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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

- Analyze proportional relationships and use them to solve real-world and mathematical problems
  - 7.RP.A.1
  - 7.RP.A.2
  - 7.RP.A.3

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Grade	CCSS Domain	CCSS Cluster
7	**Ratios and Proportional Relationships**	**Analyze proportional relationships and use them to solve real-world and mathematical problems.**

Cluster Standard: 7.RP.A.1

Standard	Standards for Mathematical Practice
Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.	● **SMP 1:** Make sense of problems and persevere in solving them. ● **SMP 6:** Attend to precision.

Clarification Statement	Students Who Demonstrate Understanding Can...
● Students will continue their work with ratios to analyze proportions and proportional relationships.	● Discover that the structure of computing unit rates with whole numbers is the same concept as unit rates with ratios of fractions. ● Compute unit rates in real world problems that involve complex fractions. ● In writing, explain the errors that can be made when computing unit rates with complex fractions.

DOK	Blooms
1-2	Understand, Apply

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Grade	CCSS Domain	CCSS Cluster
7	**Ratios and Proportional Relationships**	**Analyze proportional relationships and use them to solve real-world and mathematical problems.**

Cluster Standard: 7.RP.A.2

Standard	Standards for Mathematical Practice
7.RP.A.2: Recognize and represent proportional relationships between quantities. ● 7.RP.A.2.A: Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. ● 7.RP.A.2.B: Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. ● 7.RP.A.2.C: Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. ● 7.RP.A.2.D: Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.	● **SMP 5:** Use appropriate tools strategically. ● **SMP 7:** Look for and make use of structure.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
● Students expand their knowledge of unit rates to include computations with complex fractions. They recognize and represent proportional relationships in equations, in tables, and on graphs.	● Sort real-world examples from non-examples. ● Create their own examples to demonstrate they understand the concept of proportional relationships. ● Communicate (orally/writing) that a proportion is a statement of two equivalent ratios. ● Model proportional relationships- concrete, visual, abstract (verbal [sentence], table, graph,

	equation).
	● Prove or disprove proportional relationships between two points.
	● Determine appropriate representation of a proportional relationship.
	● Fluently assess and solve problems from various representations.
	● Model proportional relationships in several different ways.
	● Translate a proportional relationship from verbal, table, graph, equation.
	● Determine the unit rate from verbal, tables, graphs, equations, diagrams.
	● Connect that the unit rate is the pattern or numerical coefficient (k or m) of the equation y=kx + b or y = mx + b.
	● Model proportional relationships in equation form. • Justify in writing the reasoning used to create an equation.
	● Explain the meaning of a point on a graph in context.
	● Discover that graphed proportional relationships are straight lines.
DOK	**Blooms**
1-2	Understand, Apply

Grade	CCSS Domain	CCSS Cluster
7	**Ratios and Proportional Relationships**	Analyze proportional relationships and use them to solve real-world and mathematical problems.

💡 Cluster Standard: 7.RP.A.3

Standard	Standards for Mathematical Practice
Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.	**SMP 3:** Construct viable arguments and critique the reasoning of others. **SMP 8:** Look for and express regularity in repeated reasoning.

Clarification Statement	Students Who Demonstrate Understanding Can...
Students use proportional reasoning to solve multi-step ratio and percent problems involving real world scenarios (percent change, sales tax, simple interest, etc.)	- Explore and connect vocabulary terms with real world examples. - Explain how they are used in each situation. - Solve problems proportional problems using cross multiplication. - Solve percent error and percent increase/decrease problems. - Explain how formulas for percent error and increase/decrease are similar.

DOK	Blooms
1-2	Understand, Apply

Common Misconceptions

- Direct Versus Proportional Division: Mistakes occur when direct instead of proportional division is used. For example, if it takes 2 people 4 hours to do a certain task, students may mistakenly think that it would take 1 person 2 hours rather than 8 hours. (ASCD Source) - Common vocabulary words such as sale, discount, and tax. Student will come in with a variety of	When using a graph and locating the unit rate, students have difficulty identifying which variable the x, or y (x,y) is the unit rate. Using an example such as 1 orange for $0.35, 1 is X and cost is Y.

background knowledge with a concept of the meaning of this vocabulary	

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: **Ratios and Proportional Relationships**	Strand: **Analyze proportional relationships and use them to solve real-world and mathematical problems**

Suggested Student Discourse Questions

- How can we assess the reasonableness of answers using estimation? - Where do we see the use of unit rates in our day to day life?	- What would be the meaning of the unit rates if the numerator and denominator are reversed (reciprocal of the unit rate)? - How would you describe the information given by the unit rate?

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ASSESSMENT GUIDE
● Analyze proportional relationships and use them to solve real-world and mathematical problems

Grade	CCSS Domain	CCSS Strand
7	**Ratios and Proportional Relationships**	**Analyze proportional relationships and use them to solve real-world and mathematical problems**
	Sample Task #1 (Constructed Response)	

There are 200 students in the 7th grade, and 40% of them are in band.

a. How many students in the 7th grade are in band?

