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New Mexico Instructional Scope

7th Grade Number System Guide

The purpose of this tool is to help educators understand each of the grade level standards and how those standards connect to the students' overall preparation for college and career readiness.

The NMIS is a teacher-influenced tool, designed to provide instructional planning support at the programmatic level for districts and instructional level for teachers. Its foundation stems from the vision and mission of the PED and came into existence to assure that students in NM will be engaged in a culturally and linguistically responsive educational system that meets the social, emotional, and academic needs of ALL students. This is also rooted in the belief that all students must have access to on-grade-level standards, focusing on acceleration. The purpose of this tool is to help educators understand each of the grade level standards and how those standards connect to the students' overall preparation for college and career readiness.

Standards are defined as the most critical prerequisite skills and knowledge. This document is color-coded to reflect both anchor and priority standards. Though previous emphasis was placed on priority standards to address lost learning due to COVID-19, New Mexico teachers should note that moving forward, while priority standards allow for acceleration of learning, all standards should be addressed in instruction throughout the school year.

In this guide you will find:

- A breakdown of each of the grade level standards within the cluster, including:
  - Standards of Mathematical Practice
  - Common Misconceptions
  - Identification of Priority Standards, as identified by NMPED.
  - Level of Rigor Identification
- Sample aligned assessment items
- Suggested Student Discourse Guide
- A multilayered system of supports (MLSS) and culturally and linguistically responsive instruction (CLR) guide

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Key		
	Priority Standard	Priority standards, as identified by NMPED, are denoted with red highlighting. Priority standards are the most critical prerequisite skills and knowledge a student needs. This does not mean that these are only standards required to be taught, just these are the standards that will allow for the acceleration the students of New Mexico need during this time.
	*Conceptual Understanding*	Conceptual Understanding standards help students build a deep understanding of the **how** and **why** of mathematics.
	*Application*	Application standards help students identify the appropriate concepts and skills to tackle **novel real-world problems.**
	*Procedural Skill and Fluency*	Procedural standards help students develop **efficiency** and **accuracy** in computations.

Standards Breakdown

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
  - 7.NS.A.1
  - 7.NS.A.2
  - 7.NS.A.3

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Grade	*CCSS Domain*	*CCSS Cluster*
7	**THE NUMBER SYSTEM**	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers**

Cluster Standard: 7.NS.A.1

Standard	Standards for Mathematical Practice
Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. A: Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. B: Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. C: Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts. D: Apply properties of operations as strategies to add and subtract rational numbers.	• **SMP 5:** Use appropriate tools strategically. • **SMP 8:** Look for and express regularity in repeated reasoning.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
• Students learn to add and subtract rational numbers. As students begin this work visual representations are critical; they become less necessary as students become more fluent with these operations. In sixth grade, students found	• Solve numerical addition and subtraction equations by using the properties of operations • Define and apply the commutative, associative, and additive identity properties to rational numbers

the distance of horizontal and vertical segments on the coordinate plane. In seventh grade, students build on this understanding to recognize subtraction as finding the distance between two numbers on a number line. This standard allows for adding and subtracting negative fractions and decimals and interpreting solutions in a given context. Students should learn to use the terms “rational numbers”, “additive inverse”, and “integers” with increasing precision	• Formulate rules for integer operations • Expressively (orally and in writing) express understanding of “positive”, “negative”, “additive inverse”, and “zero” • Model combining positive and negative numbers and provide a rationale for their solutions • Apply mathematics to real world examples of positive and negative numbers
DOK	**Blooms**
1-2	Understand

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Grade	*CCSS Domain*	*CCSS Cluster*
7	**THE NUMBER SYSTEM**	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

