table below in no specific order. Create a data display. What are some observations that can be made from the data display?

11	21	5	12	10	31	19	13	23	33
10	11	25	14	34	15	14	29	8	5

22	26	23	12	27	4	25	15	7	
2	19	12	39	17	16	15	28	16	

A histogram using 5 ranges (0-9, 10-19, …30-39) to organize the data is displayed below.



- Ms. Wheeler asked each student in her class to write their age in months on a sticky note. The 28 students in the class brought their sticky notes to the front of the room and posted them in order on the whiteboard. The data set is listed below in order from least to greatest. Create a data display. What are some observations that can be made from the data display?

130	130	131	131	132	132	132	133	134	136
137	137	138	139	139	139	140	141	142	142
142	143	143	144	145	147	149	150		

Five-number summary

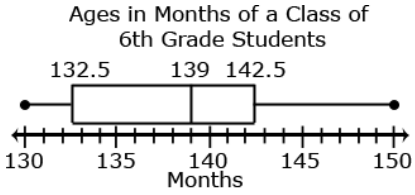
Minimum – 130 months

Quartile 1 (Q1) – (132 + 133) ÷ 2 = 132.5 months

Median (Q2) – 139 months

Quartile 3 (Q3) – (142 + 143) ÷ 2 = 142.5 months

Maximum – 150 months



This box plot shows that:

- o $\frac{1}{4}$ of the students in the class are from 130 to 132.5 months old
- o $\frac{1}{4}$ of the students in the class are from 142.5 months to 150 months old
- o $\frac{1}{2}$ of the class are from 132.5 to 142.5 months old
- o the median class age is 139 months

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Statistical Variability and Data Distributions 6.DA.A.1 6.DA.A.2 6.DA.A.3 6.DA.B.4 6.DA.B.5	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	**Recognizes a statistical question and** understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.
	Understands the purpose of center **and variability** and the center of a set of data can be summarized with a single number.	Understands the purpose of center and the center of a set of data can be summarized with a single number.	Understands **the purpose of center and** the center of a set of data can be summarized with a single number.	Understands the center of a set of data can be summarized with a single number.
	Displays numerical data in plots on a number line, including dot plots, histograms, and box plots.	Displays numerical data in plots on a number line, including dot plots, histograms, **and box plots**.	Displays numerical data on a number line, including dot plots **and histograms**.	Displays numerical data on a number line, including dot plots.
	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing the nature of the attributes under investigation, and using	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, **describing the nature of the attributes under investigation, and**	**Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing and using measures of center, and using the interquartile**	

	measures of center and variability.	**using measures of center and variability.**	**range as a measure of variability.**	
	Determines which measures of center and variability are the most appropriate for a set of data.			

6.DA.B.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), 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.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** 6.DA.A.2, 6.DA.A.3 **6th Grade Standard Taught Concurrently:** 6.DA.B.4	Conceptual Understanding (5, 5a, 5b, 5c, 5d), Procedural Skill and Fluency (5, 5c)
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.		

Examples and Explanations

Students summarize numerical data by providing background information about the attribute being measured, methods and unit of measurement, the context of data collection activities, the number of observations, and summary statistics. Summary statistics include quantitative measures of center, spread, and variability, including extreme values (minimum and maximum), mean, median, range, quartiles, and interquartile ranges.

The measure of center that a student chooses to describe a data set will depend on the shape of the data distribution and the context of data collection. The mode is the value in the data set that occurs most frequently. The mean is a very common measure of center computed by adding all the numbers in the set and dividing by the number of values. The mean can be affected greatly by a few data points that are very low or very high. In this case, the median or middle value of the data set might be more descriptive. In data sets that are symmetrically distributed, the mean and median will be very close to each other. In data sets that are skewed, the mean and median will be different, with the median frequently providing a better overall description of the data set.