There are 8 students in the 7th grade who play the flute in band.

b. What percent of all students in the 7th grade play the flute in band? Show your work or explain how you know.

...nd 8th grade in band. The 7th grade students ...band.

...in band? Show your work or explain how

A chair that is normally priced at $75 is marked down to $41.25. What is the percent of the discount?

Ⓐ 34%

Ⓑ 45%

Ⓒ 55%

Ⓓ 82%

MLSS AND CLR GUIDE

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

CCSS Domain	CCSS Cluster
Ratios and Proportional Relationships	**Analyze proportional relationships and use them to solve real-world and mathematical problems**

Culturally and Linguistically Responsive Instruction

Relevance to Families and Communities	During a unit focused on how to analyze proportional relationships and use them to solve real-world and mathematical problems, 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, by having students examine proportional relationships in different recipes. Having students make their favorite recipe that requires them to double or triple the ingredients based on the number of servings the recipe yields vs. the number of servings needed.
Cross-Curricular Connections	Science: Evaluate design solutions for maintaining biodiversity and probability of surviving and reproducing in a specific environment.
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*	Building Procedural Fluency from Conceptual Understanding: Instruction should build from conceptual understanding to allow students opportunities to make meaning of mathematics before focusing on procedures. When new learning begins with procedures it privileges those with strong prior familiarity with school mathematics procedures for solving problems and does not allow learning to build for more methods for solving tasks that occur outside of school mathematics. For example, when studying how to analyze proportional relationships and use them to solve real-world and mathematical problems the types of mathematical tasks are critical because students come to our classrooms with *Informal Knowledge/Funds of Knowledge*.

	creating mathematical identities as capable mathematicians that can use mathematics within school and society?	

Planning for Multi-Layered System of Supports

Vertical Alignment

Previous Learning	*Current Learning*	*Future Learning*
● This cluster connects student learning from 6th grade with ratios. Students learned to understand, represent, compare, and reason with ratios. These skills will be necessary as students analyze proportional relationships.	● Students connect their understanding of rational numbers to solve for unit rates, proportional reasoning and percent problems throughout grade 7.	● Students will continue to connect their understanding of units as a way to understand problems and find the solution in a multi-step problem. Students choose and interpret units consistently in formulas, choose and interpret the scale and origin in graphs and data displays.

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?*	In Grade 6, students learned to reason about ratios by using equivalent ratios, tables of equivalent ratios, bar diagrams, and double-number-line diagrams. . They also were introduced to a special type of ratio called a rate. Provide opportunities to review terms, and methods for solving fraction division.
Intensive	*What critical understandings will prepare students to access the mathematics for this cluster?*	6.RP.A.2 This standard provides a foundation for work with analyzing proportional relationships and using them to solve real-world and mathematical problems because teachers can help students develop the concept of unit rates. Its purpose is to help students see that when you have a context that can be modeled with a ratio and associated unit rate, there is almost always another ratio with its associated unit rate (the only exception is when

		one of the quantities is zero), and to encourage students to flexibly choose either unit rate depending on the question at hand. 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.

Universal Support Framework		
A student should know/understand...	A student should be able to do...	*Potential Scaffolds*
- A complex fraction is a fraction where the numerator, denominator, or both contain a fraction and can be simplified by dividing the numerator by the denominator. - In an equation that represents a proportional relationship, the coefficient represents the same quantity as the unit rate, as well as the constant of proportionality. - The graph of a proportional relationship is a line that passes through the origin. - The meaning of the percent of increase/decrease.	- Simplify complex fractions, including calculating unit rates from a given complex fraction or ratio with unlike units. - Write equations from context and identify the coefficient as the unit rate (which is also the constant of proportionality.) - Graph relationships to determine if two quantities are a proportional relationship and interpret the ordered pairs. - Determine the percent change from one quantity to another, as well as identify that change as an increase or a decrease.	- Build on students' experience with the following skills: - Understand, represent, compare and reason with ratios. - 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: - Graphic Organizer with blank ratio tables - Multiplication Charts - Graphic Organizer with an example of proportional graph and a non-proportional graph

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 analyzing proportional relationships and using them to solve real-world and mathematical problems by revisiting student thinking through a short mini-lesson because reviewing equivalent ratios and unit rates reminds students that they can find equivalent ratios using multiplication or division.
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 analyzing proportional relationships and using them to solve real-world and mathematical problems by offering opportunities to understand and explore different strategies because and make sure students understand the difference between rate and unit rate. Connect that unit rate is one of many representations of equivalent ratios they can find.

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: some learners may benefit from an extension such as the application of and development of abstract thinking skills when studying analyzing proportional relationships and using them to solve real-world and mathematical problems because it advances students by challenging them to find unit rates using complex fractions and converting them to decimals.