Grand Island Public Schools
K-12 Mathematics Program Curriculum Framework

Strand 1: Communicating Mathematical Thinking		
K-12 Program Strands & Curriculum Standards	**K-12 Program Enduring Understandings**	**K-12 Program Essential Questions**
1.1 Problem Solving Build new mathematical knowledge through problem solving Apply and adapt a variety of appropriate strategies to solve problems	Enduring Understandings are related to the mathematical content of Strands 2-5. Using the Essential Questions from strand 1 fosters mathematical thinking so that students build understanding of the mathematical content.	**Problem Solving** • What do I see/visualize when I look at this problem? • What information do I have? What information do I need? How do I get that information? • What strategy do I use to solve the problem? What strategies do others use? What strategy is best? • What do I do when I get stuck? • What common mistakes do people make when working with this type of problem? What is the misunderstanding that causes the mistake?
1.2 Connections Recognize and use connections among mathematical ideas and/or apply in contexts outside of mathematics		**Connections** • Have I seen this before? How does that connection help? • Where do I recognize and apply mathematics in my life?
1.3 Reasoning and Proof Investigate, develop, and evaluate mathematical arguments and proofs		**Reasoning and Proof** • Does my answer/solution make sense? How do I prove it? • Is there a pattern/rule? What is it? Does it always work?
1.4 Representation Select, apply, and move fluently among mathematical representations to solve problems.		**Representation** • How do I best show my thinking?

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<tr><th colspan="3">Strand 2: Number and Operations</th></tr>
<tr><th>K-12 Program Strands
& Curriculum Standards</th><th>K-12 Program
Enduring Understandings</th><th>K-12 Program
Essential Questions</th></tr>
<tr><td>2.1 Number Sense
Recognize that a variety of numerical representation can be used to describe quantitative relationships</td><td>• Abstraction is what makes mathematics work: conceptual understanding significantly impacts the efficiency and effectiveness of problem solving.
• Numerical representations can be used to describe quantitative relationships.
• The type of representation used depends upon the nature of the question to be answered.</td><td rowspan="3">Communicating Mathematical Thinking
• What do I see/visualize when I look at this problem?
• What strategy did I decide to use to solve the problem? What strategies did other students use? What strategy is most efficient?
• What do I do when I get stuck?
• Does my answer/solution make sense? How do I prove it?
• How do I best show my thinking?
• What information do I have? What information do I need? How do I get that information?
• Have I seen this before? How does that connection help?
• What common mistakes do people make when working with this type of problem? What is the misunderstanding that causes the mistake?
• Is there a pattern/rule? What is it? Does it always work?
• Where do I recognize and apply mathematics in my life?</td></tr>
<tr><td>2.2 Numerical Relationships
Use numbers and their properties to compute flexibly and fluently</td><td>• The problem in front of you is a member of a family of problems.
• The ability to express the relationship amongst sets of numbers provides the foundations for the rules that govern arithmetic and algebra.</td></tr>
<tr><td>2.3 Estimation
Use estimation skills to solve problems and check the reasonableness of solutions</td><td>• Estimating the answer to a problem helps mathematicians predict the reasonableness of a solution.</td></tr>
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Strand 3: Algebraic Concepts		
K-12 Program Strands & Curriculum Standards	**K-12 Program Enduring Understandings**	**K-12 Program Essential Questions**
3.1 Patterns Recognize, create, and extend patterns from real-world, geometric, graphical, and numeric situations	• Algebraic representations generalize patterns and relationships that help solve specific problems.	**Communicating Mathematical Thinking** • What do I see/visualize when I look at this problem? • What strategy did I decide to use to solve the problem? What strategies did other students use? What strategy is most efficient? • What do I do when I get stuck? • Does my answer/solution make sense? How do I prove it? • How do I best show my thinking? • What information do I have? What information do I need? How do I get that information? • Have I seen this before? How does that connection help? • What common mistakes do people make when working with this type of problem? What is the misunderstanding that causes the mistake? • Is there a pattern/rule? What is it? Does it always work? • Where do I recognize and apply mathematics in my life?
3.2 Algebraic Relationships Express mathematical relationships verbally, symbolically, graphically, & as tables of values	• Mathematicians communicate through words, numbers, graphs and symbols, moving fluently from one representation to another as the situation requires.	
3.3 Algebraic Applications Use algebraic representations to solve problems, make predictions, draw conclusions, with and without technology	• Mathematicians formulate equations or functional relationships to communicate generalizations (general patters, rules and connections to prior concepts that are at the core of the problem) so that specific problems can be solved more efficiently.	
3.4 Functions Perform operations on and make generalizations about functions.	• Functions and relations help us formulate potential solutions for real-life problems involving two variables.	

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Strand 4: Geometry, Spatial Concepts, & Measurement		
K-12 Program Strands & Curriculum Standards	**K-12 Program Enduring Understandings**	**K-12 Program Essential Questions**
4.1 Geometric Figures Understand geometric figure and their properties	• The language of geometry allows us to communicate in a precise and efficient manner.	**Communicating Mathematical Thinking** • What do I see/visualize when I look at this problem? • What strategy did I decide to use to solve the problem? What strategies did other students use? What strategy is most efficient? • What do I do when I get stuck? • Does my answer/solution make sense? How do I prove it? • How do I best show my thinking? • What information do I have? What information do I need? How do I get that information? • Have I seen this before? How does that connection help? • What common mistakes do people make when working with this type of problem? What is the misunderstanding that causes the mistake? • Is there a pattern/rule? What is it? Does it always work? • Where do I recognize and apply mathematics in my life?
4.2 Geometric Relationships Understand the relationship of geometric figures	• Relationships exist among the angles, sides, lengths, perimeters, areas and volumes of geometric figures. • The properties of geometric figures determine the construction of man-made objects and explains the structure of objects found in nature.	
4.3 Geometric Applications Solve problems involving geometric figures/objects	• Geometric figures can change size and/or position while maintaining proportional attributes.	
4.4 Measurement Process and Use Use measurements in a variety of settings	• Standard units of measure allow us to describe objects, interpret events and make comparisons in a way that can be universally understood.	
4.5 Measurement Applications Solve problems involving measurement	• What we measure influences how we measure. • The best mathematical solution is not always the most functional solution in the real world.	

Strand 5: Data Analysis, Probability, & Statistics		
K-12 Program Strands & Curriculum Standards	**K-12 Program Enduring Understandings**	**K-12 Program Essential Questions**
5.1 Data Organization Collect, organize, and display data using appropriate statistical and graphical methods	• The design of the questions has a significant impact on the collection of data and the validity of the results. • Choices in data collection (sampling being used and strategy for how to collect it) affect their validity, interpretation and use.	**Communicating Mathematical Thinking** • What do I see/visualize when I look at this problem? • What strategy did I decide to use to solve the problem? What strategies did other students use? What strategy is most efficient? • What do I do when I get stuck? • Does my answer/solution make sense? How do I prove it? • How do I best show my thinking? • What information do I have? What information do I need? How do I get that information? • Have I seen this before? How does that connection help? • What common mistakes do people make when working with this type of problem? What is the misunderstanding that causes the mistake? • Is there a pattern/rule? What is it? Does it always work? • Where do I recognize and apply mathematics in my life?
5.2 Data Analysis Analyze data sets to form hypotheses and make predictions	• Data illustrate relationships so inferences and predictions can be made and actions can be taken. • Organization of data creates context so that what seems random may be quite predictable.	
5.3 Probability Understand and apply basic concepts of probability	• The probability of an event occurring can be described numerically and used to make predictions about other events.	