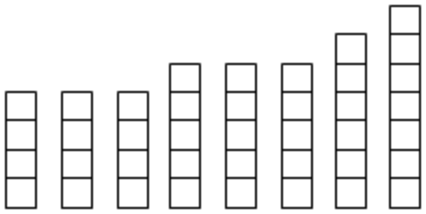
Understanding the Mean

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

develop an understanding of what the mean represents by redistributing data sets to be level or fair. The leveling process can be connected to and used to develop an understanding of the computation of the mean.

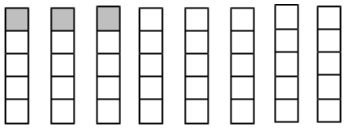
For example, students could generate a data set by measuring the number of jumping jacks they can perform in 5 seconds, the length of their feet to the nearest inch, or the number of letters in their names. It is best if the data generated for this activity are 5 to 10 data points, which are whole numbers between 1 and 10 that are easy to model with counters or stacking cubes.

Students generate a data set by drawing eight student names at random from the popsicle stick cup. The number of letters in each of the names is used to create the data set. If the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen, there would be 3 names with 4 letters each, 3 names with 5 letters each, 1 name with 6 letters, and 1 name with 7 letters.
This data set could be represented with stacking cubes.



Students can model the mean by "leveling" the stacks or distributing the blocks so the stacks are "fair." Students are seeking to answer the question "If all of the students had the same number of letters in their name, how many letters would each person have?"

One block from the stack of six and two blocks from the stack of 7 can be moved down to the stacks of 4, and then all the stacks have five blocks. If all students had the same number of letters in their names, they would have five letters. The mean number of letters in a name in this data set is 5.



If it was not possible to make the stacks exactly even, students could begin to consider what part of the extra blocks each stack would have.

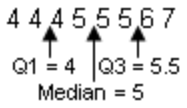
Students can also summarize and describe the center and variability in data sets using the median and a five-number summary consisting of the minimum, quartiles, and maximum, as seen in the box plot example in 6.DA.B.4. The median is the middle number of the data set, with half the numbers below the median and half the numbers above the median. The quartiles partition the data set into four parts by dividing each of the halves of the data set into halves again. Quartile 1 (Q1 or the lower quartile) is the middle value of the lower half of the data set, and quartile 3 (Q3 or the upper quartile) is the middle value of the upper half of the data set. The median can also be referred to as quartile 2 (Q2). The range of the data is the difference between the minimum and maximum values. The interquartile range of the data is the difference between the lower and upper quartiles (Q3 – Q1). The interquartile range is a measure of the dispersion or spread of the data set: a small value indicates values that are clustered near the median, whereas a larger value indicates values that are more distributed.

Consider the first data set again. Recall that the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen. The data set can be represented in a numerical list. To find the median and quartiles, the values are placed in order from least to greatest.

5 4 5 4 7 6 4 5 4 4 4 5 5 5 6 7

The middle value in the ordered data set is the median. If there are an even number of values, the median is the mean of the middle two values. In this case, the median would be 5 because 5 is the average of the 4^{th} and 5^{th} values, which are both 5.

Students find quartile 1 (Q1) by examining the lower half of the data. Again, there are 4 values, which is an even number of values. Q1 would be the average of the 2^{nd} and 3^{rd} values in the data set, or 4. Students find quartile 3 (Q3) by examining the upper half of the data. Q3 would be the average of the 6^{th} and 7^{th} values in the data set, or 5.5. The mean of the data set was 5, and the median is also 5, showing that the values are probably clustered close to the mean. The interquartile range is 1.5 (5.5 – 4). The interquartile range is small, showing little variability in the data.



Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Statistical Variability and Data Distributions 6.DA.A.1 6.DA.A.2 6.DA.A.3 6.DA.B.4 6.DA.B.5	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Recognizes a statistical question and understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	**Recognizes a statistical question and** understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.	Understands a set of collected data has a distribution which can be described by its center, spread, and overall shape.
	Understands the purpose of center **and variability** and the center of a set of data can be summarized with a single number.	Understands the purpose of center and the center of a set of data can be summarized with a single number.	Understands **the purpose of center and** the center of a set of data can be summarized with a single number.	Understands the center of a set of data can be summarized with a single number.
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	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing the nature of the attributes under investigation, and using	Summarizes numerical data sets in relation to a context, such as reporting the number of observations, **describing the nature of the attributes under investigation, and**	**Summarizes numerical data sets in relation to a context, such as reporting the number of observations, describing and using measures of center, and using the interquartile**	

	measures of center and variability.	**using measures of center and variability.**	**range as a measure of variability.**	
	Determines which measures of center and variability are the most appropriate for a set of data.			

Proportionality and Functions

A. Understand ratio concepts and use ratio reasoning to solve problems. In this cluster, the terms students should learn to use with increasing precision are: **ratio, ratio relationship, equivalent ratios, rate, unit rate, part-to-part ratio, part-to-whole ratio,** and **percent**.

6.PF.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities; use appropriate notation a:b, a to b, where $b \neq 0$. For example,

- "The ratio of wings to beaks in the birdhouse at the zoo was 2:1 (2 to 1) because, for every 2 wings, there was 1 beak."
- "For every vote candidate A received, candidate C received nearly three votes (A: C or A to C)."

Standard Overview

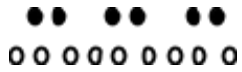
Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** 4.AR.A.2, 4.DM.A.1, 5.AR.B.3, 5.NOF.B.5 **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding

Examples and Explanations

A ratio is an ordered pair of numbers (*a, b*) where neither *a* nor *b* is zero. A ratio relationship is a set of all ratios that are equivalent to each other. Ratio language can be used to describe relationships between two types of quantities.

Example:

If there is a bowl that contains 6 guppies and 9 goldfish, then one could say the ratio of guppies to goldfish is 6 to 9, or 6:9. If the number of guppies is represented by black circles and the number of goldfish is represented by white circles, this ratio could be modeled as



These values can be regrouped into 2 black circles (guppies) to 3 white circles (goldfish), creating an equivalent ratio of 2 to 3 or 2:3.

Students should be able to identify and describe any ratio using ratio language, “For every _____, there are _____.” In the example above, the relationship could be described as, “For every 2 guppies, there are 3 goldfish.”

Teacher Note: Although ratios and fractions do not have identical meanings, a fraction can be formed from a given ratio to describe a part-whole relationship

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.8, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Ratio and Rate 6.PF.A.1 6.PF.A.2 6.PF.A.3	Uses ratio and rate reasoning to solve real-world and mathematical problems, including ratio, unit rate, percent, and unit conversion problems, **using and connecting a variety of representations and strategies.**	Uses ratio and rate reasoning to solve **real-world and** mathematical problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.	**Uses ratio and rate reasoning to** solve **mathematical** problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.	Solves problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.
	Finds missing values in tables and plots pairs of values on the coordinate plane.	Finds missing values in tables and locates **and plots** pairs of values on the coordinate plane.	**Finds missing values in tables and locates pairs of values on the coordinate plane.**	

6.PF.A.2 Understand the concept of a unit rate *a/b* associated with a ratio *a:b* where *b* ≠ *0*, and use rate language in the context of a ratio relationship. Expectations for unit rates in this grade are limited to non-complex fractions. For example,

- "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar."
- "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.AR.A.2, 5.NOF.B.3, 5.NOF.B.7 **6th Grade Standard Taught in Advance:** 6.PF.A.1 **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding
Foundational Skills: 1. Fluently divide multi-digit numbers using standard algorithms. 3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.		

