NEW MEXICO
Public Education Department

6.EE: EXPRESSIONS & EQUATIONS

Cluster Statement: A: Apply and extend previous understandings of arithmetic to algebraic expressions.

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.EE.A.1: Write and evaluate numerical expressions involving whole-number exponents.	SMP 6: Students can attend to precision by using appropriate vocabulary and translate between verbal and numerical expressions fluently and accurately. Students must also set up expressions, equations, and/or inequalities that represent the correct interpretation of the problem at hand	• Write and evaluate numerical expressions involving whole number exponents using the correct terminology • Evaluate numerical expressions using their knowledge of order of operations from previous years. **Webb's Depth of Knowledge:** 2 **Bloom's Taxonomy:** Understand, Apply
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. • **6.EE.A.2.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.*** • **6.EE.A.2.B: Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as***	SMP 1: Students can make sense of problems and persevere in solving them by looking for meaning in the problems and find effective ways to represent and solve them. Students must understand what the variable is represented in the problem in front of them stands for in order to make sense of the problem and solve for it. They will be able to explain what the variable represents and how their answer makes sense.	• Express orally and in writing that variables represent unknown quantities. • Write expressions using variables that represent unknown numbers. • Identify context to write algebraic expressions. • Translate verbal expressions into numerical expressions. • Use information from real world examples to evaluate expressions with variables **Webb's Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand, Apply

a product of two factors; view (8 + 7) as both a single entity and a sum of two terms. • **6.EE.A.2.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 = ½.***		
Standard Text **6.EE.A.3** **Apply the properties of operations to generate equivalent expressions.** ***For example, 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); apply properties of operations to y + y + y to produce the equivalent expression 3y.***	**Standard for Mathematical Practices** SMP 2: Students can reason abstractly and quantitatively by reasoning with symbolic representations in equations and manipulating algebraic expressions while maintaining equality.	**Students who demonstrate understanding can:** • Create an equivalent expression through the use of properties of operations • Apply the distributive, commutative, identity, and distributives properties to expressions that include variables **Webb's Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand, Apply

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<table>
<tr>
<td>Standard Text

6.EE.A.4
Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.</td>
<td>Standard for Mathematical Practices

SMP 7: Students can look for and make use of structure by applying the properties to generate equivalent expressions. Students also use the structure of the properties to generate the expressions and will need to prove that their expressions are equivalent by using substitution.</td>
<td>Students who demonstrate understanding can:
• Identify equivalent expressions.
• Combine like terms
• Reason that two expressions are equivalent through the use of substitution

Webb’s Depth of Knowledge: 1-2

Bloom’s Taxonomy:
Understand</td>
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<td><u>Previous Learning Connections</u>
• Students will connect their prior knowledge on using whole-number exponents to denote the powers of 10 in order to properly set-up exponents and identify the base. Additionally, in 5th grade learners have already been taught the commutative and associative property of both addition and multiplication.</td>
<td><u>Current Learning Connections</u>
• Students will connect what they were previously taught in 6th grade finding the greatest common factor of two whole numbers and using the distributive property to express sums of whole numbers to this cluster. These skills will be needed when students create and identify equivalent expressions.</td>
<td><u>Future Learning Connections</u>
• In 7th grade, learners will learn to apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. Learners will develop an understanding of operations with rational numbers when working with expressions and linear equations. In 8th grade, students will know and apply the properties of integer exponents to generate equivalent numerical expressions. In high school, students will need to interpret parts of an expression, such as terms, factors, and coefficients.</td>
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<td colspan="3">Clarification Statement:

The focus for this cluster is writing and evaluating numerical expressions involving whole number exponents, finding the value of an expression using exponential notation such as $4^2 = 4 \times 4$ or $d\ 3 = d \times d \times d$, and using the appropriate terminology to explain how to evaluate an expression. Students are applying the properties of operations to generate equivalent expressions including the distributive property to produce equivalent representation.</td>
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<tr>
<td colspan="3">Common Misconceptions
• When given an expression with an exponent, students may misinterpret the base and the exponent as factors and multiply the two numbers. For example, show that 5 x 3=15, which is much smaller than 5x5x5 which equals 125.
• Students may use distributive property incorrectly in that students will often multiply the first term, but forget to do the same to the second term.
• Students may misuse the communitive property by applying it to subtraction and/or division problems.</td>
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- Students confuse variables with letters for unit of measure.

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 rehearses new mathematical language when studying writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions because this cluster requires the acquisition of a considerable amount of new vocabulary. The terms that are used to identify the parts and types of expressions will support students in becoming proficient in explaining and discussing many new concepts encompassed in expressions, equations, and inequalities. This is the first formal experience students have with variables, coefficients, and constants. Students will also be extending previous learning of exponents, order of operations, sums, differences products, quotients, equivalent, like and unlike terms.

