New Mexico Instructional Scope

Algebra 1 See Structure in Expressions 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

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

- Interpret the structure of expressions.
  - HSA.SSE.A.1
  - HSA.SSE.A.2
- Interpret the structure of expressions.
  - HSA.SSE.B.3

Grade	CCSS Domain	CCSS Cluster
A1	Seeing Structure in Expressions	Interpret the structure of expressions

Cluster Standard: HSA.SSE.A.1

Standard	Standards for Mathematical Practice
Interpret expressions that represent a quantity in terms of its context. • HSA.SSE.A.1.A: Interpret parts of an expression, such as terms, factors, and coefficients. • HSA.SSE.A.1.B: Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*	• **SMP4:** Model with mathematics. • **SMP7:** Look for and make use of structure.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
• The middle grades standards in Expressions and Equations build a ramp from arithmetic expressions in elementary school to more sophisticated work with algebraic expressions in high school. As the complexity of expressions increases, students continue to see them as being built out of basic operations; they see expressions as sums of terms and products of factors. In "Animal Populations" students compare $P + Q$ and $2P$ by seeing $2P$ as $P + P$. They distinguish between $(Q–P)/2$ and $Q – P/2$ by seeing the first as the quotient where the numerator is a difference and the second as a difference where the second term is a quotient.	• Identify parts of an expression, such as terms, factors, coefficients, exponents, etc. • Interpret simple compound expressions by viewing one or more of their parts as a single entity.
DOK	**Blooms**
1-2	Remember, Understand, Analyze

Grade	CCSS Domain	CCSS Cluster
A1	Seeing Structure in Expressions	Interpret the structure of expressions

Cluster Standard: HSA.SSE.A.2

Standard	Standards for Mathematical Practice
Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*	• **SMP3**: Construct viable arguments and critique the reasoning of others. • **SMP8:** Look for and express regularity in repeated reasoning.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
• Seeing structure in expressions entails a dynamic view of an algebraic expression, in which potential rearrangements and manipulations are ever present. An important skill for college readiness is the ability to try possible manipulations mentally without having to carry them out, and to see which ones might be fruitful and which ones might not.	• Recognize equivalent forms of expressions. • Use the structure of an expression to identify ways to rewrite it. • Make generalizations about the possible equivalent forms expressions can have (e.g., a quadratic expression can always be represented as the product of two factors containing its roots). • Rewrite expressions to identify important components, such as where zeros may occur or end behavior.
DOK	**Blooms**
1-2	Remember, Understand, Apply

Common Misconceptions

- Students may confuse the parts of an expression, such as counting variables and not terms and therefore misidentifying the number of terms an expression has.
- Students may not have a conceptual basis for patterns, such as an area model for difference of squares, and therefore struggle to recognize and apply them to new situations.

Grade	CCSS Domain	CCSS Cluster
A1	Seeing Structure in Expressions	Interpret the structure of expressions

Cluster Standard: HSA.SSE.B.3

Standard	Standards for Mathematical Practice
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. • HSA.SSE.B.3.A: Factor a quadratic expression to reveal the zeros of the function it defines. • HSA.SSE.B.3.B: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. • HSA.SSE.B.3.C: Use the properties of exponents to transform expressions for exponential functions. *For example, the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%*	• **SMP3:** Construct viable arguments and critique the reasoning of others. • **SMP7:** Look for and make use of structure.

Clarification Statement	Students Who Demonstrate Understanding Can...
• The standards emphasize purposeful transformation of expressions into equivalent forms that are suitable for the purpose at hand. The standards avoid talking about simplification, because it is often not clear what the simplest form of an expression is, and even in cases where that is clear, it is not obvious that the simplest form is desirable for a given purpose. There are three commonly used forms for a quadratic expression: • Standard form, e.g., $x^2 - 2x - 3$ • Factored form, e.g., $(x + 1)(x - 3)$ • Vertex form (a square plus or minus a constant), e.g. $(x - 1)^2 - 4$ Rather than memorize the names of these forms,	• Write a quadratic expression with rational coefficients in an equivalent form by factoring and by completing the square. • Identify and use the zeros to solve or explain familiar problems. • Use properties of exponents to write equivalent forms of exponential functions with one or more variables, integer coefficients, and nonnegative rational exponents involving operations of addition, subtraction and multiplication, including distributing an exponent across terms within parentheses. • Find the maximum or minimum values of a quadratic function. • Choose an appropriate equivalent form of an expression in order to reveal a property of interest when solving problems.

students need to gain experience with them and their different uses. The traditional emphasis on simplification as an automatic procedure might lead students to automatically convert the second two forms to the first, rather than convert an expression to a form that is useful in each context. The introduction of rational exponents and systematic practice with the properties of exponents in high school widens the field of operations for manipulating expressions.	
DOK	**Blooms**
1-2	Understand, Apply, Analyze

Common Misconceptions

- When factoring a quadratic where $a > 0$, students may look at c only when determining which factors to use, rather than looking for the factors of the product a and c.
- When completing the square, students may forget to subtract the number that was added inside the parentheses.