Examples and Explanations

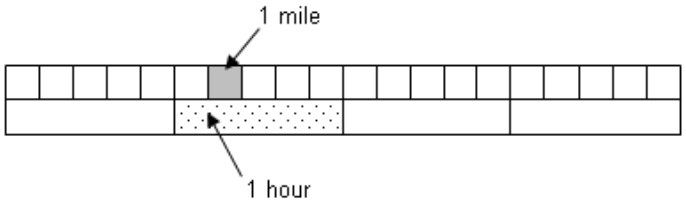
As students extend their work in 6.PF.A.1 with ratio relationships, they understand that for two ratios to be considered equivalent, they must have the same value. All ratios have an associated value, and that value is called the unit rate. Therefore, when students are trying to determine if a set of ratios is in a ratio relationship, they can find the value of each ratio (i.e., the unit rate). From there, students can use rate language to describe the ratio relationship in simpler terms. This will lead students to solving real-world problems involving unit pricing and constant speed (6.PF.A.3a). In grade 6, students are not expected to work with unit rates expressed as complex fractions. Both the numerator and denominator of the original ratio will be whole numbers.

Examples:

- On a bicycle, you can travel 20 miles in 4 hours. What is the distance you can travel in 1 hour, and the amount of time required to travel 1 mile?

  Solution: You can travel 5 miles in 1 hour, written as $\frac{5\ mi}{1\ hr}$ and it takes $\frac{1}{5}$ of an hour to travel each mile.

  Students can represent the relationship between 20 miles and 4 hours.



- A simple modeling clay recipe calls for 1 cup of corn starch, 2 cups of salt, and 2 cups of boiling water. How many cups of corn starch are needed to mix with each cup of salt?

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.8, LEAP.III.6.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Ratio and Rate 6.PF.A.1 6.PF.A.2 6.PF.A.3	Uses ratio and rate reasoning to solve real-world and mathematical problems, including ratio, unit rate, percent, and unit conversion problems, **using and connecting a variety of representations and strategies.**	Uses ratio and rate reasoning to solve **real-world and** mathematical problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.	**Uses ratio and rate reasoning to** solve **mathematical** problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.	Solves problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.
	Finds missing values in tables and plots pairs of values on the coordinate plane.	Finds missing values in tables and locates **and plots** pairs of values on the coordinate plane.	**Finds missing values in tables and locates pairs of values on the coordinate plane.**	

6.PF.A.3 Use and apply 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.
b. Solve unit rate problems, including those involving unit pricing and constant speed. 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 unit rate were lawns being mowed?
c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $\frac{30}{100}$ times the quantity); solve problems involving finding the whole, given a part, and the percent.
d. Use ratio reasoning to convert measurement units within and between the U.S. customary and metric systems; manipulate and transform units appropriately when multiplying or dividing quantities.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major	**Previous Grade(s) Standard:** none **6th Grade Standard Taught in Advance:** none **6th Grade Standard Taught Concurrently:** none	Conceptual Understanding (3a, 3d), Procedural Skill and Fluency (3, 3a, 3c, 3d), Application (3, 3b, 3c)

Foundational Skills:

1. Fluently divide multi-digit numbers using standard algorithms.
2. Divide fractions by fractions.
3. Add, subtract, multiply, and divide multi-digit decimals using standard algorithms.
4. Determine the unknown number in an addition or subtraction equation.
5. Determine the unknown number in a multiplication and division equation.
6. Evaluate expressions with positive, whole-number exponents.

Examples and Explanations

Once students have developed a strong understanding of ratios, ratio relationships, rates, and unit rates, they can begin solving real-world problems using various methods and representations of ratio relationships. Previously, students have used additive reasoning in tables to solve problems. To begin the shift to proportional reasoning, students need to begin using multiplicative reasoning. Scaling up or down with multiplication maintains the equivalence. To aid in the development of proportional reasoning, **the**

cross-product algorithm is *not* expected at this level. When working with ratio tables and graphs, **whole number** measurements are the expectation for this standard.

