NEW MEXICO
Public Education Department

6.RP: RATIO AND PROPORTIONAL RELATIONSHIPS

Cluster Statement: A: Understand ratio concepts and use ratio reasoning to solve problems.

Major Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.	SMP 6: Students can attend to precision by communicating precisely with others and using clear mathematical language when describing a ratio relationship between quantities. SMP 8: Students look for and express regularity in repeated reasoning by identifying patterns of regularity in a ratio relationship that demonstrate the proportionality. They can extend the pattern to create additional equivalent ratios and rates in various forms, including an equation, a table, a graph, etc. They can use the patterns to discuss the ratio relationship, explain their strategy and/or solution to a given problem.	• Understand and explain that a ratio is a comparison of two quantities. • Describe what a ratio illustrates using ratio language. • Write a ratio relationship in the forms a:b, a to b, a/b. • Translate a ratio relationship into words. • Understand the differences between part:part and part:whole relationships. **Webb's Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand

<table>
<tr>
<td>Standard Text

6.RP.A.2: Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.</td>
<td>Standard for Mathematical Practices

SMP 2: Students can reason abstractly and quantitatively by analyzing and comparing ratios and unit rates in tables, equations, and graphs from a variety of situations.

SMP 4: Students can model with mathematics by analyzing real-life ratio situations with mathematics and creating mathematical representation to model the situation.

SMP 6: Students can attend to precision by communicating precisely with others and use clear mathematical language when describing a ratio relationship between quantities.

SMP 7: Students can look for and make use of structure by making connections between covariance, rates, and representations showing the relationships between quantities.</td>
<td>Students who demonstrate understanding can:
• Define a unit rate in relation to the concept of a ratio.
• Calculate unit rates from scenarios.
• Read and hear contexts involving unit rates and interpret them.
• Represent units rates symbolically, in contexts, and through visuals.
• Use precise language of unit rate to describe ratio relationships both orally and in writing.

Webb’s Depth of Knowledge: 1-2

Bloom’s Taxonomy:
Understand, Apply</td>
</tr>
<tr>
<td>Standard Text

6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</td>
<td>Standard for Mathematical Practices

SMP 2: Students reason abstractly and quantitatively by representing a wide variety of real-world contexts through the use of real numbers and variables in mathematical terms. Students consider the ratio relationship contained in the problem to understand the meaning of the number or variable. They use multiplicative reasoning when finding the missing element in a proportion. They will manipulate symbolic representations such as tables, tape diagrams, graphs, etc. by applying properties of operations. They will interpret their solution in the context of the original ratio relationship and/or the equivalent rate.

SMP 3: Students construct viable arguments, in both a verbal and written format, to support and defend their solution, strategy, reasoning, and interpretation. They will use mathematical and proportional</td>
<td>Students who demonstrate understanding can:
• Create and interpret tables of equivalent ratios
• Plot values from a table on a coordinate plane
• Examine tables in order to compare ratios.
• Solve real-world unit rate problems
• Calculate the percent of a quantity as a rate per 100.
• Reason with ratios to convert, manipulate and transform units of measure

Webb’s Depth of Knowledge: 1-2

Bloom’s Taxonomy:
Understand, Apply</td>
</tr>
</table>

	reasoning (in addition to possible visual representations such as a table, double number line, graph, etc) to support and defend their argument. They will critically analyze and evaluate their reasoning and strategies, as well as those of their peers. They will ask and answer questions such as: "How does your answer relate to the ratio relationship in the problem?" "How do you know your answer is correct?" "Can you use another strategy or show that in a different way?" SMP 4: Student model a ratio relationship in various forms such as an equation or inequality, a table, a tape diagram, a double number line diagram, a graph. In addition, they can use a model to demonstrate when a relationship is not proportional. They can use mathematical symbols and visual diagrams. They can use the models to support and defend their reasoning.	
Previous Learning Connections • Connect students' previous understandings of conversion tables, graphing points, and how these ideas connect to the real-world. These previous understandings will support students in their understanding of number relationships, specifically when comparing numbers. • In Grade 4, learners were taught to multiply or divide to solve word problems involving multiplicative comparison. In Grade 5, learners had to interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b) AND interpret	**Current Learning Connections** • Connect student understandings of ratio relationships and number relationship as they move to use variables to represent two quantities that change in relationship to one another in the 6.EE.9 CCSS.	**Future Learning Connections** • Connect student understanding of ratios and rate from Grade 6 to compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. • These skills from this cluster are connected in Grade 7 when learners will recognize and represent proportional relationships between quantities. This includes student understanding of proportional relationships to solve multistep ratio and percent problems.

multiplication as scaling or resizing. These skills will need to be explicitly reviewed to support student success with this domain.		

Clarification Statement:
Students are introduced to ratios, a relationship or comparison of two quantities or measures. They will represent ratios in various forms (a:b, a to b, a/b) and compare types of ratios. They will use reasoning about multiplication and division to solve ratio and rate problems about quantities. Students will learn how and where ratios and rates are used in the real world.

Common Misconceptions
When working to solve ratio problems, students may run into confusion with the order of quantities (i.e: the ratio of triangles to squares requires students to write the quantity of triangles first as the numbers are not interchangeable). Students may have similar difficulties when understanding when to create a part-to-part ratio vs. a part-to-whole ratio.

Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies

Pre-Teach

Pre-teach (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 analyzes common misconceptions when studying understanding ratio concepts and use reasoning to solve problems because students need to understand the difference between ratio and fractions which is a huge misconception.

Pre-teach (intensive): *What critical understandings will prepare students to access the mathematics for this cluster?*

- 5.NF.B.3 This standard provides a foundation for work in this cluster because it is interpreting a fraction of which students need a solid foundation as to not confuse fractions and ratios. 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.