Cluster Standard: 7.NS.A.2

Standard	Standards for Mathematical Practice
Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. A: Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. B: Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(– q). Interpret quotients of rational numbers by describing real world contexts. C: Apply properties of operations as strategies to multiply and divide rational numbers. D: Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.	● **SMP 5:** Use appropriate tools strategically. ● **SMP 6**: Attend to precision.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
● Students learn to add and subtract rational numbers. As students begin this work visual representations are critical; they become less necessary as students become more fluent with these operations. In sixth grade, students found	● Discover the rules for multiplying rational numbers Refer to the negative (-) sign correctly as “negative” or ``the opposite of” to make sense of real-world context. ● Conclude that properties of the operations for

the distance of horizontal and vertical segments on the coordinate plane. In seventh grade, students build on this understanding to recognize subtraction as finding the distance between two numbers on a number line. This standard allows for adding and subtracting negative fractions and decimals and interpreting solutions in a given context. Students should learn to use the terms "rational numbers", "additive inverse", and "integers" with increasing precision.	multiplication are still applicable to rational numbers. ● Use reasoning to determine that division by zero is undefined. ● Discover that division as the inverse of multiplication still applies to rational numbers. ● Generalize rules for division with signed numbers from examples. Use and articulate notations interchangeably p ÷(-q) is the same as p⁄-q. Interpret a rational quotient ● Clarify their own understanding of the relationship between multiplications and division of rational numbers through writing. ● Develop fluency through practice with multiplication and division of rational numbers. ● Use properties of the operations to explain the solutions to real world problems. ● Clarify and explain their understanding of properties of operations using mathematical discourse. ● Use math vocabulary appropriately. ● Use long division to convert rational numbers in fraction form to decimal form ● Explain why and how they know a long division quotient will repeat. ● Sort the decimal form of a rational numbers into two types: terminating or repeating
DOK	**Blooms**
1-2	Understanding, Apply

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Grade	*CCSS Domain*	*CCSS Cluster*
7	**THE NUMBER SYSTEM**	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

Cluster Standard: 7.NS.A.3

Standard	Standards for Mathematical Practice
Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)	• **SMP 2**: Reason abstractly and quantitatively. • **SMP 3**: Construct viable arguments and critique the reasoning of others. • **SMP 4**: Model with mathematics.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
• Students learn to add and subtract rational numbers. As students begin this work visual representations are critical; they become less necessary as students become more fluent with these operations. In sixth grade, students found the distance of horizontal and vertical segments on the coordinate plane. In seventh grade, students build on this understanding to recognize subtraction as finding the distance between two numbers on a number line. This standard allows for adding and subtracting negative fractions and decimals and interpreting solutions in given context. Students should learn to use the terms "rational numbers", "additive inverse", and "integers" with increasing precision	• Apply operations with rational numbers to problems that involve the order of operations • Solve mathematical problems that use the four operations with rational numbers • Compute with complex fractions
DOK	**Blooms**
1-2	Understand, Apply

Common Misconceptions

- The major misconceptions in this cluster are around the conceptualization of integer operations and the properties of subtraction. Students may struggle with using the number line to understand positive and

negative numbers as distances from zero. It is important to use models to allow students to visualize rational numbers. When moving into operations, subtraction can lead to misconceptions when students must recall that subtraction is not commutative. They also may find difficulties with conceptualization when expressing that subtraction is the same as adding the inverse.

Student Discourse Guide

- **Purposeful, rich classroom discourse offers students the opportunity to express their ideas, thinking, and to critique the reasoning of others in a variety of ways (writing, drawing, verbal). Purposeful implementation of classroom discourse allows students to activate funds of knowledge and to refine their mathematical understanding. When students have frequent opportunities for discourse they find various paths to solutions and reveal knowledge or misunderstandings to educators. The process also allows educators to honor students' culture, lived experiences and evolving math identities.**
- **Discourse that focuses on tasks that promote reasoning and problem solving is a primary mechanism for developing conceptual understanding and meaningful learning of mathematics (Michaels, O'Connor, and Resnick, 2008)**

Domain: **The Number System**	Strand: **Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers**

Suggested Student Discourse Questions

- How can we predict that the sum of two integers is positive, negative or zero?
- How is subtraction the same as adding the inverse (additive property)?
- How can we make a connection between the commutative property and how we live in our community?
- What is the difference between the opposite and the absolute value of a number?