Examples:

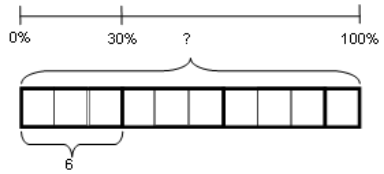
- Using the information in the table, find the number of yards in 24 feet.

Feet	3	6	9	15	24
Yards	1	2	3	5	?

  There are several strategies that students could use to determine the solution to this problem.
  - Add quantities from the table to total 24 feet (9 feet and 15 feet); therefore, the number of yards must be 8 yards (3 yards and 5 yards).
  - Use multiplication to find 24 feet: 1) 3 feet x 8 = 24 feet; therefore 1 yard x 8 = 8 yards, or 2) 6 feet x 4 = 24 feet; therefore 2 yards x 4 = 8 yards.
- Compare the number of black to white circles. If the ratio remains the same, how many black circles will you have if you have 60 white circles?

Black	4	40	20	60	?
White	3	30	15	45	60

- If 6 is 30% of a value, what is that value? (*Solution*: 20)
- What is 60% of 125? (Solution: 75)



Students recognize that a conversion factor is a fraction equal to 1 since the numerator and denominator both describe the same quantity. For example,

$\frac{12\ inches}{1\ foot}$ is a conversion factor since the numerator and denominator equal the same amount. Since the fraction is equivalent to 1, the identity property of multiplication allows an amount to be multiplied by the fraction. Conversion factors will be given and can occur both between and across the metric and English systems.

- How many centimeters are in 7 feet, given that 1 inch = ≈ 2.54 cm

  Solution:

  7 feet x $\frac{12 \text{ inches}}{1 \text{ foot}}$ x $\frac{2.54 \text{ cm}}{1 \text{ inch}}$ = 7 ~~feet~~ x $\frac{12 \text{ ~~inches~~}}{1 \text{ ~~foot~~}}$ x $\frac{2.54 \text{ cm}}{1 \text{ ~~inch~~}}$ = 7 x 12 x 2.54 cm = 213.36 cm

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.6.8, LEAP.III.6.1, LEAP.III.6.3

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Ratio and Rate 6.PF.A.1 6.PF.A.2 6.PF.A.3	Uses ratio and rate reasoning to solve real-world and mathematical problems, including ratio, unit rate, percent, and unit conversion problems, **using and connecting a variety of representations and strategies.**	Uses ratio and rate reasoning to solve **real-world and** mathematical problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.	**Uses ratio and rate reasoning to** solve **mathematical** problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.	Solves problems, including ratio, unit rate, percent, and unit conversion problems using a limited variety of representations and strategies.
	Finds missing values in tables and plots pairs of values on the coordinate plane.	Finds missing values in tables and locates **and plots** pairs of values on the coordinate plane.	**Finds missing values in tables and locates pairs of values on the coordinate plane.**	

Cross Content Connections

Mathematics supports understanding and skills across all disciplines. The ability to apply mathematics learning across disciplines allows students to transform abstract concepts into practical tools, deepen engagement, think critically, and apply mathematics to the real world.

English Language Arts

The connection between math and English language arts (ELA) begins in disciplinary literacy, which requires literacy skills in technical subjects, including the ability to decode complex word problems as narrative structures. Students must master the language of math by using ELA skills like reading comprehension and argumentative writing to explain their reasoning, prove theorems, and articulate the logic behind their numerical solutions.

Science

K-12 math and science are deeply integrated, with mathematics serving as the essential language that allows students to quantify, model, and analyze real-world phenomena they observe in science. As students progress, they use mathematics and computational thinking — ranging from simple data graphing to complex algebraic modeling — to turn raw scientific observations into evidence-based conclusions and predictable patterns. Explicit connections between the LSSM and Louisiana Student Standards for Science (LSSS) can be found on the Connections to K-12 ELA and Math document within the LSSS files.