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: **Seeing Structure in Expressions**	Strand: **Interpret the structure of expressions**

Suggested Student Discourse Questions

- Looking at an algebraic expression, what does each symbol in the expression represent? Include any given coefficients and operations.
- Compare how you rewrote the formula with your shoulder partner. How could you improve their process?

- Try to find the most efficient way to rewrite the formula in terms of one of its variables.
- Looking at this formula, choose the variable that is most difficult to measure in real life. Rewrite the formula so that it is defined by the OTHER variables.

ASSESSMENT GUIDE

- Interpret the structure of expressions.
- Interpret the structure of expressions.

Grade	CCSS Domain	CCSS Cluster
A1	Seeing Structure in Expressions	Interpret the structure of expressions

Sample Task #1 (Constructed Response)

If $x^2 = a + b$ and $y^2 = a + c$, what is $(x^2 - y^2)^2$?

SAT, #5204412

Sample Task #2 (Multiple Choice)

Which of the following is equivalent to the expression $x^4 - x^2 - 6$?

A. $(x^2+1)(x^2-6)$

B. $(x^2+2)(x^2-3)$

C. $(x^2+3)(x^2-2)$

D. $(x^2+6)(x^2-1)$

Grade	CCSS Domain	CCSS Cluster
A1	Seeing Structure in Expressions	Interpret the structure of expressions

Sample Task #1 (Constructed Response)

An arrow is shot into the air. A function representing the relationship between the number of seconds it is in the air, t, and the height of the arrow in meters, h, is given by

$$h(t) = -4.9t^2 + 29.4t + 2.5.$$

a. Complete the square for this function. Show all work.

b. What is the maximum height of the arrow? Explain how you know.

Engage NY - Algebra 1
Module 4, End of Module Assessment, #3a/b

Sample Task #2 (Multiple Choice)

Which of the following is equivalent to the expression $x^4 - x^2 - 6$?

A. $(x^2+1)(x^2-6)$

B. $(x^2+2)(x^2-3)$

C. $(x^2+3)(x^2-2)$

D. $(x^2+6)(x^2-1)$

SAT, #5308651

MLSS AND CLR GUIDE

- Interpret the structure of expressions.
- Interpret the structure of expressions.

CCSS Domain	*CCSS Cluster*
See Structure in Expressions	Interpret the structure of expressions

Culturally and Linguistically Responsive Instruction

Relevance to Families and Communities	During a unit focused on interpreting the structure of expressions, consider options for learning from your families and communities the cultural and linguistic ways mathematics exists outside of school to create stronger home to school connections for students. For example, ask them about structures that they encounter in their everyday lives that help them parse information, such as knowing which gaming platform a video game is operating on or how to substitute ingredients in a recipe based on someone's food allergies.	
Cross-Curricular Connections	Science: Many science formulas take on linear, exponential and quadratic forms. For example, $F = ma$. Consider providing a connection for students to explore these formulas and identify their structure and how knowing that structure helps them make sense of the context. Social Studies: In high school the New Mexico Social Studies Standards state students should “understand basic economic principles.” Consider providing a connection for students to use expressions to model cost and revenue.	
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*	• 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 hinders 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 interpreting the structure of expressions the types of mathematical tasks

	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?	are critical because the conceptual part of interpreting the structure of expressions is foundational for being able to build and understand equations later on and is not something that is going to be culturally relevant to most students' home lives.

Planning for Multi-Layered System of Supports

Vertical Alignment

Previous Learning	***Current Learning***	***Future Learning***
• Connect to identifying and interpreting slope and y-intercept for linear representations. **(8.F.3-4)** • Connect to rewriting standard linear equation to slope-intercept form for systems of equations. **(8.EE.8)**	• Connect to rewriting quadratic functions to find specific key features. (HSA.SSE.B.3) • Connect to rewriting formulas to highlight quantities of interest. (HSA.CED.4)	• Connect to work with expressions of all function types. **(HSA.SSE.A.1-2 - *polynomial and rational*)**

