NEW MEXICO
Public Education Department

7.EE: EXPRESSIONS & EQUATIONS

Cluster Statement: B: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Major Cluster (Students should spend much 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:**
7.EE.B.3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. ***For example: If a woman making $25 an hour gets a 10% raise, she will make an additional $1/10$ of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 $3/4$ inches long in the center of a door that is 27 $1/2$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.***	SMP 5: Students use appropriate tools strategically by demonstrating their ability to select and use the most appropriate tool (pencil/paper, manipulatives, calculators, protractors, etc.) while rewriting/evaluating/analyzing expressions, solving and representing and analyzing linear relationships. SMP 8: Students use repeated reasoning to understand algorithms and generalize about patterns. During multiple opportunities to solve and model problems, they may notice that a/b ÷ c/d = ad/bc and construct other examples and models that confirm their generalization. They extend their thinking to include complex fractions and rational numbers.	• Solve multi-step real life and mathematical problems that include positive and negative rational numbers • Convert between fractions, decimals, and percentages • Use properties of operations as needed to solve the problems. • Justify the reasonableness of their answers using estimation **Webb's Depth of Knowledge:** 2 **Bloom's Taxonomy:** Remember, Understand

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<td>Standard Text:

7.EE.B.4: 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.

• 7.EE.B.4.A: Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?
• 7.EE.B.4.B: Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.</td>
<td>Standard for Mathematical Practices:

SMP 1: Students solve real world problems through the application of algebraic 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?”.

SMP 3: Students construct viable arguments and critique the reasoning of others when students discuss the differences among expressions, equations and inequalities using appropriate terminology and tools/visuals. Students will apply their knowledge of equations and inequalities to support their arguments and critique the reasoning of others while supporting their own position.</td>
<td>Students who demonstrate understanding can:
• Write equations in the appropriate form.
• Solve and graph inequalities
• Apply the inequality and the solution in the context of the problem.

Webb’s Depth of Knowledge: 1-2

Bloom’s Taxonomy:
Remember, Understand</td>
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<td><u>Previous Learning Connections</u>
• In 6th grade, students use variables to represent numbers and write expressions when solving a real-world or mathematical problem with equations or expressions. This connects directly to this cluster as students build upon this</td>
<td><u>Current Learning Connections</u>
• In 7th grade, students will develop an understanding of operations with rational numbers when working with expressions and linear equations. They will use these skills later in 7th grade when applying these skills to scale</td>
<td><u>Future Learning Connections</u>
• In 8th grade students solve linear equations (including rational number coefficients) in one variable with one solution, infinitely many solutions, or no solutions. In 8th grade, learners analyze and solve pairs of simultaneous linear</td>
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skill with multiple step problems and the inclusion of rational numbers.	drawings, geometric constructions, area, and volume.	equations (in one and two variables).

Clarification Statement:
Students apply properties of operations to add, subtract, factor and expand linear equations with rational coefficients. Students then become able to rewrite expressions in different forms to solve a multi-step problem, explain the quantities and graph a solution.

Common Misconceptions

- Students may have difficulty with representing numbers in different forms such as moving from a percentage to a fraction.
- Students may need support scaffolding multi-step problems that require steps that build upon each other.

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 provides additional time for confusion to happen with new mathematical ideas when studying solving real life and mathematical problems using numerical and algebraic expressions and equations because this cluster focuses on solving two step equations/inequalities and the previous 6th grade cluster focused on one-step equations. Providing time for students to struggle and to determine how to apply their previous knowledge from one step-equations can help clear up misconceptions because students will have had time to develop their thought process instead of just going through steps.

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

- 6.EE.B.7 This standard provides a foundation for work with solving real life and mathematical problems using numerical and algebraic expressions and equations because in this standard students are expected to solve real world and mathematical problems in the form of x + p = q and px=q, which are one step equations with positive rational numbers. In the 7th grade cluster, students are introduced to two step equations & inequalities with positive and negative rational numbers. 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:
Interest: *How will the learning for students provide multiple options for recruiting student interest?*

- For example, learners engage with solving real life and mathematical problems using numerical and algebraic expressions and equations benefit when learning experiences include ways to recruit interest such as supporting culturally relevant connections because students will be invested in understanding and engaging with the mathematics.