Computer Science

The integration of mathematics and computer science is codified through state standards that treat computational thinking as a practical application of algebraic logic and problem-solving. Students use mathematical foundations, such as functions and data analysis, to build algorithms and write code that solves real-world challenges in Louisiana's growing technology and energy sectors. The Louisiana CS Frameworks make explicit connections and embed technology tools such as artificial intelligence to support students as they engage in math and computer science learning. Students can strategically use artificial intelligence tools to explore math ideas, test conjectures, analyze patterns and trends, and refine their thinking. The appropriate and skillful use of artificial intelligence in math requires students to use their mathematical reasoning to validate and critique artificial intelligence outputs in addition to naming how the use of artificial intelligence

supports and extends their thinking, understanding, and reasoning about concepts, ensuring the student maintains ownership of the mathematics, and leverages artificial intelligence as a resource.

Social Studies

The intersection of math and social studies is most evident in the analysis of historical data and economic trends, allowing students to quantify the impact of events such as the Great Flood of 1927 or the evolution of Louisiana's energy industry. By applying statistical tools to demographic shifts and geographic mapping, students move beyond historical content standards to demonstrate understanding of the skills and practices standards for social studies. Identifying and interpreting mathematical patterns strengthens students' ability to recognize trends that have shaped the geographical, economic, political, and cultural landscape of our state, nation, and world.

Leveraging Lower Grade Standards to Support Student Learning

Grade 1 Standards

■ **1.AR.B.3** Apply properties of operations to add and subtract.
Return to ■ 6.AR.A.3

Grade 3 Standards

■ **3.AR.B.5** Apply properties of operations as strategies to multiply and divide.
Return to ■ 6.AR.A.3

■ **3.AR.B.6** Understand division as an unknown-factor problem, providing an explanation that leverages the relationship between and the properties of multiplication and division.
Return to ■ 6.NOF.A.1

■ **3.NOF.A.2** Understand a fraction with denominators 2, 3, 4, 6, and 8 as a number on a number line diagram.

a. Represent a fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size $\frac{1}{b}$ and that the endpoint of the part, based at 0, locates the number $\frac{1}{b}$ on the number line.
b. Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off *a* lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line.

Return to ■ 6.NOF.C.6

Grade 4 Standards

■ **4.AR.A.2** Multiply or divide to solve real-world mathematical tasks involving multiplicative comparison.

a. Represent these tasks by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

Return to ■ 6.PF.A.1, ■ 6.PF.A.2

■ **4.NOF.C.7** Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{(n \times a)}{(n \times b)}$ by using visual fraction models or number line diagrams, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. (Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100.)
Return to ○ 6.NOF.B.3

◘ **4.AR.B.4** Using whole numbers in the range 1–100,

a. Find all factor pairs for a given whole number.
b. Recognize that a given whole number is a multiple of each of its factors.
c. Determine whether a given whole number is a multiple of a given one-digit number.
d. Determine whether a given whole number is prime or composite.

Return to ○ 6.NOF.B.4, ■ 6.AR.A.1

◘ **4.DM.A.1** Know relative sizes of measurement units within one system of units, including: ft, in; km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.

a. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. (Conversions are limited to one-step conversions.)
b. Record measurement equivalents in a two-column table. (Conversions are limited to one-step conversions.)

Return to ■ 6.PF.A.1

◘ **4.DM.A.3** Apply the area and perimeter formulas for rectangles in real-world mathematical tasks.
Return to ◘ 6.GL.A.1

◘ **4.DM.D.7** Recognize area as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.

a. Solve addition and subtraction real-world mathematical tasks to find unknown angles on a diagram, e.g., by using an equation with a letter for the unknown angle measure.

Return to ◘ 6.GL.A.1

Grade 5 Standards

○ **5.AR.A.2** Write simple expressions that record calculations with whole numbers, fractions and decimals, and interpret numerical expressions without evaluating them.
Return to ○ 6.NOF.B.4, ■ 6.AR.A.2, ■ 6.AR.A.3

○ **5.AR.B.3** Generate and extend two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Explain these relationships informally.

a. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

Return to ■ 6.PF.A.1, ■ 6.AR.A.2, ■ 6.AR.C.8

■ **5.NOF.C.9** Explain and apply patterns when multiplying or dividing a number by powers of 10.

a. Explain and apply patterns in the number of zeros of the product when multiplying a number by powers of 10.
b. Use whole-number exponents to denote powers of 10.