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?*	Some learners may benefit from targeted pre-teaching that focuses on interpreting the structure of expressions because when students feel comfortable with the vocabulary being used, they are more likely to use it and using the correct terminology when discussing the structure of an equation allows everyone (bother students and teachers) to communicate their ideas and understanding more clearly.
Intensive	*What critical understandings will prepare students to access the mathematics for this cluster?*	5.OA.A.2: This standard provides a foundation for work with interpreting the structure of expressions because students write out the numerical expression without the calculation. Students become comfortable with using the vocabulary words: difference, greater than, multiple, etc. 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. 6.EE.A.4: This standard provides a foundation for work with interpreting the structure of expressions because being able to tell if two expressions are equivalent is the building blocks for being able to construct and deconstruct expressions to use their structure. Being able to tell if what you have done to an expression essentially changes it or not leads to the understanding of how to use these changes to manipulate the expressions and equations to better understand their structure. 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***

• Different forms of an expression can be equivalent and are useful in different contexts.
• The addition, subtraction, or multiplication of polynomials results in another polynomial.
• When a situation and its potential constraints will be represented by a linear or quadratic, or exponential equation/inequality or a system of those equations/inequalities.
• The relationship between solutions of equations/ inequalities and their graphical representations.
	• Use the structure of an expression and the properties of mathematics to rewrite it in a different form.
	• Perform the operations of addition, subtraction, and multiplication with polynomials.
	• Determine reasonable solutions based on the context of real-world problems from graphs of equations/inequalities and systems of equations/inequalities.
	• Use the properties of mathematics to solve linear and quadratic equations/inequalities and systems of those equations/inequalities.
		• Build on students' experience with the following skills:
		  ○ Connect to identifying and interpreting slope and *y*-intercept for linear representations. (8.F.3-4)
		  ○ Connect to rewriting standard linear equation to slope intercept form for systems of equations. (8.EE.8)
		  ○ Connect to knowing and apply the properties of integer exponents to generate equivalent, simplified numerical expressions using the properties of exponents. (8.A.1)
		  ○ Connect to combining like terms and simplifying expressions using the distributive property (6.EE.3)
		  ○ Connect to creating and solving equations in one variable. (7.EE.4)
		  ○ Connect to reasoning with inequalities. (7.EE.4)
		  ○ Connect to solving real world problems involving two linear equations in two variables. (8.EE.8)
		• 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:
		  ○ Desmos graphing calculator
		  ○ Algebra tiles
		  ○ Graphic Organizers

		○ Sketch graph ○ Create table of values
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?	For example, students may benefit from re-engaging with content during a unit on interpreting the structure of expressions by clarifying mathematical ideas and/or concepts through a short mini-lesson because the structure of an expression can be looked at in many different ways and you don't students to get locked into one way of thinking about equations, like understanding that slope-intercept, point-slope, and standard form are all useful ways of looking at linear equations and can tell you different things about the equation.
Intensive	What assessment data will help identify content needing to be revisited for intensive interventions?	For example, students may benefit from re-engaging with content during a unit on interpreting the structure of expressions by clarifying mathematical ideas and/or concepts through a short mini-lesson because the structure of an expression can be looked at in many different ways and you don't students to get locked into one way of thinking about equations, like understanding that slope-intercept, point-slope, and standard form are all useful ways of looking at linear equations and can tell you different things about the equation.
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?		Some learners may benefit from an extension interpreting the structure of expressions because looking at the structure of the different types of equations and disciplines will help reinforce concepts such as the inverse relationship between logarithmic and exponential functions.

CCSS Domain	*CCSS Cluster*
See Structure in Expressions	Interpret the structure of expressions

Culturally and Linguistically Responsive Instruction

Relevance to Families and Communities	During a unit focused on writing expressions in equivalent forms to solve problems, consider options for learning from your families and communities the cultural and linguistic ways mathematics exists outside of school to create stronger home to school connections for students. For example, ask students to share about structures that they encounter every day that they manipulate, such as changing the formatting of a picture or video so that it is sharable on different device platforms.	
Cross-Curricular Connections	Science: Finding the zeros and maximum for a model that created a projectile motion equation may also require students to rewrite a quadratic in an equivalent form. Consider providing a connection for students to experiment with projectile motion by tossing objects themselves, possibly using technology, and then exchanging equations with another classmate or group to identify key components. Social Studies: In high school the New Mexico Social Studies Standards state students should "understand basic economic principles." Consider providing a connection for students to rewrite the model $P(1+r)^t$ for compound interest to identify the quarterly, monthly or weekly interest rate.	
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*	• Supporting Productive Struggle in Learning Mathematics: The standard for mathematical practice, makes sense of mathematics and persevere in solving them is the foundation for supporting productive struggle in the mathematics classroom. "Too frequently, historically marginalized students are overrepresented in classes that focus on memorizing and practicing procedures and rarely provide opportunities for students to think and figure things out for themselves. When students in these classes struggle, the teacher often tells them what to do without building their capacity for persistence." Teachers need to provide tasks that challenge students and maintain that challenge while encouraging them to persist. This encouragement or "warm-demander" requires a strong relationship with students and an