ASSESSMENT GUIDE

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

Grade	*CCSS Domain*	*CCSS Strand*
7	**THE NUMBER SYSTEM**	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

Sample Task #1 (Constructed Response)

. Michael has a jar with 24 coins.

- $\frac{3}{8}$ of the coins are United States coins.
- The rest of the coins are foreign coins.

Michael adds 12 United States coins to the jar.

a. What fraction of the coins in the jar are **foreign** coins now? Show your work or explain how you know.

Michael continues to add United States coins to the jar.

b. How many more United States coins must Michael add to the jar so that $\frac{1}{8}$ of the coins are foreign coins? Show your work or explain how you know.

Sample Task #2 (Multiple Choice)

. Look at this expression.

$$\left(-\frac{3}{5}\right)\times\left(-\frac{7}{8}\right)$$

Which statement about the expression is true?

Ⓐ The product is greater than 1.
Ⓑ The product is a negative number.
Ⓒ The product is less than both factors.
Ⓓ The product is greater than both factors.

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MLSS AND CLR GUIDE

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

CCSS Domain	*CCSS Cluster*
The Number System	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers**

Culturally and Linguistically Responsive Instruction

Relevance to Families and Communities	During a unit focused on apply and extend previous understanding of operations with fractions, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, for example, fractions are used for cooking, the amount of ingredients may need to increase or decrease based on the members of the family. Being able to convert fractions is essential.
Cross-Curricular Connections	**Science and Technology:** Science and math are intimately connected, particularly in fields such as chemistry, astronomy and physics. Students who can't master basic arithmetic skills will struggle to read scientific charts and graphs. More complex math, such as geometry, algebra and calculus, can help students solve chemistry problems, understand the movements of the planets and analyze scientific studies. Math is also important in practical sciences, such as engineering and computer science. Students may have to solve equations when writing computer programs and figuring out algorithms. Nursing majors may have great bedside manner. but they also need to know how to precisely calculate dosages to pass their courses. **Social Studies:** Social studies classes, such as history, often require students to review charts and graphs that provide historical data or information on ethnic groups. In geography classes, students might need to understand how the elevation of an area affects its population or chart the extent to which different populations have different average life spans. Knowledge of basic mathematical terms and formulas makes statistical information accessible **Literature and Writing**: Literature might seem like a far cry from math but mastering basic arithmetic can enable students to better understand poetry. The meter of poetry, the number of words to include in a line and the effect that certain rhythms have on the reader are all products of mathematical calculations. At a more mundane level, math can help students plan reading assignments in literature classes by

	discerning their average reading time and estimating how long it will take them to read a particular work. The linear, logical thinking used in mathematical problems can also help students write more clearly and logically. **Art/Music:** Students interested in pursuing careers in theater, music, dance or art can benefit from basic mathematical knowledge. Musical rhythm often follows complex mathematical series, and math can help students learn the basic rhythms of dances used in ballet and theater performances. Art thrives on geometry, and students who understand basic geometric formulas can craft impressive art pieces. Photographers use math to calculate shutter speed, focal length, lighting angles and exposure time.

Validate/Affirm/Build/Bridge	• *How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?* • *How can you create connections between the cultural and linguistic behaviors of your students' home culture and language, the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?*	• Goal Setting: Setting challenging but attainable goals with students can communicate the belief and expectation that all students can engage with interesting and rigorous mathematical content and achieve in mathematics. Unfortunately, the reverse is also true, when students encounter low expectations through their interactions with adults and the media, they may see little reason to persist in mathematics, which can create a vicious cycle of low expectations and low achievement. For example, when studying application and extension of previous understandings of operations with fractions to add, subtract, multiply, and divide with rational numbers, goal setting is critical because it provides students opportunities to use mathematics to understand and investigate meaningful situations.