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

- 5.NBT.B.7: This standard provides a foundation for work with writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions because it ensures that students have a mastery of all operations with whole numbers and decimals. In addition, this standard focuses on the properties of operations and the relationship between addition and subtraction. If students understand that relationship, they can then make the connection to the relationship between multiplication and division. For students to successfully evaluate algebraic expressions and generate equivalent expressions, they need to have a mastery of all parts of this standard to use as an anchor for new learning. 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 engaging with writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions in which letters stand for numbers benefit when learning experiences include ways to recruit interest such as providing choices in their learning such as multiple modes of representation because students with various learning modalities will be better able to access the conceptual ideas relating to algebraic expressions and variables if they can share individual representations. For example, a student who learns visually or with tactile supports can draw or create a visual representation of a given expression, while a linear thinker can write an algebraic representation. As students share different representations of algebraic expressions, this will support them in making connections to equivalent expressions.

Build

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

- For example, learners engaging with writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions in which letters stand for numbers benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as constructing communities of learners engaged in common interests or activities because students can work collaboratively on tasks that require them to represent algebraic expressions, apply new knowledge and concepts, and extend that learning to real-world situations. A community of learners can work collaboratively and learn from one another, as they bring different strengths and learning styles to the group.

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 writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions in which letters stand for numbers benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity and comprehensibility for all learners such as highlighting how complex terms, expressions, or equations are composed of simpler words or symbols by attending to the structure because this cluster contains a great deal of mathematical vocabulary that is new to students. Since this is their first introduction to algebraic expressions and concepts, it is imperative to give them a firm foundation with the complex terms and structures that will support them in future mathematical experiences.

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 writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions in which letters stand for numbers benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as solving problems using a variety of strategies because students have different learning styles and strengths. Allowing them to apply different strategies, as well as taking the time to share and discuss those strategies, will encourage students to acquire an assortment of strategies that they can employ when solving a problem or approaching a task.

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 writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions in which letters stand for numbers 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 this cluster encompasses a great deal of foundational algebraic knowledge and experience that students will need to support their learning in upcoming clusters and in future math courses. Students will need to be able to examine and reflect upon their thinking strategies, as well as

those of their peers in order to begin making connections and generalizations about similar types of expressions and similar types of tasks. Many students will require support and explicit instruction, along with opportunities to apply the new learning and to test generalizations.

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 writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions by examining tasks from a different perspective through a short mini-lesson because students often need to see multiple representations or approaches to interpreting and generating algebraic expressions. The conceptual way of thinking about mathematics is new to them, and many of them need opportunities to engage with their peers who may offer a different perspective or approach to understanding.

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 on writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions by addressing conceptual understanding because some students will need explicit instruction, in order to make connections between their prior knowledge and experiences working with numerical expressions and the conceptual way of understanding algebraic expressions.

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 the opportunity to explore links between various topics when studying writing, reading, evaluating algebraic expressions because students can extend their learning of evaluating algebraic expressions by applying it to Geometry topics. They should be given tasks and opportunities to apply the concept of evaluating using geometric formulas. They can make the connection between the variables represented in the formulas for Volume, Area, and Surface Area with the conceptual way of calculating them without the use of concrete objects.

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?

Using and Connecting Mathematical Representations: The standard for mathematical practice, use appropriate tools strategically, provides a strong foundation to validate and bridge for students. Mathematical representations are mathematical tools. The linguistic and cultural experiences of students provide different and varied types of representations for solving mathematical problems. By explicitly encouraging students to use multiple mathematical representations students can draw on their "mathematical, social, and cultural

competence". By valuing these representations and discussing them we can connect student representations to the representations of school mathematics and build a bridge for students to position them as competent and capable mathematicians. For example, when studying writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions the use of mathematical representations within the classroom is critical because it allows students to use various strategies or representations that are familiar or logical to them, in order to make sense of verbal expressions and algebraic expressions. Many students need the support of physical or visual representations to connect their understanding of mathematical concepts and language that are new and foreign to them. This cluster introduces students to what will be the critical foundation to their conceptual understanding of algebraic concepts and patterns/relationships applied within the properties of operations, so it is important to allow students time and opportunities to connect these concepts to various mathematical representations.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: http://tasks.illustrativemathematics.org/content-standards/6/EE/A/1/tasks/532

6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.

- Learning Target: I can write an expression, using variables, to represent exponential growth in a task.
- Webb's Depth of Knowledge: 2
- This type of assessment question requires students to apply and extend previous understandings of arithmetic to algebraic expressions specifically with exponents. This task can be used to determine if students can solve the problem and write an expression to represent a repeated calculation. Students can get an answer without writing an expression; however, mastery of the cluster requires students to write and evaluate a numerical expression.

Relevance to families and communities:

During a unit focused on writing, reading, evaluating algebraic expressions and identifying/generating equivalent expressions, 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, learn about the habits and experiences that your students have at home or other settings away from school. Create or modify tasks to reflect situations or topics that will be interesting or familiar to your students and their concept of the world around them.

Cross-Curricular Connections:

Science: https://www.nextgenscience.org/pe/ms-ps2-1-motion-and-stability-forces-and-interactions Students can work to create, read, and evaluate expressions that result from the forces at work. Students will have to be able to create and support their argument. (MS-PS2-1, Motion and Stability: Forces and Interactions)

English:

- RST.6.8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.6.8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.
- RST.6.8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.