	students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?	understanding of the culture of the students. For example, when writing expressions in equivalent forms to solve problems supporting productive struggle is critical. Students will come to this cluster with a variety of knowledge about how to manipulate equations and there are a lot of correct ways to do so; therefore, they need to be encouraged to work through the process to find the ways that are more effective on their own instead of being asked to memorize rote procedures for a given situation.

Planning for Multi-Layered System of Supports

Vertical Alignment

Previous Learning	***Current Learning***	***Future Learning***
• Connect to knowing and apply the properties of integer exponents to generate equivalent, simplified numerical expressions using the properties of exponents. **(8.A.1)**	• Connect to recognizing and flexibly writing expressions (or rewriting) to use that expression and solve the problem at hand. **(HSA.SSE.A.2)**	• Connect to factoring polynomial functions of varying degrees. **(HSA.APR.3)** • Connect to completing the square to solve quadratic equations with imaginary solutions**. (HSN.CN.7)** • Connect to rewriting exponential equations as logarithmic equations**. (HSF.LE.4)**

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?*	Some learners may benefit from targeted pre-teaching that focuses on writing expressions in equivalent forms to solve problems because they will be asked to combine several skills that they had previously learned independently of each other. For example, like rewriting exponents into one larger problem so reviewing these individual skills will help them be more confident in the larger problem.
Intensive	*What critical understandings will prepare students to access the mathematics for this cluster?*	7.EEA.1: This standard provides a foundation for work with writing expressions in equivalent forms to solve problems because they need to be able to manipulate expressions in a basic sense of linear equations if they are going to be successful at manipulating more complex expressions. 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***
• Different forms of an expression can be equivalent and are useful in different contexts. • The addition, subtraction, or multiplication of polynomials results in another polynomial. • When a situation and	• Use the structure of an expression and the properties of mathematics to rewrite it in a different form. • Perform the operations of addition, subtraction, and multiplication with polynomials. • Determine reasonable	• Build on students' experience with the following skills: ○ Connect to identifying and interpreting slope and *y*-intercept for linear representations. (8.F.3-4) ○ Connect to rewriting standard linear equation to slope intercept form for systems of equations. (8.EE.8) ○ Connect to knowing and apply the properties of integer exponents to

its potential constraints will be represented by a linear or quadratic, or exponential equation/inequality or a system of those equations/inequalities. ● The relationship between solutions of equations/ inequalities and their graphical representations.	solutions based on the context of real-world problems from graphs of equations/ inequalities and systems of equations/ inequalities. ● Use the properties of mathematics to solve linear and quadratic equations/inequalities and systems of those equations/inequalities.	generate equivalent, simplified numerical expressions using the properties of exponents. (8.A.1) ○ Connect to combining like terms and simplifying expressions using the distributive property (6.EE.3) ○ Connect to creating and solving equations in one variable. (7.EE.4) ○ Connect to reasoning with inequalities. (7.EE.4) ○ Connect to solving real world problems involving two linear equations in two variables. (8.EE.8) ● 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: ○ Desmos graphing calculator ○ Algebra tiles ○ Graphic Organizers ○ Sketch graph ○ Create table of values

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?	For example, students may benefit from re-engaging with content during a unit on writing expressions in equivalent forms to solve problems by critiquing student approaches/solutions to make connections through a short mini-lesson because there are a variety of ways to solve problems and looking at the ways that other students are solving the problems can help the students to make connections between their preferred methods and another that could help them become more efficient at solving similar problems in the future.
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 writing expressions in equivalent forms to solve problems by offering opportunities to understand and explore different strategies because different strategies of looking at the equivalent forms are more efficient for certain tasks and exploring when it is most appropriate to use a particular form will help them become more flexible in their problem-solving skills.

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?	Some learners may benefit from an extension addressing writing expressions in equivalent forms to solve problems because some students will pick up on the technical mechanics of a particular technique quickly. Having them go more deeply into why it works will help them gain a better understanding of the overall intricacies of the method. For example, factoring using a variety of methods, like factoring by grouping and how it relates to factoring a traditional trinomial into two binomials.