Return to ■ 6.AR.A.1

■ **5.NOF.D.13** Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value understanding, the properties of operations, subtracting multiples of the divisor, and/or the relationship between multiplication and division.

a. Illustrate and/or explain the calculation by using equations, rectangular arrays, area models, or other strategies based on place value understanding.

Return to ○ 6.NOF.B.2, ○ 6.NOF.B.3

■ **5.NOF.D.14** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value understanding, properties of operations, and/or the part-whole relationship between addition and subtraction or multiplication and division.

a. Justify the reasoning of methods used for calculation with a written explanation.

Return to ○ 6.NOF.B.3

■ **5.NOF.A.1** Add and subtract fractions with unlike denominators (including mixed numbers and fractions greater than 1) by replacing given fractions with equivalent fractions to produce an equivalent equation with fractions that have like denominators.

Return to ■ 6.AR.B.6

■ **5.NOF.B.3** Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b}$ = a ÷ b). Solve real-world mathematical tasks involving division of whole numbers in the form of fractions to include fractions greater than one or mixed numbers, e.g., by using visual fraction models, number line diagrams, or equations to represent the problem.

Return to ■ 6.PF.A.2

■ **5.NOF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product ($\frac{m}{n}$) x q as *m* parts of a partition of *q* into *n* equal parts; equivalently, as the result of a sequence of operations, m x q ÷ n.
b. Construct or critique a model to develop understanding of the concept of multiplying two fractions and create a story context for the equation. In general, ($\frac{m}{n}$) x ($\frac{c}{d}$) = $\frac{(mc)}{(nd)}$.

Return to ■ 6.AR.B.6, ◘ 6.GL.A.1

■ **5.NOF.B.5** Interpret multiplication as scaling (resizing) by:
a. Comparing the size of a product to the size of one factor based on the size of the other factor, without performing the indicated multiplication.
b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case).
c. Explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number.
d. Relate the principle of fraction equivalence $\frac{a}{b}$ = $\frac{(nxa)}{(nxb)}$ to the effect of multiplying $\frac{a}{b}$ by 1.

Return to ■ 6.PF.A.1

■ **5.NOF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions within and without the context of real-world mathematical tasks, e.g., by using visual fraction models, number line diagrams, or equations to represent the problem.
a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.
b. Interpret division of a whole number by a unit fraction, and compute such quotients.

Return to ■ 6.PF.A.2, ■ 6.NOF.A.1

■ **5.NOF.D.12** Fluently multiply multi-digit whole numbers using a standard algorithm.

Return to ○ 6.NOF.B.3

◘ **5.DM.B.2** Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$).
- Use operations on fractions, excluding dividing fractions by fractions, to solve real-world mathematical tasks involving information presented in line plots.

Return to ○ 6.DA.A.1, ○ 6.DA.A.2, ○ 6.DA.B.4

■ **5.DM.C.5** Relate volume to the operations of multiplication and addition and solve real-world mathematical tasks involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and connect that the volume is the same as multiplying the edge lengths, also by multiplying the height by the area of the base (i.e., compute the layers of area).
    - Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
b. Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world-mathematical tasks.
c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world mathematical tasks..

Return to 6.GL.A.2

5.GL.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates.

- Understand that in an ordered pair, the first number shows how far to move along the x-axis, and the second number shows how far to move along the y-axis from the origin. With this convention, the names of the two axes and the coordinates correspond.

Return to 6.NOF.C.6

5.GL.A.2 Represent real-world mathematical tasks by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Return to 6.NOF.C.8, 6.GL.A.3