Core Instruction

Access

Perception*: How will the learning for students provide multiple formats to reduce barriers to learning, such as providing the same information through different modalities (e.g., through vision, hearing, or touch) and providing information in a format that will allow for adjustability by the user?*

- For example, learners engaging with understand ratio concepts and use reasoning to solve problems benefit when learning experiences ensure information is accessible to learners with sensory and perceptual disabilities, but also easier to access and comprehend for many others such as offering alternatives for visual information such as <descriptions (text or spoken) for all images, graphics, video, or animations; touch equivalents (tactile graphics or objects of reference) for key visuals that represent concepts; objects and spatial models to convey perspective or interaction; auditory cues for key concepts and transitions in visual information because using different visual information will allow students to use their learning style to access information such as reading the concept, listening to concept, or having visual animation that allow students to see and using physical manipulative to touch the concept.

Build

Effort and Persistence*: How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with understand ratio concepts and use reasoning to solve problems benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as using prompts or scaffolds for visualizing desired outcomes because this will give students specific information on what you expect them to be able to accomplish and gives them a place to look for information that can help them to relook at the concepts.

Language and Symbols: *How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds).*

- For example, learners engaging with understand ratio concepts and use reasoning to solve problems benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as making connections to previously learned structures because ratios is about comparing where they learned in fourth grade to determine equivalence. Ratios is also a multiplicative comparison therefore looking at fifth grade where they learned to interpret a fraction will activate students prior understanding and reasoning about ratios.

Expression and Communication*: How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?*

- For example, learners engaging with understand ratio concepts and use reasoning to solve problems benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing multiple examples of ways to solve a problem (i.e. examples that demonstrate the same outcomes but use differing approaches, strategies, skills, etc.)because there are three ways to look at a ratio and understanding that no matter the form used the outcome is the same.

Internalize

Comprehension*: How will the learning for students' support transforming accessible information into usable knowledge, knowledge that is accessible for future learning and decision-making?*

- For example, learners engaging with understand ratio concepts and use reasoning to solve problems benefit when learning experiences attend to students by intentionally building connections to prior understandings and experiences; relating important information to the learning goals; providing a process for meaning making of new learning; and, applying learning to new contexts such as incorporating explicit opportunities for review and practice because students need to practice ratio understanding as to not confuse it with fractions problems. The more the students have the opportunity to review and practice comparing ratios the increase reasoning skills and higher order thinking skills.

Re-teach

Re-teach (targeted): *What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?*

- For example, students may benefit from re-engaging with content during a unit on understanding ratio concepts and use ratio reasoning to solve problems by clarifying mathematical ideas and/or concepts through a short mini lesson because students often confuse ratios and fractions. By clarifying the ratio concepts, misconceptions will be reduced, and it will allow students to explore ratios.

Re-teach (intensive): *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit understanding ratio concepts and use ratio reasoning to solve problems by addressing conceptual understanding because it allows students to attend to two quantities simultaneously. The students will be able to form a multiplicative comparison of two quantities and increase understanding of equivalent concepts.

Extension

What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?

- For example, some learners may benefit from an extension such as open ended tasks linking multiple disciplines when studying understanding ratio concepts and use ratio reasoning to solve problems because open ended tasks that link multiple disciplines will allow students to make connections and broaden their understanding of the concept and when and where to use it. Thus, increasing higher order thinking skills.

Culturally and Linguistically Responsive Instruction:

Validate/Affirm: 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?
Build/Bridge: 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?

Equity Based Practice (Facilitating Meaningful Mathematical Discourse): Mathematics discourse requires intentional planning to ensure all students feel comfortable to share, consider, build upon and critique the mathematical ideas under consideration. When student ideas serve as the basis for discussion we position them as knowers and doers of mathematics by using equitable talk moves students and attending to the ways students talk about who is and isn't capable of mathematics we can disrupt the negative images and stereotypes around mathematics of marginalized cultures and languages. "A discourse-based mathematics classroom provides stronger access for every student — those who have an immediate answer or approach to share, those who have begun to formulate a mathematical approach to a task but have not fully developed their thoughts, and those who may not have an approach but can provide feedback to others." For example, when studying understanding ratio concepts and using ratio reasoning to solve problems, facilitating meaningful mathematical discourse is critical because it improves students' reasoning abilities which builds their higher order thinking skills.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: Cognia Testlet for Grade 6 Ratios

6.RP.01.03.c: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations: Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

- Learning Target: I can find the percent of a whole and use it to solve problems.
- Webb's Depth of Knowledge: 2

A state park trail is 2.4 kilometers long.

a. This year the park closed 624 meters of the trail for repairs. What percent of the trail was closed for repairs? Show your work or explain how you know.

The park plans to close a different section of the trail each year for the next 3 years. Each year 20% of the total length of the trail will be repaired.

b. How many meters of trail will still need to be repaired after the planned repairs are completed? Show your work or explain how you know.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on understanding ratio concepts and using ratio reasoning to solve 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, learning about ratios used in the home and community can a be a great way to connect schools tasks with home tasks.	Science: Students can apply this to science by creating a ratio of the model of the solar system to the actual size of the solar system. In addition, students can use their knowledge of ratios to help them interpret the ratios of time, space, and energy to determine a ratio. MS-PS3-1 (Energy), MS-ESS1-3 (Earth's Place in the Universe)[1] https://www.nextgenscience.org/pe/ms-ps3-1-energy https://www.nextgenscience.org/pe/ms-ess1-3-earths-place-universe Social Studies: Students can apply the idea of ratios to social studies. They can determine ratios of populations and other types of ratios that are associated with their study of social studies.

[1] https://www.nextgenscience.org/pe/ms-ps3-1-energy
https://www.nextgenscience.org/pe/ms-ess1-3-earths-place-universe