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

- Investigate patterns of association in bivariate data.
  - 8.SP.A.1
  - 8.SP.A.2
  - 8.SP.A.3
  - 8.SP.A.4

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Grade	CCSS Domain	CCSS Cluster
8	**STATISTICS & PROBABILITY**	**Investigate patterns of association in bivariate data.**

📋 Cluster Standard: 8.SP.A.1

Standard	Standards for Mathematical Practice
Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	● **SMP 2:** Reason abstractly and quantitatively. ● **SMP 4**: Model with mathematics. ● **SMP 5**: Use appropriate tools strategically.

Clarification Statement	Students Who Demonstrate Understanding Can...
● Students construct scatter plots and interpret patterns focusing on linear association. They construct two-way tables and interpret relationships using relative frequencies.	● Construct a Scatter Plot using two sets of quantitative data. ● Identify outliers and clusters in a scatter plot. ● Determine if there is a linear or nonlinear association in a scatter plot; determine if a linear association is positive or negative. ● Explain what the different patterns mean in different contexts. ● Describe the patterns and associations they see between two quantities.

DOK	Blooms
1-2	Apply

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Grade	CCSS Domain	CCSS Cluster
8	**STATISTICS & PROBABILITY**	**Investigate patterns of association in bivariate data.**

📋 Cluster Standard: 8.SP.A.2

Standard	Standards for Mathematical Practice
Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	● **SMP 3:** Construct viable arguments and critique the reasoning of others.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
● Students construct scatter plots and interpret patterns focusing on linear association. They construct two-way tables and interpret relationships using relative frequencies.	● Construct a trend line and justify its placement among the data. ● Model real-world linear relationships on a graph. ● Use a trend line to determine whether a set of paired data has a linear association, nonlinear association or no association. ● Determine whether the association is positive or negative, strong or weak. ● Justify a fit line is a good fit or not. ● Explain orally and/or inwriting the meaning of the fit line and
DOK	**Blooms**
1-2	Apply

Grade	CCSS Domain	CCSS Cluster
8	**STATISTICS & PROBABILITY**	**Investigate patterns of association in bivariate data.**

📋 Cluster Standard: 8.SP.A.3

Standard	Standards for Mathematical Practice
Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	● **SMP 2**: Reason abstractly and quantitatively. ● **SMP 6:** Attend to precision.

Clarification Statement	Students Who Demonstrate Understanding Can...
● Students construct scatter plots and interpret patterns focusing on linear association. They construct two-way tables and interpret relationships using relative frequencies.	● Use linear models to make predictions from data in a scatterplot (trend line) in context. ● Interpret the slope and intercept for the context. ● Write the linear equation. ● Analyze and interpret the meaning of the slope and y- intercept in a linear model from data in a scatterplot. ● Make predictions from the line.

DOK	Blooms
1-3	Apply, Analyze

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Grade	CCSS Domain	CCSS Cluster
8	**STATISTICS & PROBABILITY**	**Investigate patterns of association in bivariate data.**

📋 **Cluster Standard: 8.SP.A.4**

Standard	Standards for Mathematical Practice
Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	● **SMP 1**: Make sense of problems and persevere in solving them. ● **SMP 2:** Reason abstractly and quantitatively. ● **SMP 3:** Construct viable arguments and critique the reasoning of others. ● **SMP 4**: Model with mathematics. ● **SMP 6:** Attend to precision. ● **SMP 8:** Look for and express regularity in repeated reasoning.
Clarification Statement	**Students Who Demonstrate Understanding Can...**
● Students construct scatter plots and interpret patterns focusing on linear association. They construct two-way tables and interpret relationships using relative frequencies.	● Create two-way frequency tables to display data. ● Collect categorical data on two variables ● Analyze and interpret the data in two-way frequency tables. ● Calculate relative frequencies and describe possible associations between the variables.
DOK	**Blooms**
2-4	Apply Create

Common Misconceptions

● Students may make the error of not reading the plot from left to right; students may interpret a roughly linear relationship as only being shown with data points that fall directly on a line.
● Sometimes when a scatter plot shows no association, students may struggle so they need examples of data that may have no association (length of a person's hair and his or her final grade in mathematics).

- Students may struggle with numbering the axes so that the data is visible, but not misleading.
- Students often think that a line of fit must go through at least some of the data points on the scatter plot.

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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: **Statistics & Probability**	Strand: **Investigate patterns of association in bivariate data**

Suggested Student Discourse Questions

- How could you use (a student's name) strategy to check to make sure your solution is reasonable?
- How can we use the equation of the line of best fit to make a prediction about the data?

- What two types of data in real life will show positive correlation? Negative correlation? No correlation?
- Does the amount of data we collect have an impact on the correlation?
- Does correlation imply causation?