Planning for Multi-Layered System of Supports

Vertical Alignment		
Previous Learning	***Current Learning***	***Future Learning***

• In grade 6, learners understand that positive and negative numbers are used together to describe quantities having opposite directions or values. In grade 6, learners solve problems involving fractions by fractions. In grade 6, learners use order of operations to solve problems	• In grade 7, learners apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. In grade 7, learners solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form. In grade 7, learners use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities.	• In grade 8, learners understand that there are numbers that are not rational and approximate them by rational numbers. In grade 8, learners use square root and cube root symbols to represent solutions to equations of the form x6 2 = p and x 3 = p, where p is a positive rational number.

Suggested Instructional Strategies

Pre-Teach

Level of Intensity	***Essential Question***	***Examples***
Targeted	*What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?*	For example, some learners may benefit from targeted pre-teaching that rehearses prior learning when studying application and extension of previous understandings of operations with fractions to add, subtract, multiply, and divide with rational numbers because students learn best when concepts are connected, and they can "see" the connection across and within grade levels. This allows a familiarity and comfort level to approach new or different tasks using what they already know.
Intensive	*What critical understandings will prepare students to access the mathematics for this cluster?*	*6.NS.C.5 This standard provides a foundation for work with applying and extending previous understandings of operations with fractions to add, subtract, multiply, and 5 divide rational numbers because in Grade 6, the number line is extended to include negative numbers. Students initially encounter negative numbers in contexts where it is natural to describe both the magnitude of the quantity, e.g. vertical distance from sea level in meters, and the direction of the quantity (above or below sea level). If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.*

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Universal Support Framework		
A student should know/understand...	A student should be able to do...	***Potential Scaffolds***

• A number and its opposite are equidistant from zero. Opposites are called additive inverses because their sum is zero.
• Understand that |p| is the (positive) distance from p to zero on a number line, regardless of which direction p is from zero.
• Subtraction of integers is the same as adding the opposite.
• Different interpretations for the (−) sign such as "negative" or "the opposite of"
	• Use properties to add or subtract rational numbers.
	• Multiply and divide rational numbers and use properties of arithmetic to model multiplication and division of rational numbers.
	• Convert a rational number into a terminating or repeating decimal using long division.
	• Solve real world problems involving the four operations with rational numbers.
	•
		• Build on students' experience with the following skills:
		  ○
		  ○ Understand positive and negative numbers.
		  ○ Understand how positive and negative numbers are used together to describe quantities having opposite directions or values.
		  ○ Solve problems involving fractions by fractions.
		  ○ Use order of operations to solve problems.
		• Cognitive Strategies
		  ○ Repeatedly model the strategies
		  ○ Monitor the students' use of the strategies
		  ○ Provide feedback to students
		  ○ Teach self-questioning and self-monitoring strategies
		  ○ Introduce multiple means of representation for mathematical ideas
		• Encourage students to use alternative tools to better access the grade level content. Examples include:
		  ○ Multiplication chart
		  ○ Divisibility Rules (Prime Factorization)

Re-Teach		
Level of Intensity	***Essential Question***	***Examples***
Targeted	What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisited during a unit?	Examine assessments for evidence of lingering misconceptions (see common misconceptions). If students exhibit one more of these misconceptions, consider addressing the misconception by re-engaging with content during a unit on applying and extending previous understandings of operations with fractions to

		add, subtract, multiply, and divide rational numbers by clarifying mathematical ideas and/or concepts through a short mini lesson because it identifies and corrects 7 misconceptions, allows for quick formative checks for understanding to move learning forward.
Intensive	What assessment data will help identify content needing to be revisited for intensive interventions?	Examine assessments for evidence of students still developing the underlying ideas. For example, some students may benefit from intensive extra time during and after a unit applying and extending previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers by confronting student misconceptions because it allows response to instruction as well as to response to intervention.

Extension	
Essential Question	***Examples***
What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?	To extend students learning : For example, some learners may benefit from an extension such as in-depth, self-directed exploration of self-selected topics when studying application and extension of previous understandings of operations with fractions to add, subtract, multiply, and divide with rational numbers because extension and/or enrichments using rich mathematical tasks can be essential for engaging learners and creating dynamic classrooms. Rich modeling tasks are often the missing piece in problem-solving experiences in the classroom.