Build:

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

- For example, learners engaging with solving real life and mathematical problems using numerical and algebraic expressions and equations benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as generating relevant examples with students that connect to their cultural background and interests because students need to see that numeric and algebraic equations and expressions are relevant to their life. Students will be more engaged and persist in their learning if they can see the cultural connections.

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 solving real life and mathematical problems using numerical and algebraic expressions and equations benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as making all key information available in English also available in first languages (e.g., Spanish) for English Learners and in ASL for learners who are deaf because real life and mathematical problems tend to rely heavily on textual information that can hinder a student's ability to solve problems. Providing the text in a student's language will allow the teacher to determine if the student's struggles are mathematical.

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 solving real life and mathematical problems using numerical and algebraic expressions and equations 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 because depending on a student's strengths and backgrounds they will approach problems in a variety of different ways using a variety of different strategies.

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 using properties of operations to generate equivalent expressions 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 using multiple examples and non-examples to emphasize critical features because understanding why an expression isn't equivalent can help students deepen their understanding of equivalence.

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?*

- 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 solving real life and mathematical problems using numerical and algebraic expressions and equations by examining tasks from a different perspective through a short mini-lesson because students often struggle with the concept of an inequality versus an equation, even though solving both is very similar. By looking at a task through the perspective of needing one answer versus a number set students may be able to deepen their understanding of solving an equation/inequality.

Re-teach (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 solving real life and mathematical problems using numerical and algebraic expressions and equations by addressing conceptual understanding because in this cluster students are solving two-step equations/ inequalities. Students might forget to keep the equation/inequality in balance when solving. Teachers can check this by having them use algebra tiles when solving equations/inequalities.

Extension

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 about ... For example, some learners may benefit from an extension such as the opportunity to explore links between various topics when studying solving real life and mathematical problems using numerical and algebraic expressions and equations because of the link between expressions, equations and inequalities. What is similar, different, what generalizations about each can be made? What do we know about the solutions for each?

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?

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 to solve real life and mathematical problems using numerical and algebraic expressions and equations facilitating meaningful mathematical discourse is critical because these real life and mathematical problems tend to have multiple entry points for students in order to solve the problem. Students should be able to enter the problem at their level

and then take the task to a higher level through connections to previous learning or to additional strategies. Allowing students to discuss the mathematical strategy they used to solve the problem provides them a voice and an opportunity to share their thinking with the group in a way that is okay to be different.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: http://tasks.illustrativemathematics.org/content-standards/7/EE/B/4/tasks/643

A coach buys a uniform and a basketball for each of the 15 players on the team. Each basketball costs $9. The coach spends a total of $420 for uniforms and basketballs. Enter the cost, in dollars, of 1 uniform.

This type of assessment question requires students to illustrate an uptick from students work in grade 6 (6.EE.B.7) where they were required to write and solve simple equations of the form x + p = q and px = q to the grade 7 work of writing and solving real-world problems leading to equations of the form px + q= r, where *p, q* and *r* are specific rational numbers. Items assessing this standard could also involve coefficients that aren't whole numbers and aren't positive numbers. This item assesses the modeling aspects of 7. EE.B.4a, not the part of the standard about fluency with solving algebraic equations.

Relevance to families and communities:

During a unit focused on solving real life and mathematical problems using numerical and algebraic expressions and equations, 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 calculating the cost of bills within a budget for a family. Students could write an expression or equation for each bill for the month. Students could even create an inequality with the amount of money set aside for bills so they could determine the amount of discretionary money left after paying the bills.

Cross-Curricular Connections:

Science:

- Collaborate with peers to define or describe an issue in society and how to evaluate solutions.
- Run tests of solutions and change designs as needed.
- Construct scientific arguments for how uneven distributions of Earth's Mineral, energy, groundwater resources are the result of past and current geoscience processes. Examples: Metal ores, volcanic activity, soil weathering, rock deposits, mining by humans.