NORTH DAKOTA DEPARTMENT OF
PUBLIC INSTRUCTION

2023 Math Attributes and 2017 Mathematical Practices

The mathematical attributes identified in the 2023 North Dakota Mathematics K-12 Standards will assist learners in solving authentic math problems while connecting concepts, providing evidence explaining the reasoning and efficiency of strategies used, and proving the accuracy of solutions. The three attributes align with the Mathematical Practices identified in the 2017 North Dakota Mathematics K-12 Standards. The attributes used in the 2023 North Dakota Mathematics K-12 Standards were identified within the 2022 North Dakota Learning Continuum. The charts below show this alignment and identify concepts contained within the attributes.

Math Attribute: Problem-Solving

Practices Aligned	Concepts Included
Math Practice 1: Make sense of problems and persevere. **Math Practice 6**: Attend to Precision.	• Interpret the meaning of problems. • Determine starting point. • Analyze the information given. • Plan a solution pathway. • View the overall process of the problem and attend to details. • Identify important quantities to examine in relationships. • Identify relationships between various presentations of information. • Monitor progress and make changes in approach as needed. • Ask - “Does this make sense?” • Label quantities appropriately. • Express numerical answers accurately. • Calculate efficiently and accurately. • Identify relevant resources to pose and solve problems.

Math Attribute: Connections

Practices Aligned	Concepts Included
Math Practice 5: Use Appropriate tools strategically. **Math Practice 7**: Look for and make use of structure. **Math Practice 8**: Look for and express regularity in repeated reasoning.	• Relate current situations to concepts or skills previously learned. • Connect mathematical ideas to one another. • Apply general mathematical rules to specific situations. • Look for structure and patterns. • View complicated things as single objects or a composition of several objects. • Look for generalizations or shortcuts within repeated calculations. • Understand the broader application of patterns. • See structure in similar situations. • Apply math to solve everyday problems. • Use estimation and other mathematical knowledge to detect errors. • Use technology tools to deepen mathematical understanding. • Use mathematical models to visualize and analyze information.

NORTH DAKOTA DEPARTMENT OF
PUBLIC INSTRUCTION

Math Attribute: Reasoning and Proof

Practices Aligned	Concepts Included
Math Practice 2: Reason abstractly and quantitatively. **Math Practice 3**: Construct viable arguments and critique the reasoning of others. **Math Practice 4**: Model with Mathematics	• Make sense of quantities and their relationship. • Decontextualize (represent symbolically) and contextualize (understand symbol meaning). • Create logical representations of problems. • Understand the meaning of quantities. • Analyze problems using mathematical assumptions, definitions, and arguments. • Justify conclusions with mathematical ideas. • Listen to others' arguments. • Ask questions to determine if arguments make sense. • Suggest ideas to improve/revise arguments. • Communicate precisely to others. • Use clear mathematical language when discussing reasoning. • Understand the meanings of mathematical symbols. • Compare two arguments to discover and correct flawed logic. • Evaluate the reasonableness of results. • Simplify complex problems. • Ask - "How can I represent this mathematically?"

References:

McCallum, William (2011). *Grouping the Standards.* The University of Arizona. Retrieved May 15, 2023, from Math Practice Standards: Classroom Evidence

North Dakota Learning Continuum | North Dakota Department of Public Instruction. (2022, Summer). North Dakota Department of Public Instruction | Retrieved March 8, 2023 from ND Learning Continuum v9 (003).pdf

Wichita Public Schools Math Department (May 2016). *Implementing Standards for Mathematical Practices*. Retrieved May 15, 2023, from Implementing Standards for Mathematical Practices (achievethecore.org)