ASSESSMENT GUIDE

- Investigate patterns of association in bivariate data

Grade	*CCSS Domain*	*CCSS Strand*
8	**STATISTICS & PROBABILITY**	**Investigate patterns of association in bivariate data.**

Sample Task #1 (Constructed Response)
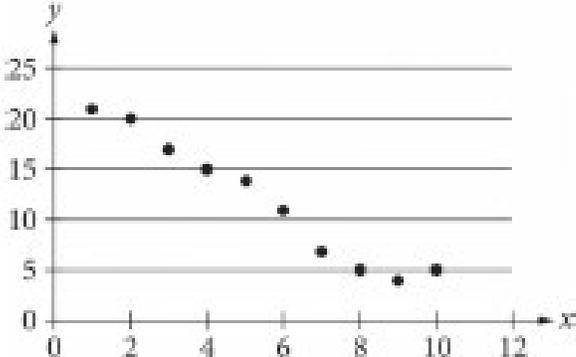
Which of the following could be an equation of a line of best fit for the data shown in the scatterplot? Explain

Sample Task #2 (Multiple Choice)

Albert works in a store that sells T-shirts. He made this graph to show the relationship between the number of customers that come into the store each day and the number of T-shirts the store sells each day.

T-Shirt Sales
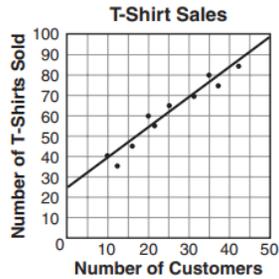
Based on the graph, about how many T-shirts would be sold on a day when 100 customers come into the store?

Ⓐ 150

Ⓑ 175

Ⓒ 200

Ⓓ 225

MLSS AND CLR GUIDE
● Investigate patterns of association in bivariate data

CCSS Domain	CCSS Cluster
Statistics and Probability	**Investigate patterns of association in bivariate data**

Culturally and Linguistically Responsive Instruction	
Relevance to Families and Communities	During a unit focused on studying patterns of association in bivariate data, 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, having students survey their families, bring back the data and share with the class. The class can then create a two-way frequency table and a scatter plot that represents their data and the classroom's data. They can use the data to see if there is a correlation between their data and the classroom data. (Height and shoe size).
Cross-Curricular Connections	● **Science:** Students can conduct experiments in connection with NGSS science standards, collect bivariate data, represent that data in a two-way table, and hypothesize correlations between the two variables. ● **Social Studies**: Study trends in overtime such as populations, the stock market or gross domestic product.
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*	● Task: When planning with your HQIM, consider how to modify tasks to represent the prior experiences, culture, language and interests of your students to "portray mathematics as useful and important in students' lives and promote students' lived experiences as important in mathematics class." Tasks can also be designed to "promote social justice [to] engage students in using mathematics to understand and eradicate social inequities (Gutstein 2006)." For example, when studying patterns of association in bivariate data the types of mathematical tasks are critical because all students need to make connections to mathematics to make it relevant to them. Teachers can build/bridge various cultures and linguistics behaviors by creating tasks where students collect data that is relevant to them. When students display their data in tables and scatter plots, they can analyze the data and study trends that they relate to their personal lives.

	school mathematics to support students in 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*
● In 5th and 6th grade, students learn to plot points in a coordinate grid.	● In 8th grade, students are able to construct an equation or a function to model a linear relationship and determine/interpret the slope and y-intercept (seen in standards **8.EE.B and 8.F.B)**	● In future courses, students compute and interpret the correlation coefficient and distinguish between correlation and causation. Students will represent two variables on a scatter plot and describe how they are related. They construct, interpret, and summarize data in a two-way table

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?*	For example, some learners may benefit from targeted pre-teaching that previews new contexts for tasks within the unit when studying patterns of association in bivariate data because students can oftentimes express patterns in data when presented in context versus presented as a scatter plot with an equation. Students can generalize about relationships between categorical data based on experiences and context from their lives prior to introducing the mathematical practices associated with forming these generalizations.
Intensive	*What critical understandings will prepare students to*	*5.G.A.2: This standard provides a foundation for work with interpreting values of points in the context of a*

	access the mathematics for this cluster?	situation to develop the recognition of patterns between data and scatter plot representations and two-way tables because students interpret real word 4 problems and produce a graph based on information gathered from the problem. This learning is essential when it comes to developing awareness of how real-world information is represented visually and how visual representations relate to each other. 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

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 patterns of association in bivariate data by examining tasks from a different perspective through a short mini-lesson because interpretation of data, especially using straight lines to model relationships, leaves room for discussion amongst peers for how a student arrives at a particular conclusion. If students are struggling with drawing conclusions, hearing examples and seeing peers model their thinking may help alleviate misconceptions.
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 of recognizing patterns of association in bivariate data by addressing conceptual understanding because many scaffolded skills produce mastery of this cluster. Students need to be able to construct and interpret a scatter plot, describe relationships using statistical jargon, assess model fit, use and interpret equations and read and construct two-way tables. By addressing conceptual understanding of each of these skills, misconceptions can be revealed.

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?	For example, some learners may benefit from an extension such as open-ended tasks linking multiple disciplines when studying patterns of association in

	bivariate data because data collection is heavily supported in 8th grade Science. Instead of being given a two-way table, students can conduct experiments in connection with NGSS science standards, collect bivariate data, represent that data in a two-way table, and hypothesize correlations between the two variables.